UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioners,

v.

HANNIBAL IP LLC,
Patent Owner.

U.S. Patent No. 11,368,911
Case No. IPR2025-01189

DECLARATION OF FRIEDHELM RODERMUND IN SUPPORT OF PETITIONS FOR *INTER PARTES* REVIEW OF U.S. PATENT NOS. 11,368,911

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I, Friedhelm Rodermund, do hereby declare as follows:

I. INTRODUCTION AND ENGAGEMENT

1. I have been retained in this matter by the Petitioners to provide testimony regarding the standard business practices of 3rd Generation Partnership Project ("3GPP") for record keeping and publishing technical specifications, change request proposals, reports, and other documents developed during the course of standards activities carried out by 3GPP and the European Telecommunications Standards Institute ("ETSI").

2. I have been asked to provide my opinions regarding the authenticity and dates of public accessibility of the following 3GPP documents:

- TDoc R1-1903016, which represents a 3GPP document with the title "Potential Techniques for UE Power Saving" (hereinafter "R1-1903016") (Ex. 1008)
- TDoc R1-1905031, which represents a 3GPP document with the title "PDCCH-based power saving channel design" (hereinafter "R1-1905031") (Ex. 1007)
- TDoc R1-1904738, which represents a 3GPP document with the title "Discussion on power saving signal triggering UE adaptation" (hereinafter "R1-1904738") (Ex. 1013)

- TDoc R1-1905384, which represents a 3GPP document with the title "PDCCH-based power saving signal/channel" (hereinafter "R1-1905384") (Ex. 1014)
- TDoc R1-1905466, which represents a 3GPP document with the title "Design of PDCCH-based power saving signal/channel" (hereinafter "R1-1905466") (Ex. 1015)
- TDoc RP-190727, which represents a 3GPP document with the title "New WID: UE Power Saving in NR" (hereinafter "RP-190727") (Ex. 1016)
- 3GPP TS 36.321 V15.4.0 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 15)") (hereinafter "TS 36.321 V15.4.0") (Ex. 1010)
- 3GPP TS 38.300 V15.5.0 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2 (Release 15)" (hereinafter "TS 38.300 V15.5.0") (Ex. 1011)
- 3GPP TS 38.331 V15.4.0 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio

Resource Control (RRC) protocol specification; Stage 2 (Release 15)" (hereinafter "TS 38.331 V15.4.0") (Ex. 1012)

- 3GPP TS 36.211 V14.9.0 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 14)" (hereinafter "TS 36.211 V14.9.0") (Ex. 1020)
- 3GPP TS 38.211 V15.4.0 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation (Release 15)" (hereinafter "TS 38.211 V15.4.0") (Ex. 1021)
- 3GPP TS 38.321 V15.4.0 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol specification (Release 15)") (hereinafter "TS 38.321 V15.4.0") (Ex. 1022)
- Version 15.4.0 of technical specification 3GPP TS 36.331 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 15)") (hereinafter "TS 36.331 V15.4.0", Ex. 1025)

3. As an ETSI Project Manager and Secretary, from June 1998 to December 2004, I have personal knowledge of 3GPP's standard business and records keeping practices. I continued following 3GPP's work ever since. Thus, based on my experience, personal knowledge, and review of 3GPP's business records, I am able to testify regarding the authenticity of certain documents published by 3GPP and the timing of their publication.

4. I am being compensated for my time spent on this matter at my usual rate of €500 per hour. My fee is not contingent on the outcome of this or any matter, or on the content of any of the testimony I give in this declaration. I have no financial interest in the Petitioner.

5. I have been informed that Hannibal IP, LLC ("Hannibal" or "Patent Owner") is the current assignee of U.S. Patent No. 11,368,911 ("the '911 Patent"). I have no financial interest in the Patent Owner or the '911 Patent.

6. In forming my opinions, I have considered the cited exhibits, including the exhibits identified in Appendix B, and my academic and professional training and experience in the field of wireless communications and standards development as described herein.

II. BACKGROUND AND QUALIFICATIONS

7. I have more than 25 years of experience working with standards development organizations including 3GPP, ETSI, and the Open Mobile Alliance

("OMA"). I have particular experience with the development of standards related to cellular telecommunications, including the standards for the Universal Mobile Telecommunications System ("UMTS"), Long Term Evolution ("LTE"), and 5G, which are all standards developed by the 3GPP.

8. I attended the University of Technology Aachen in Aachen, Germany, where I performed graduate studies in Electrical Engineering with a focus on telecommunications technologies ("Dipl.-Ing. TH" degree). I also attended the University of Technology Trondheim in Trondheim, Norway, and completed my Diploma thesis, "Design of a dual processor computer for digital signal processing in power electronics," in 1993.

9. From December 1993 to June 1998, I worked at Mannesmann Mobilfunk as a System Engineer and Project Manager in Quality Assurance and Technical Standards. One of my responsibilities was to ensure by managing and performing related test activities that cellular network equipment was compatible with the Global System for Mobile Communications ("GSM") standard developed by ETSI. During that time, I also started working as a standards delegate. I attended my first ETSI meeting in 1996 (although I was already following ETSI developments from 1992 during my studies).

10. From June 1998 to December 2004, I worked at ETSI as a project manager for various ETSI Special Mobile Group ("SMG") and 3GPP working

groups. First, I served as a secretary of SMG4 "Data Services" and SMG8 "Base Stations Testing." Then, as a project manager with the ETSI Mobile Competence Center ("MCC"), I supported establishing 3GPP as the new international standards development organization for cellular telecommunications. One of my roles was acting as Secretary for 3GPP's Technical Specifications Group Terminals, Working Group ("T2"), the group which played a leading role in the creation of standards for Multimedia such as the Multimedia Messaging Service ("MMS").

11. Later, I was a secretary of the highest-level Technical Specifications Group Terminals which was besides other things responsible for the development of test specifications including tests for the radio interface.

12. I edited all technical specifications produced by my working groups and presented results to the parent body for approval. I attended all meetings (apart from some sub-working group meetings) and was also responsible for compiling meeting reports, for handling all the meeting documents, and managing the work plan. It was also my role to guide the groups and to advise the chairmen regarding 3GPP working methods and procedures including document handling, and to make sure delegates were aware of their company's obligations under the 3GPP Intellectual Property Rights policy.

13. As part of my responsibilities at ETSI, I acted as a 3GPP custodian of records by personally managing 3GPP's public File Transfer Protocol (FTP) folders,

which I used to make publicly accessible various 3GPP documents, including versions of 3GPP specifications, technical reports, liaison statements, change requests, contributions, agendas, meeting reports, and other 3GPP documents from my working groups. I am also knowledgeable about document management practices used in other working groups and within 3GPP in general with regard to making documents publicly accessible through the same public FTP server of 3GPP.

14. Since I left ETSI as a staff member in 2005, I have been continuously involved in standardization activities, including with OMA, ETSI, and 3GPP. Since 2017, I also have been attending the ETSI Intellectual Property Rights ("IPR") Special Committee, which is responsible for the maintenance of the ETSI IPR Policy.

15. After I left ETSI, I worked from January 2005 to October 2014 at Vodafone, first as a Project Manager for Mobile Broadcast Standards, and then as Vice Chairman of the Device Management working group of the Open Mobile Alliance, and then as a Senior Standards Strategist, all with responsibilities as described on my curriculum vitae. At Vodafone, I was deeply involved in standards work with ETSI and 3GPP and other standards setting organizations, including as a delegate to 3GPP SA1 "Services." As part of my responsibilities, I attended selected 3GPP meetings, submitted documents to 3GPP, used 3GPP resources (including 3GPP's FTP server) extensively, and remained knowledgeable about 3GPP policies

and procedures with regard to document management and public accessibility. I was also involved in the creation of patents, defense activities related to patent litigations, and patent evaluation, mostly in the context of standards development.

16. Since leaving Vodafone in 2014, I have performed consulting work regarding Internet of Things (IoT) and Machine to Machine (M2M) technology and standards, first at Friedhelm Rodermund Consulting and then as the Founder and Director of IOTECC GmbH. In connection with my work, I regularly deal with standards such as OMA's Lightweight M2M (LwM2M) and 3GPP's LTE, Narrowband IoT (NB-IoT) and 5G standards. And I have extensively used 3GPP resources and have remained knowledgeable about 3GPP policies and procedures with regard to document management and public accessibility.

17. I also provide consulting services related to patents, in particular around 3GPP Standard Essential Patents ("SEPs"), and I have worked as an expert witness on a number of occasions. I continue to closely follow the maintenance of the ETSI IPR Policy as a delegate to the ETSI IPR Special Committee. Furthermore, I am conducting a seminar on SEPs and the Internet of Things at the Technical University of Ilmenau, Germany.

18. At the time of writing this declaration, I am following – including attending selected meetings – the following standards committees: ETSI oneM2M, ETSI IPR Special Committee, OMA, and 3GPP.

19. A copy of my curriculum vitae, which includes a detailed description of my experience and education, is attached as Appendix A. A list of litigation matters on which I have worked over the last five years is also included in my curriculum vitae.

III. SUMMARY OF MY OPINIONS

20. It is my opinion that Ex. 1008 is an authentic copy of 3GPP T-doc R1-1903016 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by February 16, 2019, at the latest.

21. It is my opinion that Ex. 1007 is an authentic copy of 3GPP T-doc R1-1905031 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by April 3, 2019, at the latest.

22. It is my opinion that Ex. 1013 is an authentic copy of 3GPP T-doc R1-1904738 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by April 2, 2019, at the latest.

23. It is my opinion that Ex. 1014 is an authentic copy of 3GPP T-doc R1-1905384 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by April 2, 2019, at the latest.

24. It is my opinion that Ex. 1015 is an authentic copy of 3GPP T-doc R1-1905466 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by April 3, 2019, at the latest.

25. It is my opinion that Ex. 1016 is an authentic copy of 3GPP T-doc RP-190727 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by March 21, 2019, at the latest.

26. It is my opinion that Ex. 1010 is an authentic copy of 3GPP TS 36.321 V15.4.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by January 13, 2019.

27. It is my opinion that Ex. 1011 is an authentic copy of 3GPP TS 38.300 V15.5.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by April 9, 2019.

28. It is my opinion that Ex. 1012 is an authentic copy of 3GPP TS 38.331 V15.4.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by January 14, 2019.

29. It is my opinion that Ex. 1020 is an authentic copy of 3GPP TS 36.211 V14.9.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by January 11, 2019.

30. It is my opinion that Ex. 1021 is an authentic copy of 3GPP TS 38.211 V15.4.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by January 16, 2019.

31. It is my opinion that Ex. 1022 is an authentic copy of 3GPP TS 38.321 V15.4.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by January 11, 2019.

32. It is my opinion that Ex. 1025 is an authentic copy of 3GPP TS 36.331 V15.4.0 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by February 19, 2019.

IV. PUBLICATION OF 3GPP SPECIFICATIONS AND RELATED DOCUMENTS

A. General Practices

33. Unless otherwise noted, the foregoing and following is an accurate description of 3GPP general practices from 1998 to the present, including in 2019, regardless of whether I use the present or past tense to describe those practices.

34. 3GPP was established in 1998 by a group of telecommunications standard development organizations from Japan, Korea, China, Europe, and the United States to jointly develop worldwide standards for mobile telecommunications. Today, 3GPP consists of seven partners: Association of Radio Industries and Businesses, Japan ("ARIB"), Alliance for Telecommunications Industry Solutions, USA ("ATIS"), China Communications Standards Association

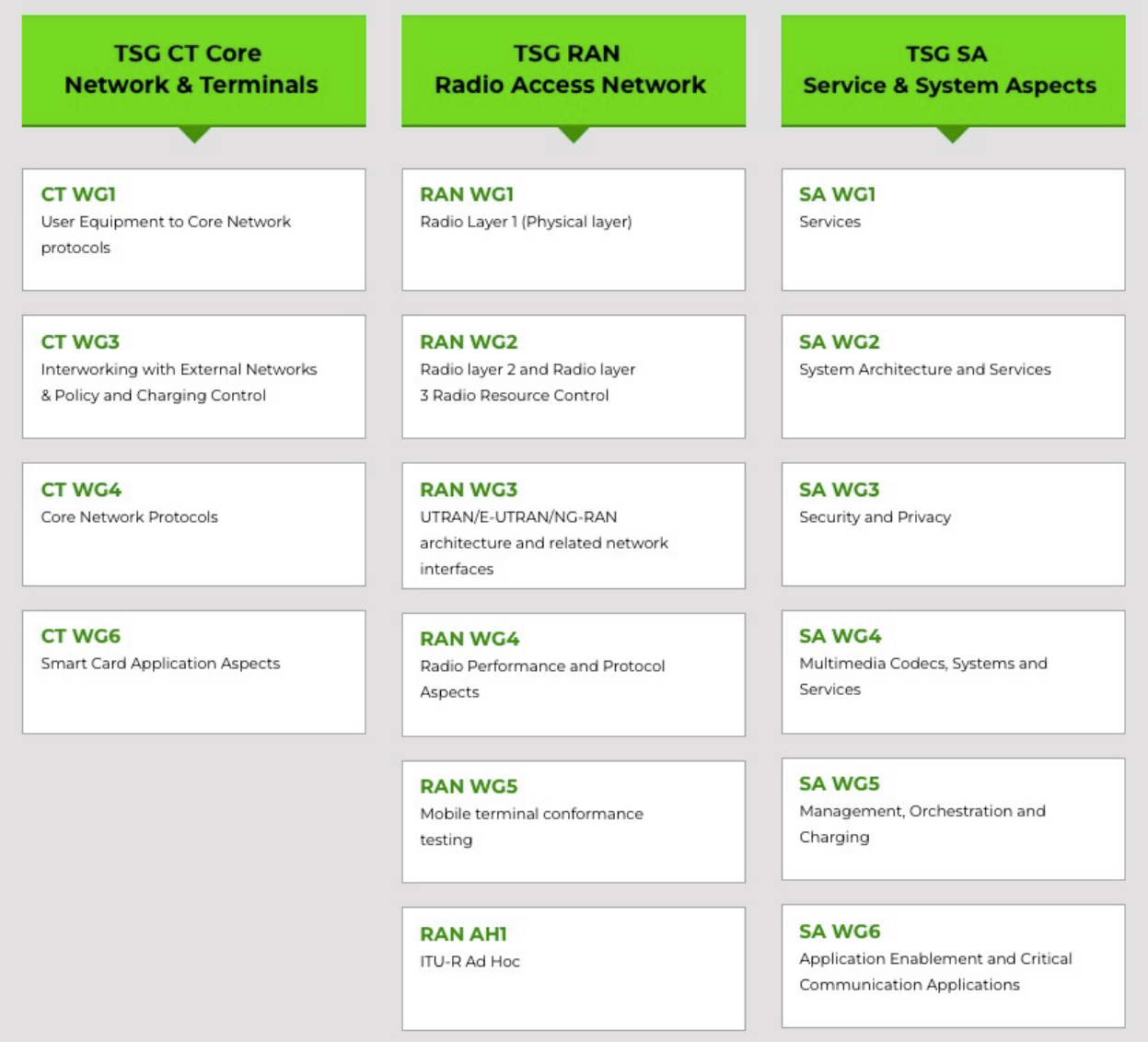
("CCSA"), European Telecommunications Standards Institute ("ETSI"), Telecommunications Standards Development Society, India ("TSDSI"), Telecommunications Technology Association, Korea ("TTA"), and Telecommunication Technology Committee, Japan ("TTC"). In addition to being one of the founding partners, ETSI hosts the Mobile Competence Centre ("MCC"), which provides administrative and technical support for the day-to-day work of 3GPP. Furthermore, ETSI manages 3GPP's IT services such as the 3GPP website, FTP server, and email exploders.

35. 3GPP is the world's leading organization for developing and maintaining cellular telecommunications standards, which it has done since its foundation in 1998. As noted above and in my curriculum vitae, I began working for 3GPP, as part of my work at ETSI, the European-based organizational partner of 3GPP.

36. In the ordinary course of its regularly conducted business activities, and pursuant to its standard business practices, 3GPP publishes technical specifications, proposals, reports, and other documents related to the development of cellular telecommunications standards. Such documents are published for the purposes of discussion and establishment of industry standards for cellular telecommunications. This has been 3GPP's ordinary course of business since when I began working at ETSI in 1998.

37. In the ordinary course of 3GPP's regularly conducted business activities, and pursuant to its standard business practices, all draft technical specifications, proposals, reports, and other temporary documents to be discussed or considered in relation to 3GPP's telecommunications standards activities were, and continue to be, assigned a temporary document number and made publicly available, including on the FTP server associated with the 3GPP website, currently residing at ftp.3gpp.org. Such documents are referred to as "TDocs." Final versions of the technical specifications also were, and continue to be, publicly available from that same FTP server.

38. The names and the structure of 3GPP working groups, as of today, can be found at https://www.3gpp.org/3gpp-groups (reproduced below):



39. Each Technical Specification Group (TSG) or Working Group adopts a structured numbering system for the documents associated with their meetings, and those systems typically follow a consistent numbering system as shown in the following example: xminnzzzz. The numbering system normally comprises five logical elements: (1) x: a single letter corresponding to the TSG; wherein in 2019 x was one of R (Radio Access Network), C (Core and Terminals), or S (Service and

System Aspects); (2) m: a single character corresponding to the Working Group identity (typically 1, 2, 3, etc.) or, in the case of the TSG itself, the letter "P"; (3) i: normally the hyphen character "-"; (4) nn: the calendar year of the meeting to which the document was submitted; and (5) zzzz: a running number (some working groups use 5 digits).

40. In the ordinary course of 3GPP's regularly conducted business activities, and pursuant to its standard business practices, from December 1998 onwards, 3GPP published all of its TDocs and all final versions of its technical specifications on its FTP server, which has always been easily and publicly accessible from its website and currently resides at ftp.3gpp.org.

41. As early as December 1998, including in 2019, 3GPP's FTP server was freely accessible to the general public with no login, password, or membership requirement.

42. By 1999, at least 100 companies were members of 3GPP (719 companies by December 2020), ranging from Bosch to Ericsson to Nokia to Samsung and generally including those interested in the discussion, creation, and adoption of cellular telecommunications standards, including UMTS. Each of these companies typically delegated multiple individuals to regularly participate in 3GPP meetings. Further, pursuant to 3GPP's standard business practices, 3GPP working groups sent emails notifying these individuals as soon as new or additional

documents had been uploaded to 3GPP's FTP server. Thus, not only did the general public have access to the documents on the FTP server, but some of the most interested members of the public—those working to develop standards for cellular telecommunication or working to implement the standards—were personally informed of their availability by email.

43. Based on my experience with 3GPP and the telecommunications industry, I would expect any person implementing a cellular network or device, e.g., an LTE or 5G network, to consult the corresponding specifications on the 3GPP FTP server, as well as other related documents. The whole purpose of 3GPP creating and making these specifications available was so that engineers and other individuals would have ready access to them when developing and implementing cellular networks and devices.

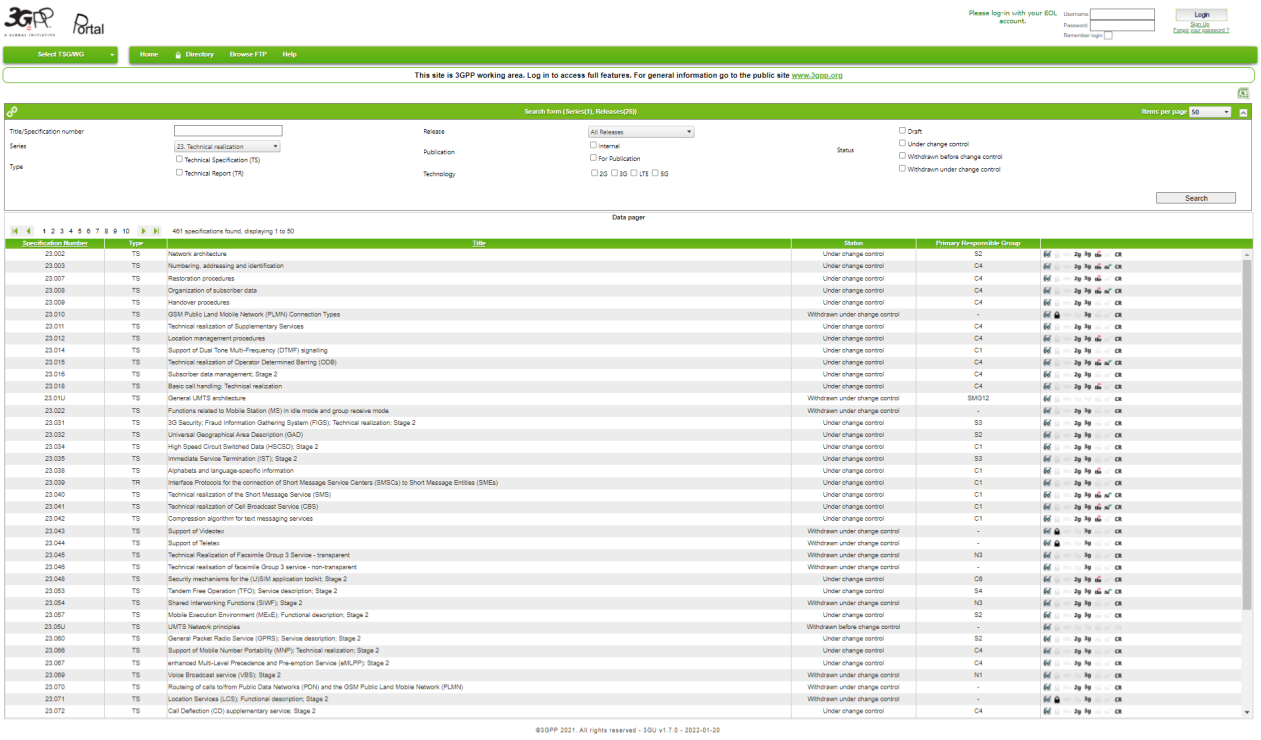
44. Since 3GPP was created, its FTP server was well-known to persons in the cellular telecommunications industry as a source of public information regarding industry standards and technological advances.

45. 3GPP specifications bear a specification number consisting of four or five digits, e.g., 09.02 or 29.002. The first two digits define the specification series which are defined to group the different aspects of the 3GPP system into, e.g., requirements, service aspects, radio aspects codecs, security aspects, and test specifications. The series digits are followed by two additional digits for the 01 to

13 series or three further digits for the 21 to 55 series. The subjects of the individual specification series are explained on 3GPP's website at https://www.3gpp.org/specifications-technologies/specifications-by-series, and reproduced below.

Subject of specification series	3G and beyond / GSM (R99 and later)	GSM only (Rel-4 and later)	GSM only (before Rel-4)
Requirements	21 series	41 series	01 series
Service aspects ("stage 1")	22 series	42 series	02 series
Technical realization ("stage 2")	23 series	43 series	03 series
Signalling protocols ("stage 3") - user equipment to network	24 series	44 series	04 series
Radio aspects	25 series	45 series	05 series
CODECs	26 series	46 series	06 series
Data	27 series	47 series (none exists)	07 series
Signalling protocols ("stage 3") -(RSS-CN) and OAM&P and Charging (overflow from 32.- range)	28 series	48 series	08 series
Signalling protocols ("stage 3") - intra-fixed-network	29 series	49 series	09 series
Programme management	30 series	50 series	10 series
Subscriber Identity Module (SIM / USIM), IC Cards. Test specs.	31 series	51 series	11 series
OAM&P and Charging	32 series	52 series	12 series
Access requirements and test specifications		13 series (1)	13 series (1)
Security aspects	33 series	(2)	(2)
UE and (U)SIM test specifications	34 series	(2)	11 series
Security algorithms (3)	35 series	55 series	(4)
LTE (Evolved UTRA), LTE-Advanced, LTE-Advanced Pro radio technology	36 series		
Multiple radio access technology aspects	37 series		
Radio technology beyond LTE	38 series		

46. Following a link for a series (e.g., "23 series" link) leads to a 3GPP web page providing access to all specifications in a series, as shown by the screenshot below:



47. As another example of a series, the LTE radio standard is covered in the "36 series" and is further subdivided into separate sections or specifications. The LTE radio specification series starts at TS 36.101 and ends at TR 36.978. Excluding withdrawn specifications, the LTE standard consists of more than 250 specifications.

48. As another example of a series, the 5G New Radio (NR) standard is covered in the "38 series" and is further subdivided into separate sections or specifications. Selecting the "38 series" link on the website shown in paragraph 34 leads to the 3GPP portal (portal.3gpp.org) page for all of the 38 series technical specifications.[1] These 5G NR specifications start at TS 38.101 and end at TR 38.922. Excluding withdrawn specifications, the 5G NR standard consists of more than 140 specifications.

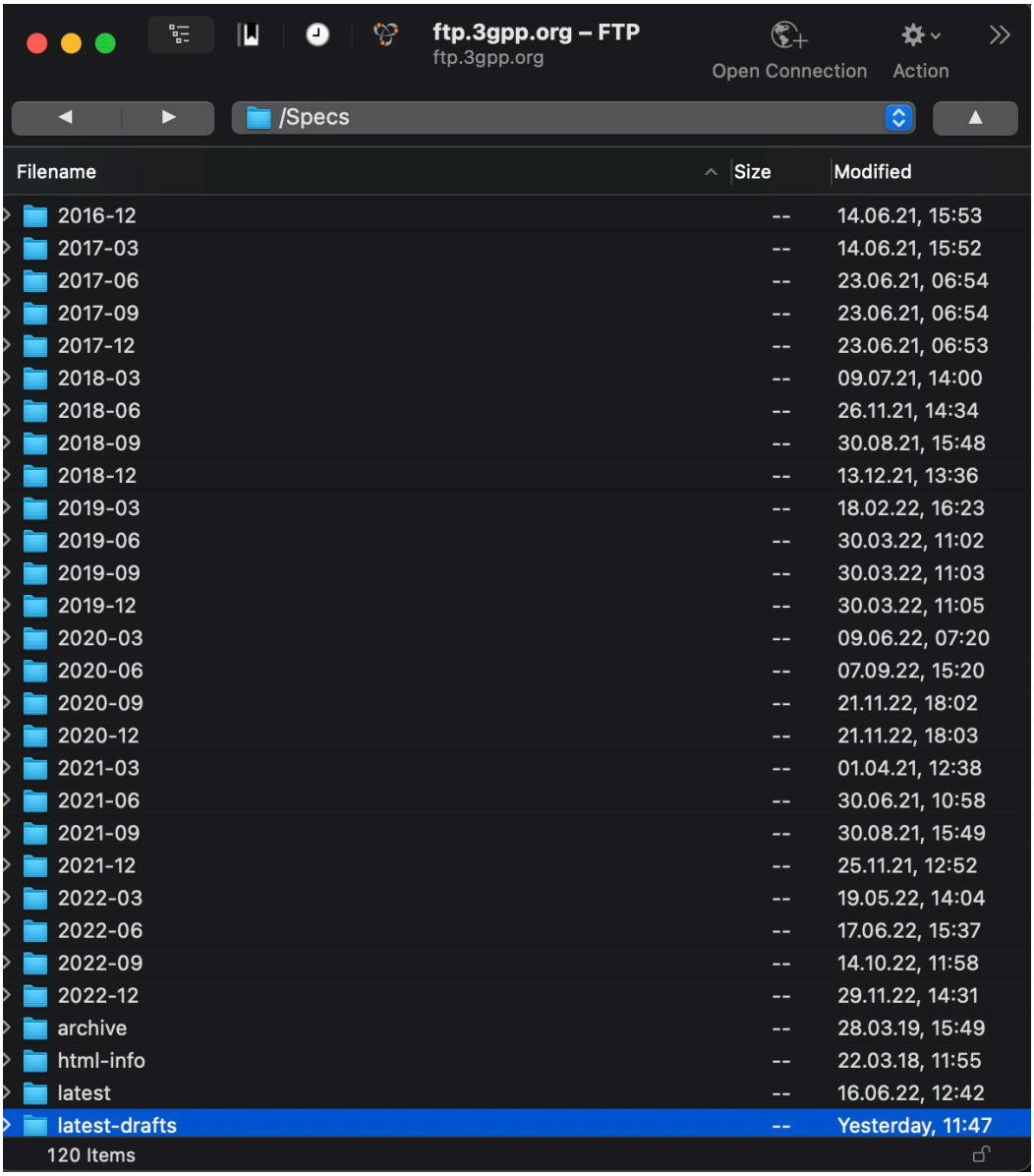
49. Each LTE or 5G specification can span from a few pages to hundreds of pages. One full version of the LTE or 5G standard is massive, spanning tens of thousands of pages across the particular series of technical specifications.

50. In the ordinary course of 3GPP's regularly conducted business activities, and pursuant to its standard business practices, TDocs are usually uploaded to 3GPP's FTP server and website before the meeting where they are to be discussed. Documents created or revised during the course of a meeting are normally uploaded at the latest during the week following the meeting (e.g., the meeting report of the meeting is usually published for review during the week following the meeting).

[1] https://portal.3gpp.org/Specifications.aspx?q=1&series=45&releases=all&draft=False&underCC=False&withACC=False&withBCC=False&numberNYA=False

51. In the ordinary course of 3GPP's regularly conducted business activities, and pursuant to its standard business practices, 3GPP maintains archives that include different versions of the specifications, as well as email communications to its membership, including emails announcing the uploading of new or additional documents to 3GPP's FTP server. These archives are created at the time the emails are initially sent.

52. 3GPP specifications almost always are duplicated in at least two and sometime more locations on the FTP server. One location corresponds to a "snapshot" of the specifications corresponding to a particular plenary meeting cycle—for instance, the 2018-12 snapshot contains a snapshot of numerous specifications after the December 2018 3GPP plenary meetings. The second location is an "archive" that contains all versions over time for a given specification. The screenshot below shows an excerpt of the "Spec" folder at ftp.3gpp.org:



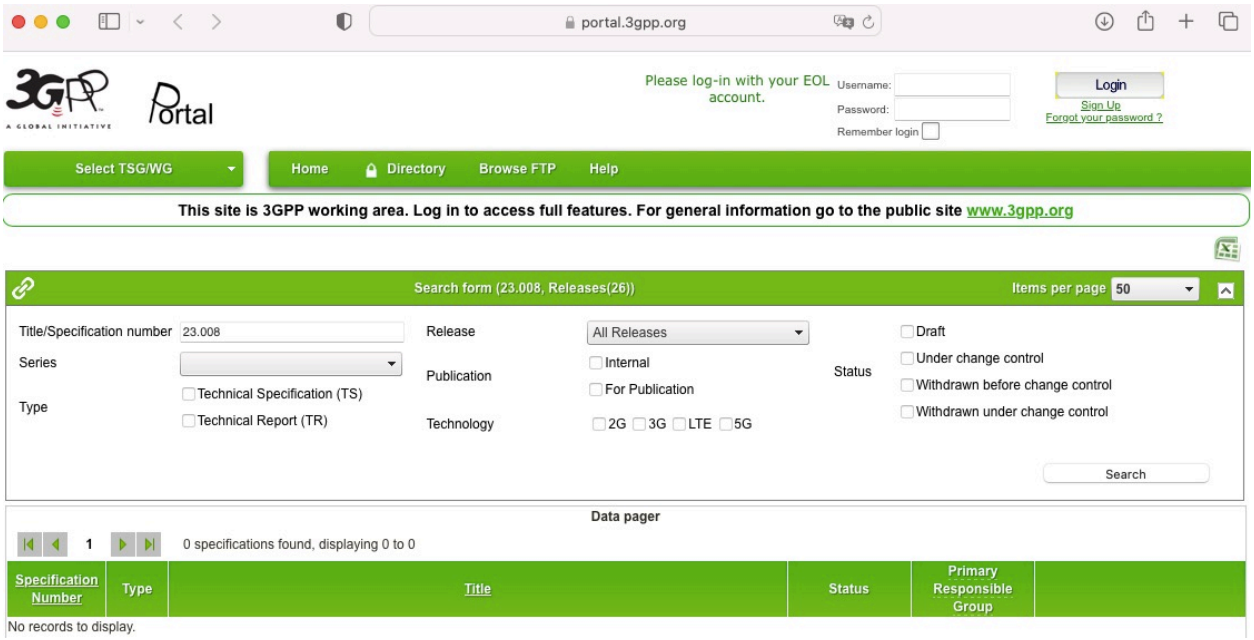
53. While 3GPP aims to upload the updated specifications to both locations at the same time, occasionally there may be a small difference in the upload date, and thus the date stamp, for the same specification uploaded to the two locations. Additionally, specifications which are not yet approved (so called "draft" specifications) are presented as TDocs at working group and at plenary meetings (as

soon as the working group decides to submit the specification to the plenary meeting for information or approval). In many cases, the TDocs are also distributed on the email exploder of the working group prior to the meeting, making the TDocs available to all those subscribed to the email distribution list.

54. The timestamp on 3GPP's FTP server shows the date when the document was uploaded the last time. Thus, the timestamp shows the latest possible date the document became publicly available and accessible on 3GPP's FTP server. The given document might have been available earlier and the original timestamp might have been overwritten because the document was uploaded again. According to my experience, this is something which happened occasionally. Thus, the FTP timestamp is reliable as the latest possible upload date but it may not always represent the first upload of a document to the FTP server.

55. An additional means of accessing 3GPP documents including TDocs and specifications is the 3GPP portal. *See* https://portal.3gpp.org/Specifications.aspx. 3GPP preserves the posted document indefinitely on its server for future reference. *Id.* As detailed below, the 3GPP website provides the date that a particular version of a technical specification was uploaded, using the date convention YYYY-MM-DD. The 3GPP portal also provides a login function to unlock full features, however, login is not required for searching and downloading technical specifications. Based on my personal

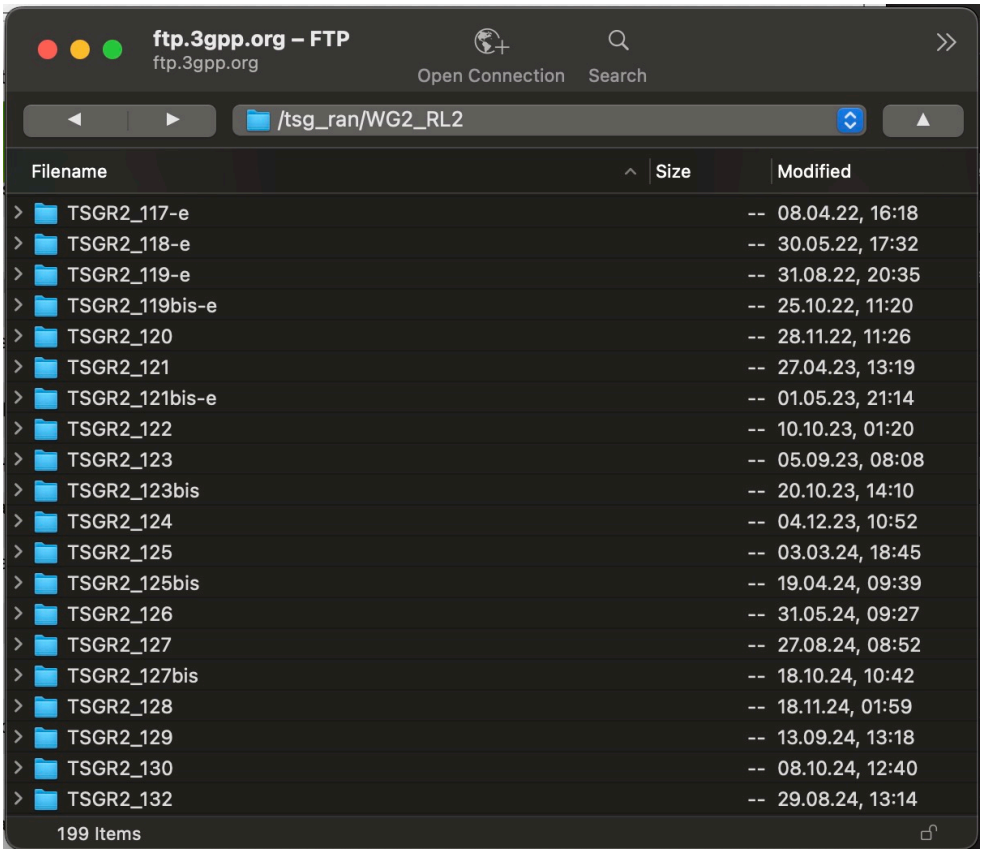
experience, throughout the 2019 timeframe, anyone interested in a particular 3GPP specification could search the 3GPP portal to find and download the latest version of a technical specification using the 3GPP portal in substantially the same manner as they would today:



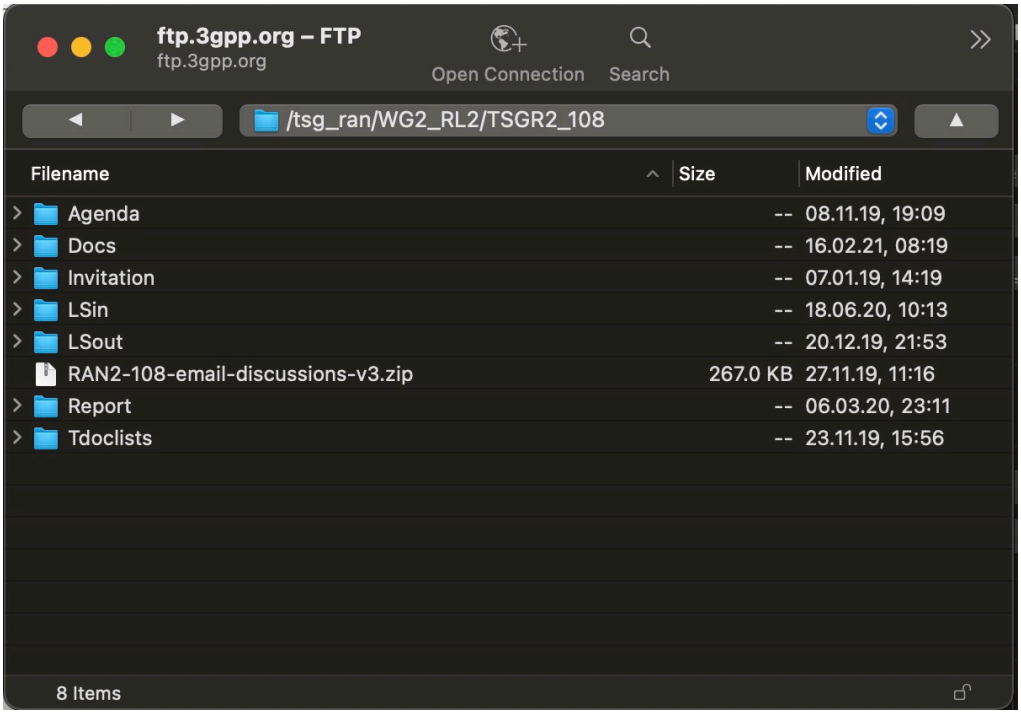
https://portal.3gpp.org/Specifications.aspx; *see, e.g.,* 2015 internet archive https://web.archive.org/web/20150924200802/https://portal.3gpp.org/.

56. 3GPP's working practice to store their documents on its FTP server, as described above, has not changed over time. Starting from the first 3GPP meetings in 1998 until present, all WGs and plenary meetings are represented by dedicated meeting folders on the FTP server. These meeting folders include the documents discussed at the meetings. Both the folders and the documents are accessible to the public. Almost every week, a new meeting folder with the respective documents is

added. As an example, the screenshot below shows an extract of the RAN WG2 folder named "WG2_RL2" showing that every meeting has a dedicated number:



57. As an example, the screenshot below shows the typical structure of a meeting folder including the most important folders "Agenda", "Docs" (includes all meeting contributions), and "Report" (includes the meeting report):



58. In addition to the plenary and WG meeting folders, and some other folders, there is also the "Specs" folder, which holds all 3GPP specifications including the aforementioned "snapshot" and archive folders. Since the early days of 3GPP a new folder is added inside the "Specs" folder after each TSG plenary meeting to hold the latest versions of specifications approved at those TSG plenary meetings. This is still 3GPP's working practice today; thus, this practice has not changed over time.

59. 3GPP maintains a set of publicly accessible documents[2] providing further details on its way of working:

[2] All available from https://www.3gpp.org/delegates-corner/3gpp-working-procedures

- 3GPP Working Procedures
- Vocabulary for 3GPP Specifications 3GPP TR 21.905
- Working Methods 3GPP TR 21.900
- Specification Drafting Rules 3GPP TR 21.801

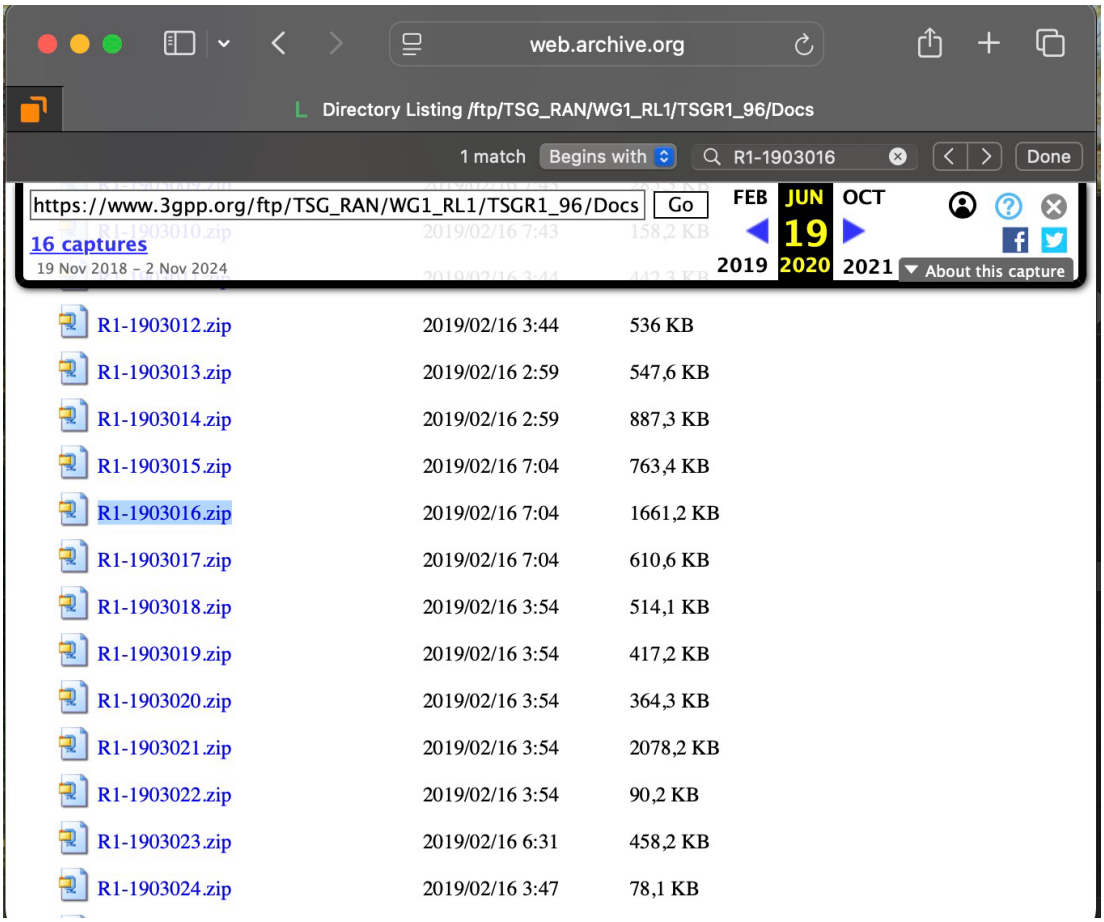
B. Specific Documents

1. TDoc R1-1903016

60. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1008 as a true and correct copy of 3GPP TDoc R1-1903016, which represents a 3GPP document with the title "Potential Techniques for UE Power Saving." The document was authored by Qualcomm Incorporated and discussed details for UE power saving techniques including wake-up signaling (WUS).

61. On its face, R1-1903016 refers to the RAN WG1 meeting #96 held on February 25 – March 1, 2019, in Athens, Greece. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that R1-1903016 was available either prior to or during or shortly after that meeting to at least all attending 3GPP members.

62. The public availability of the document is confirmed by the date stamp, February 16, 2019, shown on the historic 3GPP FTP server[3] for the corresponding downloadable file ("R1-1903016.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200619192044/https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_96/Docs, and as shown by the screenshot below:



[3] The present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_96/Docs shows November 25, 2024, as the upload date which obviously cannot be the earliest upload date given the meeting took place in February/March 2019. This is an example where the original content of a folder was overwritten by re-uploading the files, as explained in paragraph 46.

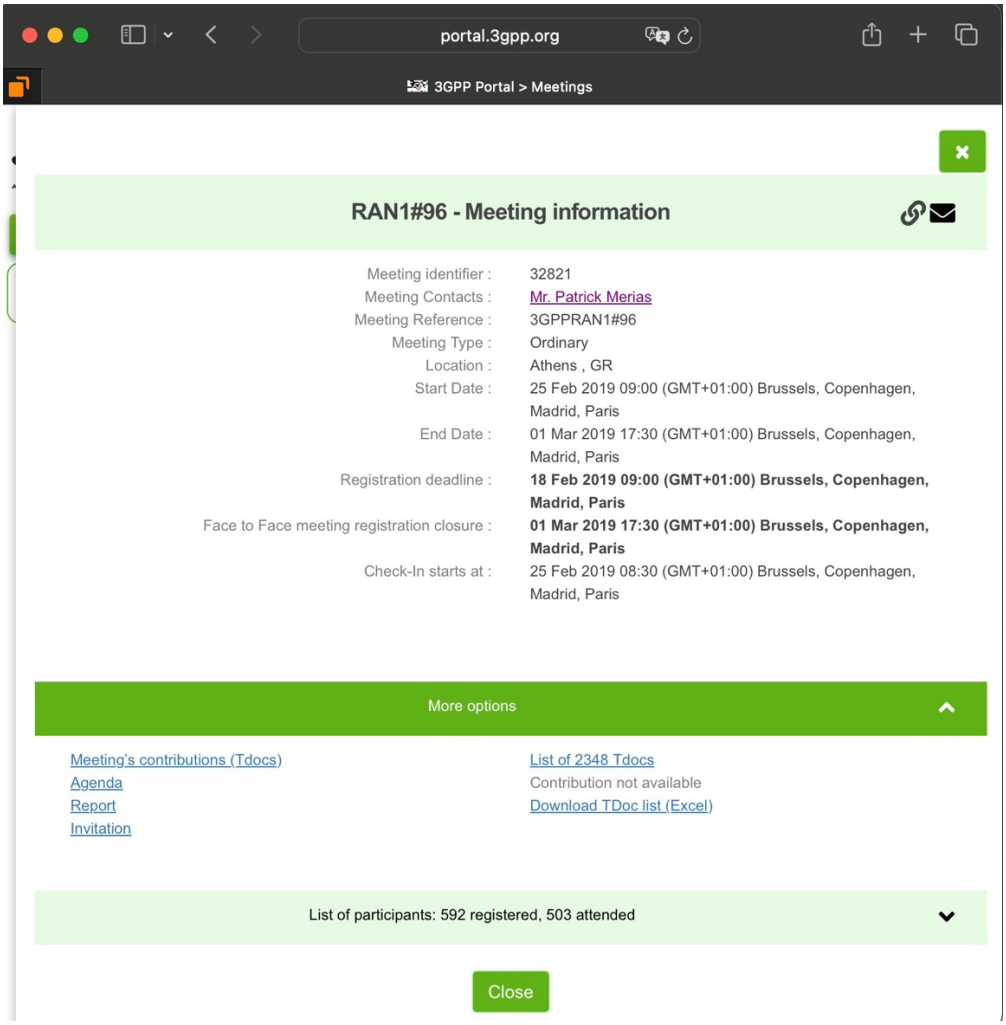
63. Experts in the field of determining the public availability of 3GPP documents would reasonably rely upon the FTP server upload date on the 3GPP FTP server as the date the document became available to the public.

64. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "15. February 2019," as shown in the screenshot below.



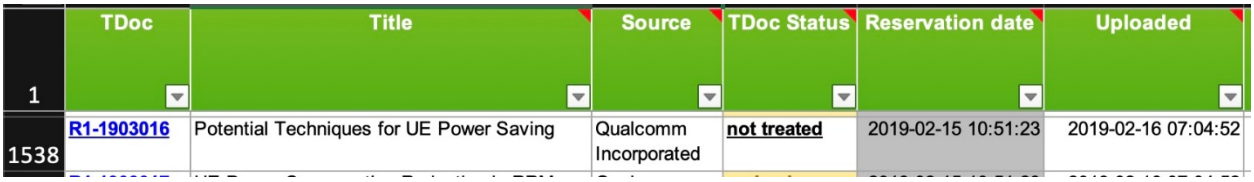
65. This last modified date is consistent with the February 16, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

66. The final meeting report of the RAN WG1 meeting #96 held on February 25 – March 1, 2019, can be found in Appendix C. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 503 individuals (out of 592 registered participants):



67. The meeting report mentions R1-1903016 on page 135 which clearly indicates that the document was registered for this meeting. Furthermore, the meeting report includes in the zip file the meeting's document list of which an

excerpt can be found in Appendix D.[4] R1-1903016 is listed in row 1538 and is tagged as "not treated". Furthermore, the "Uploaded" date is shown as "2019-02-16" indicating the document was available at the meeting, as can be seen by the screenshot below:



	TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
1						
1538	R1-1903016	Potential Techniques for UE Power Saving	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:04:52

68. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, Ex. 1008 is an authentic copy of 3GPP TDoc R1-1903016 that was uploaded and made available via the 3GPP FTP server to the general public by February 16, 2019, at the latest.

2. TDoc R1-1905031

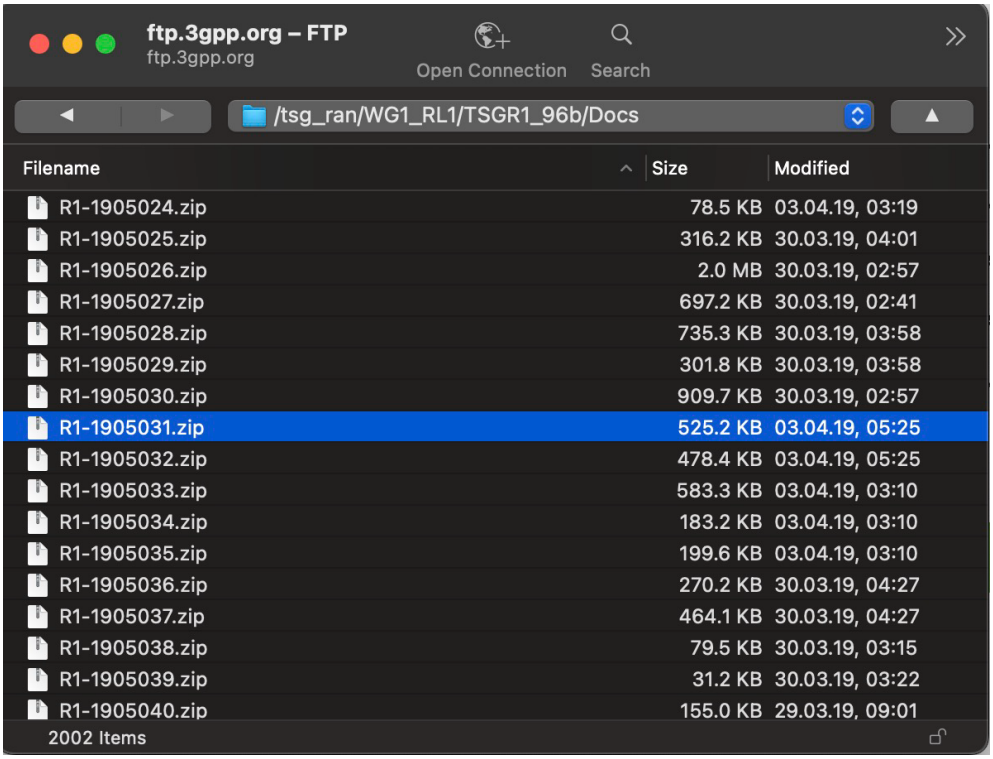
69. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1007 as a true and correct copy of 3GPP TDoc R1-1905031, which represents a 3GPP document with the title "PDCCH-based power saving channel design." The document was authored by Qualcomm Incorporated

[4] Given the size of the document list with over 2000 rows (documents) and over 20 columns the Appendix only includes the columns relevant for this declaration: TDoc, Title, Source, TDoc Status, Reservation date, Uploaded.

and discussed further details for UE power saving techniques including wake-up signaling (WUS).

70. On its face, R1-1905031 refers to the RAN WG1 meeting #96bis held on April 8 –12, 2019, in Xi'an, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that R1-1905031 was available either prior to or during or shortly after that meeting to at least all attending 3GPP members.

71. The public availability of the document is confirmed by the date stamp, April 3, 2019, shown on the historic 3GPP FTP server for the corresponding downloadable file ("R1-1905031.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200619151553/https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_96b/Docs/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_96b/Docs as shown in the screenshot below:



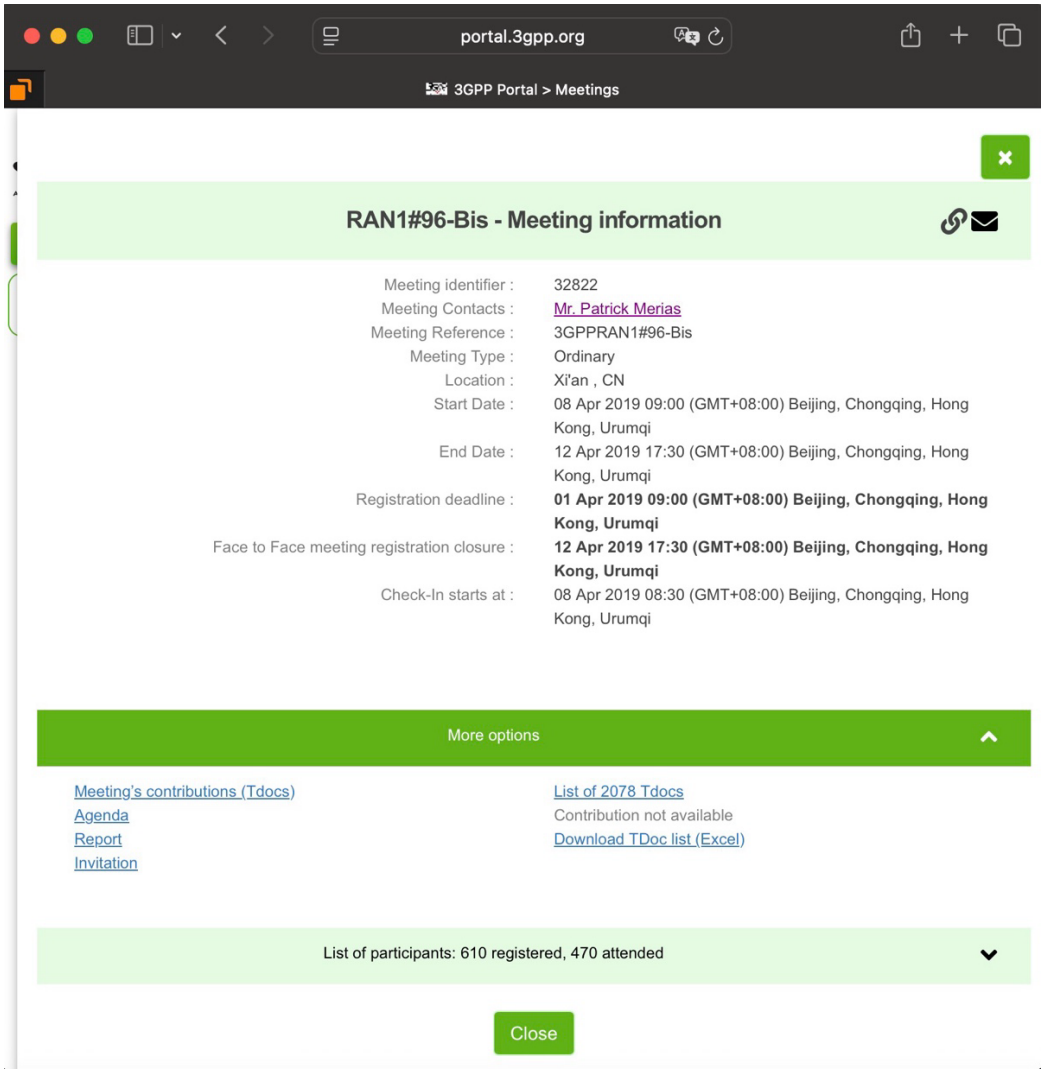
72. Experts in the field of determining the public availability of 3GPP documents would reasonably rely upon the FTP server upload date on the 3GPP FTP server as the date the document became available to the public.

73. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "2. April 2019," as shown in the screenshot below.



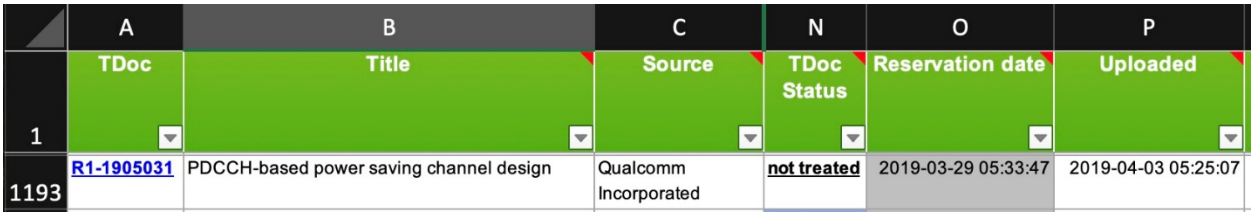
74. This last modified date is consistent with the April 3, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

75. The final meeting report of the RAN WG1 meeting #96bis held on April 8 – 12, 2019, can be found in Appendix E. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 470 individuals (out of 610 registered participants):



76. The meeting report mentions R1-1905031 on page 133 which clearly indicates that the document was registered for this meeting. Furthermore, the meeting report includes in the zip file the meeting's document list of which an

excerpt can be found in Appendix F.[5] R1-1905031 is listed in row 1193 and is tagged as "not treated". Furthermore, the "Uploaded" date is shown as "2019-04-03" indicating the document was available at the meeting, as can be seen by the screenshot below:



	A	B	C	N	O	P
1	TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
1193	R1-1905031	PDCCH-based power saving channel design	Qualcomm Incorporated	not treated	2019-03-29 05:33:47	2019-04-03 05:25:07

77. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, Ex. 1007 is an authentic copy of 3GPP TDoc R1-1905031 that was uploaded and made available via the 3GPP FTP server to the general public by April 3, 2019, at the latest.

3. TDoc R1-1904738

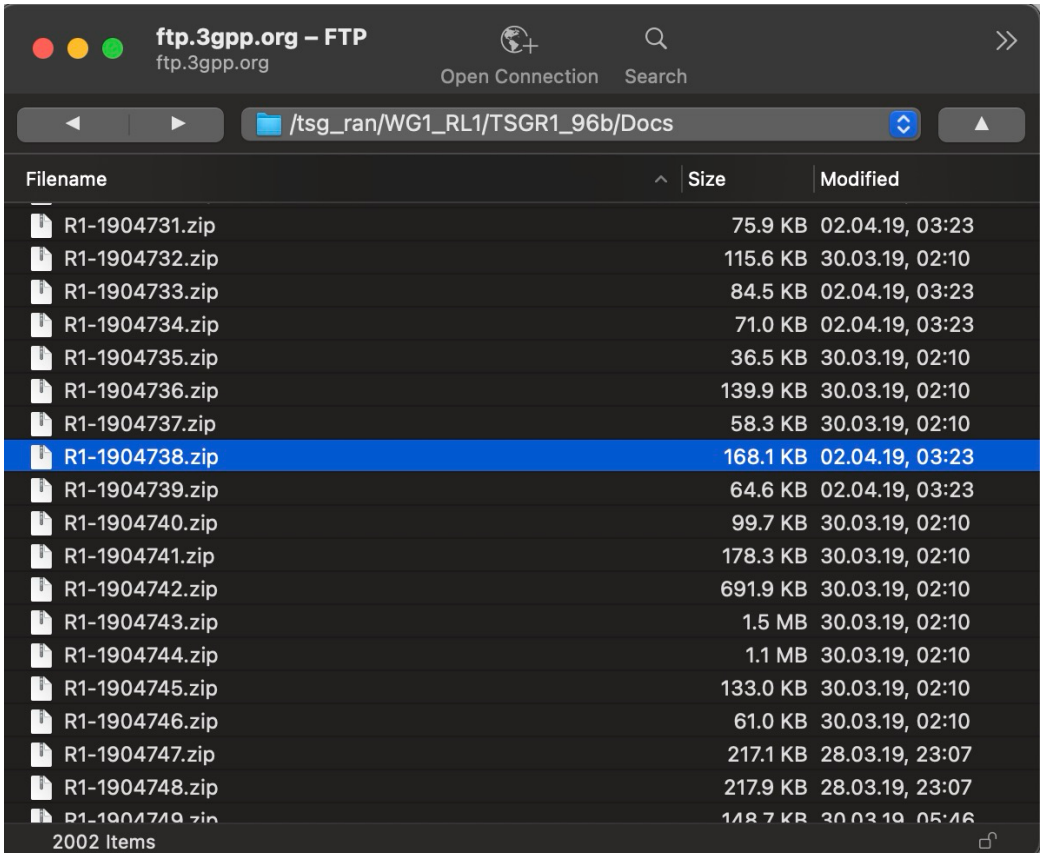
78. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1013 as a true and correct copy of 3GPP TDoc R1-1904738, which represents a 3GPP document with the title "Discussion on power saving signal triggering UE adaptation." The document was authored by CMCC and discussed the general PDCCH-based power saving signal design and the

[5] Given the size of the document list with over 2000 rows (documents) and over 20 columns the Appendix only includes the columns relevant for this declaration: TDoc, Title, Source, TDoc Status, Reservation date, Uploaded.

triggering of power saving state adaptations, and other aspects related to UE power saving.

79. On its face, R1-1904738 refers to the RAN WG1 meeting #96bis held on April 8 – 12, 2019, in Xi'an, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that R1-1904738 was available either prior to or during or shortly after that meeting to at least all attending 3GPP members.

80. The public availability of the document is confirmed by the date stamp, April 2, 2019, shown on the historic 3GPP FTP server for the corresponding downloadable file ("R1-1904738.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200619151553/https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_96b/Docs/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_96b/Docs as shown in the screenshot below:



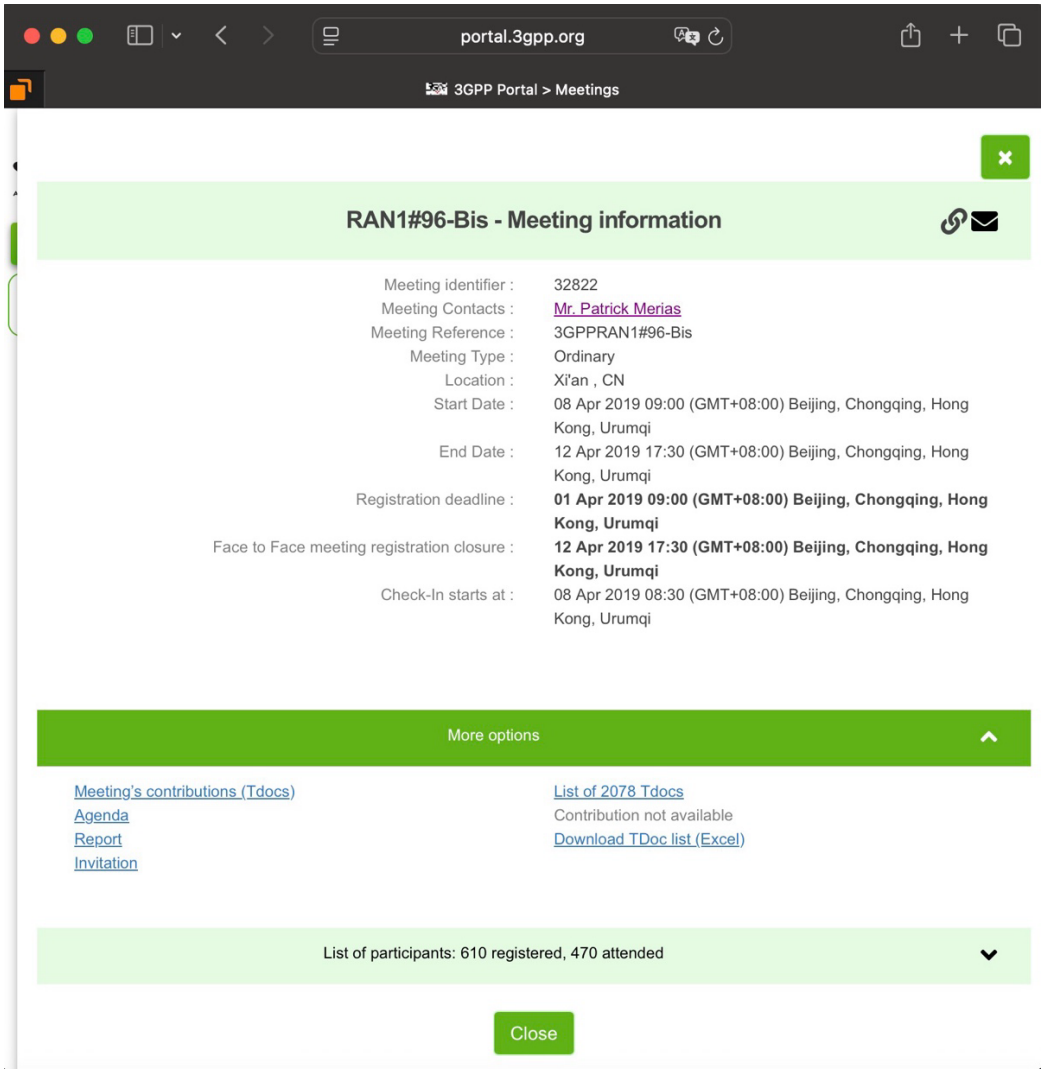
81. Experts in the field of determining the public availability of 3GPP documents would reasonably rely upon the FTP server upload date on the 3GPP FTP server as the date the document became available to the public.

82. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "2. April 2019," as shown in the screenshot below.



83. This last modified date is consistent with the April 2, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

84. The final meeting report of the RAN WG1 meeting #96bis held on April 8 – 12, 2019, can be found in Appendix E. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 470 individuals (out of 610 registered participants):



85. The meeting report mentions R1-1904738 on page 129-130 which clearly indicates that the document was registered for this meeting. Furthermore, the

meeting report reflects a summary of the different proposals mentioned in the document, as can be seen below:

R1-1904738 **Discussion on power saving signal triggering UE adaptation** **CMCC**

- Proposal 1: Two different PDCCH-based power saving signals could be designed for different UE operation states, e.g., during DRX off time during DRX active time, in non-DRX operation.
  - Power saving signal #1 could be designed to be transmitted in DRX off time in order to wake up UE, trigger CSI report before DRX ON, or other potential power saving schemes such as adaptation in BWP/Scell operation.
  - Power saving signal #2 could be designed to be transmitted in DRX active time and non-DRX operation in order to trigger UE adaptation to PDCCH monitoring, cross-slot scheduling, maximum MIMO layer or other schemes.
- Proposal 2. PDCCH-based Power saving signal used in DRX off time could be transmitted at least to trigger UE wake up in the next DRX cycle or not, and some other fields for triggering CSI before DRX ON or other potential power saving schemes such as adaptation in BWP/Scell operation should also be considered when designing this PDCCH-based power saving signal.
- Proposal 3. Power saving signal used in DRX off time could trigger an on demand CSI report before DRX ON. Aperiodic CSI-RS or periodic CSI-RS could be used as the CSI measurement resource and PUCCH could be used as the CSI report resource for the on demand CSI report before DRX ON. The aperiodic CSI-RS configuration index or the periodic CSI-RS configuration index and associated shifted duration could be indicated in the power saving signal used in DRX off time.

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3GPP TSG RAN WG1 Meeting #97 **R1-1905921**
Reno, USA, 13th – 17th May 2019

- Proposal 4. PDCCH-based power saving signal could be used to indicate UE to go to sleep for a duration in DRX active time or non-DRX operation for triggering UE skipping PDCCH monitoring.
- Proposal 5. Introduce the concept of power saving states when designing the PDCCH-based power saving signal to trigger UE adaptation in DRX active time and non-DRX operation. Several different power saving states could be configured with RRC signalling, and then PDCCH-based power saving signal could be used to further dynamically indicate UE which power saving state to use.
- Proposal 6. To avoid BWP switch in power saving signal based DRX operation before UE waking up in next DRX cycle, the following schemes can be further studied:
  - UE stops or restarts bwp-InactivityTimer after detecting the power saving signal
  - UE ignores the configuration of bwp-InactivityTimer after receiving the power saving signal configuration in one DL BWP.

Decision: The document is noted.

86. Furthermore, the meeting report includes in the zip file the meeting's document list of which an excerpt can be found in Appendix F.[6] R1-1904738 is listed in row 900 and is tagged as "noted". Furthermore, the "Uploaded" date is shown as "2019-04-02" indicating the document was available at the meeting, as can be seen by the screenshot below:

	A	B	C	N	O	P
1	TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
900	R1-1904738	Discussion on power saving signal triggering UE adaptation	CMCC	noted	2019-03-28 12:21:48	2019-04-02 03:23:59

87. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, Ex. 1013 is an authentic copy of 3GPP TDoc R1-1904738 that was uploaded and made available via the 3GPP FTP server to the general public by April 2, 2019, at the latest.

4. TDoc R1-1905384

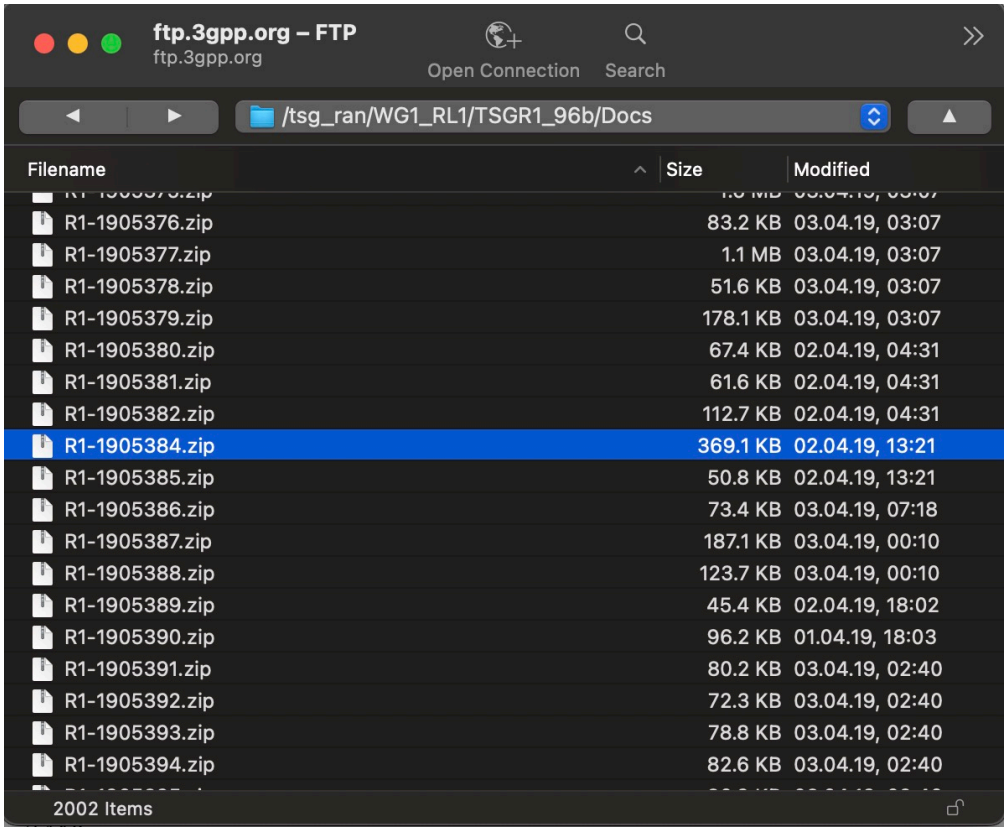
88. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1014 as a true and correct copy of 3GPP TDoc R1-1905384, which represents a 3GPP document with the title "PDCCH-based power

[6] Given the size of the document list with over 2000 rows (documents) and over 20 columns the Appendix only includes the columns relevant for this declaration: TDoc, Title, Source, TDoc Status, Reservation date, Uploaded.

saving signal/channel." The document was authored by Nokia and Nokia Shanghai Bell and discussed the PDCCH-based power saving signal/channel design.

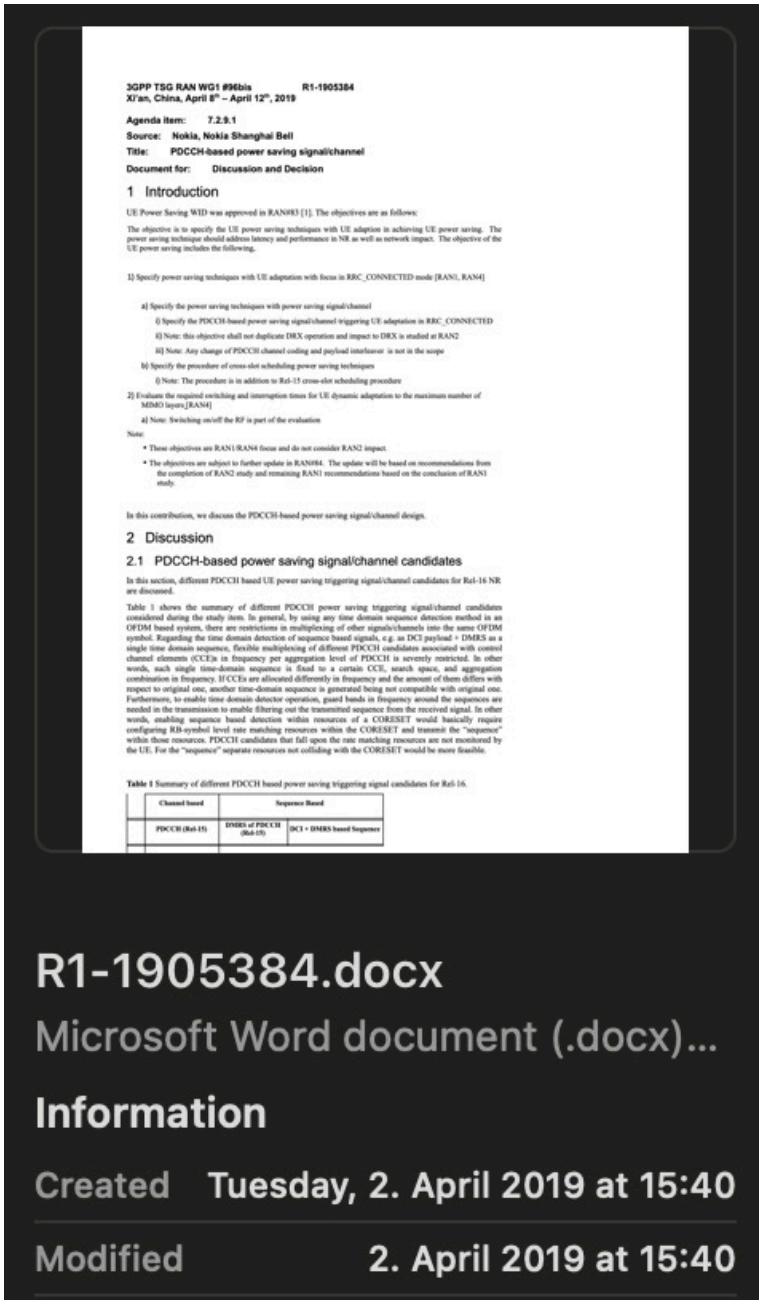
89. On its face, R1-1905384 refers to the RAN WG1 meeting #96bis held on April 8– 12, 2019, in Xi'an, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that R1-1905384 was available either prior to or during or shortly after that meeting to at least all attending 3GPP members.

90. The public availability of the document is confirmed by the date stamp, April 2, 2019, shown on the historic 3GPP FTP server for the corresponding downloadable file ("R1-1905384.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200619151553/https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_96b/Docs/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_96b/Docs as shown in the screenshot below:



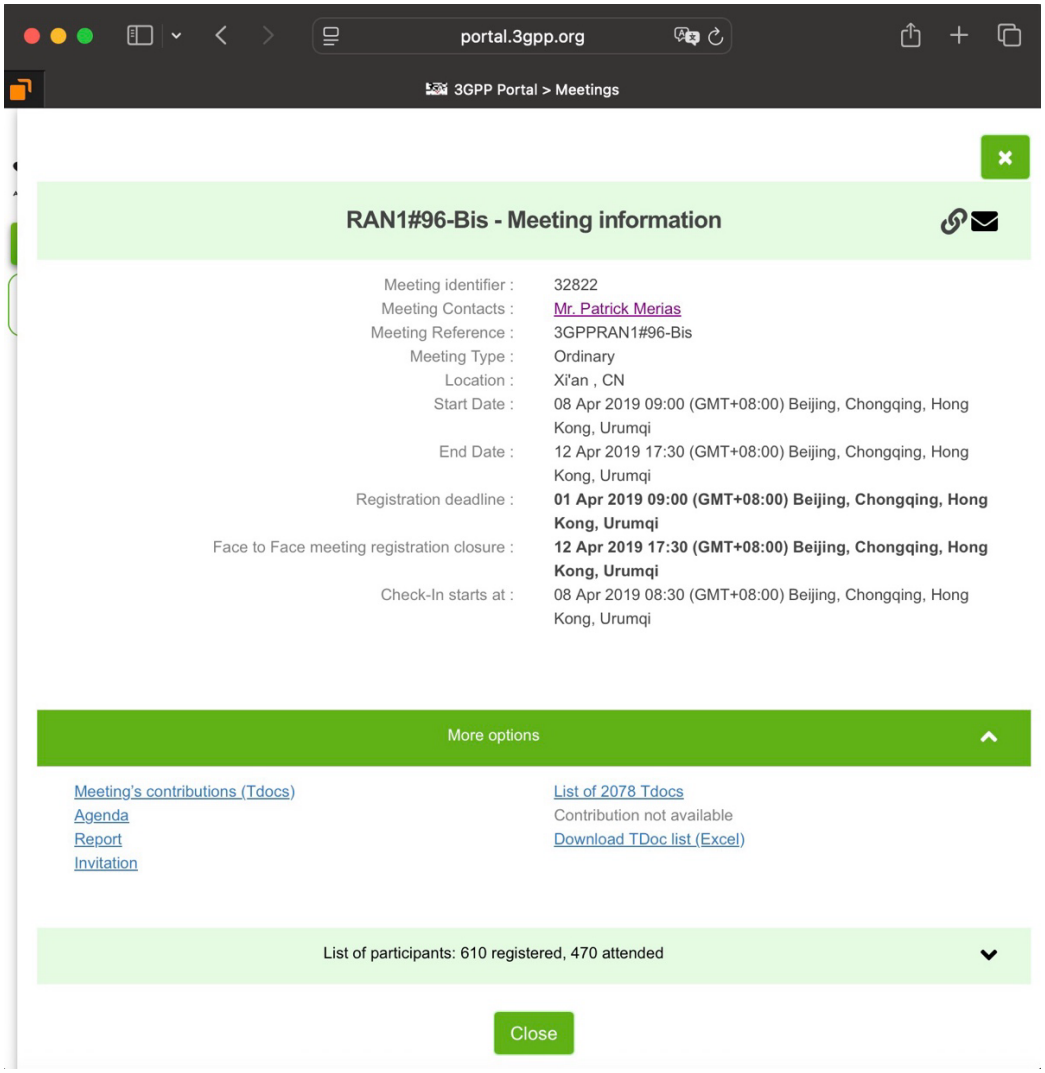
91. Experts in the field of determining the public availability of 3GPP documents would reasonably rely upon the FTP server upload date on the 3GPP FTP server as the date the document became available to the public.

92. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "2. April 2019," as shown in the screenshot below.



93. This last modified date is consistent with the April 2, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

94. The final meeting report of the RAN WG1 meeting #96bis held on April 8 –12, 2019, can be found in Appendix E. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 470 individuals (out of 610 registered participants):



95. The meeting report mentions R1-1905384 on page 130-131 which clearly indicates that the document was registered for this meeting. Furthermore, the

meeting report reflects a summary of the document's observations and proposals, as can be seen below:

R1-1905384 PDCCH-based power saving signal/channel Nokia, Nokia Shanghai Bell

- Observation 1: The detection performance of DCI + DMRS degrades significantly in the presence of more frequency selective channel (i.e. 100ns w.r.t. 300ns).
- Observation 2: Since precoder cycling associated with PDCCH and related DMRS is UE transparent and precoding is not specified in NR Rel-15, using time domain detection with DCI+ DMRS sequence prevents using precoder cycling.
- Observation 3: DCI + DMRS sequence can not be considered as a preferable solution for Rel-16 power saving signal.
- Observation 4: Rel-15 DMRS of PDCCH can carry only 1-bit information as payload, and as such is not attractive option for Rel-16 power saving signal/channel.
- Observation 5: PDCCH enables efficient support for multiplexing with existing Rel-15 channels/signals/reference signals. Furthermore, support for multiple triggering options with minimal specification efforts for Rel-16 can be provided.
- Observation 6: To reduce specification impacts as well as improve reliability and coverage, it is beneficial to consider existing Rel-15 DCI formats with small payload sizes for power saving wake-up channel.
- Proposal 1: Support PDCCH as a power saving channel for Rel-16.
- Observation 7: The supported Rel-15 DCI formats can carry payload from 1 bit up to 128 bits. For Rel-15 the minimum payload size has been agreed to be 12 bits with zero padding.
- Observation 8: To achieve the targeted miss-detection rate for wake-up signal/channel, i.e. 0.1%, around 2 dB performance gain can be obtained by reducing the payload size from 48 bits to 10 bits with large ALs=8, 16.
- Proposal 2: Consider the following principles for PDCCH-based power saving channel:
  - define a power saving specific DCI format,
  - the size of new DCI format should be able to be configured to have the same size as some other DCI format and
  - introduce a new RNTI, e.g. PS-C-RNTI, which the UE searches for new DCI format when configured.
- Proposal 3: Study further whether power saving signal DCI format is associated to search space set(s) used for existing unicast DCI formats or a new dedicated search space set for the new DCI format.
- Proposal 4: Investigate the feasibility of using dedicated CORESET for monitoring power saving channel.

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Reno, USA, 13th – 17th May 2019

- In section 2.3 we consider the applicability of the signal inline with the target of achieving power saving and observe as follows:
- Observation 9: Using Release-15 mechanisms network can optimize between UE power saving and scheduling latency using DRX.
- Observation 10: Use of power saving channel should be considered only when DRX is configured.

Decision: The document is noted.

96. Furthermore, the meeting report includes in the zip file the meeting's document list of which an excerpt can be found in Appendix F.[7] R1-1905384 is listed in row 1546 and is tagged as "noted". Furthermore, the "Uploaded" date is shown as "2019-04-02" indicating the document was available at the meeting, as can be seen by the screenshot below:

	A	B	C	N	O	P
1	TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
1546	R1-1905384	PDCCH-based power saving signal/channel	Nokia, Nokia Shanghai Bell	noted	2019-04-01 11:52:31	2019-04-02 13:21:30

97. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, Ex. 1014 is an authentic copy of 3GPP TDoc R1-1905384 that was uploaded and made available via the 3GPP FTP server to the general public by April 2, 2019, at the latest.

5. TDoc R1-1905466

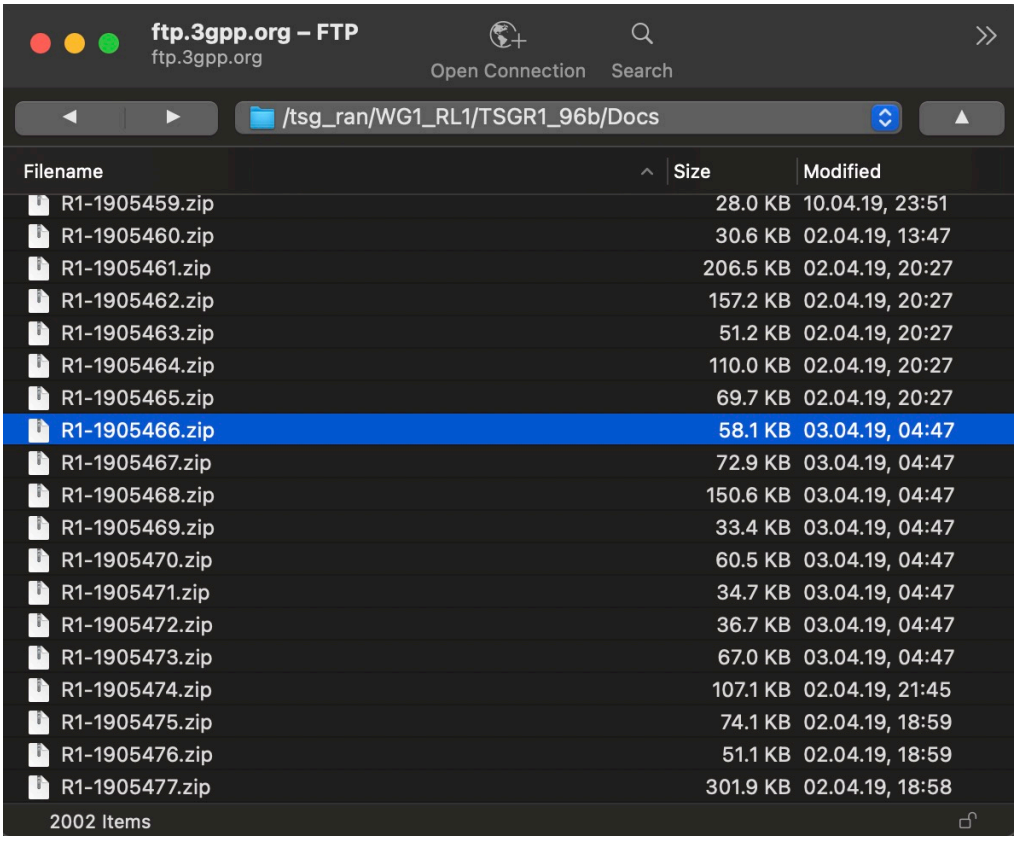
98. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1015 as a true and correct copy of 3GPP TDoc R1-1905466, which represents a 3GPP document with the title "Design of PDCCH-

[7] Given the size of the document list with over 2000 rows (documents) and over 20 columns the Appendix only includes the columns relevant for this declaration: TDoc, Title, Source, TDoc Status, Reservation date, Uploaded.

based power saving signal/channel." The document was authored by Ericsson and discussed design details for PDCCH-based power saving signal/channel.

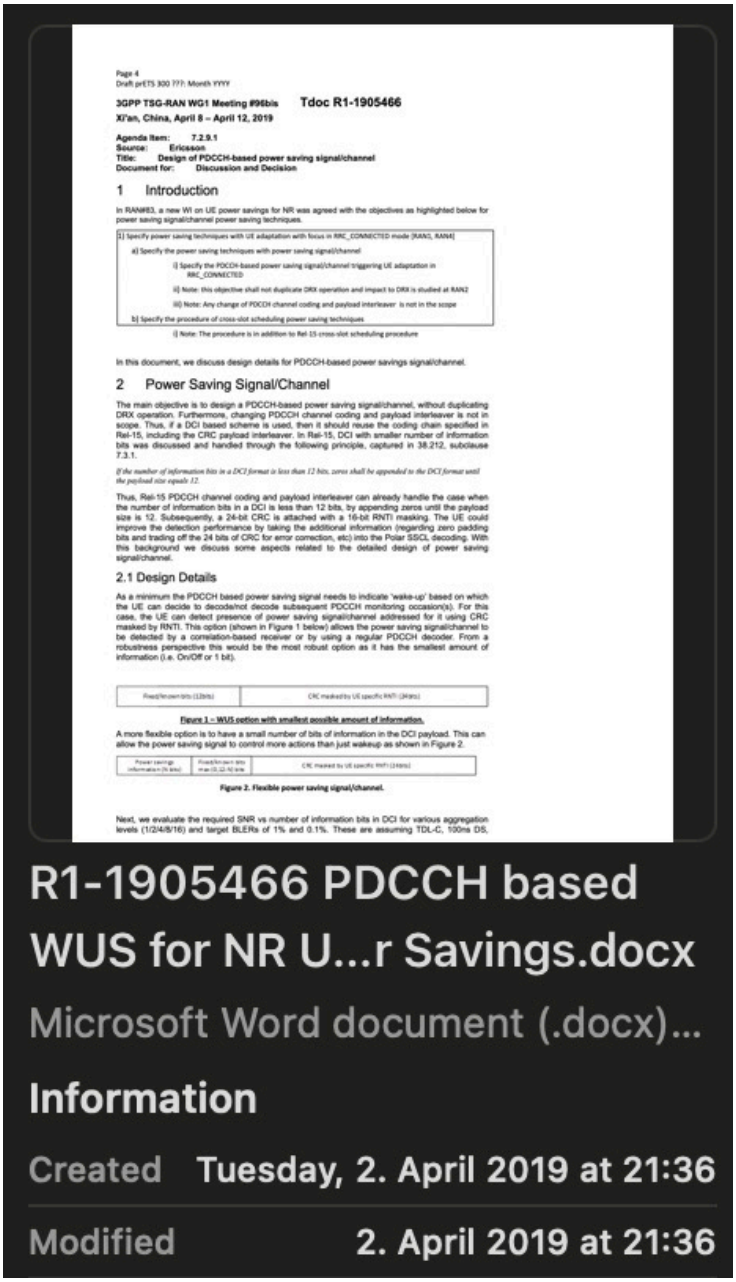
99. On its face, R1-1905466 refers to the RAN WG1 meeting #96bis held on April 8 –12, 2019, in Xi'an, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that R1-1905466 was available either prior to or during or shortly after that meeting to at least all attending 3GPP members.

100. The public availability of the document is confirmed by the date stamp, April 3, 2019, shown on the historic 3GPP FTP server for the corresponding downloadable file ("R1-1905466.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200619151553/https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_96b/Docs/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_96b/Docs as shown in the screenshot below:



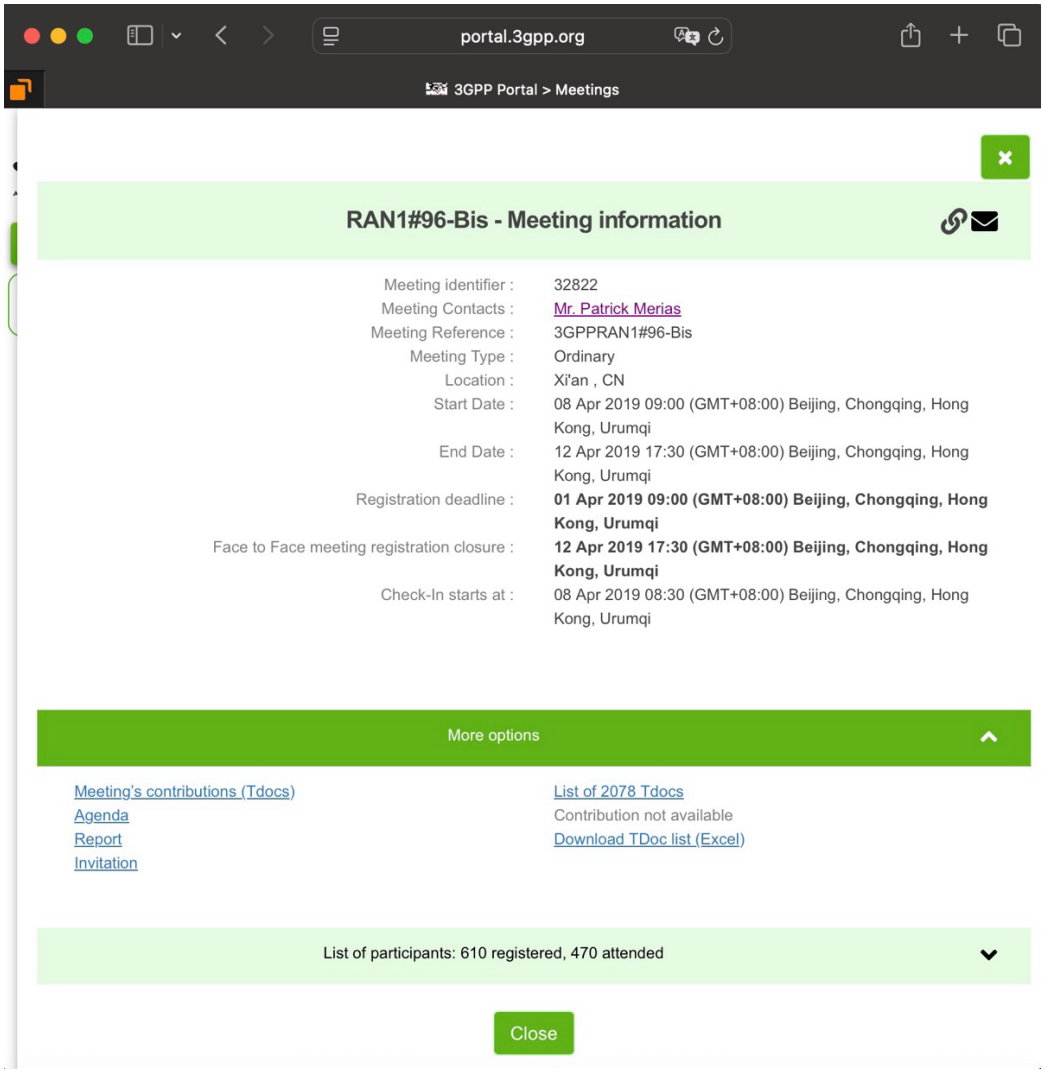
101. Experts in the field of determining the public availability of 3GPP documents would reasonably rely upon the FTP server upload date on the 3GPP FTP server as the date the document became available to the public.

102. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "2. April 2019," as shown in the screenshot below.



103. This last modified date is consistent with the April 3, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

104. The final meeting report of the RAN WG1 meeting #96bis held on April 8–12, 2019, can be found in Appendix E. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 470 individuals (out of 610 registered participants):



105. The meeting report mentions R1-1905466 on page 130-133 which clearly indicates that the document was registered for this meeting.

Furthermore, the meeting report includes in the zip file the meeting's document list of which an excerpt can be found in Appendix F.[8] R1-1905466 is listed in row 1628 and is tagged as "not treated". Furthermore, the "Uploaded" date is shown as "2019-04-02" indicating the document was available at the meeting, as can be seen by the screenshot below:

	A	B	C	N	O	P
1	TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
1628	R1-1905466	Design of PDCCH-based power saving signal/channel	Ericsson	not treated	2019-04-02 13:51:03	2019-04-03 04:48:17

106. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, Ex. 1015 is an authentic copy of 3GPP TDoc R1-1905466 that was uploaded and made available via the 3GPP FTP server to the general public by April 3, 2019, at the latest.

6. TDoc RP-190727

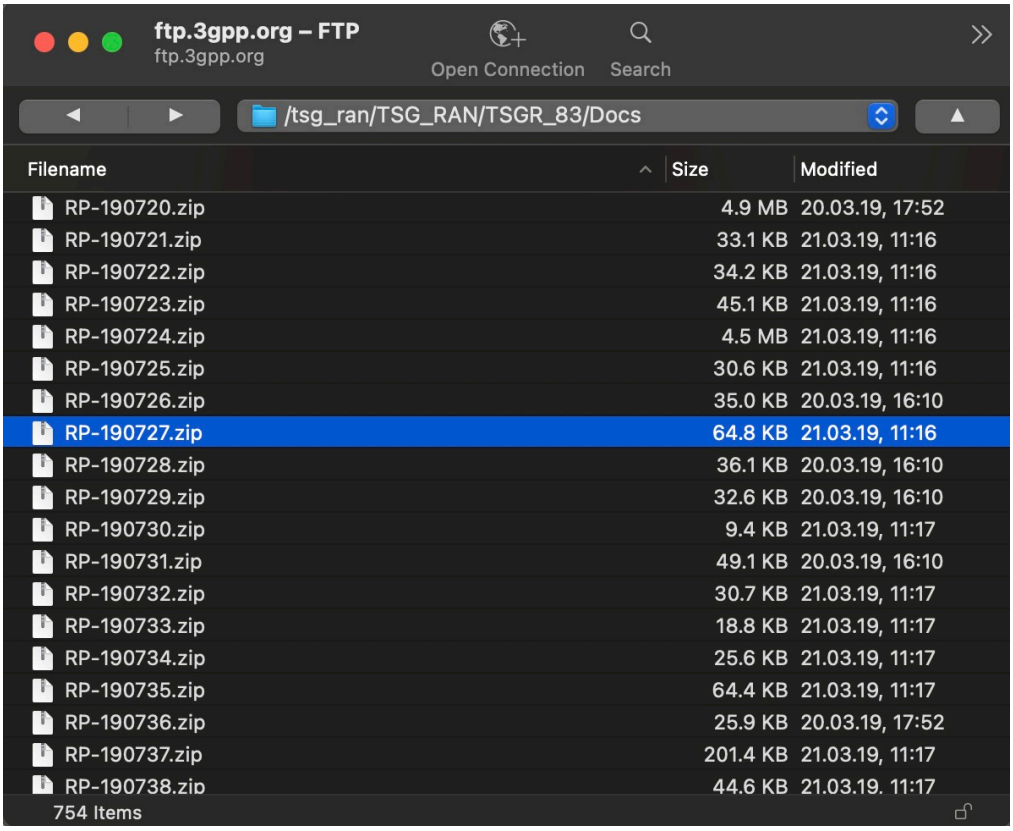
107. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1017 as a true and correct copy of 3GPP TDoc RP-190727, which represents a 3GPP document with the title "New WID: UE Power

[8] Given the size of the document list with over 2000 rows (documents) and over 20 columns the Appendix only includes the columns relevant for this declaration: TDoc, Title, Source, TDoc Status, Reservation date, Uploaded.

Saving in NR." The document was authored by CATT and CAICT and represents the work item description for UE Power Saving in New Radio including objectives and time scale.

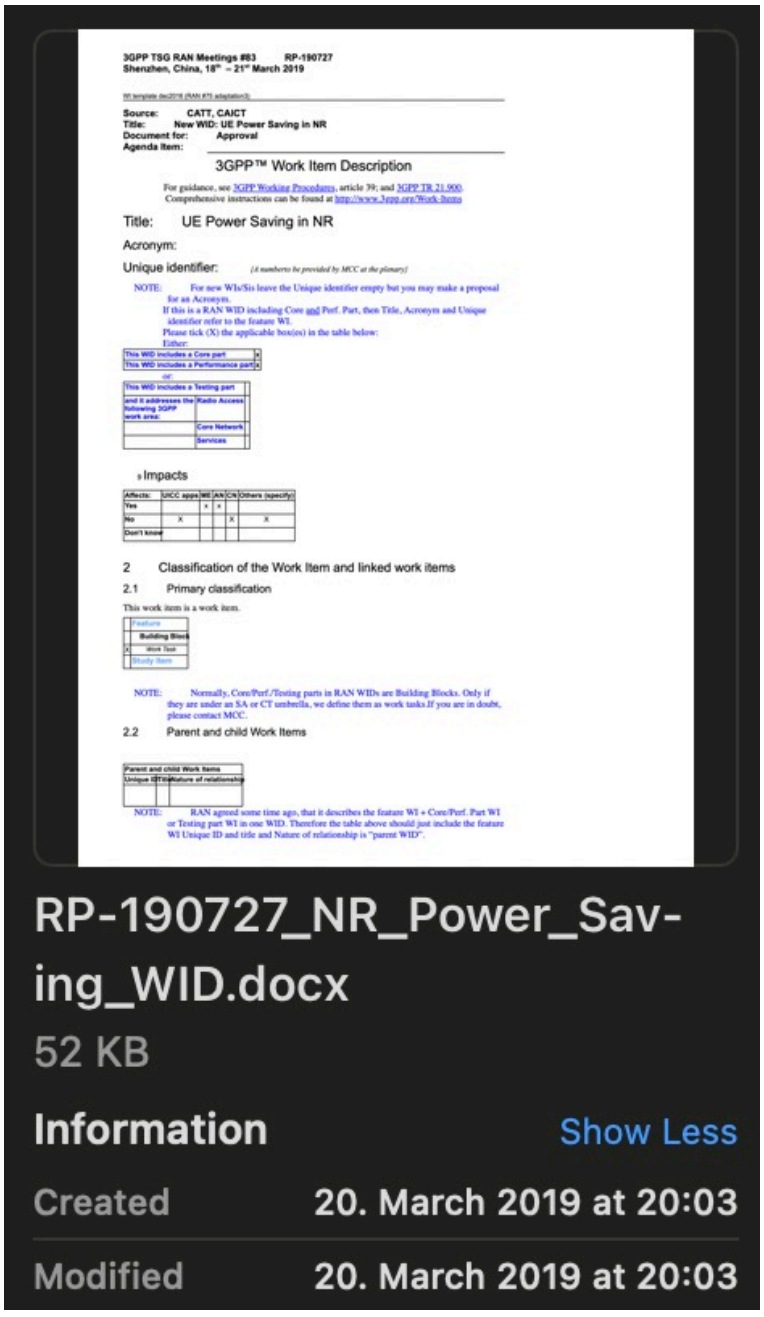
108. On its face, RP-190727 refers to the RAN meeting #83 held on March 18-21, 2019, in Shenzhen, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that RP-190727 was available either prior to or during or shortly after that meeting to at least all attending 3GPP members.

109. The public availability of the document is confirmed by the date stamp, March 21, 2019, shown on the historic 3GPP FTP server for the corresponding downloadable file ("RP-190727.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200622115332/https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_83/Docs/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_83/Docs as shown in the screenshot below:



110. Experts in the field of determining the public availability of 3GPP documents would reasonably rely upon the FTP server upload date on the 3GPP FTP server as the date the document became available to the public.

111. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "20. March 2019," as shown in the screenshot below.



3GPP TSG RAN Meetings #83 RP-190727
Shenzhen, China, 18th – 21st March 2019

Source: CATT, CAICT
Title: New WID: UE Power Saving in NR
Document for: Approval
Agenda Item:

3GPP™ Work Item Description

For guidance, see 3GPP Working Procedures, article 39; and 3GPP TR 21.900.
Comprehensive instructions can be found at http://www.3gpp.org/Work-Items

Title: UE Power Saving in NR

Acronym:

Unique identifier: *(A number to be provided by MCC at the plenary)*

NOTE: For new WIs/SIs leave the Unique identifier empty but you may make a proposal for an Acronym.
If this is a RAN WID including Core and Perf. Part, then Title, Acronym and Unique identifier refer to the feature WI.
Please tick (X) the applicable box(es) in the table below:
Either:

This WID includes a Core part	
This WID includes a Performance part	x

or:

This WID includes a Testing part		
and it addresses the following 3GPP work area:	Radio Access	
	Core Network	
	Services	

1 Impacts

Affects:	UICC apps	ME	AN	CN	Others (specify)
Yes		x	x		
No	X			X	X
Don't know					

2 Classification of the Work Item and linked work items

2.1 Primary classification

This work item is a work item.

	Feature
	Building Block
X	Work Task
	Study Item

NOTE: Normally, Core/Perf./Testing parts in RAN WIDs are Building Blocks. Only if they are under an SA or CT umbrella, we define them as work tasks.If you are in doubt, please contact MCC.

2.2 Parent and child Work Items

Parent and child Work Items	
Unique ID/Title	Nature of relationship

NOTE: RAN agreed some time ago, that it describes the feature WI + Core/Perf. Part WI or Testing part WI in one WID. Therefore the table above should just include the feature WI Unique ID and title and Nature of relationship is "parent WID".

RP-190727_NR_Power_Saving_WID.docx

52 KB

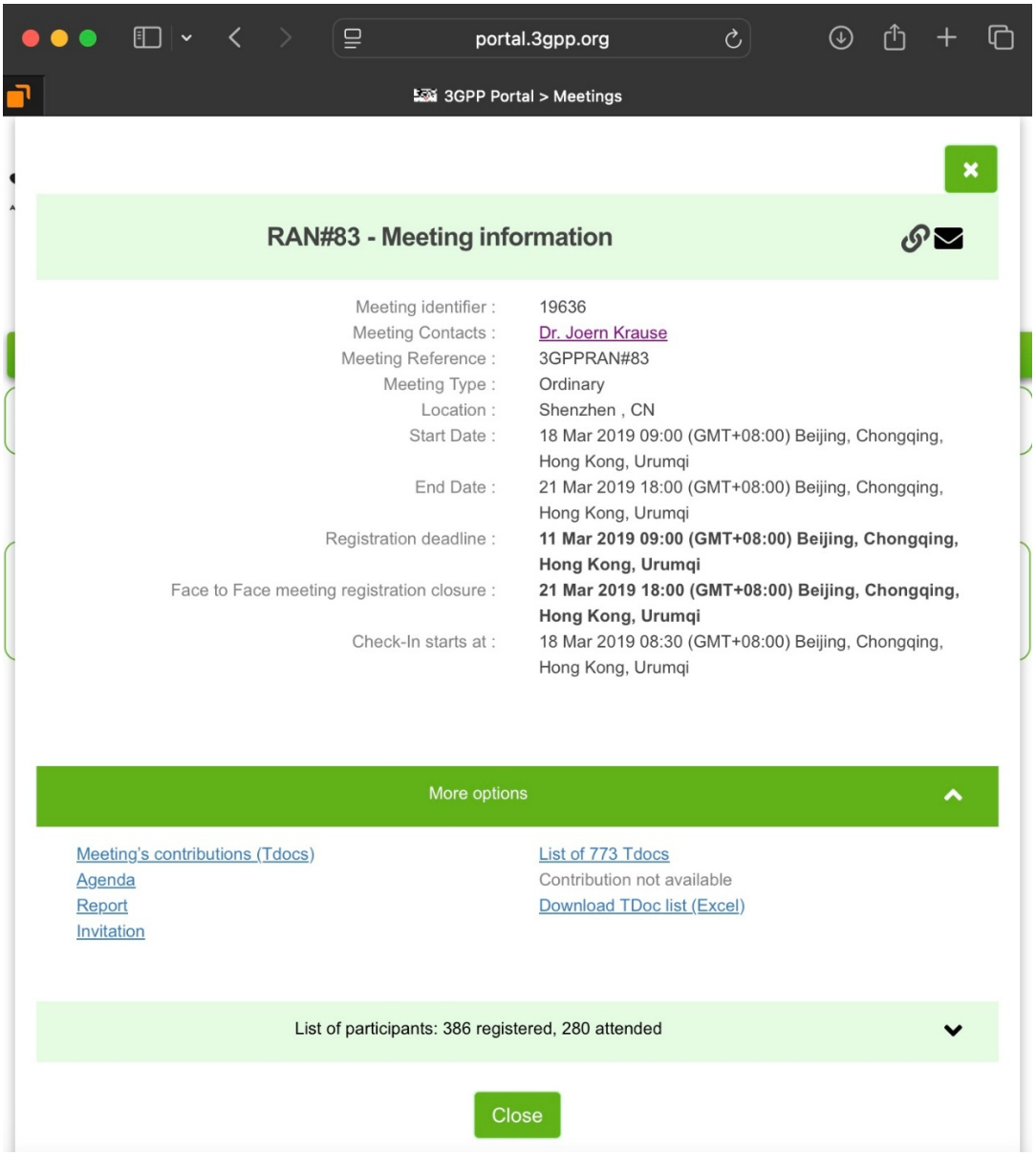
Information Show Less

Created 20. March 2019 at 20:03

Modified 20. March 2019 at 20:03

112. This last modified date is consistent with the March 21, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

113. The final meeting report of the RAN meeting #83 held on March 18-21, 2019, in Shenzhen, China, can be found in Appendix G. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 280 individuals (out of 386 registered participants):



114. The meeting report mentions RP-190727 on page 8, 9, 51, and 207 which clearly indicates that the document was registered for this meeting. Furthermore, the meeting report includes in the zip file the meeting's document list of which an excerpt can be found in Appendix H.[9] RP-190727 is listed in row 728

[9] Given the size of the document list the Appendix only includes the columns relevant for this declaration.

and is tagged as “Available: Yes” and “approved”. Furthermore, the ”AvailabilityDate” is shown as “21.03.19” which is aligned with the upload date shown on the 3GPP FTP server, as can be seen by the screenshot below:

	B	C	E	F	G	Y	Z
1	Available	Decision	Tdoc	Title	Source	ReservationDate	AvailabilityDate
728	Yes	approved	RP-190727	New WID: UE Power Saving in NR	CATT	20.03.19 08:25	21.03.19 05:45

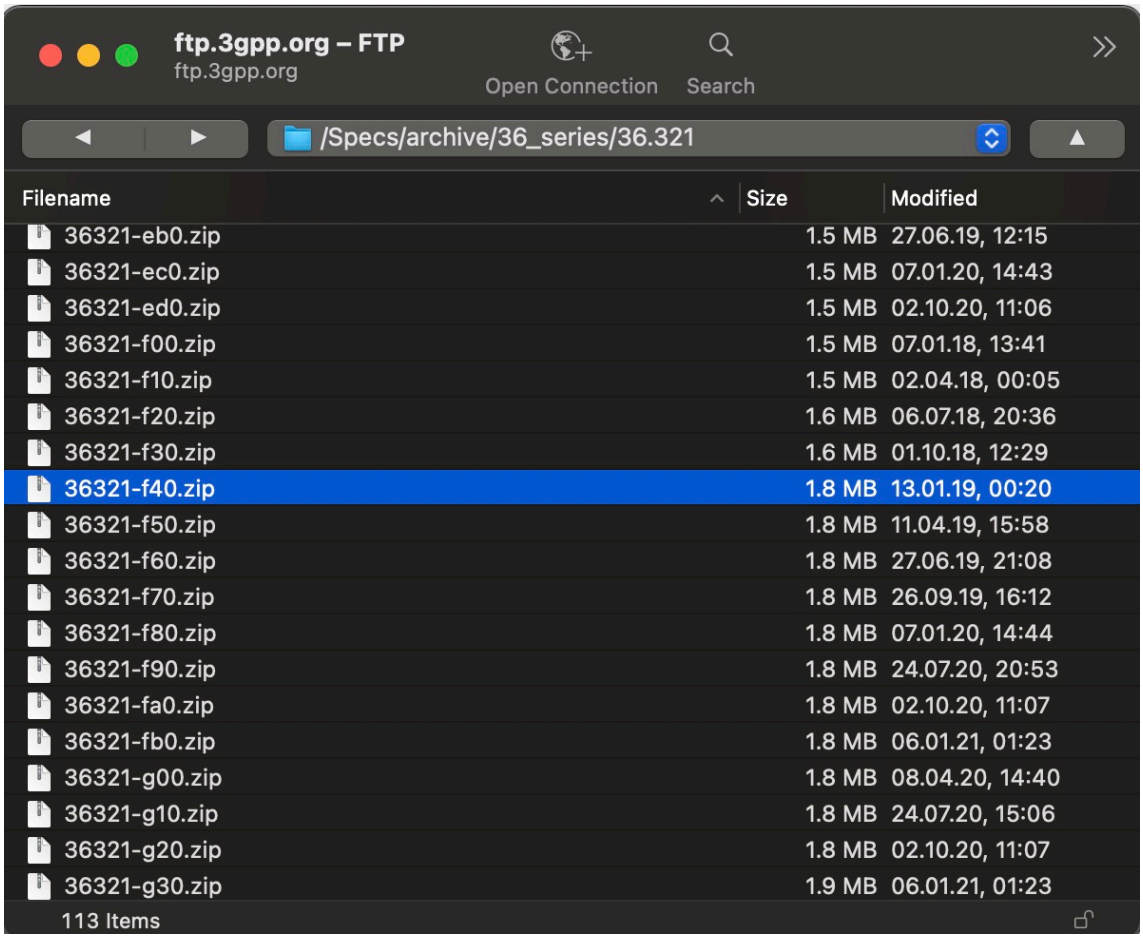
115. Thus, based on my personal knowledge and experience with ETSI’s and 3GPP’s standard business practices, Ex. 1016 is an authentic copy of 3GPP TDoc RP-190727 that was uploaded and made available via the 3GPP FTP server to the general public by March 21, 2019, at the latest.

7. TS 36.321 V15.4.0

116. Based on my personal knowledge and my review of 3GPP’s business records, I recognize Ex. 1010 as a true and correct copy of version 15.4.0 of technical specification 3GPP TS 36.321 (“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release

15)"), which shows on its cover page "2018-12" as the year (2018) and month (December) during which this document was released by 3GPP.

117. The document was published and freely available on 3GPP's FTP server by January 13, 2019. This is confirmed by the date stamp shown on the historic 3GPP FTP server for the corresponding downloadable file ("36321-f40.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200622063157/https://www.3gpp.org/ftp/Specs/archive/36_series/36.321/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/Specs/archive/36_series/36.321, as shown by the screenshot below:



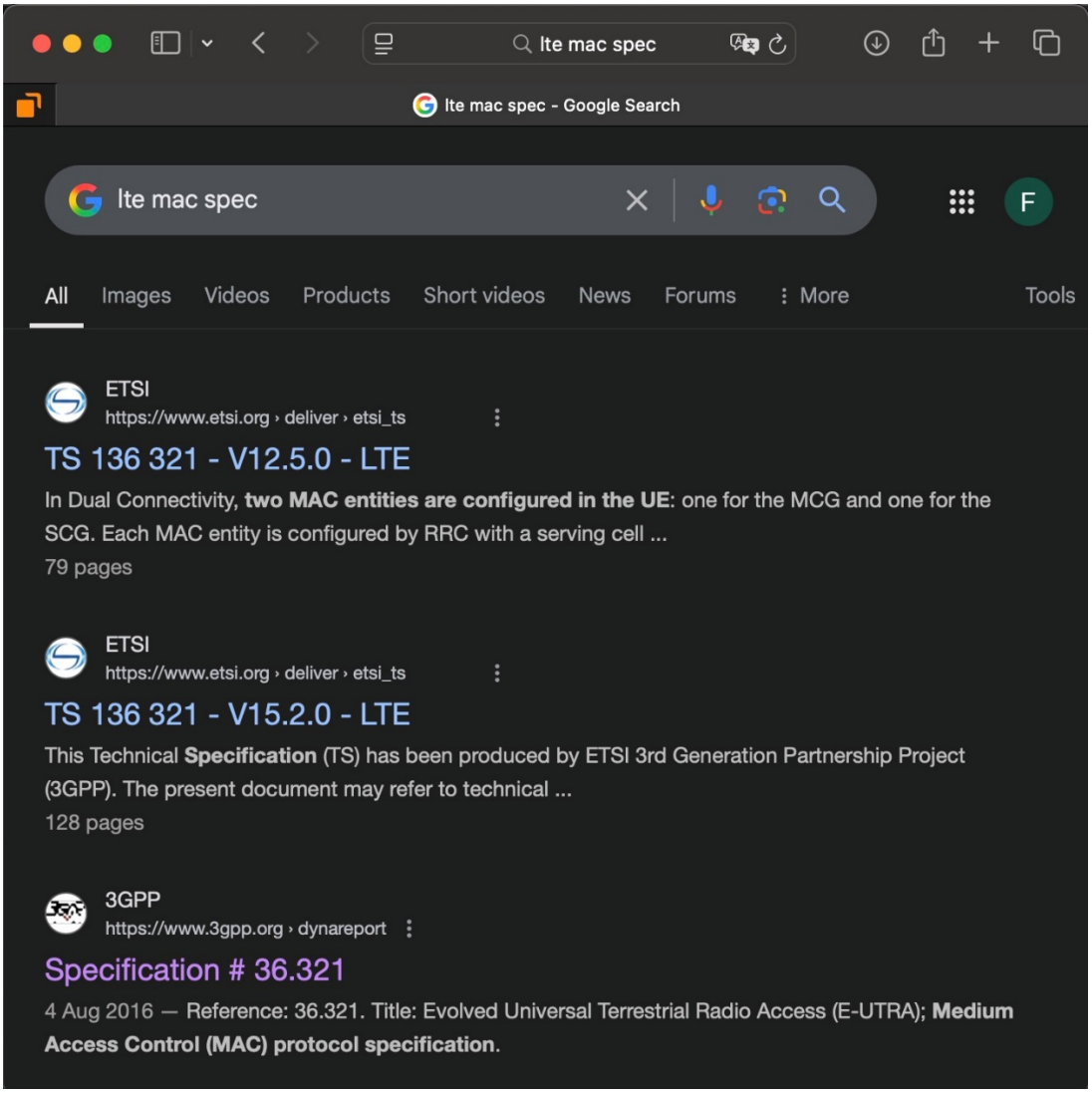
118. In addition, metadata information for the downloaded and extracted specification file states a last “Modified” date of “13. January 2019”, as shown in the screenshot below:


3GPP TS 36.321 V15.4.0 (2018-12)
Technical Specification
3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Medium Access Control (MAC) protocol specification
(Release 15)
Keywords
LTE, E-UTRAN, radio
3GPP
Postal address
Internet
Copyright Notification
No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.
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36321-f40.doc
6,4 MB
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Created
13. January 2019 at 00:15
Modified
13. January 2019 at 00:15

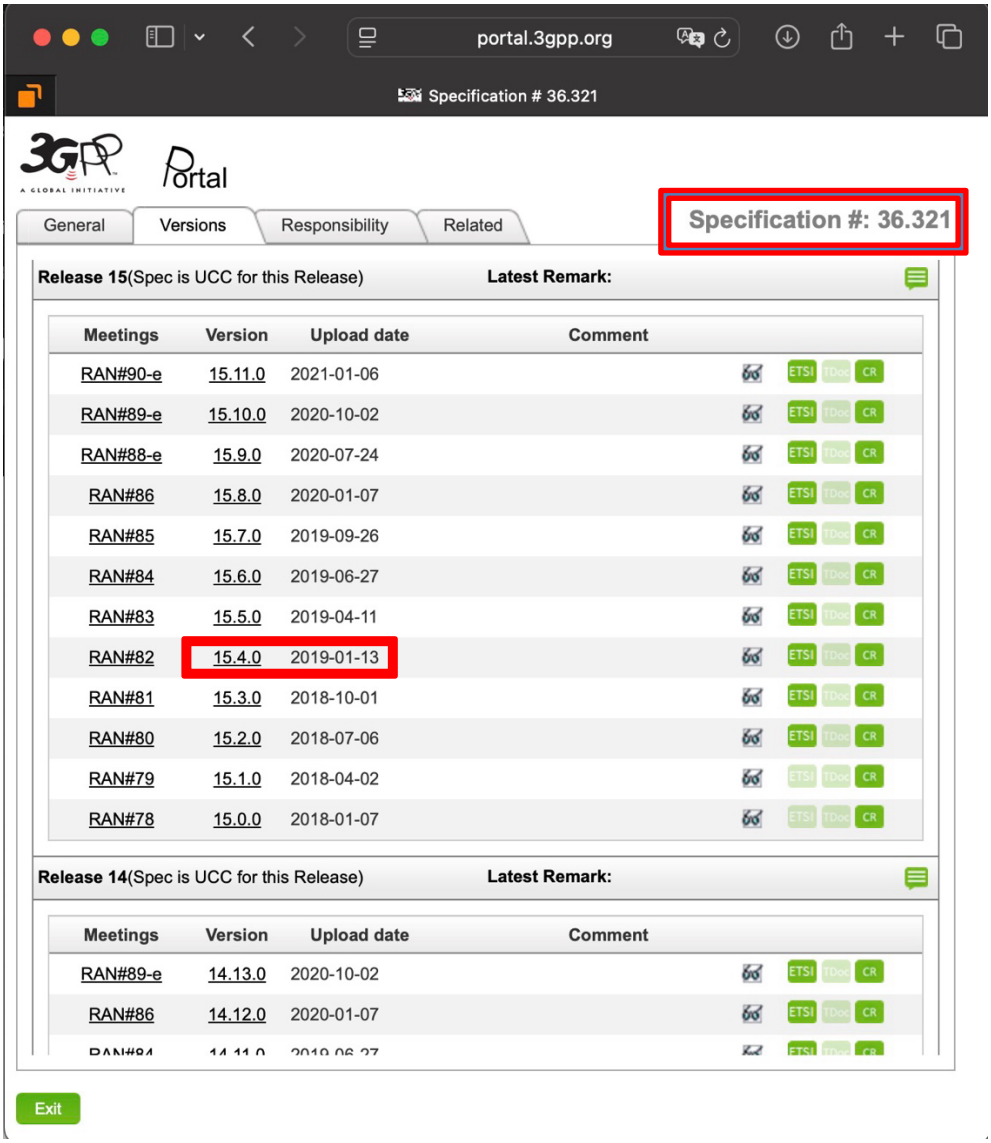
119. This last modified date is well aligned with the January 13, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload documents shortly after completing them.

120. Furthermore, the availability of several new RAN2 specification versions including TS 36.321 v15.4.0 (filename 36321-f40) was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on January 13, 2019, as shown in Appendix I. As of today, the 3GPP_TSG_RAN_WG2 email exploder has around 1,100 subscribers at https://list.etsi.org/scripts/wa.exe?INDEX. According to my experience I would expect a similar or only slightly smaller number of subscribers around 2019.

121. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for “lte mac spec” provides the TS number “36.321” as one of the top results as can be seen in the screenshot below:



122. Following the provided search result link "Specification # 36.321" leads to a 3GPP web page offering under the tab "Versions" download links to all versions of TS 36.321 including version 15.4.0, as shown by the screenshot below:



123. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even without prior knowledge of 3GPP to locate any version of TS 36.321, including version 15.4.0, for download.

124. The above search was performed at the time of writing this report. According to my personal experience, in January 2019 or around that timeframe it would have been similarly straightforward to locate a path to download version 15.4.0 of TS 36.321.

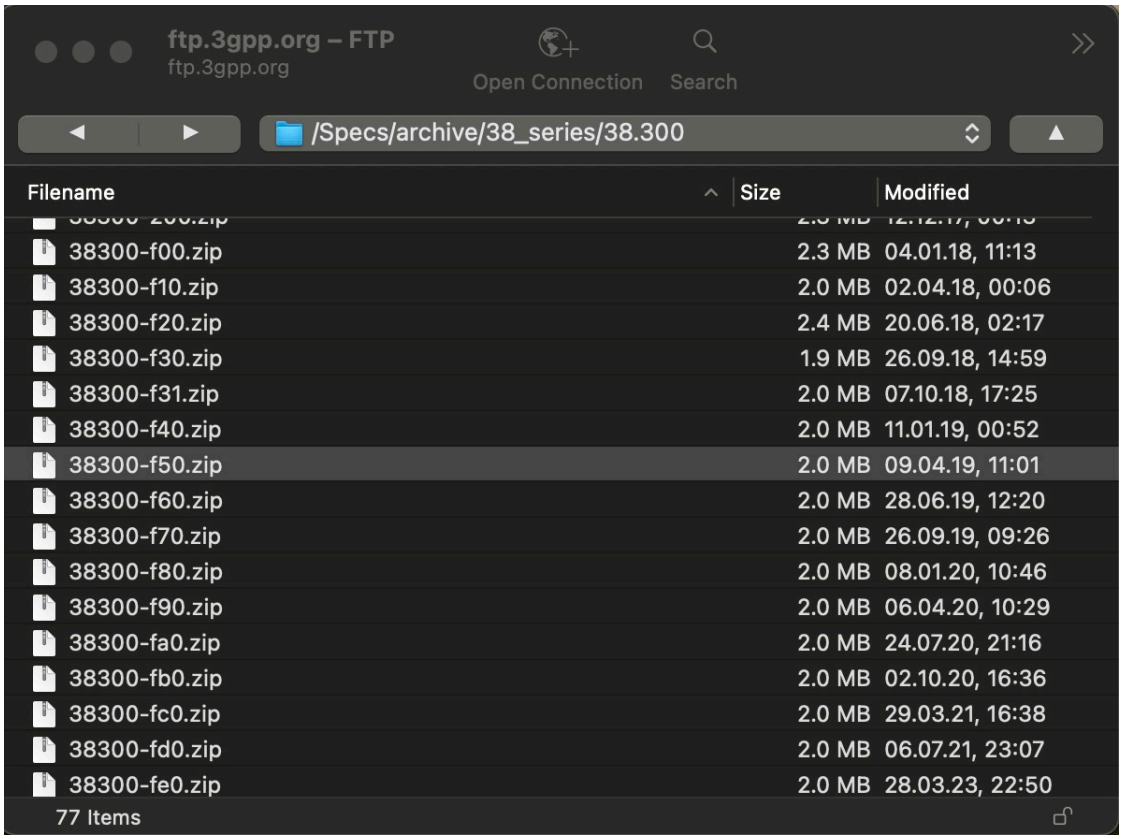
125. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by January 13, 2019, at the latest.

8. TS 38.300 V15.5.0

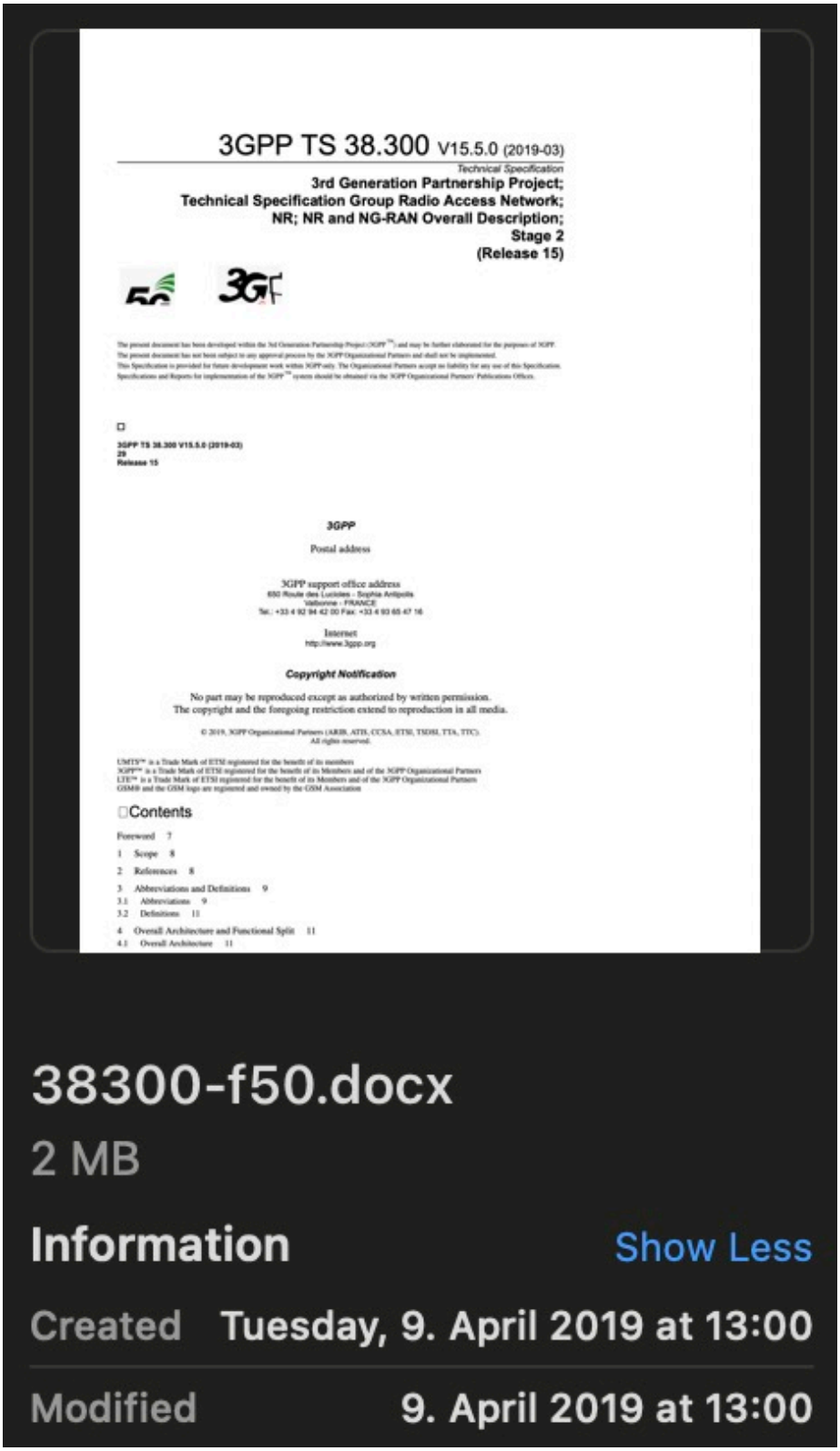
126. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1011 as a true and correct copy of version 15.5.0 of technical specification 3GPP TS 38.300 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2 (Release 15)"), which shows on its cover page "2019-03" as the year (2019) and month (March) during which this document was released by 3GPP.

127. The document was published and freely available on 3GPP's FTP server by April 9, 2019. This is confirmed by the date stamp shown on the historic 3GPP FTP server for the corresponding downloadable file ("38300-f50.zip"), as

maintained by the Internet Archive at https://web.archive.org/web/20200306020914/https://www.3gpp.org/ftp/Specs/archive/38_series/38.300/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/Specs/archive/38_series/38.300, as shown by the screen shot below:



128. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of "9. April 2019", as shown in the screenshot below:



3GPP TS 38.300 V15.5.0 (2019-03)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
NR; NR and NG-RAN Overall Description;
Stage 2
(Release 15)

3GPP TS 38.300 V15.5.0 (2019-03)
29
Release 15

3GPP

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Contents

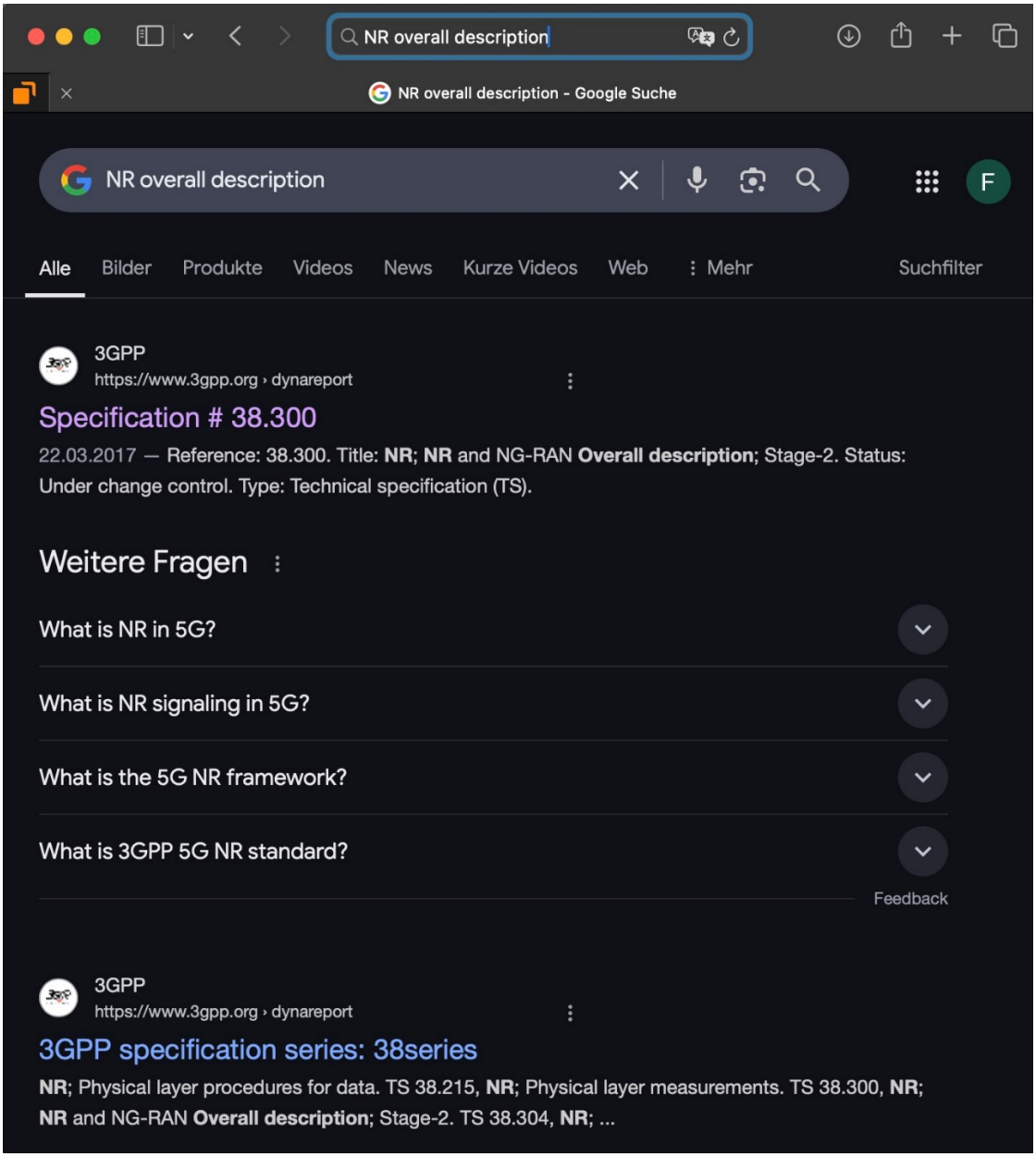
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2 MB
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Created Tuesday, 9. April 2019 at 13:00
Modified 9. April 2019 at 13:00

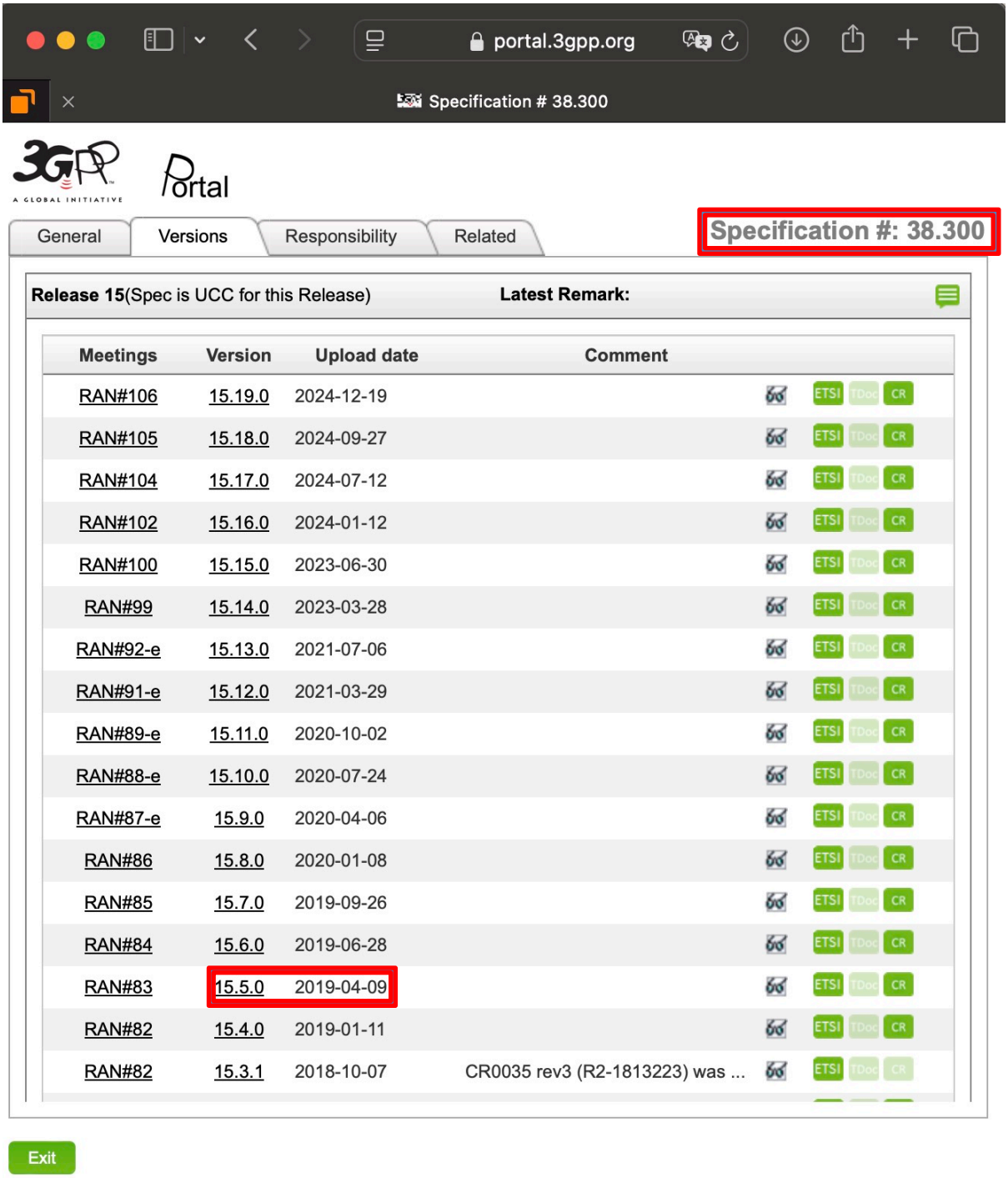
129. This last modified date well aligned with the April 9, 2009, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

130. Furthermore, the availability of several new RAN2 specification versions including TS 38.300 v15.5.0 (filename 38300-f50) was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on April 9, 2019, as shown in Appendix K. As of today, the 3GPP_TSG_RAN_WG2 email exploder has around 1,100 subscribers at https://list.etsi.org/scripts/wa.exe?INDEX. According to my experience I would expect a similar or only slightly smaller number of subscribers around 2019.

131. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for "NR overall description" provides the TS number "38.300" as one of the top results as can be seen in the screenshot below:



132. Following the provided search result link "Specification # 38.300" leads to a 3GPP web page offering under the tab "Versions" download links to all versions of TS 38.300 including version 15.5.0, as shown by the screenshot below:



133. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even

without prior knowledge of 3GPP to locate any version of TS 38.300, including version 15.5.0, for download.

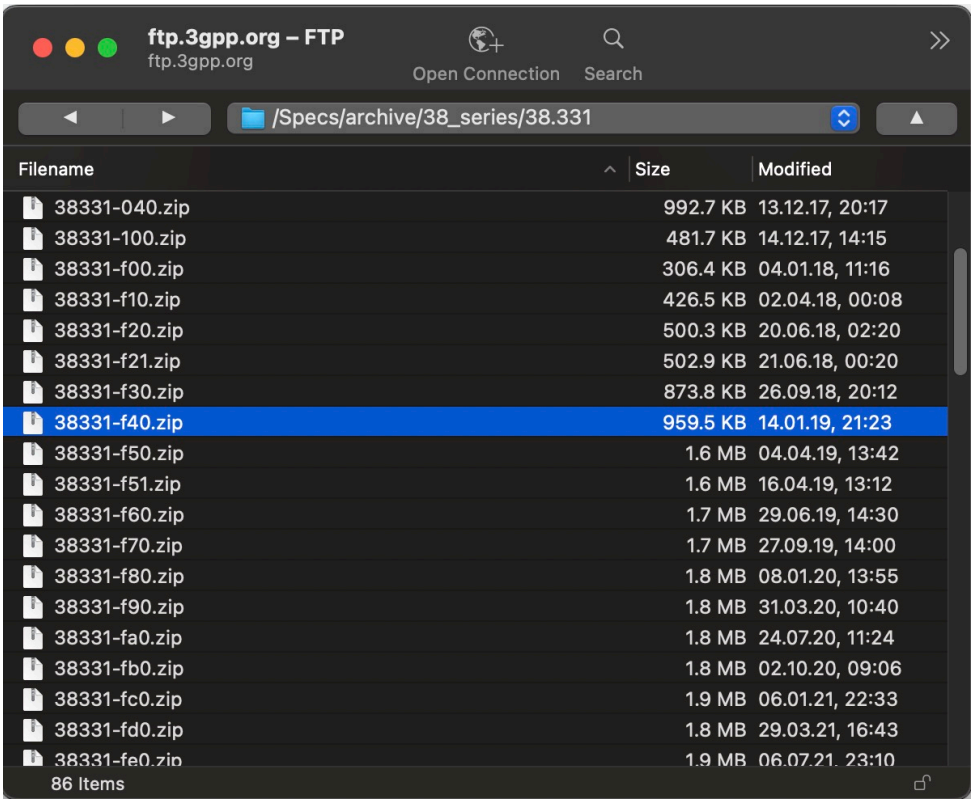
134. The above search was performed at the time of writing this report. According to my personal experience, in April 2019 or around that timeframe it would have been similarly straightforward to locate a path to download version 15.5.0 of TS 38.300.

135. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by April 9, 2019, at the latest.

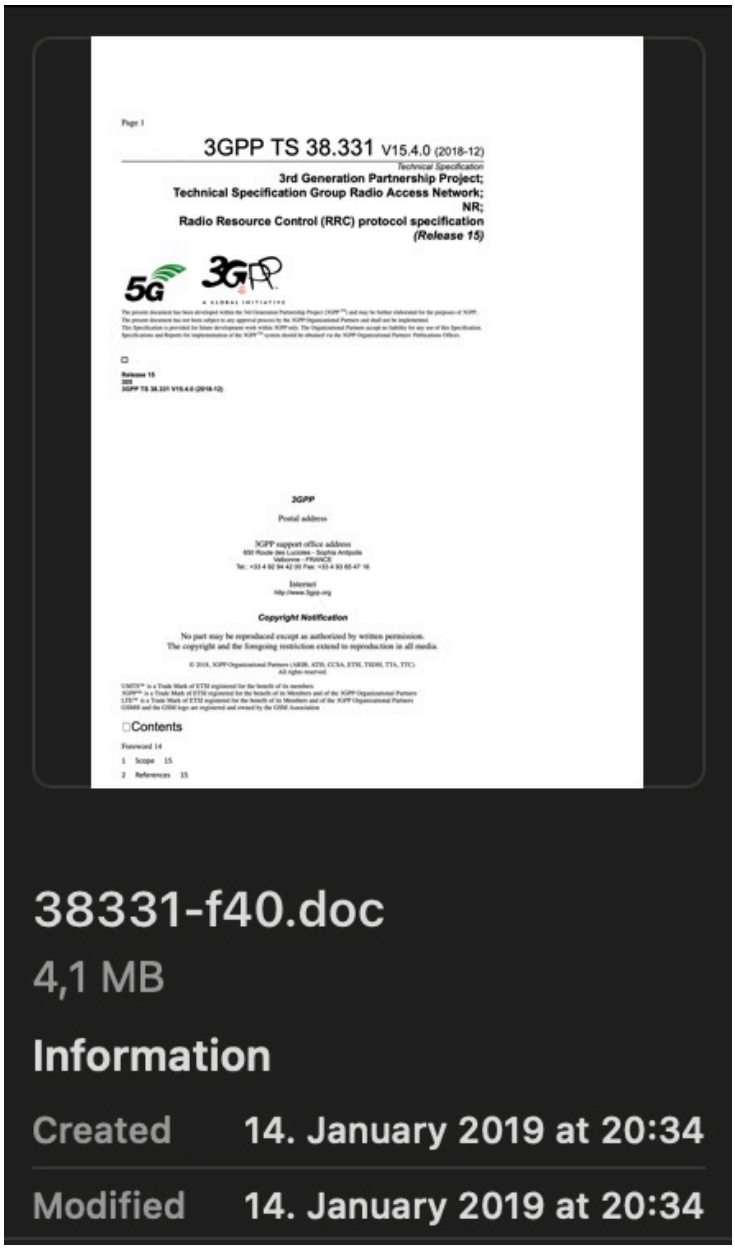
9. TS 38.331 V15.4.0

136. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1012 as a true and correct copy of version 15.4.0 of technical specification 3GPP TS 38.331 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio Resource Control (RRC) protocol specification (Release 15)"), which shows on its cover page "2018-12" as the year (2018) and month (December) during which this document was released by 3GPP.

137. The document was published and freely available on 3GPP's FTP server by January 14, 2019. This is confirmed by the date stamp shown on the historic 3GPP FTP server for the corresponding downloadable file ("38331-f40.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200317211810/https://www.3gpp.org/ftp/Specs/archive/38_series/38.331/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP FTP server at https://www.3gpp.org/ftp/Specs/archive/38_series/38.331, as shown by the screenshot below:



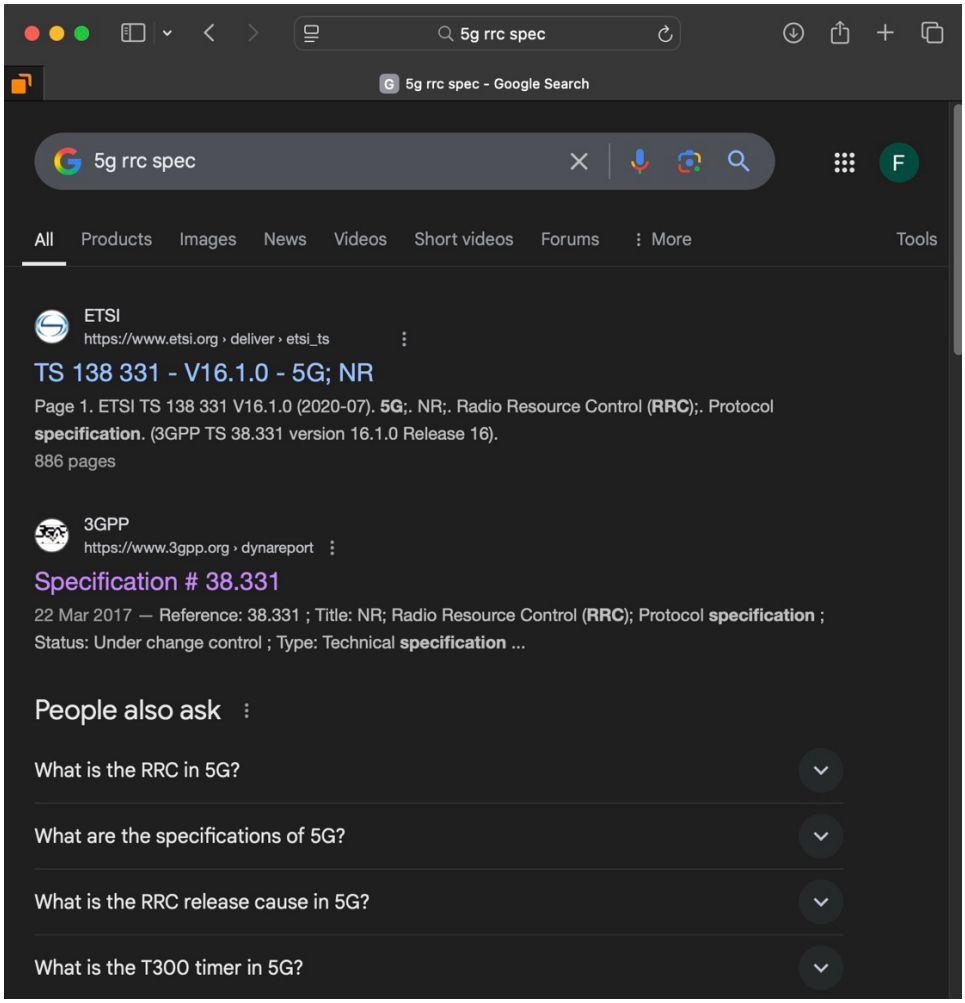
138. In addition, metadata information for the downloaded and extracted specification file states a last "Modified" date of "14. January 2019", as shown in the screenshot below:



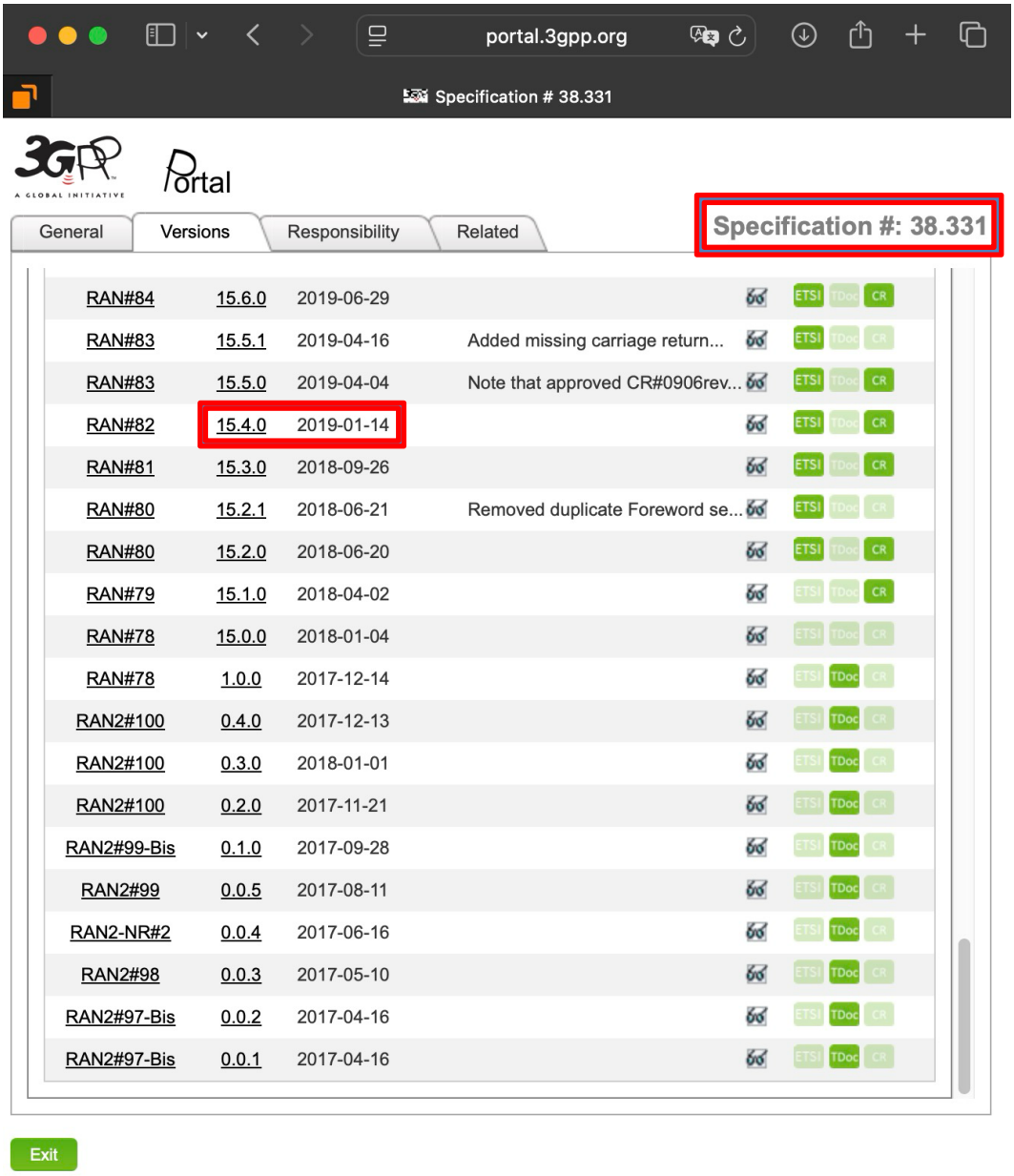
139. This last modified date is well aligned with the January 14, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload documents shortly after completing them.

140. Furthermore, the availability of several new RAN2 specification versions including TS 38.331 V15.4.0 (filename 38331-f40) was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on January 14, 2019, as shown in Appendix J. As of today, the 3GPP_TSG_RAN_WG2 email exploder has around 1100 subscribers at https://list.etsi.org/scripts/wa.exe?INDEX. According to my experience I would expect a similar or only slightly smaller number of subscribers around 2019.

141. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for “5g rrc spec” provides the TS number “38.331” as one of the top results as can be seen in the screenshot below:



142. Following the provided search result link "Specification # 38.331" leads to a 3GPP web page offering under the tab "Versions" download links to all versions of TS 38.331 including version 15.4.0, as shown by the screenshot below:



143. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even without prior knowledge of 3GPP to locate any version of TS 38.331, including version 15.4.0, for download.

144. The above search was performed at the time of writing this report. According to my personal experience, in January 2019 or around that timeframe it would have been similarly straightforward to locate a path to download version 15.4.0 of TS 38.331.

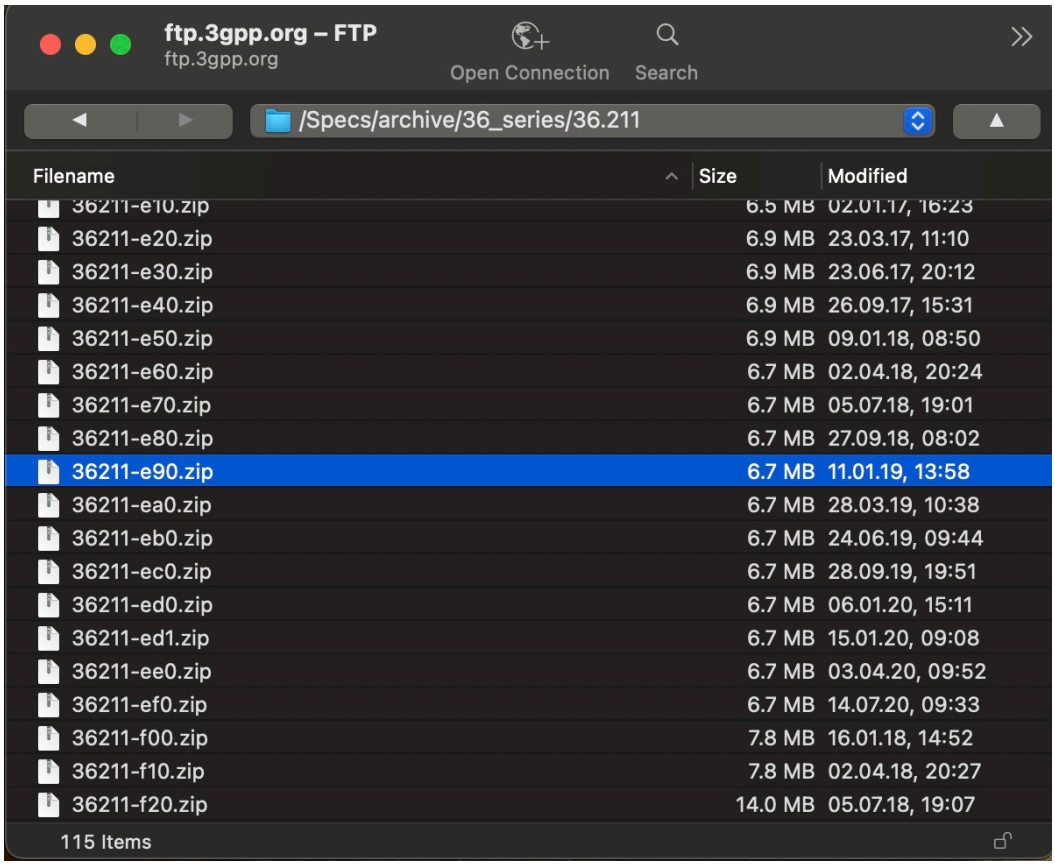
145. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by January 14, 2019, at the latest.

10. TS 36.211 V14.9.0

146. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1020 as a true and correct copy of version 14.9.0 of technical specification 3GPP TS 36.211 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 14)"), which shows on its cover page "2018-12" as the year (2018) and month (December) during which this document was released by 3GPP.

147. The document was published and freely available on 3GPP's ftp server by January 11, 2019. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36211-e90.zip"), as

maintained by the Internet Archive at https://web.archive.org/web/20200620084412/https://www.3gpp.org/ftp/Specs/archive/36_series/36.211/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at https://www.3gpp.org/ftp/Specs/archive/36_series/36.211, as shown by the screenshot below:



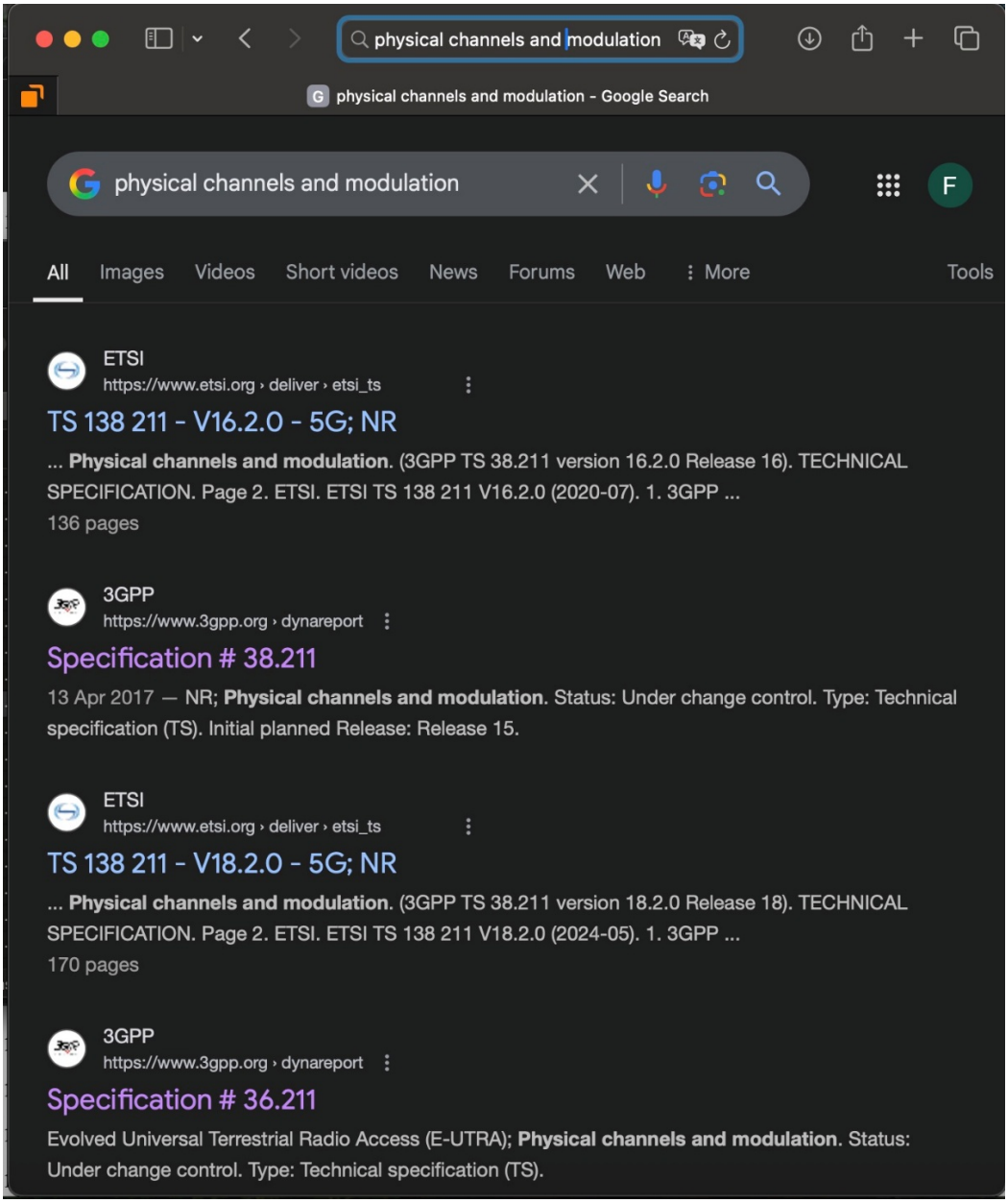
148. In addition, metadata information for the downloaded and extracted specification files states a last Modified dates of "6. December 2018[10]", as shown in the screenshot below:

[10] The gap of several weeks between the last modified date and the upload date is not typical in 3GPP and might be partially due to Christmas holidays.

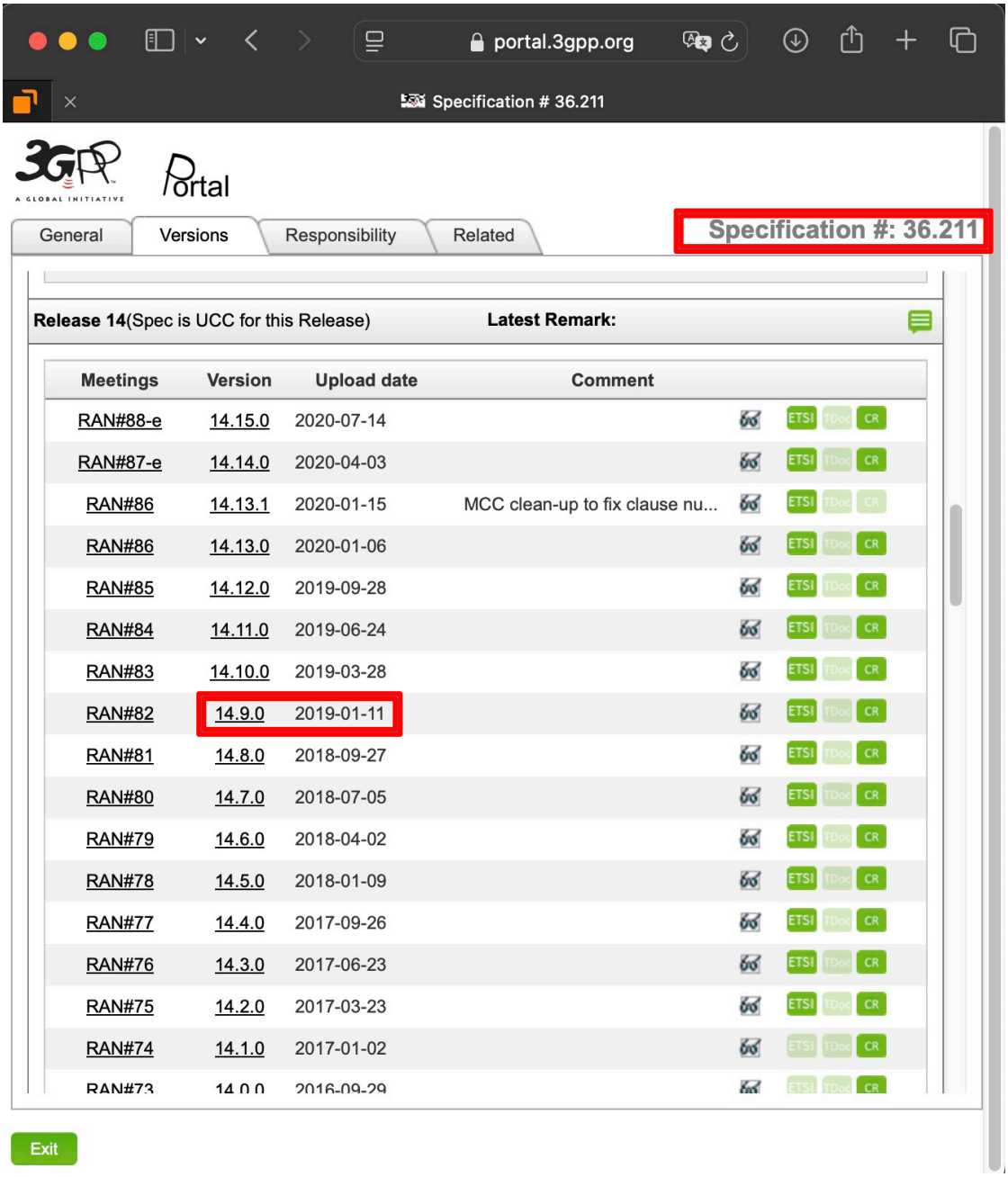


149. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by January 11, 2019, at the latest.

150. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for "physical channels and modulation" provides the TS number "36.211" as one of the top results as can be seen in the screenshot below:



151. Following the provided search result link “Specification # 36.211” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.211 including version 14.9.0, as shown by the screenshot below:



152. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even

without prior knowledge of 3GPP to locate any version of TS 36.211, including version 14.9.0, for download.

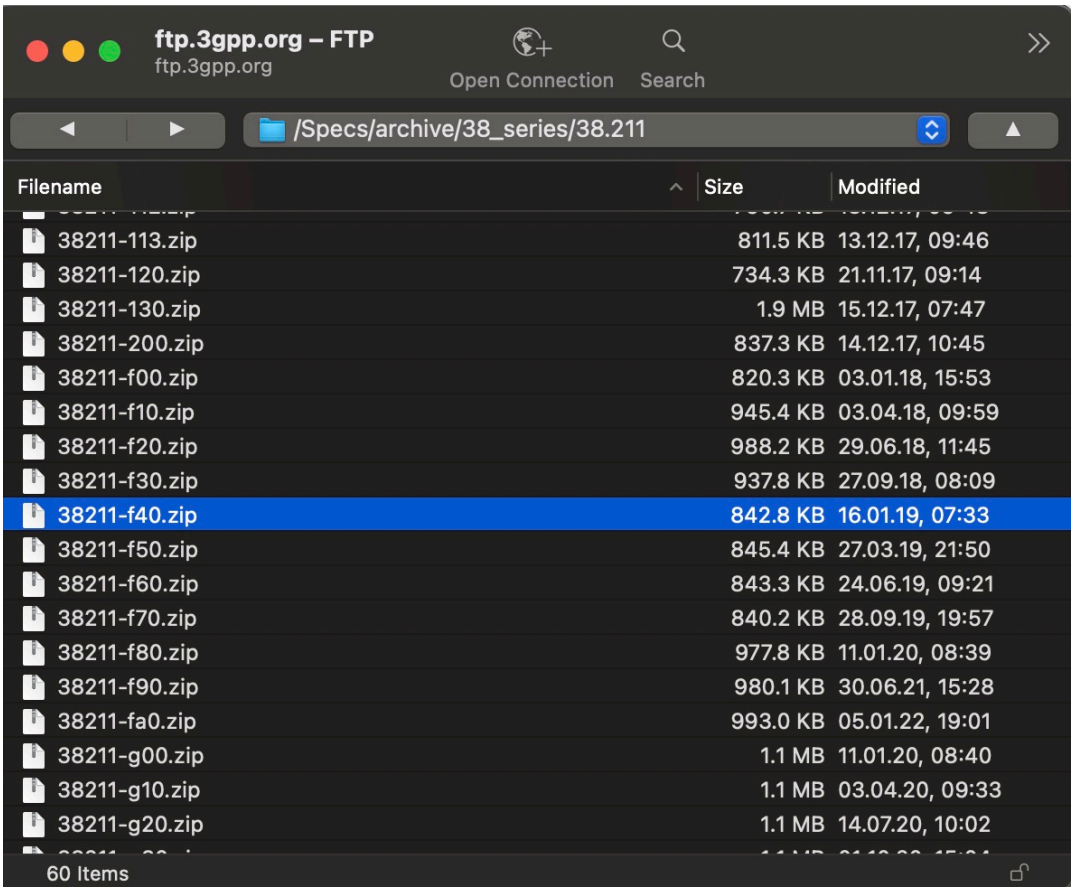
153. The above search was performed near the time of writing this report. According to my personal experience, similar searches done in January 2019 or around that timeframe would have similarly provided the path to download version 14.9.0 of TS 36.211.

11. TS 38.211 V15.4.0

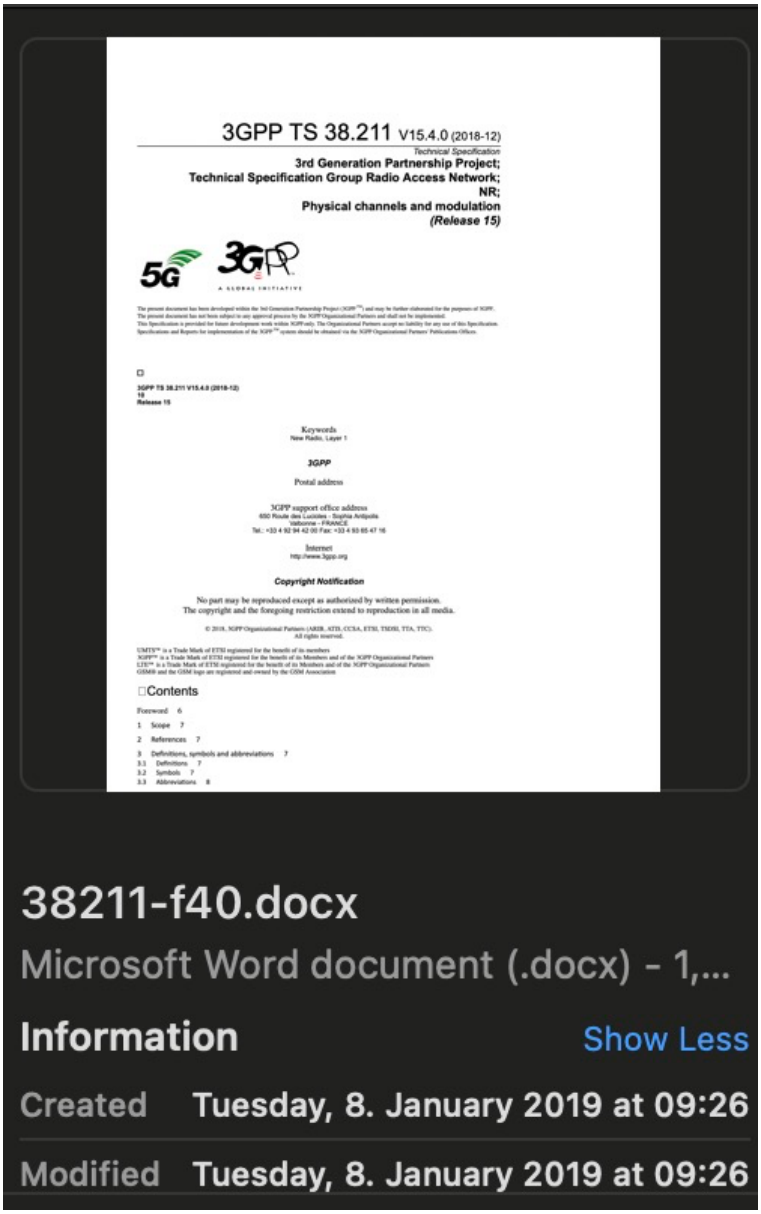
154. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1021 as a true and correct copy of version 15.4.0 of technical specification 3GPP TS 38.211 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation (Release 15)"), which shows on its cover page "2018-12" as the year (2018) and month (December) during which this document was released by 3GPP.

155. The document was published and freely available on 3GPP's ftp server by January 16, 2019. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("38211-f40.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200315162707/https://www.3gpp.org/ftp/Specs/archive/38_series/38.211/. This information is also shown on the date stamp for the

present-day listing of the same document on the 3GPP ftp server at https://www.3gpp.org/ftp/Specs/archive/38_series/38.211, as shown by the screenshot below:



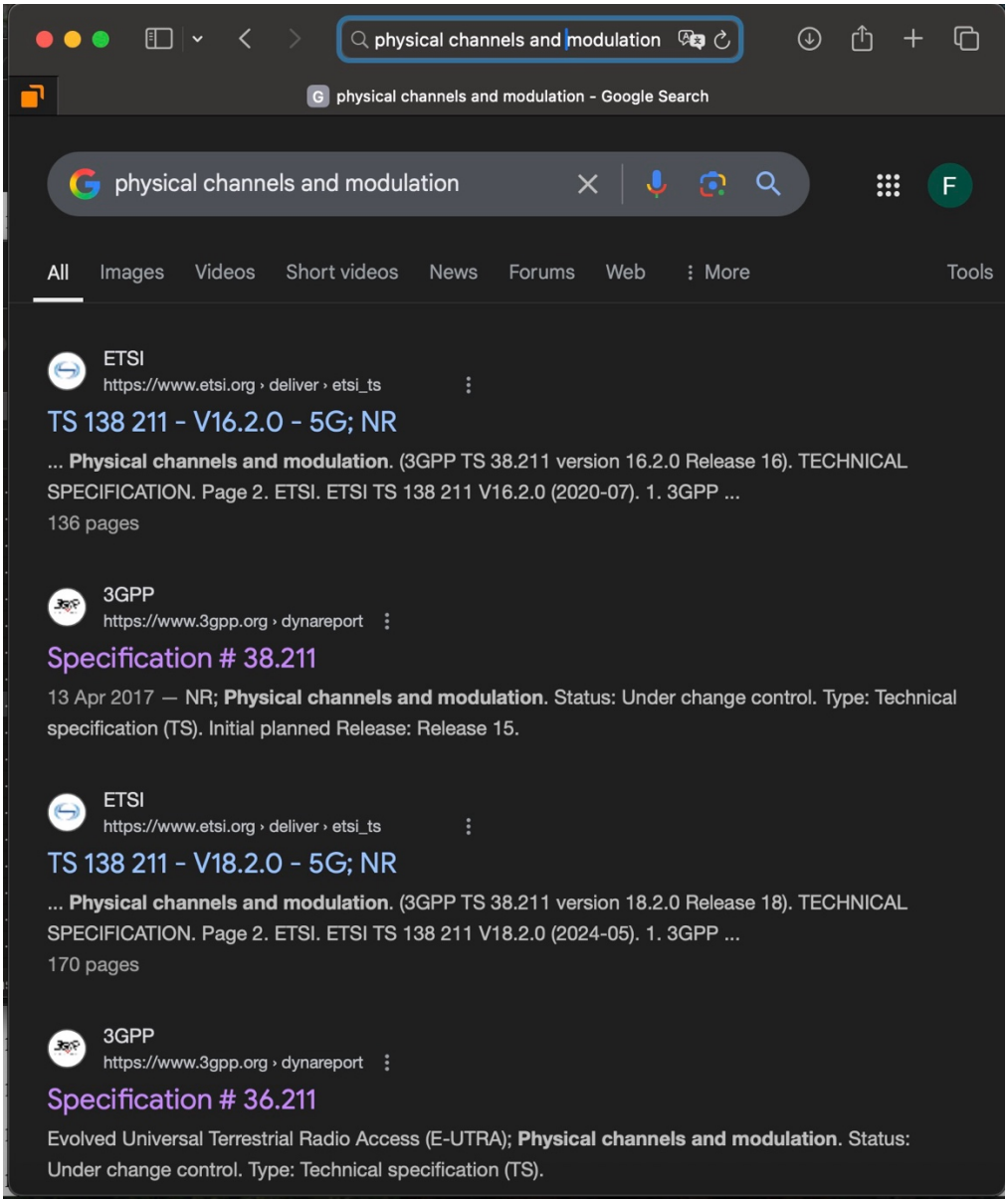
156. In addition, metadata information for the downloaded and extracted specification files states a last Modified dates of "8. January 2019", as shown in the screenshot below:



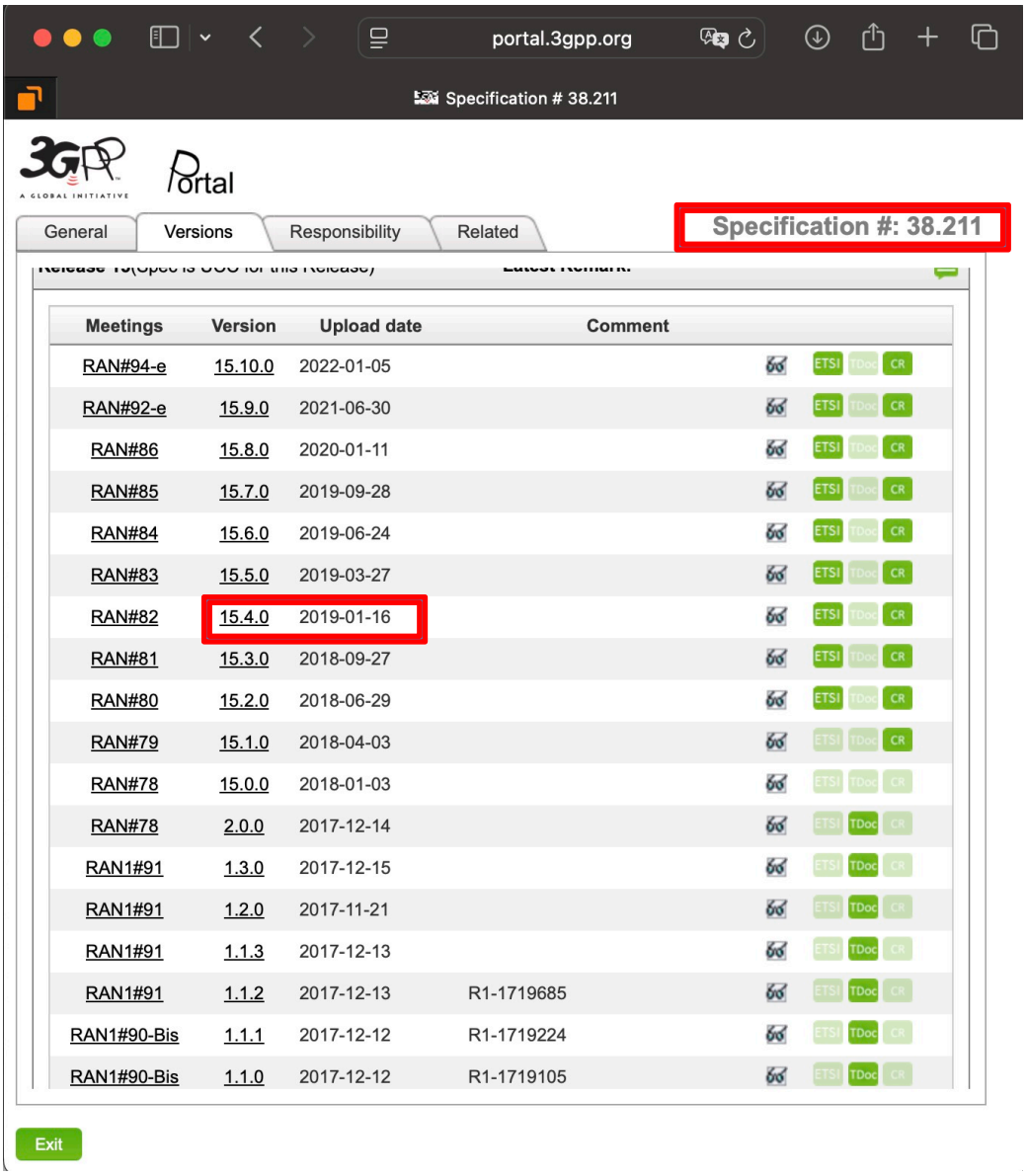
157. This last modified date is well aligned with the January 16, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload documents shortly after completing them.

158. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by January 16, 2019, at the latest.

159. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for "physical channels and modulation" provides the TS number "38.211" as one of the top results as can be seen in the screenshot below:



160. Following the provided search result link "Specification # 38.211" leads to a 3GPP web page offering under the tab "Versions" download links to all versions of TS 38.211 including version 15.4.0, as shown by the screenshot below:



161. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even without prior knowledge of 3GPP to locate any version of TS 38.211, including version 15.4.0, for download.

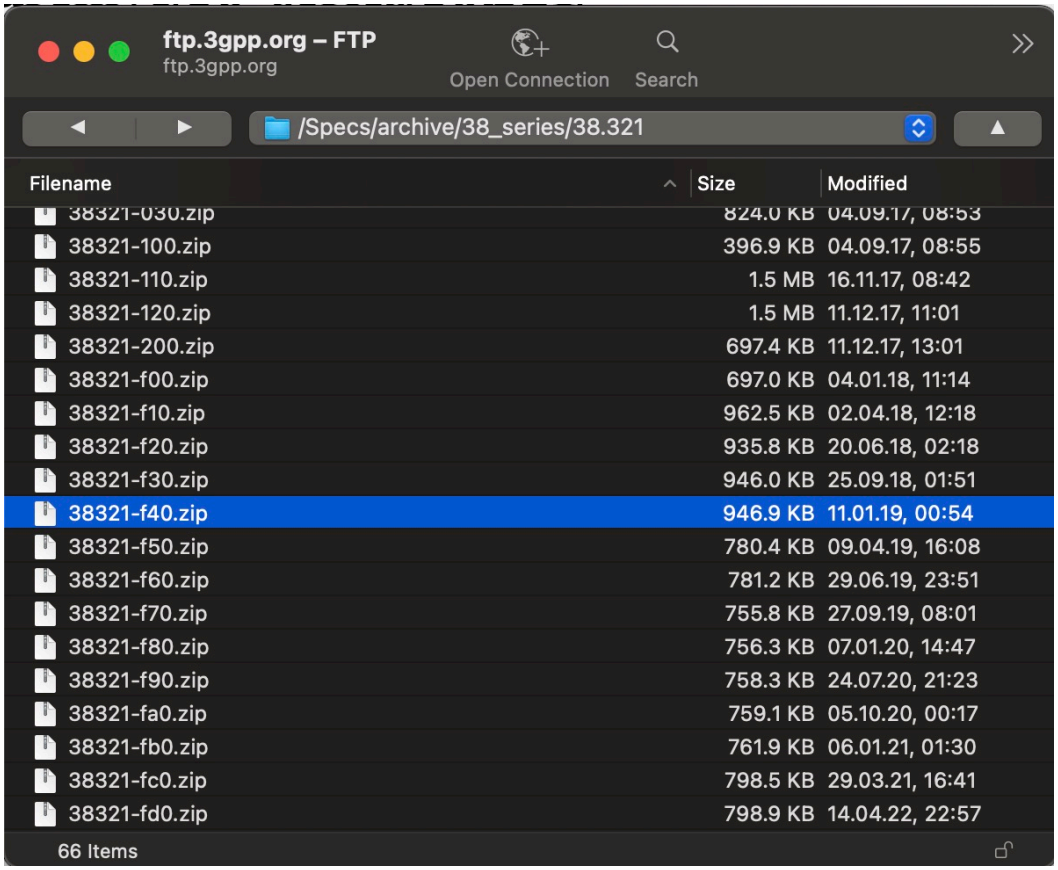
162. The above search was performed near the time of writing this report. According to my personal experience, similar searches done in January 2019 or around that timeframe would have similarly provided the path to download version 15.4.0 of TS 38.211.

12. TS 38.321 V15.4.0

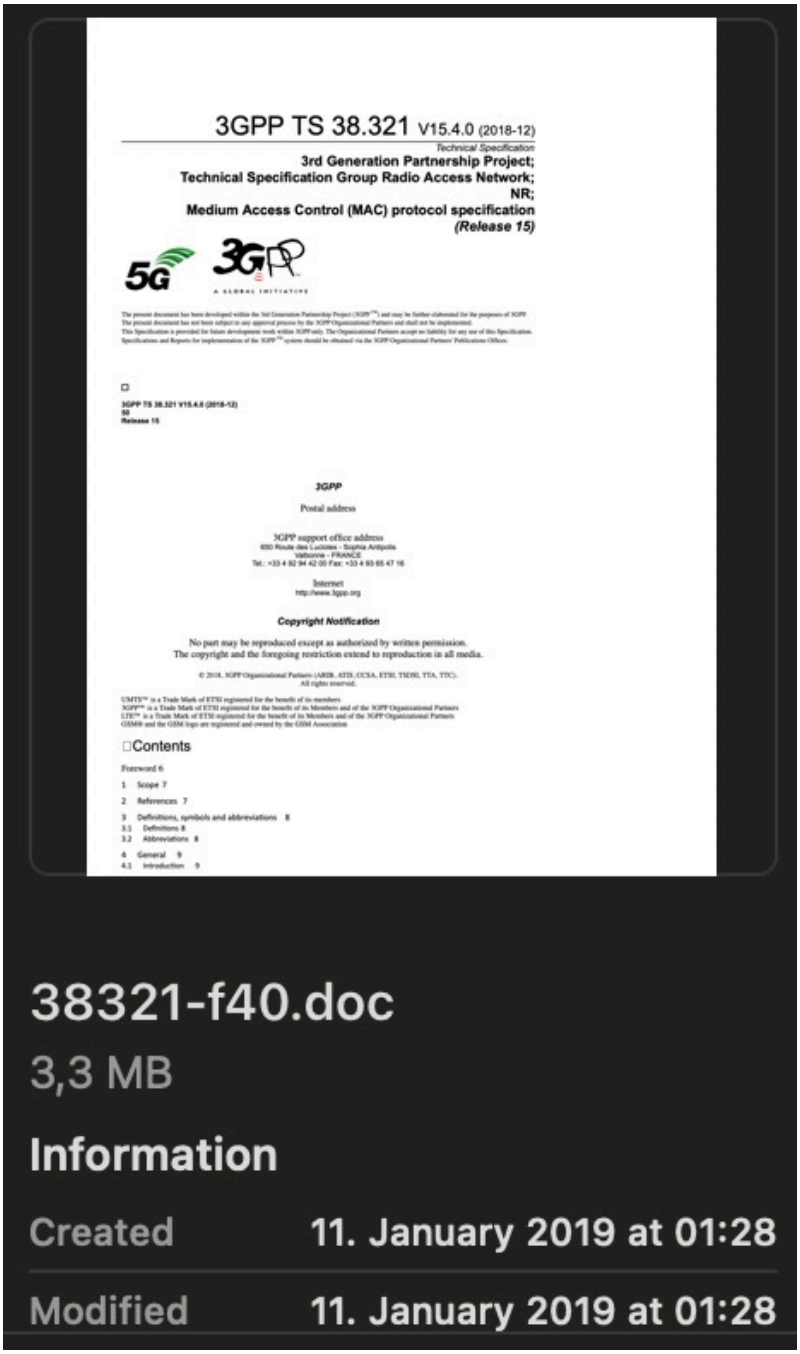
163. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1022 as a true and correct copy of version 15.4.0 of technical specification 3GPP TS 38.321 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol specification (Release 15)"), which shows on its cover page "2018-12" as the year (2018) and month (December) during which this document was released by 3GPP.

164. The document was published and freely available on 3GPP's ftp server by January 11, 2019. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("38321-f40.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20190723072255/https://www.3gpp.org/ftp/Specs/archive/38_series/38.321/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at

https://www.3gpp.org/ftp/Specs/archive/38_series/38.321, as shown by the screenshot below:



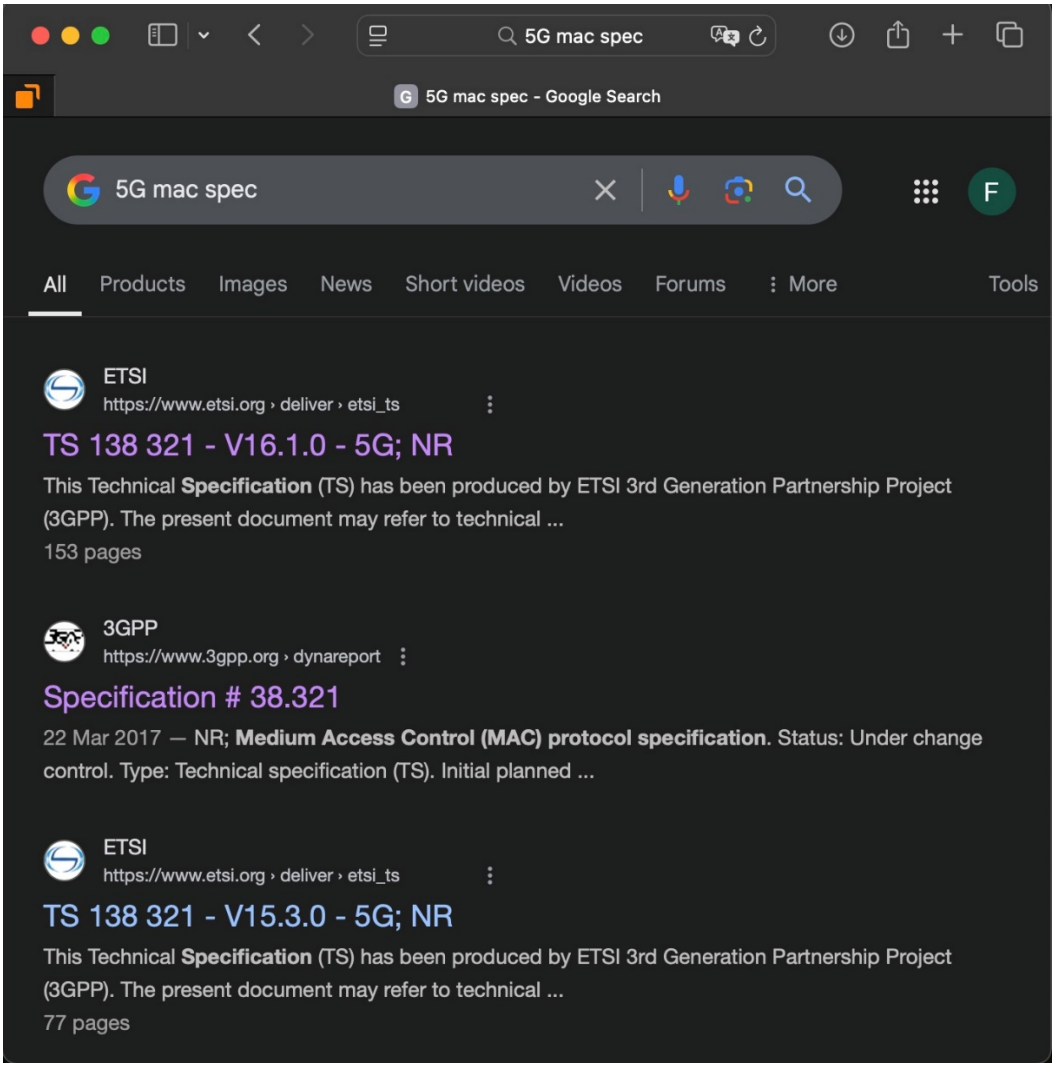
165. In addition, metadata information for the downloaded and extracted specification file states a last “Modified” date of “11. January 2019”, as shown in the screenshot below:



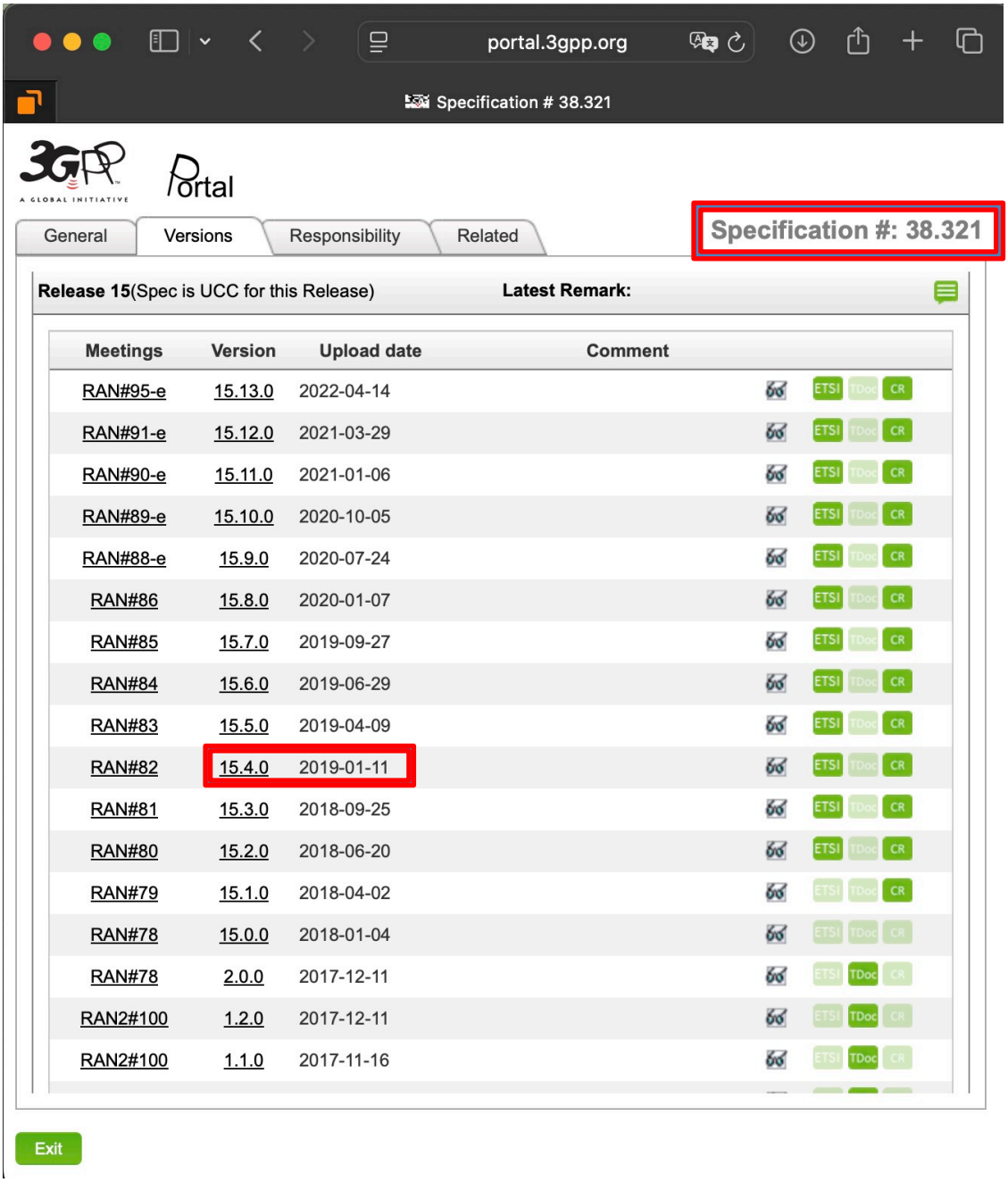
166. This last modified date is well aligned with the January 11, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload documents shortly after completing them.

167. Furthermore, the availability of several new RAN2 specification versions including TS 38.321 v15.4.0 (filename 38321-f40) was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on January 11, 2019, as shown in Appendix L. As of today, the 3GPP_TSG_RAN_WG2 email exploder has around 1100 subscribers at https://list.etsi.org/scripts/wa.exe?INDEX. According to my experience I would expect a similar or only slightly smaller number of subscribers around 2018.

168. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for "5G mac spec" provides the TS number "38.321" as one of the top results as can be seen in the screenshot below:



169. Following the provided search result link "Specification # 38.321" leads to a 3GPP web page offering under the tab "Versions" download links to all versions of TS 38.321 including version 15.4.0, as shown by the screenshot below:



170. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even

without prior knowledge of 3GPP to locate any version of TS 38.321, including version 15.4.0, for download.

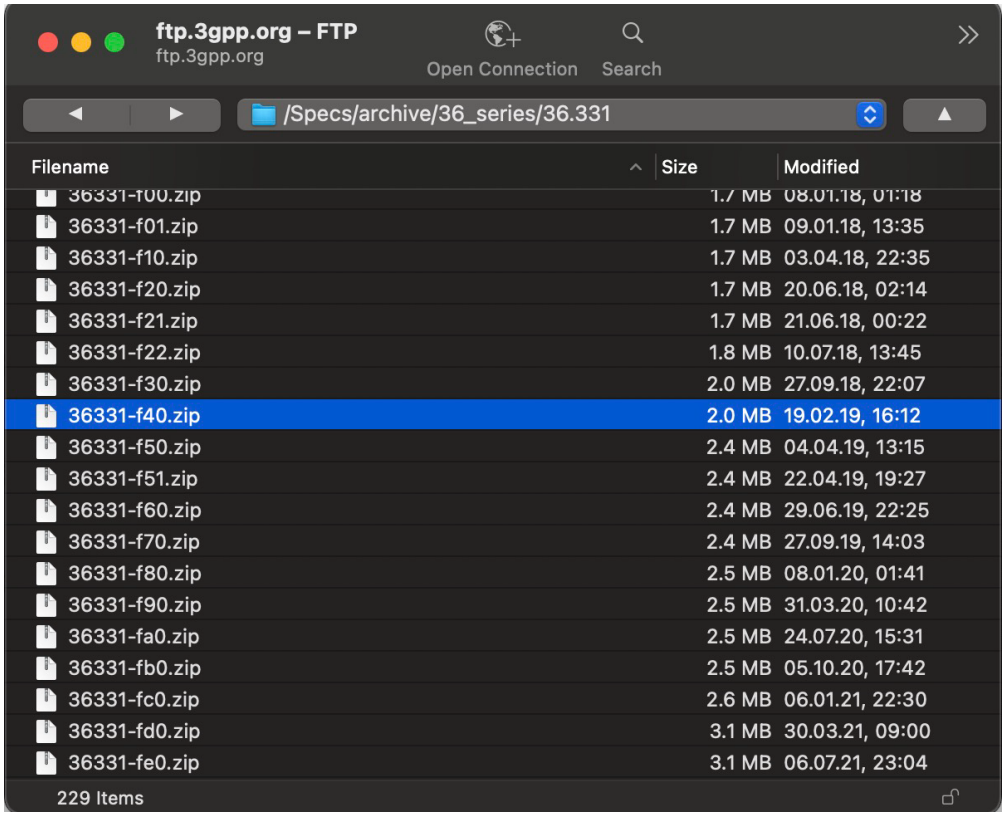
171. The above search was performed at the time of writing this report. According to my personal experience, in September 2018 or around that timeframe it would have been similarly straightforward to locate a path to download version 15.4.0 of TS 38.321.

172. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by January 11, 2019, at the latest.

13. TS 36.331 V15.4.0

173. Based on my personal knowledge and my review of 3GPP's business records, I recognize Ex. 1025 as a true and correct copy of version 15.4.0 of technical specification 3GPP TS 36.331 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 15)"), which shows on its cover page "2018-12" as the year (2018) and month (December) during which this document was released by 3GPP.

174. The document was published and freely available on 3GPP's ftp server by February 19, 2019, at the latest. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36331-f40.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20200620221657/https://www.3gpp.org/ftp/Specs/archive/36_series/36.331. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at https://www.3gpp.org/ftp/Specs/archive/36_series/36.331, as shown by the screenshot below:

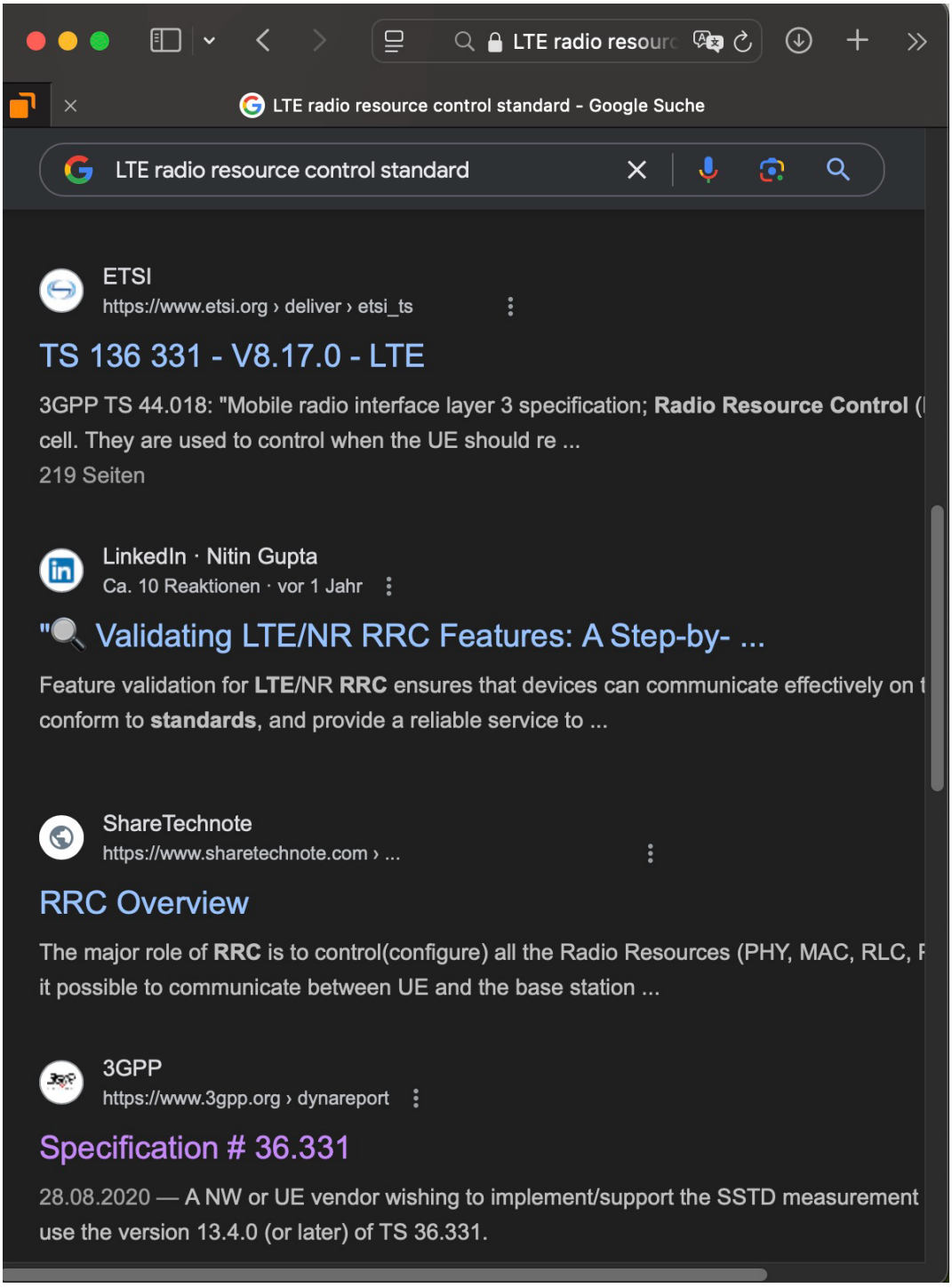


175. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of "18. January 2019", as shown in the screenshot below:

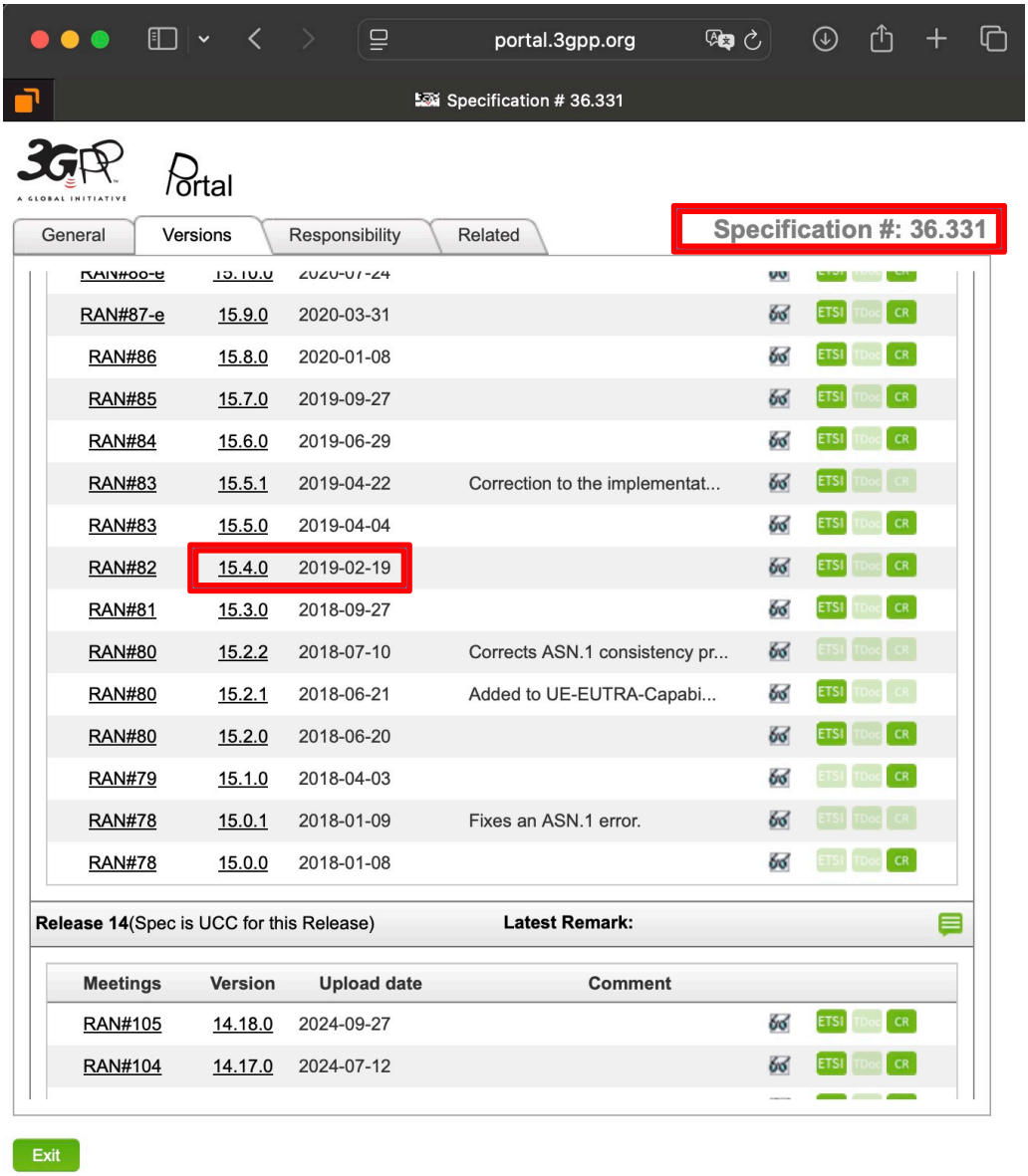


176. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by February 19, 2019, at the latest.

177. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for "LTE radio resource control standard" provides the TS number "36.331" as one of the top results as can be seen in the screenshot below:



178. Following the provided search result link "Specification # 36.331" leads to a 3GPP web page offering under the tab "Versions" download links to all versions of TS 36.331 including version 15.4.0, as shown by the screenshot below:



179. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even without prior knowledge of 3GPP to locate any version of TS 36.331, including version 15.4.0, for download.

180. The above search was performed near the time of writing this report. According to my personal experience, similar searches done in February 2019 or

around that timeframe would have similarly provided the path to download version 15.4.0 of TS 36.331.

V. AVAILABILITY FOR CROSS-EXAMINATION

181. In signing this declaration, I recognize that the declaration may be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will cooperate to the best of my ability to appear for cross examination within the United States during the time allotted for cross examination.

A. Right To Supplement

182. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner raises and to take into account new information as it becomes available to me.

B. Signature

183. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false

statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

184. I declare under penalty of perjury that the foregoing is true and correct.

Dated: July 1, 2025



Friedhelm Rodermund

APPENDIX A

CURRICULUM VITAE

I. PERSONAL DATA

Name: **Friedhelm RODERMUND**

Mailing address: Am Steiner Graben 18
56077 Koblenz, Germany

Phone: +49 172 2606489

Email: fred@iotecc.com

II. PROFESSIONAL EXPERIENCE

Summary

Senior expert in telecommunications and Internet of Things (IoT) technology. 25 years of experience within the mobile communications industry, and several years in the IoT domain in various roles such as project management, technology innovation and evolution, standards development, technology strategy, patent creation and patent litigations, and development/introduction of new services.

Recognized standards expert who was actively involved in leading roles in the development of key standards for mobile telephony/data and service anablers across standards development organizations such as 3GPP, ETSI, GSMA, IETF, OMA, and oneM2M. Currently focussing on standards for the Internet of Things including ETSI and 3GPP standards such as 5G and 6G, and OMA Lightweight M2M (LwM2M).

Founder and director of IOTECC GmbH which provides consulting services around technologies and standards enabling the Internet of Things, and consulting and expert services related to patents for mobile telcommunications and IoT.

01/2015 – present **IOTECC GmbH** **Koblenz, Germany**

Founder and CEO

- Mobile telecommunications, Internet of Things (IoT) technology and standards consulting
- Telecommunications and IoT patent consulting
  - Consulting services around telecommunications and IoT patents in particular related to 3GPP, ETSI and OMA standards
  - State of the art/prior art research services related to patent filing e.g. for 5G and 6G
  - Prior art research, essentiality assessment, patent infringement analysis related to litigations and validity actions
  - Advising on IP strategy
  - Advising on Standards Development Organisations (SDO) e.g. ETSI and 3GPP working processes and IPR policy
  - Conducting seminar on Standards Essential Patents (SEPs) for the Internet of Things at the Technical University of Ilmenau, Germany
  - Experienced expert witness (please see section III for a list of supported actions)

11/2014 – 12/2014 **Friedhelm Rodermund Consulting** **Koblenz, Germany**

Internet of Things (IoT) Consultant

- IoT standards development and introduction of new IoT services

01/2011 – 10/2014 **Vodafone Germany / Vodafone Group R&D** **Düsseldorf, Germany**

Senior Standards Strategist
- Representing Vodafone in various standardisation bodies
- Creating technical standards for the Internet of Things
- Work item lead, technical editor and key contributor of Open Mobile Alliance (OMA) "Lightweight M2M (LwM2M)" – the new standard for the Internet of Things
- Advising and supporting various IoT/M2M projects related to e.g. smart metering
- Advising on the introduction of new IoT/M2M technologies and services
- Leading Proof of Concepts of emerging technologies
- Involved in innovation projects
- Supporting the creation and protection of Intellectual Property

01/2009 – 12/2010 **Vodafone Germany** **Düsseldorf, Germany**

Vice Chairman Open Mobile Alliance (OMA) Device Management (DM)
- Responsible for Vodafone's Device Management standardisation
- As OMA DM Vice Chairman, co-leading the group, chairing committee meetings and web conferences, steering the technical direction, management of the different work items
- Editor of several specifications, rapporteur of various work items
- Support of projects for the introduction of device management
- Delegate to 3GPP SA1 with responsiblity for the introduction of MTC (machine type communications) related service/network requirements

01/2005 – 12/2008 **Vodafone Germany** **Düsseldorf, Germany**

Project Manager Mobile Broadcast Standards
- Responsible for Mobile Broadcast standardisation across different broadcast systems/standards bodies and across all Vodafone local operations
- Responsible for Mobile Broadcast standardisation strategy development and implementation
- Delegation Lead for the Open Mobile Alliance (OMA) BCAST working group
- Initiated and managed the BCAST device profile development in the BMCO Forum
- Leading the "Service Protection" (pay-TV) stream of the German DVB-H Consortium
- Filed several patents
- Supporting patent litigations and patent portfolio evaluation (various technical areas)

04/2003 – 12/2003 **GSM Association** **London, United Kingdom**

Member of the MMS Task Force
- Verification of the MMS operator interworking framework
- Supporting the definition and specification of the MMS functional evolution
- Acting as a "link" between 3GPP and GSMA in the area of MMS

06/1998 – 12/2004 **European Telecommunications Standards Institute (ETSI)**
Sophia Antipolis, France

01/2002 – 12/2004: Secretary 3GPP Technical Specifications Group *"Terminals"* and Terminals Working Group 2 *"Terminal Services and Capabilities"*

Samsung Exhibit 1026, Page 110 of 900

01/1999 – 12/2001: Secretary 3GPP Terminals Working Group 2 *"Terminal Services and Capabilities"* and GERAN 3 *"Base Station Testing"*

06/1998 – 03/1999: Secretary ETSI SMG4 *"Data Services"* and SMG8 *"Base Station Testing"*

- Supported the establishment of 3GPP (3rd Generation Partnership Project) as the leading standards organization for mobile telecommunications
- Project manager and secretary of TSG "Terminals" reponsbile for Terminal Conformance Testing, Terminal Services and Capabilities, Universal Subscriber Identity Module (USIM)
- Project manager and secretary of Terminals Working Group 2 "Terminal Services and Capabilities" that was responsible for Terminal Execution Environments, Messaging including Short Message Service (SMS), Cell Broadcast Service (CBS), Enhanced Messaging Service (EMS), Multimedia Messaging Service (MMS), Terminal Interfaces incl. AT-commands, Generic User Profile, Data Synchronization and others
- Establishment and management of the Work Plan and follow-up and report on the progress of the related work items
- Advising the chairmen and the standards groups on technical, procedural and political issues
- Editorship of various GSM and UMTS technical specifications
- Responsible for presenting the technical results of the working groups to the parent body
- Responsible for the communication with other standards bodies inside and outside 3GPP
- PR activities (articles, interviews)

12/1993 – 06/1998 Mannesmann Mobilfunk GmbH Düsseldorf, Germany

System Engineer and Project Manager in Quality Assurance and Technical Standards

- Leadership and management of acceptance test projects in the area of GSM Base Station Controller (BSC) and GSM Base Station (BTS) hardware and software.
- Leading project teams of around 15 people
- Responsible for the clearance of releasing new software/hardware into the network
- Supported Request for Quotations, supplier evaluation and pre-selection, project manager of System Verification as a central part of the supplier selection process.
- Representation of Mannesmann Mobilfunk to the ETSI standardization group "Standardization Technical Committee SMG3 System Architecture"
- Conduction of product and hardware development quality audits
- Representative of Mannesmann Mobilfunk in A-interface interoperability testing activities
- Member of BSS product planning group which was defining operator requirements for future BSS releases
- Development of process improvements for type acceptance

III. LIST OF SUPPORTED PATENT LITIGATIONS AND VALIDITY ACTIONS

2025

Pantech Corp. v. OnePlus Technology Co., Ltd
Inter Partes Review matters
On behalf of OnePlus
Counsel: Bayes PLLC
Role: Expert witness and consulting services

2025

Pantech Corp. v. OnePlus Technology Co., Ltd.
Inter Partes Review matters
On behalf of OnePlus
Counsel: Leydig, Voit & Mayer, Ltd.
Role: Expert witness and consulting services

2025

Apex Beam Technologies LLC v. Apple Inc.
Inter Partes Review matters
On behalf of Apple
Counsel: Fish&Richardson P.C.
Role: Expert witness and consulting services

2024

Pantech Corporation v. Oppo Mobile Telecommunications Corp., Ltd.
Inter Partes Review matters
On behalf of Oppo
Counsel: Bayes PLLC
Role: Expert witness and consulting services

2024

Pantech Corp. et al. v. LG Electronics Inc. et al.
Civil Action No. 5:22-cv-00113-RWS-JBB (E.D.Tx.)
On behalf of LG Electronics
Counsel: Ropes & Gray LLP
Role: Expert witness and consulting services

2024

Ericsson v. Lenovo
Inter Partes Review matters
On behalf of Lenovo
Counsel: Kirkland & Ellis LLP
Role: Expert witness and consulting services

2024

Pantech Corp. et al. v. OnePlus Technology Co., Ltd.
Civil Action No. 5:22-cv-00069-RWS (E.D.Tx.)
On behalf of OnePlus
Counsel: Leydig, Voit & Mayer, Ltd.
Role: Expert witness and consulting services

2024

G+ Communications, LLC, v. Samsung Electronics Co., Ltd.
Civil Action No. 2:22-CV-78 (E.D.Tx.)
On behalf of Samsung
Counsel: Fish&Richardson P.C.
Role: Expert witness and consulting services

2023

Unified Patents, LLC v. Helios Streaming LLC

Inter Partes Review matters
On behalf of Unified Patents
Counsel: Akin
Role: Expert witness and consulting services

2023

Unified Patents, LLC v. SLS Manager Technologies
Inter Partes Review matters
On behalf of Unified Patents
Counsel: Unified Patents
Role: Expert witness and consulting services

2023

Headwater Research LLC v. Samsung Electronics Co., Ltd.
Inter Partes Review matters
On behalf of Samsung
Counsel: Fish&Richardson P.C.
Role: Expert witness and consulting services

2023

Pantech Corp. et al. v. LG Electronics Inc. et al.
Inter Partes Review matters
On behalf of LG Electronics
Counsel: Ropes & Gray LLP
Role: Expert witness and consulting services

2023

Apple Computer Trading (Shanghai) Co., Ltd, Apple Electronics Products Commerce (Beijing) Co., Ltd. v. Optis Cellular Technology LLC
Shenzhen, China, Intermediate People's Court
On behalf of Apple
Counsel: WilmerHale
Role: Expert witness and consulting services

2023

Huawei Technologies Co., Ltd. v. MediaTek Inc.
Inter Partes Review matters
On behalf of MediaTek
Counsel: Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.
Role: Expert witness and consulting service

2023

Apex Beam Technologies LLC v. Samsung
Inter Partes Review matters
On behalf of Samsung
Counsel: Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.
Role: Expert witness and consulting services

2022

Constellation Designs LLC v. LG Electronics, Inc.
Inter Partes Review matters
On behalf of LG Electronics
Counsel: Fish&Richardson P.C.
Role: Expert witness and consulting services

2022

Unified Patents, LLC v. Togail Technologies LTD.
Inter Partes Review matters
On behalf of Unified Patents
Counsel: Duane Morris LLP
Role: Expert witness and consulting services

2022

Ericsson v. Apple
Certain Mobile Telephones, Tablet Computers With Cellular Connectivity, And Smart Watches With Cellular Connectivity, Components Thereof, And Products Containing Same, Inv. No. 337-TA-1299 (U.S.I.T.C.)
On behalf of Apple
Counsel: WilmerHale
Role: Expert and consulting services

2022

Ericsson v. Apple
Civil Action No. 2:21-cv-376 (E.D.Tex.)
On behalf of Apple
Counsel: WilmerHale
Role: Expert and consulting services

2022

Intellectual Ventures II LLC v. Toyota Motor Cooperation.
Inter Partes Review matters
On behalf of Toyota
Counsel: Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.
Role: Expert witness and consulting services

2022

Ericsson v. Apple
2nd Business Court, Rio de Janeiro, Brazil
On behalf of Apple
Counsel: WilmerHale
Role: Expert and consulting services

2022

Ericsson v. Apple
Civil Court, Bogotá, Columbia
On behalf of Apple
Counsel: WilmerHale
Role: Expert and consulting services

2022

Proven Networks LLC. v. NetApp Inc.
Inter Partes Review matters
On behalf of NetApp
Counsel: Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., Ropes & Gray LLP
Role: Expert witness and consulting services

2022

Ericsson v. Apple
Inter Partes Review matters
On behalf of Apple
Counsel: Fish&Richardson, Erise IP
Role: Expert witness and consulting services

2021

AEGIS 11 LLC v. Hisense Company, Ltd. and Hisense USA Corporation
Inter Partes Review matters
On behalf of Hisense
Counsel: Orrik Herrington & Sutcliffe LLP
Role: Expert witness and consulting services

2021

Nokia v. Lenovo
Certain Electronic Devices, Including Computers, Tablet Computers, and Components and Modules Thereof, Inv. No. 337-TA-1208 (U.S.I.T.C.)

On behalf of Lenovo
Counsel: WilmerHale
Role: Expert witness and consulting services

2021

Optis Cellular Technology LLC et al. v. Apple
Claim No. HP-2019-000006 (High Court of Justice, Business and Property Courts of England and Wales)
On behalf of Apple
Counsel: WilmerHale
Role: Expert witness and consulting services

2021

Ericsson v. Samsung
Inter Partes Review matters
On behalf of Samsung
Counsel: Kirkland&Ellis LLP, Fish&Richardson
Role: Expert witness and consulting services

2020

Panoptis Patent Management LLC et al. v. Apple Inc.
Civil Action No. 2:19-cv-66 (E.D. Tex.)
On behalf of Apple
Counsel: WilmerHale
Role: Expert witness at bench trial

2020

Sol IP, LLC v. AT&T Mobility, LLC et al.
Civil Action No. 2:18-cv-526 (E.D. Tex.)
On behalf of AT&T, Verizon, Sprint
Counsel: Gibson Dunn
Role: Expert witness and consulting services

2020

Bell Northern Research LLC v. LG Electronics Inc. et al.
Civil Action No. 18-CV-2864-CAB-BLM (S.D. Cal.)
On behalf of LG Electronics Inc.
Counsel: Fish&Richardson
Role: Expert witness and consulting services

2019

Conversant Wireless Licensing S.a.r.l. v. LG Electronics Deutschland GmbH
Civil Action No. 7 O 3277/18 (Landgericht Munich, Germany)
On behalf of LG Electronics Deutschland GmbH
Counsel: Wildanger Kehrwald Graf von Schwerin & Partner mbB
Role: Expert witness and consulting services

2019

Bell Northern Research, LLC v. Huawei Device Co., Ltd, et al.
Civil Action No. 3:18-cv-01784-CAB-BLM
On behalf of Huawei
Counsel: Fish&Richardson
Role: Expert witness and consulting services

2019

Uniloc USA, Inc., et al. v. Samsung Electronics America, Inc. and Samsung Electronics Co. Ltd.
Civil Action Nos. 2:18-cv-00040-JRG, 2:18-cv-00041-JRG, 2:18-cv-00042-JRG and 2:18-cv-00044-JRG (United States District Court for the Eastern District of Texas)
On behalf of Samsung
Counsel: Greenberg Traurig
Role: Expert witness and consulting services

2019

Uniloc USA, Inc., et al. v. Huawei Device USA, Inc. et al.
Civil Action No. 2:18-cv- 00072-JRG-RSP (E.D. Tex.)
On behalf of Huawei
Counsel: McGuireWoods
Role: Expert witness and consulting services

2019

Microsoft Corporation v. Uniloc 2017 LLC
Inter Partes Review of U.S. Pat. No. 7,167,487
Inter Partes Review of U.S. Pat. No. 7,075,917
On behalf of Microsoft and on behalf of Apple as joinder petitioner
Counsel: Klarquist Sparkman (Microsoft), Erise IP (Apple)
Role: Expert witness and consulting services

2019

Qualcomm v. KFTC
South Korean Case, Seoul High Court
On behalf of intervenor Apple supporting the KFTC
Counsel: Boies Schiller Flexner
Role: Expert witness

2018/19

Evolved Wireless, LLC v. Apple, Inc.
Civil Action No. 1:15-cv-00542-JFB-SRF
On behalf of Apple
Counsel: DLA Piper
Role: Expert witness and consulting services

2018/19

Cisco Systems Inc. v. Traxcell Technologies
Inter Partes Review of Traxcell Technologies patents
On behalf of Cisco
Counsel: King&Spalding
Role: Expert witness and consulting services

2018/19

Qualcomm Inc. v. Apple Inc.
Civil Action No. 3:17- cv-02398-DMS-MDD (United States District Court for the Southern District of California)
Civil Action No. 3:17-cv-02402-WQH-MDD
Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof (II), Inv. No. 337-TA-1093
Inter Partes Review of U.S. PATENT NO. 9,154,356
Cases IPR2019-00047, IPR2019-00048, IPR2019-00049, IPR2019-00128, IPR2019-00129
On behalf of Apple and Intel
Counsel: WilmerHale
Role: Expert witness and consulting services

2018/19

Apple Inc. v. Qualcomm Inc.
Civil Action No. 3:17-CV-00108-GPC-MDD (United States District Court for the Southern District of California)
On behalf of Apple
Counsel: Fish&Richardson, Boies Schiller Flexner
Role: Expert witness and consulting services

2018

3G Licensing, S.A. et al. v. LG Electronics Inc. et al
Inter Partes Review of U.S. Patent No. 7,995,091
On behalf of LG Electronics

Counsel: Fish&Richardson
Role: Expert witness

2017

Huawei Technologies Co. LTD. v. T-Mobile US, Inc. & T-Mobile USA, Inc.
E.D. Tex. Case Nos. 2:16-cv-00052-JRG-RSP; 2:16-cv-00055-JRG-RSP; 2:16-cv-00056-JRG-RSP; and 2:16-cv-00057-JRG-RSP
On behalf of T-Mobile
Counsel: Gibson Dunn
Role: Expert witness and consulting services

2016

Koninklijke KPN N.V. v. Samsung Electronics America, Inc. et al.
Civil Action No. 14-cv-1165
On behalf of Samsung Electronics
Counsel: Baker Botts
Role: Expert witness and consulting services

2016

SSH v. Sony
OLG Düsseldorf, Germany
On behalf of SSH
Counsel: Cohausz&Florack
Role: Technical expert support

2015/16

LG Electronics v. Core Wireless Licensing S.A.R.L.
Inter Parles Review of U.S. Patent No. 8,165,049
On behalf of LG Electronics
Counsel: Greenberg Traurig
Role: Expert witness

2015/16

Core Wireless Licensing S.A.R.L. v. LG Electronics Inc. and LG Electronics MobileComm U.S.A., Inc
Civil Action No. 2:14-cv-911 (lead case) and Civil Action No. 2:14-cv-912 (consolidated)
On behalf of LG Electronics
Counsel: Greenberg Traurig, Sidley Austin
Role: Expert witness

2015

Intellectual Ventures I LLC v. T-Mobile USA, Inc. & T-Mobile US, Inc.
D. Del. Case No. 1:13-cv-01632
Intellectual Ventures II LLC v. T-Mobile USA, Inc. & T-Mobile US, Inc.
D. Del. Case No. 1:13-cv-01633
On behalf of T-Mobile
Counsel: Gibson Dunn
Role: Technical expert support

IV. EDUCATION

10/1984 – 10/1993 **University of Technology Aachen** **Aachen, Germany**
Graduate of Electrical Engineering with a focus on telecommunications technologies (Dipl.-Ing. TH)

10/1992 – 04/1993 **University of Technology Trondheim** **Trondheim, Norway**
Diploma Thesis "Design of a dual processor computer for digital signal processing in power electronics"

V. LANGUAGES

German, English, French

VI. PUBLICATIONS (selection)

- ”Standardessentielle Patente (SEPs) für das Internet der Dinge (IoT)”, PATINFO 2025 Proceedings, May 2025
- “The need for standardisation in the M2M services layer”, Global Telecoms Business, February 2014
- Co-authored white paper “Lightweight M2M: Enabling device management and applications for the internet of things”, Open Mobile Alliance, March 2014
- “Objects are a new way to create M2M applications”, Global Telecoms Business, April 2014
- “The need for standardisation in the M2M services layer”, M2M Now, July 2015
- “Objects are a new way to create M2M applications”, Global Telecoms Business, April 2014
- Co-authored white paper “Lightweight M2M: Enabling device management and applications for the internet of things”, Open Mobile Alliance, March 2014
- “The need for standardisation in the M2M services layer”, Global Telecoms Business, February 2014
- ”Unlocking the internet of things and driving the need for interoperability”, Global Telecoms Business, December 2013

APPENDIX B

Appendix	Description
A	Curriculum Vitae of Friedhelm Rodermund
B	List of Appendices
C	Report of RAN WG1 meeting #96 held on February 25 – March 1, 2019, in Athens, Greece
D	Document list of RAN WG1 meeting #96 held on February 25 – March 1, 2019, in Athens, Greece
E	Report of RAN WG1 meeting #96bis held on April 8 – 12, 2019, in Xi'an, China
F	Document list of RAN WG1 meeting #96bis held on April 8 – 12, 2019, in Xi'an, China
G	Report of the RAN meeting #83 held on March 18-21, 2019, in Shenzhen, China
H	Document list of the RAN meeting #83 held on March 18-21, 2019, in Shenzhen, China
I	Email sent via the public 3GPP_TSG_RAN_WG2 email exploder on January 13, 2019, announcing availability of TS 36.321 V15.4.0
J	Email sent via the public 3GPP_TSG_RAN_WG2 email exploder on January 14, 2019, announcing availability of TS 38.331 V15.4.0
K	Email sent via the public 3GPP_TSG_RAN_WG2 email exploder on April 9, 2019, announcing availability of TS 38.300 V15.5.0
L	Email sent via the public 3GPP_TSG_RAN_WG2 email exploder on January 11, 2019, announcing availability of TS 38.321 V15.4.0

APPENDIX C

3GPP TSG RAN WG1 Meeting #96bis **R1-1905837**
Xi'an, China, 8th – 12th April 2019

Source: **MCC Support**

Title: **Final Report of 3GPP TSG RAN WG1 #96 v2.0.0 (Athens, Greece, 25th February – 1st March 2019)**

Document for: **Approval**



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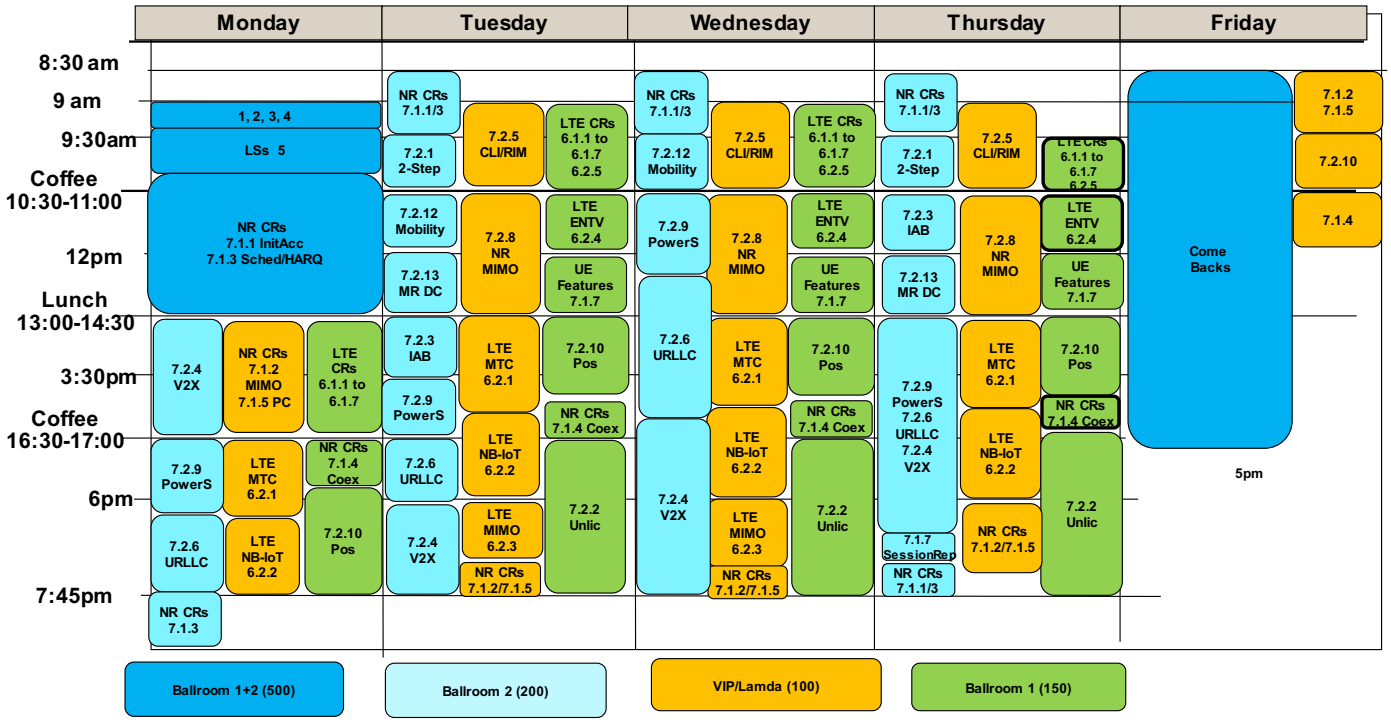
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Main facts summary

The 3GPP TSG WG RAN1#96 meeting, hosted by EF3, was held at the Intercontinental ATHENAEUM ATHENS Hotel, Athens, Greece.
The meeting started at 9:00 on Monday 25th February and finished at 17:05 on Friday 1st March 2019.
The number of attending delegates, having confirmed their participation through the electronic check-in application, was **503.**
Note that the number of registered was 592.

The schedule of the week was as follows:



The list of action points that require RAN1 post meeting follow-up is listed in Annex F (end of document).

The number of contributions for this meeting was **2312**.

Note: The amount of documents includes those discussed during the email discussion session post meeting.

	Contribution is agreed/approved
	Contribution is not pursued (no consensus)
	Further discussion is required – come-back needed
	Working assumption
	Specific action needed from MCC
	Contribution is for email discussion/approval

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1 Opening of the meeting

Mr Wanshi Chen (RAN1 Chairman) welcomed the participants of the RAN WG1 #96 meeting and opened the meeting at 09:00.

Mr Dorin Panaitopol from Thales Group on behalf of the hosts the European Friends of 3GPP, Apple, BlackBerry, BT, Deutsche Telekom, Ericsson, Huawei, Intel, InterDigital, KPN, Motorola, Nokia, Orange, Qualcomm, SIMAlliance, Sony, Telefonica, Telenor, Thales, TIM, Vodafone – welcomed the delegates, and detailed the domestic arrangements for the full week.

1.1 Call for IPR

*The attention of the members of this Technical Specification Group was drawn to the fact **that 3GPP Individual Members have the obligation** under the IPR Policies of their respective Organizational Partners to **inform their respective** Organizational Partners **of Essential IPRs they become aware of**.*
The members take note that they are hereby invited:

- *to investigate whether their organization or any other organization owns IPRs which were, or were likely to become Essential in respect of the work of 3GPP.*
- *to notify their respective Organizational Partners of all potential IPRs, e.g., for ETSI, by means of the IPR Information Statement and the Licensing declaration forms (e.g. see the ETSI IPR forms http://webapp.etsi.org/Ipr/).*

1.2 Competition law statement

The Chairman also drew Member's attention to the fact that 3GPP activities are subject to antitrust and competition laws and that compliance with said laws is therefore required of any participant of this WG meeting including the Chairman and Vice Chairmen. In case of question, please contact your legal counsel.
The present meeting will be conducted with strict impartiality and in the interests of 3GPP.
Furthermore, the Chairman reminded Members that timely submission of work items/contributions in advance of WG meetings is important to allow for full and fair consideration of such matters.

1.3 Network usage conditions

The PCG has laid down the following network usage conditions:

Users shall not use the network to engage in illegal activities. This includes activities such as copyright violation, hacking, espionage or any other activity that may be prohibited by local laws.

Users shall not engage in non-work related activities that consume excessive bandwidth or cause significant degradation of the performance of the network.
Since the **network is a shared resource**, users should exercise some basic etiquette when using the 3GPP network at a meeting. It is understood that high bandwidth applications such as downloading large files or video streaming might be required for business purposes, but delegates should be strongly discouraged in performing these activities for personal use. Downloading a movie or doing something in an interactive environment for personal use essentially wastes bandwidth that others need to make the meeting effective. The meeting chairman should remind end users that the network is a shared resource; the more one user grabs, the less there is for another. Email and its attachments already take up significant bandwidth (certain email programs are not very bandwidth efficient). In case of need the chair can ask the delegates to restrict IT usage to things that are essential for the meeting itself.

1. DON'T place your WiFi device in ad-hoc mode
2. DON'T set up a personal hotspot in the meeting room
3. DO try 802.11a if your WiFi device supports it
4. DON'T manually allocate an IP address
5. DON'T be a bandwidth hog by streaming video, playing online games, or downloading huge files
6. DON'T use packet probing software which clogs the local network (e.g., packet sniffers or port scanners)

1.4 Check-in for Registered Delegates

The attention of the delegates to this meeting was drawn to the fact that it is not permitted to check in other delegates on their behalf. In the event of technical difficulties preventing check-in, delegates should present themselves in person to the Secretary.

1.5 Aspects related to RAN1 Meeting Management

Delegates are encouraged to check R1-1721392 for some thoughts on RAN1 meeting management.

2 Approval of Agenda

R1-1901480 **Draft Agenda of RAN1#96 meeting** **RAN1 Chair**

Wanshi Chen (RAN1 Chair) proposed the agenda for the meeting, as well the schedule of the week.

Discussion: No comments to the agenda.

Huawei: concerns with the large number of NR Rel-15 CRs and CRs with possible impact to implementation and deployment. Strong care should be taken to only essential CRs. No new functionality or behavior impacting implementation should be agreed

RAN1 chair: Yes, the bar is very high. RAN1 will first look at the feature leads' summaries, encouraged all delegates to carefully check the CRs as they cannot all be treated online and to report/discuss with feature leads

Huawei: All will still need to have a status assigned to them by MCC (final Tdoc_list)

Decision: The agenda is approved.

3 Highlights from RAN plenary

R1-1901481 **Highlights from RAN#82** **RAN1 Chair**

Discussion: NR part already presented in January ad-hoc. Quick look at the LTE related part.

Decision: The document is noted.

4 Approval of Minutes from previous meetings

R1-1901482 **Report of RAN1#95 meeting** **ETSI MCC**

The document was presented by Patrick Merias from MCC (ETSI Mobile Competence Center) and provides the report from RAN1#95 meeting in Spokane.

Discussion: MCC recalled the need to checking-in due to the upcoming RAN WG elections and voting rights calculation.

Decision: The agenda is approved.

R1-1901483 **Report of RAN1#AH_1901 meeting** **ETSI MCC**

The document was presented by Patrick Merias from MCC (ETSI Mobile Competence Center) and provides the report from last RAN1#AH_1901 meeting in Taipei.

Discussion: No comment

Decision: The agenda is approved.

5 Incoming Liaison Statements

LTE related

//eMTC

R1-1901486 **LS on RSS based measurements signallingRAN2, Huawei**

RAN2 would like to know which parameters can be carrier specific instead of cell specific, and whether and how the size of the parameters can be minimised. RAN2 will also look at ways to reduce the signalling overhead but would first like confirmation on the parameter applicability and size.

Decision: The document is noted. Reply LS is necessary.

//NB-IoT

R1-1901491 **LS reply on UL PRB to DL PRB center offset for TDD NB-IoT** **RAN4, Ericsson**

Decision: The document is noted. No action to be taken by RAN1.

//EnTV - 5G requirements for dedicated broadcast networks

R1-1901499 **Reply LS on 5G requirements for dedicated broadcast networks** **SA2, Qualcomm**

Decision: The document is noted.

NR related

//NR-U

R1-1901484 **LS on FR1 rangeRAN, Qualcomm**

RAN informs RAN1 and RAN4 that the proposed extension of FR1 should not have any bearing on the selection of subcarrier spacing (SCS) in Rel-16 discussions for NR-U operation in the 6GHz band. Therefore, RAN requests RAN1 and RAN4 to carry on discussions on that aspect based on technical merit for Rel-16.

Discussion: Huawei commented that from RAN1 perspective, the proposed change could be introduced in Rel-15 without spec impact.

Decision: The document is noted. Discuss further offline whether there is any action necessary from RAN1 perspective – Peter (Qualcomm)

Friday

R1-1903801 **Correction to support FR1 extension to 7.125 GHz** **Huawei, HiSilicon**

Decision: CR (38.213, CR0032) is agreed.

R1-1903808 **Response LS on FR1 range** **Qualcomm**

Decision: The draft LS is endorsed. Final LS is approved in R1-1903816 and should include the agreed CR in R1-1903801 as attachment.

R1-1903329 **Invitation to a Coexistence Workshop in Vienna, Austria July 2019** **IEEE 802.11 WG**

Workshop mainly focused on LAA coexistence

RAN1 interested delegates are invited to attend

Topic will be further discussed in the next plenary meeting for decision

Qualcomm: suggested whether a contribution sourced RAN1 (kind of RAN1 endorsed input) is needed and could be prepared

IEEE confirmed that the workshop agenda includes a related NR-U AI where input is expected either fron RAN or RAN1

Decision: The document is noted.

//UE-feature

R1-1901485 **LS on RAN1 NR UE features** **RAN, NTT DOCOMO**

RAN discussed NR UE features regarding whether the NR UE features are mandatory / optional and made decisions on mandatory/optional aspects for all the NR UE features as shown in RP-182866.

Decision: The document is noted.

Qualcomm: whether/ how to capture the table could be further considered offline

Note Nokia in R1-1903151 suggests RAN2 to capture mandatory features in TS38.306

//Power control

R1-1901487 **LS on PHR procedure in dual-connectivity** **RAN2, Qualcomm**

RAN2 has agreed to the following change to

- LTE PHR procedure for EN-DC:
  - After a PHR is triggered, if dualConnectivityPHR is configured, UE needs to report power headroom information of all activated LTE and NR serving cells. For a NR serving cell, whether UE reports its PH value based on real transmission or reference format is determined based on UL transmissions that have been scheduled or configured until 4 ms prior to the TTI in which the PHR MAC CE is transmitted.
- both LTE and NR PHR procedure:
  - For a band combination in which a UE is not capable of dynamic power sharing, the UE may omit reporting power headroom information for serving cells in the other MAC entity.

Decision: The document is noted. See under 7.1.5.

R1-1902965 Discussion of RAN2 LS on PHR Procedure in Dual-Connectivity Qualcomm Incorporated

R1-1902966 Draft Response LS on PHR Procedure in Dual-Connectivity Qualcomm Incorporated

//BWP

R1-1901488 **LS on BWP ID interpretation for DCI code point** **RAN2, Intel**

RAN2 agreed that the network configuration of BWPs (which includes adding and releasing these) to the UE is such that the IDs of the BWPs configured to the UE are consecutive without any gaps (i.e. UE configuration with e.g. BWP IDs 0 & 2 is not allowed – network has to use BWP IDs 0 & 1 instead)

RAN1 to evaluate if the RAN1 specifications needs any update based on the RAN2 agreement

Decision: The document is noted.

//MIMO

R1-1901490 **LS on SSB based BFD** **RAN4, Intel Corporation**

RAN4 is in the process of defining the requirements for Beam Failure Detection (BFD) and RAN4 would like to confirm with RAN1 on whether or not SSB can be configured as BFD RS.

Decision: The document is noted. Reply LS is necessary

R1-1901646 Draft reply to LS on SSB based BFD vivo

R1-1902448 Draft Reply to LS on SSB based BFD Intel Corporation

R1-1901492 **LS on the beam correspondence requirement and multi-band applicability framework for FR2 power class 3** Ues RAN4, Apple

In order to resolve the remaining open issue associated with the DL RS aspects of the beam correspondence requirement, RAN4 requests RAN and RAN1 for information on the following questions:

1. Whether there exists a feature group or a collection of feature groups which can enable the UE to use CSI-RS to meet the beam correspondence requirement and, if so, what are they?
2. If the answer to Question 1 is affirmative, whether support of CSI RS for Beam Correspondence is mandatory, mandatory with capability signaling or optional?

Decision: The document is noted.

//Co-ex/MR-DC

R1-1901493 **LS reply on NR-LTE Co-existence** **RAN4, Intel Corporation**

RAN4 asks RAN1 to take the reply into account and confirm the definition of "normal UE behaviour" and related UE capability

Decision: The document is noted. Reply LS is necessary

R1-1902449 [DRAFT] Reply LS on NR-LTE Co-existence Intel Corporation

R1-1902947 Draft reply to RAN4 LS on NR-LTE Co-existence Ericsson

R1-1901494 **Updated reply LS on intra-band combination for NR-CA and MR-DC** **RAN4, Intel Corporation**

Decision: The document is noted.

//Others

5GAA//V2X

R1-1903333 **LS on 2Rx Antennas for NR V2X Sidelink5GAA WG4, General Motors**

Decision: The document is noted.

ITU-T

R1-1901500 **LS on Draft new Recommendation E.RQST – "KPI targets for mobile networks"** **ITU-T Study Group 12**

Decision: The document is noted.

//The following LSs are noted, not to be presented online, unless explicitly requested

R1-1901489 LS for inclusion of Receive Only Mode MBMS service parameters in USD RAN2, Qualcomm

R1-1901495 LS reply on NR MIMO layer configuration RAN4, Intel Corporation

R1-1901496 LS to RAN2 on UE signalling for Xscale RAN4, SPRINT Corporation

R1-1901497 LS on new UE capability for intra-band EN-DC and intra-band NR UL CA RAN4, CHTTL

R1-1901498 Reply LS to TSG RAN regarding LTE LAA channel combinations for 5GHz RAN4, Charter Communications

R1-1903373 Reply LS on TSN requirements evaluation SA1, Nokia

R1-1901563 Draft response to LS on Combinations of Uu QoS characteristics values for V2X services Huawei, HiSilicon

R1-1901564 Evaluation results on Combinations of Uu QoS characteristics values for V2X services Huawei, HiSilicon

Huawei commented that above two papers could be treated under AI 7.2.6.4

RAN1 Chair: let's further check during the dedicated online/offline sessions

R1-1902890 On the LS from ETSI BRAN Ericsson

The following LSs were received during the week
R1-1903603 LS on RAN2 conclusion for NR positioning SI RAN2, Intel
Treated under 7.2.10
R1-1903496 LS on MBSFN subframe pattern configuration for LTE CRS rate matching RAN2, Ericsson
Treated under 7.1.4

Friday main session
R1-1903765 LS to RAN1 on power saving RAN2, vivo
R1-1903787 LS on Conclusion of NR V2X and Agreed TP for TR 38.885 RAN3, LGE
R1-1903802 LS on RAN2 conclusion for NR positioning SI RAN3, Intel

6 E-UTRA

6.1 Maintenance of E-UTRA Releases 8 – 15

6.1.1 Maintenance of E-UTRA Release 8 – 14

R1-1903524 Chairman's notes of AI 6.1.1 Maintenance of E-UTRA Release 8 – 14 Ad-hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1901591 Correction on PSSCH resource pool determination in 36.213 Huawei, HiSilicon
Final CRs are agreed in R1-1903287 (TS36.213, CR1224, Rel-14) and R1-1903288 (TS36.213, CR1225, Rel-15)

R1-1901726 Discussion on case determination of EPDCCH USS when enabling CSI-RS frequency domain density reduction MediaTek Inc.
R1-1901727 CR 36.211-Correction on nEPDCCH for EPDCCH USS case determination MediaTek Inc.
R1-1901728 CR 36.213 - Correction on nEPDCCH for EPDCCH USS case determination MediaTek Inc.
R1-1902348 On EPDCCH case determination for non-uniform CSI-RS Qualcomm Incorporated
R1-1902677 Draft CR on EPDCCH rate matching for CSI-RS with density less than one Samsung
R1-1902678 Discussion on EPDCCH rate matching for CSI-RS with density less than one Samsung
Conclusion:
The UE behaviour is not specified when different PRBs have different n_{EPDCCH} values among all EPDCCH PRBs of the EPDCCH set x_0. No CR is needed to address this.

R1-1902346 CR of TS36.211 for correction of higher layer signalling for special subframe configuration 10 CMCC
Final CRs are agreed in R1-1903258 (TS36.211, 0475, Rel-14) and R1-1903259 (TS36.211, 0476, Rel-15) with the following modifications:
- Change the current version to Rel-14 in the Rel-14 CR
- Append "-Core" to the work item code

R1-1902347 CR of TS36.213 for correction of higher layer signalling for special subframe configuration 10 CMCC
Final CRs agreed in R1-1903260 (TS36.213, 1209, Rel-14) and R1-1903261 (TS36.213, 1210, Rel-15) with the following modifications:
- Change the current version to Rel-14 in the Rel-14 CR
- Append "-Core" to the work item code

R1-1902350 Priority rules for SRS carrier switching Qualcomm Incorporated

Agreement:
If PUCCH/PUSCH containing a CSI report with PUCCH reporting type 2a on a serving cell in set S(d) overlaps in the same symbol with the SRS transmission on serving cell d, then the UE shall not transmit SRS.

- The TP in Section 3 of R1-1902350 is agreed to address this issue

R1-1903262 **Priority rules for SRS carrier switching** **Qualcomm Incorporated**
Decision: CR1211, F (36.213, Rel-14) is agreed.
R1-1903263 **Priority rules for SRS carrier switching** **Qualcomm Incorporated**
Decision: CR1212, A (36.213, Rel-15) is agreed.

R1-1902351 **On support of special subframe configuration 10 with FDD+TDD CA** **Qualcomm Incorporated**

Agreement:
Introduce a new UE capability (from Rel-14) that indicates the UE supports special subframe configuration 10 only for operation with TDD carriers (i.e., not in FDD+TDD or FS3+TDD)

- Send LS to RAN2 to implement this capability.

R1-1903264 **Draft LS on support of special subframe configuration 10 with FDD+TDD CA** **Qualcomm Incorporated**
Decision: Final LS is approved in R1-1903311.

R1-1902352 **Support of 6-symbol SRS in UpPTS** **Qualcomm Incorporated**
Final CRs are agreed in R1-1903265 (TS36.213, CR1213, Rel-14) and R1-1903266 (TS36.213, CR1214, Rel-15)

R1-1902353 **Corrections for VoLTE enhancements** **Qualcomm Incorporated**
The CR is agreed in principle with a modification to separate the cases for DCI format 0C and 6A into separate sentences.
R1-1903267 Corrections for VoLTE enhancements Qualcomm Incorporated
Decision: CR1215, F (36.213, Rel-15) is agreed.
R1-1903268 Corrections for VoLTE enhancements Qualcomm Incorporated
Decision: CR1216, A (36.213, Rel-15) is agreed.

R1-1902354 **Correction for TDD UL/DL configuration 0 and PUSCH with repetitions** **Qualcomm Incorporated**
Final CRs are agreed in R1-1903269 (TS36.213, CR1217, Rel-13) and R1-1903270 (TS36.213, CR1218, Rel-14) and R1-1903271 (TS36.213, CR1219, Rel-15) with the Rel-14 and Rel-15 CRs having the extra WI code for VoLTE enhancements

R1-1902355 **UL delay for CE mode B** **Qualcomm Incorporated**
Revised in R1-1903275 UL Delay for CE Mode B Qualcomm Incorporated
Final CRs are agreed in R1-1903289 (TS36.213, CR1226, Rel-13), R1-1903290 (TS36.213, CR1227, Rel-14) and R1-1903291 (TS36.213, CR1228, Rel-15)

R1-1902356 **Antenna switching for 6 SRS symbol in UpPTS** **Qualcomm Incorporated**

R1-1902357 **Power control for RACH-less HO** **Qualcomm Incorporated**
Revised in R1-1903296 Power control for RACH-less HO Qualcomm Incorporated
Final CRs are agreed in R1-1903312 (TS36.213, CR1234, Rel-14) and R1-1903313 (TS36.213, CR1235, Rel-15)

R1-1902358 **Power control for PUSCH enhancements** **Qualcomm Incorporated**
Final CR agreed in R1-1903272 (TS36.213, CR1220, Rel-14) and R1-1903273 (TS36.213, CR1221, Rel-15) with all instances of msg3 changed to msg2 on the cover sheet.

R1-1902359 **Support of scheduling enhancements for SRS carrier switching** **Qualcomm Incorporated**

R1-1902360 **Correction for DCI 0C and special subframe configuration 10** **Qualcomm Incorporated**

Final CRs are agreed in R1-1903314 (TS36.213, CR1236, Rel-14) and R1-1903315 (TS36.213, CR1237, Rel-15)
R1-1902361 Correction for DCI 0C and special subframe configuration 10 Qualcomm Incorporated
Final CRs are agreed in R1-1903316 (TS36.212, CR0314, Rel-14) and R1-1903317 (TS36.212, CR0315, Rel-15)

R1-1902362 HARQ ID for asynchronous HARQ from DCI format 0 Qualcomm Incorporated
Final CRs are agreed in R1-1903318 (TS36.213, CR1238, Rel-14) and R1-1903319 (TS36.213, CR1239, Rel-15)

R1-1902953 Discussion on TBS determination in MPDCCH CSS/USS Samsung
R1-1903516 Draft CR on MPDCCH USS/CSS differentiation Samsung, Ericsson, Qualcomm
Final CRs are agreed in R1-1903518 (TS36.213, CR1240, Rel-14) and R1-1903519 (TS36.213, CR1241, Rel-15)

6.1.2 Maintenance of E-UTRA Release 15

R1-1903525 Chairman's notes of AI 6.1.2 Maintenance of E-UTRA Release 15 Ad-hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1901516 Correction on the MCS index range for DCI format 6-1A Huawei, HiSilicon
Final CR is agreed in R1-1903274 (TS36.213, CR1222, Rel-15)

R1-1901517 Correction on flexible UL starting PRB allocation of 3MHz system bandwidth in TDD Huawei, HiSilicon
Decision: Draft CR is postponed
R1-1901518 Correction on the number of bits of flexible UL starting PRB allocation in TDD Huawei, HiSilicon
Decision: Draft CR is postponed

R1-1901519 Correction on NPRACH format 2 configuration presence Huawei, HiSilicon
Revised in R1-1903303 Correction on NPRACH format 2 configuration presence Huawei, HiSilicon
Final CR is agreed in R1-1903308 (TS36.212, CR0313, Rel-15)
R1-1901520 Correction on NPRACH format 2 configuration presence Huawei, HiSilicon
Revised in R1-1903304 Correction on NPRACH format 2 configuration presence Huawei, HiSilicon
Final CR is agreed in R1-1903309 (TS36.213, CR1233, Rel-15)

R1-1901521 Correction on timing relationships for 2-HARQ with NPRACH format 2 Huawei, HiSilicon
Revised in R1-1903300 Correction on timing relationships for 2-HARQ with NPRACH format 2 Huawei, HiSilicon
R1-1903301 Discussion on timing relationships for 2-HARQ with NPRACH format 2 Huawei, HiSilicon
R1-1903511 Correction on timing relationships for 2-HARQ with NPRACH format 2 Huawei, HiSilicon, MediaTek

R1-1901592 Correction on type 2 power headroom Huawei, HiSilicon
Final CR is agreed in R1-1903305 (TS36.213, CR1231, Rel-15)

R1-1901729 Discussion on Ambiguity for sPDCCH Order for Random Access MediaTek Inc.
Withdrawn
R1-1901855 Discussion on Enhanced Coverage Restricted UE for eMTC ZTE
R1-1901856 Discussion for Enhanced Coverage Restricted UE for NB-IoT ZTE

R1-1902036 Corrections on CSI update capability for sTTI LG Electronics
Final CR is agreed in R1-1903302 (TS36.213, CR1230, Rel-15)
R1-1902208 Draft CR on DMRS mapping for SPDCCH Samsung
Final CR is agreed in R1-1903306 (TS36.211, CR0478, Rel-15)

R1-1902363 EPRE for RSS Qualcomm Incorporated, Ericsson

Revised in R1-1903298 EPRE for RSS Qualcomm Incorporated, Ericsson, Sierra Wireless
Final CR is agreed in R1-1903520 (TS36.213, CR1242, Rel-15)
R1-1902364 EPRE for WUS Qualcomm Incorporated, Ericsson
Revised in R1-1903299 EPRE for WUS Qualcomm Incorporated, Ericsson, Sierra Wireless
Decision: Draft CR is postponed

R1-1902365 Correction on rate matching for 1024QAM Qualcomm Incorporated
Final CR is agreed in R1-1903280 (TS36.212, CR0311, Rel-15)

R1-1902640 Corrections on channel access procedures in 37.213 Sharp, WILUS Inc., Huawei, HiSilicon
Final CR is agreed in R1-1903281 (TS37.213, CR0004, Rel-15)

R1-1902950 Correction on the 1ms HARQ-ACK transmission for the collision between sPUSCH and PUCCH/PUSCH Huawei, HiSilicon
Final CR is agreed in R1-1903307 (TS36.213, CR1232, Rel-15)

R1-1903161 DMRS sequence index for PUSCH sub-PRB allocation for LTE-MTC Ericsson
Revised in R1-1903250 DMRS sequence index for PUSCH sub-PRB allocation for LTE-MTC Ericsson
Final CR is agreed in R1-1903282 (TS36.211, CR0477, Rel-15) with a correction the cover sheet to reflect the correct clause affected.

R1-1903162 Edge PRB restriction for flexible starting PUSCH PRB for LTE-MTC Ericsson, Qualcomm Incorporated
Revised in **R1-1903249** Edge PRB restriction for flexible starting PUSCH PRB for LTE-MTC Ericsson, Qualcomm Incorporated
Final CR is agreed in R1-1903283 (TS36.213, CR1223, Rel-15)

6.2 LTE Release 16

6.2.1 Additional MTC Enhancements

LTE_eMTC5-Core; WID in RP-182891. Please refer to the WID for detailed scoping

R1-1903664 Chairman's notes of AI 6.2.1 Additional MTC Enhancements Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

R1-1903521 Draft Reply LS on RSS based measurements signalling Ericsson
Agreement
The draft LS is approved in R1-1903659 with the following modified text:

- RSS periodicity can be considered as a carrier specific parameter, hence it may be omitted from neighbor cell RSS configuration signaling.
- RAN1 expects most cells to have common or similar configurations for most parameters. Parameter commonality or similarity between serving cell and neighbor cell(s) may be exploited to reduce the required number of bits.
- RAN1 will study whether and how to reduce the overhead from the two most expensive parameters, time offset and frequency location. Depending on the study, this could be done, e.g., by making one or both of them carrier specific or by reducing their resolution.

6.2.1.1 UE-group wake-up signal

R1-1903252 Summary of 6.2.1.1 UE group MWUS Qualcomm Incorporated

Agreement
UE-group MWUS sequence is same as UE-group NWUS per RB and the same sequence is repeated in two PRBs.

R1-1903286 Remaining issues of 6.2.1.1 UE group MWUS Qualcomm Incorporated

Agreement

- A UE is required to monitor WUS(s) in only one WUS (time/frequency) resource location.

Agreement
- Single-sequence CDM is used in the same WUS resource if more than one UE group is configured to monitor the WUS resource.
- Select one among the following:
  - Up to 2 orthogonal WUS resources may be configured in time domain
  - Up to 2 orthogonal WUS resources may be configured in frequency domain
  - Up to 2 orthogonal WUS resources may be configured per dimension (up to 4 orthogonal WUS resources in total)
  - Up to 2 orthogonal WUS resources may be configured either in time or frequency domain (only one of the two can be configured)
- FFS: whether one of the WUS resources is configured to be shared with legacy WUS

Agreement
If configured, a common WUS is used to wake up all group WUS UEs monitoring the same WUS (time-frequency) resource if more than one UE group occupies the WUS resource.
- FFS: Whether the above is also applicable for Rel-15 WUS UEs
- FFS: Whether to additionally support the feature of waking up a subset of all WUS UE groups

R1-1901514	Support of sub-groups for MWUS	Huawei, HiSilicon
R1-1901647	UE-group wake-up signal for eMTC	vivo
R1-1901737	UE-group wake-up signal in LTE-MTC	Ericsson
R1-1901857	Discussion on Wake-up signal for MTC	ZTE
R1-1901953	UE-group wake-up signal for MTC	Nokia, Nokia Shanghai Bell
R1-1902055	Discussion on UE-grouping wake up signal in MTC	LG Electronics
R1-1902145	UE-group wake-up signal for Rel-16 MTC	Lenovo, Motorola Mobility
R1-1902191	UE group wake up signal for MTC	Sony
R1-1902209	UE-group wake-up signal for eMTC	Samsung
R1-1902366	UE-group wake-up signal	Qualcomm Incorporated
R1-1902450	UE-group wake-up signal for eMTC	Intel Corporation
R1-1902641	Consideration on UE-group wake-up signal for Rel-16 MTC	Sharp
R1-1902775	Discussion on UE-group wake up signal in MTC	NTT DOCOMO, INC.

6.2.1.2 Support for transmission in preconfigured UL resources

R1-1903248 LTE-M Preconfigured UL Resources Summary RAN1 #96 Sierra Wireless, S.A.

Agreement
In idle mode, the TA validation configuration can include "PUR Time Alignment Timer"
- Where the UE considers the TA as invalid if the (current time – time at last TA update) > the PUR Time Alignment Timer
- Details on how to specify the "PUR Time Alignment Timer" is up to RAN2

Agreement
In idle mode, when the UE validates TA, the UE considers the TA for the previous serving cell as invalid if the serving cell changes
- Above applies for the case where the UE is configured to use the serving cell change attribute

Agreement
For dedicated PUR in idle mode, the Dedicated PUR ACK is at least sent on MPDCCH
- RAN2 can decide if a higher layer PUR ACK is also supported

Agreement
For dedicated PUR in idle mode, the PUR search space configuration shall be included in the PUR configuration.
- PUR search space is the search space where UE monitors for MPDCCH
- FFS: Whether PUR search space is common or UE specific

R1-1903293 LTE-M Preconfigured UL Resources offline conclusion and remain issues Sierra Wireless, S.A.

Agreement
When the TA is validated and found to be invalid and the UE has data to send, the UE can obtain a valid TA and may send data via legacy RACH or EDT procedures
- FFS whether only TA is acquired and then data sent on PUR is supported
- FFS other approaches to obtain a valid TA

Agreement
When the UE is configured to use several TA validation criteria, the TA is valid only when all the configured TA validation criteria are satisfied.

Agreement
For dedicated PUR, in idle mode, the PUR resource configuration includes at least the following
- Time domain resources including periodicity(s)
  - Note: also includes number of repetitions, number of RUs, starting position
- Frequency domain resources
- TBS(s)/MCS(s)
- Power control parameters
- Legacy DMRS pattern

Agreement
In idle mode, at least the following PUR configurations and PUR parameters may be updated after a PUR transmission:
- Timing advance adjustment
- UE TX power adjustment
- FFS: Repetition adjustment for PUSCH

FFS: Whether the above update is done in L1 and/or higher layer

Agreement
In idle mode, the PUR search space configuration includes at least the following:
- MPDCCH narrowband location
- MPDCCH repetitions and aggregation levels
- MPDCCH starting subframe periodicity (variable G)
- Starting subframe position (alpha_offset)

R1-1903523 LTE-M Preconfigured UL Resources remain issues #2 Sierra Wireless

Agreement
For dedicated PUR in idle mode, the PUR resource configuration includes at least the following
- A PUSCH frequency hopping indication to enable or disable legacy frequency hopping

Agreement
In idle mode, a UE can be configured such that TA is always valid within a given cell.
- FFS: up to RAN2 how to implement e.g. PUR Time Alignment Timer = infinity

R1-1901511 UL transmission in preconfigured resource Huawei, HiSilicon
R1-1901628 LTE-M Pre-configured UL Resources Design Considerations Sierra Wireless, S.A.
R1-1901738 Support for transmission in preconfigured UL resources in LTE-MTC Ericsson
R1-1901858 Support for transmission in preconfigured UL resources for MTC ZTE
R1-1901954 Transmission in preconfigured UL resources Nokia, Nokia Shanghai Bell
R1-1902056 Discussion on preconfigured UL resources in MTC LG Electronics
R1-1902146 UL transmission in preconfigured resources for eMTC Lenovo, Motorola Mobility
R1-1902192 Considerations in using PUR Sony
R1-1902210 Discussion on transmission in preconfigured UL reosurces for MTC Samsung

R1-1902367	Support for transmission in preconfigured UL resources	Qualcomm Incorporated
R1-1902451	UL transmission in preconfigured resources for eMTC	Intel Corporation
R1-1902552	Consideration for preconfigured uplink resources (PUR)	Sequans Communications
R1-1902776	Discussion on preconfigured UL resources in MTC	NTT DOCOMO, INC.

6.2.1.3 Scheduling of multiple DL/UL transport blocks

R1-1903245 Feature lead summary for Scheduling of multiple DL/UL transport blocks for LTE-MTC Ericsson

Recommendation for future meetings:
The use of scheduling gaps for unicast/multicast is further studied.

Agreement
Support option 3 from below
For the case of single DCI scheduling multiple transport blocks with repetitions, scheduling of transport blocks repetitions is down selected between:

- Option 1: All the repetitions for one transport block are contiguously scheduled in valid UL/DL subframes
- Option 2: The repetitions for one transport block are interleaved with repetitions of all the other transport blocks
- Option 3: Option 1 and 2 are supported and eNB configures among them

Above applies for unicast only.

Agreement
For the DL/UL unicast for a UE, when multiple TBs are scheduled by one DCI, the parameter values for {MCS, Resource assignment, Repetitions} are the same across all the TBs scheduled by that DCI.

- If specified, in the case where one DCI schedules TB for both initial and retransmission, the above applies for TBs for both initial and retransmission

R1-1901510	Scheduling of multiple transport blocks	Huawei, HiSilicon
R1-1901630	LTE-M Multiple Transport Block Grant Design Considerations	Sierra Wireless, S.A.
R1-1901739	Scheduling of multiple DL/UL transport blocks in LTE-MTC	Ericsson
R1-1901859	Consideration on scheduling enhancement for MTC	ZTE
R1-1901955	Scheduling of multiple DL/UL transport blocks	Nokia, Nokia Shanghai Bell
R1-1902057	Discussion on multiple transport blocks scheduling in MTC	LG Electronics
R1-1902147	Design of scheduling of multiple DL/UL transport blocks for MTC	Lenovo, Motorola Mobility
R1-1902193	On transmission of multiple DL transport blocks	Sony
R1-1902211	Scheduling of multiple transport blocks for MTC	Samsung
R1-1902368	Scheduling of multiple DL/UL transport blocks	Qualcomm Incorporated
R1-1902452	Scheduling of multiple DL/UL TBs for eMTC	Intel Corporation

6.2.1.4 Coexistence of LTE-MTC with NR

R1-1903246 Feature lead summary for Coexistence of LTE-MTC with NR Ericsson

For further study in future meetings:

- RAN1 continues to consider all combinations of LTE-MTC system bandwidths and NR system bandwidths when discussing potential co-existence performance improvements, including the combinations considered particularly challenging (e.g. the cases with 5 MHz NR system bandwidth).
- RAN1 continues to study e.g. the following aspects of puncturing and/or rate-matching and/or exploitation of guardband (this would also require RAN4 study) as potential ways to take outlying LTE-MTC subcarriers into account for performance improvement of resource block alignment between LTE-MTC and NR:
  - How to minimize the number of outlying LTE-MTC subcarriers
  - To what extent the LTE-MTC UE needs to be aware subcarriers not used for transmission
  - Performance impacts of the LTE-MTC subcarrier puncturing
  - Some of the methods may only apply for downlink
- RAN1 studies whether to support configurable RB shift for LTE-MTC in some cases (e.g. stand-alone/in-band, FDD/TDD, DL/UL).

Agreement
RAN1 considers coexistence cases for different NR subcarrier spacing (SCS), with higher priority given first to 15 kHz SCS and then to 30 kHz SCS.

For further study in future meetings:
- RAN1 continues to study semi-static LTE-MTC resource reservation for improved coexistence with NR SSB, NR CORESET, NR CSI-RS, and NR TRS.
- RAN1 continues to study both semi-static and dynamic LTE-MTC resource reservation for improved coexistence with other NR transmissions than NR SSB, NR CORESET, NR CSI-RS, and NR TRS.
- RAN1 continues to study how to handle potential collision between LTE-MTC transmissions and NR URLLC related transmissions.

For further study in future meetings:
- RAN1 continues to study potential support of LTE-MTC transmission outside the legacy LTE system bandwidth (for reduced NR reserved resource cost for CRS, SIB1-BR, paging, etc.) while supporting legacy LTE-MTC transmission for legacy LTE-MTC UEs within the legacy LTE system bandwidth.

Conclusion
- Non-backwards-compatible approaches for reduced CRS overhead or reduced impact from frequency hopping is not supported in Rel-16.

R1-1901515	On eMTC co-existence with NR	Huawei, HiSilicon
R1-1901740	Coexistence of LTE-MTC with NR	Ericsson
R1-1901860	Coexistence of LTE-MTC with NR	ZTE
R1-1901956	Coexistence of eMTC with NR	Nokia, Nokia Shanghai Bell
R1-1902058	Discussion on coexistence of LTE-MTC with NR	LG Electronics
R1-1902369	Coexistence of LTE-MTC with NR	Qualcomm Incorporated

6.2.1.5 Support of quality report in Msg3 and Connected Mode

Including aperiodic quality report in connection mode using same quality definition as in Msg 3

R1-1903297 Feature summary of 6.2.1.5 quality report in Msg3 and Connected Mode Samsung

Agreement
For DL quality report in Msg3:
- If frequency hopping for MPDCCH is enabled, at least wideband DL quality is reported.
  - Wideband DL quality is calculated assuming transmission on all narrowband(s) to which the derived repetition number and/or aggregation level relates.
  - FFS if additionally reports DL quality on a preferred narrowband and/or position of the preferred narrowband.
- If frequency hopping for MPDCCH is disabled, DL quality based on one narrowband is reported.

Agreement
For DL quality report in connected mode
- DL quality is with respect to USS for both CE mode A and CE mode B.
- DL quality is measured at least on narrowband(s) on which MPDCCH of USS is monitored.

R1-1903517 Remaining issues on MTC DL quality report Samsung

Agreement:
For DL quality report in Msg3 in CE mode A (PRACH CE level 0, 1):
- If the repetition number in DL quality information is larger than 1, only repetition number is reported with pre-defined maximum aggregation level;
- If the repetition number in DL quality information equals to 1, FFS between:
  - Only aggregation level is reported with pre-defined repetition number equals to 1
  - Repetition number equals to 1 is reported with pre-defined [maximum] aggregation level

R1-1901512	Channel quality reporting in Msg3	Huawei, HiSilicon
R1-1901741	Support of quality report in Msg3 and connected mode in LTE-MTC	Ericsson
R1-1901861	Support of quality report in Msg3 and Connected Mode for MTC	ZTE
R1-1901957	Support of Quality report in Msg3	Nokia, Nokia Shanghai Bell
R1-1902059	Downlink channel quality report during random access procedure	LG Electronics
R1-1902194	Quality Report in Msg3	Sony
R1-1902212	Discussion on quality report in Msg3 and connected mode	Samsung
R1-1902370	Support of Quality report in msg3 and connected mode	Qualcomm Incorporated
R1-1902453	Quality report in Msg3 and connected mode for eMTC	Intel Corporation

6.2.1.6 MPDCCH performance improvement

R1-1903279 Feature lead summary of MPDCCH performance improvement Huawei, HiSilicon

Agreement
Precoding cycling in time domain with a granularity of Y_{CH} is supported. FFS whether futher values are supported in which case the granularity is configurable.

Agreement
For precoding cycling, the precoder set consists of [2 or 4] existing precoders for 2Tx antennas and 4 existing precoders for 4Tx antennas.
FFS: The precoder set is configured or not.

For further study

- The order and pattern of the used precoder in time and frequency domain for precoder cycling

R1-1901513	On MPDCCH performance improvement	Huawei, HiSilicon
R1-1901742	MPDCCH performance improvement in LTE-MTC	Ericsson
R1-1901862	Discussion on MPDCCH performance improvement	ZTE
R1-1901958	MPDCCH performance improvement	Nokia, Nokia Shanghai Bell
R1-1902060	Discussion on MPDCCH performance improvement	LG Electronics
R1-1902195	On MPDCCH performance improvement	Sony
R1-1902213	Discussion on MPDCCH performance improvement for MTC	Samsung
R1-1902371	Usage of CRS for MPDCCH	Qualcomm Incorporated
R1-1902454	MPDCCH performance improvement	Intel Corporation

6.2.1.7 CE mode A and B improvements for non-BL UEs

R1-1903278 Summary of CE mode A and B improvements for non-BL UEs LG Electronics

Conclusion

- RAN1 has no consensus on the support for dual layer DL reception for non-BL UEs in CE mode A in Rel-16

Agreement
Existing Rel-15 CSI-RS based CSI feedback is supported for non-BL CE UEs operating CE mode A. FFS on:

- The number of CSI-RS ports
- CSI feedback mechanism
- Resource assignment issue due to REs used for CSI-RS

R1-1901508 Coverage enhancement for Non-BL UE Huawei, HiSilicon

R1-1901743	CE mode A and B improvements for LTE-MTC non-BL UEs	Ericsson
R1-1901863	On CE mode A and B improvements for non-BL UE	ZTE
R1-1901959	CE mode A and B improvements for non-BL UEs	Nokia, Nokia Shanghai Bell

R1-1902061 CE mode improvements for non-BL UEs LG Electronics
R1-1902214 CE Mode A and Mode B improvements for non-BL UEs Samsung
R1-1902372 CE Mode A and B improvements for non-BL Ues Qualcomm Incorporated
R1-1902455 CE mode A and B improvements for non-BL UEs Intel Corporation

6.2.1.8 Use of LTE Control Channel Region for DL Transmission

R1-1903276 Summary of Use of LTE Control Channel Region for DL Transmission Nokia, Nokia Shanghai Bell

Agreement
Use of LTE DL control region for PDSCH and MPDCCH is configured by SIB1-BR.

Agreement
In case of retuning, the UE is not required to receive all the symbols in LTE downlink control region.
- No RAN1 specification impact

R1-1901509 DL transmission on LTE control channel region Huawei, HiSilicon
R1-1901744 Use of LTE control channel region for DL transmission in LTE-MTC Ericsson
R1-1901864 Use of LTE control channel region for DL transmission ZTE
R1-1901960 Consideration on the usage of LTE control channel region Nokia, Nokia Shanghai Bell
R1-1902062 On the use of LTE control channel region for LTE-MTC DL transmission LG Electronics
R1-1902215 Discussion on use of control channel region Samsung
R1-1902373 Use of control region for eMTC Ues Qualcomm Incorporated
R1-1902456 Use of LTE control channel region for eMTC DL transmission Intel Corporation
R1-1902777 Discussion on the use of LTE control channel region for DL transmission NTT DOCOMO, INC.

6.2.1.9 Other

Including use of RSS for measurement improvements (particularly LS from RAN2 in R2-1818662)

R1-1901745 Use of RSS for measurement improvements in LTE-MTC Ericsson

6.2.2 Additional Enhancements for NB-IoT

NB_IOTenh3-Core; WID in RP-182902. Please refer to the WID for detailed scoping

R1-1903663 Chairman's notes of AI 6.2.2 Additional Enhancements for NB-IoT Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

R1-1901501 Revision of additional enhancements for NB-IoT workplan Huawei, HiSilicon

6.2.2.1 UE-group wake-up signal

R1-1903247 Feature lead summary for Group wake-up signal for NB-IoT Ericsson

For further evaluation and study (especially from UE implementation perspective):
Benefits and costs with more grouping levels, i.e., subgroups of subgroups.

Agreement
A UE is required to monitor WUS(s) in only one WUS (T/F) resource location

R1-1903508 Further topics for 6.2.2.1 Group WUS for NB-IoT Ericsson

Agreement
Up to 2 time-multiplexed WUS resources may be configured. FFS whether a group WUS resource may be shared with legacy WUS or not.

For further study until next meeting
Companies are encouraged to provide results for the different sequence candidates, taking into account, e.g.,
a. Detection window lengths
b. Frequency errors
c. Channel model
where a starting point for evaluations is the Rel-15 WUS assumptions in R1-1714993 and Rel-15 WUS functionality (w.r.t. frequency error and detection window lengths).

R1-1901502 **UE-group wake-up signal** **Huawei, HiSilicon**

R1-1901648 UE-group wake-up signal for NB-IoT vivo
R1-1901732 UE-Group WUS in NB-IoT MediaTek Inc.
R1-1901746 UE-group wake-up signal in NB-IoT Ericsson
R1-1901865 Discussion on Wake-up signal for NB-IoT ZTE
R1-1901963 UE group wake-up signal for NB-IoT Nokia, Nokia Shanghai Bell
R1-1902063 Discussion on UE-grouping wake up signal in NB-IoT LG Electronics
R1-1902148 UE-group wake-up signal for Rel-16 NB-IoT Lenovo, Motorola Mobility
R1-1902196 UE group wake up signal for NB-IoT Sony
R1-1902216 UE-group wake-up signal for NB-IoT Samsung
R1-1902374 UE-group wake-up signal Qualcomm Incorporated
R1-1902457 UE-group wake-up signal for NB-IoT Intel Corporation
R1-1902642 Consideration on UE-group wake-up signal for Rel-16 NB-IoT Sharp
R1-1902778 Discussion on UE-group wake up signal in NB-IoT NTT DOCOMO, INC.

6.2.2.2 Support for transmission in preconfigured UL resources

R1-1903254 **Feature lead summary of Support for transmission in preconfigured UL resources** **Huawei, HiSilicon**

Agreement
When the UE is configured to use several TA validation criteria, the TA is valid only when all the configured TA validation criteria are satisfied.

Agreement
For dedicated PUR in idle mode, the PUR search space configuration shall be included in the PUR configuration.
- PUR search space is the search space where UE monitors for NPDCCH
- FFS: Whether PUR search space is common or UE specific

R1-1903513 **Updated feature lead summary of Support for transmission in preconfigured UL resources** **Huawei, HiSilicon**

Agreement
In idle mode, the TA validation configuration can include "PUR Time Alignment Timer"
- Where the UE considers the TA as invalid if the (current time – time at last TA update) > the PUR Time Alignment Timer
- Details on how to specify the "PUR Time Alignment Timer" is up to RAN2

Agreement
In idle mode, when the UE validates TA, the UE considers the TA for the previous serving cell as invalid if the serving cell changes
- Above applies for the case where the UE is configured to use the serving cell change attribute

Agreement
For dedicated PUR in idle mode, the dedicated PUR ACK is at least sent on NPDCCH

- FFS: Whether to introduce new field in DCI or reuse existing field
- RAN2 can decide if a higher layer PUR ACK is also supported

Agreement
When the TA is validated and found to be invalid and the UE has data to send, the UE can obtain a valid TA and may send data via legacy RACH or EDT procedures
- FFS whether only TA is acquired and then data sent on PUR is supported
- FFS other approaches to obtain a valid TA

Agreement
In idle mode, at least the following PUR configurations and PUR parameters may be updated after a PUR transmission:
- Timing advance adjustment
- UE TX power adjustment
- FFS: Repetition adjustment for NPUSCH

FFS: Whether the above update is done in L1 and/or higher layer

Agreement
In idle mode, the PUR search space configuration includes at least the following:
- NPDCCH repetitions and aggregation levels
- NPDCCH starting subframe periodicity (variable *G*)
- Starting subframe position (alpha_offset)

Agreement
For dedicated PUR, in idle mode, the PUR resource configuration includes at least the following
- Time domain resources including periodicity(s)
  - Note: also includes number of repetitions, number of RUs, starting position
- Frequency domain resources
- TBS(s)/MCS(s)
- Power control parameters
- Legacy DMRS pattern

R1-1901503	Transmission in preconfigured UL resources	Huawei, HiSilicon
R1-1901629	NB-IOT Pre-configured UL Resources Design Considerations	Sierra Wireless, S.A.
R1-1901733	Early Transmission in Preconfigured UL resources in NB-IoT	MediaTek Inc.
R1-1901747	Support for transmission in preconfigured UL resources in NB-IoT	Ericsson
R1-1901866	Support for transmission in preconfigured UL resources for NB-IoT	ZTE
Late submission		
R1-1901964	Preconfigured Grant for Uplink transmission	Nokia, Nokia Shanghai Bell
R1-1902064	Discussion on preconfigured UL resources in NB-IoT	LG Electronics
R1-1902149	UL transmission in preconfigured resources for NBIoT	Lenovo, Motorola Mobility
R1-1902217	Discussion on transmission in preconfigured UL reosurces for NB-IoT	Samsung
R1-1902375	Support for transmission in preconfigured UL resources	Qualcomm Incorporated
R1-1902458	UL transmission in preconfigured resources for NB-IoT	Intel Corporation
R1-1902553	Consideration for preconfigured uplink resources (PUR)	Sequans Communications
R1-1902779	Discussion on preconfigured UL resources in NB-IoT	NTT DOCOMO, INC.
R1-1902933	Discussion on transmission in preconfigured UL resources	III

6.2.2.3 Scheduling of multiple DL/UL transport blocks

R1-1903257 Summary on Multiple TB scheduling enhancement for NB-IoT ZTE

Agreement
One DCI can be used to schedule both initial and retransmission of different HARQ processes.

Agreement

Samsung Exhibit 1026, Page 142 of 900

For unicast, when all the TBs are scheduled by one DCI

- MCS, repetition number, resource allocation, are common across all UL transport blocks
  - There is a single field for each of the following as in Rel-15: Scheduling delay, DCI subframe repetition number, Flag for differentiation
- MCS, repetition number, resource assignment are common across all DL transport blocks
  - There is a single field for each of the following as in Rel-15: Scheduling delay, DCI subframe repetition number, NPDCCH order indicator, Flag for differentiation
  - FFS: HARQ-ACK resource

Agreement
For unicast, relationship 1 is supported: 1 HARQ process corresponds to 1 TB

- FFS: Whether to support relationship 2 (1 HARQ process corresponds up to 2 TBs) in addition to relationship 1
  - RAN1 will make decision on the support for the FFS part in RAN1#96bis

Agreement
For unicast, scheduling gaps between TBs scheduled by one single DCI are not supported for relationship 1

Agreement
For TBs scheduled by one DCI that are contiguous, the ACK/NACK resources are back-to-back. FFS details.

Agreement
For SC-MTCH, the maximum number of TBs scheduled is 8.

Agreement
For SC-MTCH, all the TBs scheduled by one DCI use the same resource assignment, MCS and repetition number.

Agreement
For SC-MTCH multiple TBs scheduling, down-select from the following options:

a) Modify existing DCI to indicate the number of scheduled TBs (e.g. by adding new field)
b) Reuse Rel-15 DCI and use SC-MCCH to indicate TB numbers.
c) Support both a) and b)

R1-1901504	Scheduling multiple DL/UL transport blocks for SC-PTM and unicast	Huawei, HiSilicon
R1-1901631	NB-IOT Multiple Transport Block Grant Design Considerations	Sierra Wireless, S.A.
R1-1901736	Scheduling of multiple DL/UL transport blocks in NB-IoT	MediaTek Inc.
R1-1901748	Scheduling of multiple DL/UL transport blocks in NB-IoT	Ericsson
R1-1901867	Consideration on scheduling enhancement for NB-IoT	ZTE
R1-1901965	Scheduling of multiple DL/UL transport blocks	Nokia, Nokia Shanghai Bell
R1-1902065	Discussion on multiple transport blocks scheduling in NB-IoT	LG Electronics
R1-1902150	Design of scheduling of multiple DL/UL transport blocks for NBIoT	Lenovo, Motorola Mobility
R1-1902218	Scheduling of multiple transport blocks for NB-IoT	Samsung
R1-1902376	Scheduling of multiple DL/UL transport blocks	Qualcomm Incorporated
R1-1902459	Scheduling of multiple DL/UL TBs for NB-IoT	Intel Corporation

6.2.2.4 Coexistence of NB-IoT with NR

R1-1903255 Feature lead summary of Coexistence of NB-IoT with NR Huawei, HiSilicon

For further study in future meeting (including):

- NB-IoT resource reservation on non-anchor carrier to improve the performance of coexistence of FDD/TDD NB-IoT with NR
- Subframe-level resource reservation in NB-IoT
- Symbol-level resource reservation in NB-IoT
- Slot-level resource reservation in NB-IoT

For further study in future meeting (including)::

NB-IoT transmission is dropped/postponed in reserved resources.

Conclusion
From RAN1 perspective, no issues were identified that would prevent the coexistence of NR and *FDD/TDD* NB-IoT

R1-1901505	Performance enhancements for NB-IoT coexistence with NR	Huawei, HiSilicon
R1-1901731	Coexistence of NB-IoT with NR	MediaTek Inc.
R1-1901749	Coexistence of NB-IoT with NR	Ericsson
R1-1901868	Coexistence of NB-IoT with NR	ZTE
R1-1901966	Coexistence of NB-IoT with NR	Nokia, Nokia Shanghai Bell
R1-1902377	Coexistence of NB-IoT with NR	Qualcomm Incorporated

6.2.2.5 Support of Quality report in Msg3 for non-anchor access

R1-1903256 **Feature lead summary of Support of Quality report in Msg3 for non-anchor access Huawei, HiSilicon**

For further study in future meetings:
For channel quality report in Msg3 on non-anchor access, RAN1 identified the following scenarios in which UE may monitor a carrier that is different from the carrier in which the UE receives Msg2 (i.e. RAR):

- Idle mode
  - Non-EDT random access procedure
  - EDT procedure
- Connected mode
  - NPDCCH ordered NPRACH procedure
  - Random access procedure to apply for UL-SCH resource

Agreement
For the measurement on carrier(s) other than the one UE is receiving RAR for non-anchor access, if supported, RAN1 to select one or more among the following candidates:

- Paging carrier
- Anchor carrier
- Carrier(s) configured by *CarrierConfigDedicated-NB* in connected mode
- Other carriers configured by network with implicit or explicit signaling

The following issues are identified for RAN1 further study

- Whether amount of time or gap is needed for the measurement
- Which carrier(s) UE reported if more than one carrier is measured
- What kind of NRS UE can use for the measurement and whether needs indication

Agreement
In case of 2 bits are used for a non-anchor carrier, one of 3 candidate values can be reported in Msg3

- Which depends on Rmax, the maximum number of repetitions for NPDCCH Type 2 CSS.

For further study in future meetings:
If supported, RAN1 further discuss how to derive the candidate values reported in Msg3 if no NPDCCH Type2 CSS on the carrier

R1-1901506	Msg3 quality reporting for non-anchor access	Huawei, HiSilicon
R1-1901734	Quality report in Msg3 on non-anchor carrier in NB-IoT	MediaTek Inc.
R1-1901750	Support of quality report in Msg3 for non-anchor access in NB-IoT	Ericsson
R1-1901869	Support of Quality report in Msg3 for non-anchor access	ZTE
R1-1901967	Support of Quality report in Msg3 on non-anchor carrier	Nokia, Nokia Shanghai Bell

R1-1902066 Downlink channel quality report during random access procedure on a non-anchor carrier LG Electronics
R1-1902219 Discussion on Msg3 report for non-anchor access Samsung
R1-1902378 Support of quality report in msg3 for non-anchor Qualcomm Incorporated
R1-1902460 Quality report in Msg3 for NB-IoT non-anchor access Intel Corporation

6.2.2.6 *Presence of NRS on a non-anchor carrier for paging*

R1-1903251 Presence of NRS on a non-anchor for paging (feature lead summary) Qualcomm Incorporated

Agreement
For the issue of NRS presence for NPDCCH early termination when NWUS is enabled, down-select among:
- Alt3: Decouple configuration of NRS for NPDCCH early termination and NWUS early termination
  - e.g. eNB can enable NRS for NWUS and disable for NPDCCH, or vice versa.
- Alt4: NRS is always associated with NPDCCH for paging

For further study in future meetings:
RAN1 to consider enabling presence of CRS in non-anchor carriers in subframes not containing NRS.

R1-1903515 Presence of NRS on a non-anchor for paging (feature lead summary) Qualcomm Incorporated

Agreement
The *decimation pattern* (i.e., the pattern that determines which POs have subframes with NRS even when no NPDCCH is transmitted) is designed at least with the following principles:
- P1: The decimation pattern shall be fair across UEs, i.e., all UEs see the same/similar percentage of POs with NRS.
  - FFS: the case for eDRX
- P2: A UE belonging to a given UE group (being a UE group the group of UEs that monitor paging in the same PO) can use NRS belonging to a PO of a different group in addition to the NRS of its own UE group.
  - The maximum gap between the PO with NRS and the PO the UE monitors is not larger than X (to ensure that the UE can reliably estimate the SNR for NPDCCH early termination)
- P3: The POs with NRS are quasi-uniformly/uniformly distributed from UE perspective.
- P4: The POs with NRS are quasi-uniformly/uniformly distributed from network perspective.

NOTE: It was already agreed in previous meetings that a subset of the POs have associated subframes which will contain NRS even when no paging NPDCCH is transmitted.
Further study details of decimation pattern until RAN1#96bis.

R1-1901507 NRS presence on non-anchor carriers for paging Huawei, HiSilicon
R1-1901735 NRS presence on non-anchor carrier in NB-IoT MediaTek Inc.
R1-1901751 Presence of NRS on a non-anchor carrier for paging in NB-IoT Ericsson
R1-1901870 Presense of NRS on non-anchor PRB ZTE
R1-1901968 Presence of NRS on a non-anchor carrier for paging Nokia, Nokia Shanghai Bell
R1-1902067 Discussion on NRS on a non-anchor carrier LG Electronics
R1-1902220 NRS presence on non-anchor carrier Samsung
R1-1902379 Presence of NRS on a non-anchor carrier for paging Qualcomm Incorporated

6.2.3 DL MIMO efficiency enhancements for LTE

LTE_DL_MIMO_EE-Core; WID in RP-182901. Please refer to the WID for detailed scoping

R1-1903656 Chairman's notes of AI 6.2.3 DL MIMO efficiency enhancements for LTE Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

6.2.3.1 *Support of enhancing SRS capacity and coverage*

6.2.3.1.1 Additional SRS symbols

R1-1903295 Feature summary on LTE DL MIMO efficiency enhancement Huawei, HiSilicon

Agreement
For the numbers of additional SRS symbols that can be configured to a UE: 1-13

For further study in future meetings:
For intra-subframe frequency hopping and repetition of additional SRS symbols

- For support of repetition and frequency hopping, $n_{\text{SRS}} = \lfloor l/R \rfloor$, where $l \in \{0,1,\ldots,N_{symb}^{SRS}-1\}$ is the OFDM symbol number, N_{symb}^{SRS} is the number of configured SRS symbols, and R is the repetition factor for the configured UE
  - FFS: Value of R, N_{symb}^{SRS}
  - Applies for aperiodic SRS
- Consider whether legacy SRS and additional SRS symbols have the same hopping pattern.
- Consider whether flexible configuration (e.g., comb/comb offset configuration) is supported for repetition of additional SRS symbols.
- LTE Rel-15 framework for frequency hopping and antenna switching can be reused for supporting frequency hopping and antenna switching for additional SRS symbols with appropriate changes. FFS on the appropriate changes.

Agreement
For the time location of possible additional SRS symbols in one normal UL subframe for a cell:

- 1 to 13 symbols in one subframe can be used for SRS from cell perspective
  - FFS: How/Whether to introduce specification support to handle collision of SRS and PUCCH/PUSCH transmission

For further study in future meetings:
Further study on power control enhancements of additional SRS symbols (including whether these features are needed):

- Independent power control of additional SRS symbols from legacy SRS symbols
- Reuse of SRS power control for carriers without PUCCH/PUSCH
- Consider SRS configurations to reduce the range of power variations in a subframe

Agreement
Same power control configuration applies for all additional SRS symbols configured to a single UE

R1-1903514 **Remaining issues and proposals on SRS enhancements** **Huawei, HiSilicon**

Agreement
Transmission of aperiodic legacy SRS and aperiodic additional SRS symbol(s) in the same subframes for a UE is supported

R1-1901585 Introduction of additional SRS symbols in normal UL subframe Huawei, HiSilicon
R1-1901644 Discussion on additional SRS symbols ZTE
R1-1901649 Further discussion on SRS enhancements vivo
R1-1901730 Additional SRS symbols in LTE MIMO Enhancements MediaTek Inc.
R1-1902075 Enhancements on SRS resource allocation LG Electronics
R1-1902164 Discussion of additional SRS symbols Lenovo, Motorola Mobility
R1-1902221 Discussion on additional SRS symbols Samsung
R1-1902380 Additional SRS symbols Qualcomm Incorporated
R1-1902461 Additional SRS symbols Intel Corporation
R1-1902832 Views on additional SRS designs for LTE MIMO Mitsubishi Electric Co.
R1-1902855 Discussion on introduction of additional SRS symbols Nokia, Nokia Shanghai Bell
R1-1902914 On Rel-16 LTE SRS enhancements Ericsson

6.2.3.1.2 Virtual cell ID for SRS

Agreement
When a virtual cell ID is configured, eNB has the flexibility to apply the virtual cell ID to

- Only additional SRS symbol(s)

- Or both legacy and additional SRS symbol(s)

If virtual cell ID is not configured, physical cell ID is used.

R1-1901586 On virtual cell ID for SRS sequence generation Huawei, HiSilicon
R1-1901645 Discussion on virtual Cell ID for SRS ZTE
R1-1901650 On virtual cell ID configuration for SRS vivo
R1-1902076 Discussion on VCID for SRS sequence LG Electronics
R1-1902222 Discussions on virtual cell ID for SRS Samsung
R1-1902381 Virtual cell ID for SRS Qualcomm Incorporated
R1-1902462 Virtual cell ID support for SRS Intel Corporation
R1-1902856 Remaining issues on virtual cell ID for SRS Nokia, Nokia Shanghai Bell
R1-1902915 On virtual cell ID for SRS Ericsson

6.2.3.1.3 Other

R1-1901587 Discussion on power control for additional SRS Huawei, HiSilicon

6.2.4 Study on LTE-based 5G Terrestrial Broadcast

FS_LTE_terr_bcast; SID in RP-181706. Please refer to the SID for detailed scoping

R1-1903657 Chairman's notes of AI 6.2.4 Study on LTE-based 5G Terrestrial Broadcast Ad-hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

Friday
R1-1903522 Presentation of TR 36.776 v1.0.1 Qualcomm Incorporated (TR editor)
Decision: TR 36.776 v1.0.1 is endorsed as version 1.1.0 in R1-1903660. MCC to prepare v2.0.0 for approval by next plenary.

6.2.4.1 Evaluation Results

Including both system level & link level results

R1-1901582 Simulation results on enhancement techniques for LTE ENTV Huawei, HiSilicon

R1-1902130 Evaluation Results for LTE-Based 5G Terrestrial Broadcast EBU, BBC, IRT
Revised in **R1-1903284 Evaluation Results for LTE-Based 5G Terrestrial Broadcast EBU, BBC, IRT**
R1-1902382 Evaluation results and potential enhancements Qualcomm Incorporated
Revised in R1-1902349 **Evaluation results and potential enhancements Qualcomm Incorporated**

R1-1901780 Simulation results for legacy LTE-based broadcast and effect of longer CP Shanghai Jiao Tong University
Late submission
R1-1901846 Non-Uniform Constellations in LTE-Based 5G Terrestrial Broadcast Shanghai Jiao Tong University
Late submission
R1-1903419 Performance of Non-Uniform Constellations for LTE-Based 5G Terrestrial Broadcast Shanghai Jiao Tong University
R1-1903512 Link level analysis of CAS Qualcomm Incorporated

6.2.4.2 Analysis of Requirements Not Requiring Simulations

R1-1901584 On remaining requirements not requiring simulations Huawei, HiSilicon
R1-1902383 Non-simulation requirements Qualcomm Incorporated

Agreement:
The text proposals in R1-1902383 are endorsed.

6.2.4.3 Other

R1-1903294 **Summary of evaluations for Requirements 7 and 8** **Qualcomm Incorporated**
Revised in R1-1903310 Summary of evaluations for Requirements 7 and 8 Qualcomm Incorporated

Agreement:
TP2 in R1-1903310 is endorsed for inclusion in the TR

Agreement:
TP3 in R1-1903310 is endorsed for inclusion in the TR with the following modifications at the end of the section:

- For certain differentiation of coverage between the base layer and the enhanced layer, MUST can increase system spectral efficiency for both SC-PTM and MBSFN in the range between 10-37% depending on factors such as target coverage for the enhanced layer. As the target coverage of the enhancement layer decreases, the spectral efficiency gain is larger.
    - For the case where the baseline scenario is 100% power and time allocation to the base layer:
        - In most of the evaluated cases, there is a loss in spectral efficiency for the base layer (which may be marginal).
        - For the case where the SNR loss due to introduction of the base layer allows to keep the same MCS, MUST improves the system spectral efficiency without reducing performance of the base layer.

Agreement:
TP5 in R1-1903310 except for the text for Section 6.9.4 in the TR is endorsed for inclusion in the TR.

R1-1903510 **Summary of evaluations for Requirements 7 and 8** **Qualcomm Incorporated**

Agreement:
TP2 in R1-1903510 is endorsed for inclusion in the TR with the addition of the following in the row capturing Notes in the summary table:
The channel model in TS 36.101 is different from the one for the agreed evaluation assumptions which may lead to pessimistic results.

Agreement:
TP3 in R1-1903510 is endorsed for inclusion in the TR.

Agreement:
TP5 in R1-1903510 is endorsed for inclusion in the TR with the following text replacing the first sub-bullet under the bullet for new numerology with 100μs:
For high SNR regime (corresponding SE larger than 1.3 bps/Hz), 100/400/0.33 may outperform Rel.14 1.25 kHz numerology from a link level perspective for the same SNR level, but 1.25kHz achieves higher SNR from a system level perspective

Agreement:
TP6 in R1-1903510 is endorsed for inclusion in the TR with the reference in the row for requirement 7 changed to section 6.8.6.

Agreement:
TP7 in R1-1903510 is endorsed for inclusion in the TR

Agreement:
TP1 in R1-1903510 is endorsed for inclusion in the TR

Agreement:
TP7 in R1-1903510 is endorsed for inclusion in the TR with the following modifications to Section 6.8.6:

- With respect to the CAS, in lieu of LLS in the appropriate channel models and antenna configurations:
    - Under the 50/50 channel model, and based on extrapolation of the minimum performance requirements from [TS 36.101], all channels in CAS perform adequately except for PDCCH in rooftop MPMT and HPHT.

For PDCCH, and based on extrapolation from the link level results presented in [cc], the PDCCH performance is adequate for rooftop MPMT and HPHT.
- Under the 50/1 channel model, and based on extrapolation of the minimum performance requirements from [TS 36.101], all channels in CAS may not perform adequately. Improvements in all the other component channels of the CAS may be beneficial in order to support the use cases studied under the 50/1 time model.
- A realistic scenario for CAS reception may lie in between the 50/50 time model and the 50/1 time model.

R1-1901583 On enhancement techniques for LTE ENTV Huawei, HiSilicon
R1-1902948 Text proposal for the requirements involving simulations in TR 36.776 Huawei, HiSilicon
R1-1902949 Text proposal for the conclusion of TR 36.776 Huawei, HiSilicon

6.2.5 Other

R1-1903658 Chairman's notes of AI 6.2.5 Others Ad-hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1901588 Discussion on remaining issues on introduction of wideband PRG size Huawei, HiSilicon
R1-1902384 Details of wideband PRG Qualcomm Incorporated

R1-1901590 Introduction of configured PRG size for TM9 and TM10 in 36.213 Huawei, HiSilicon
This CR can be discussed at the end of Rel-16.

Agreement:
Support independent configuration of wideband PRG size and CSI reporting type (wideband/subband).

Agreement:
The capability of supporting wideband PRG size is reported per UE.

Agreement:
Wideband PRG for sTTI is introduced with:
- Separate UE capability per TTI length
- Separate configuration per TTI length

R1-1903285 Draft LS on wideband PRG size Huawei
Decision: The draft LS is endorsed. Final LS is approved in R1-1903292.

7 NR

7.1 Maintenance of Release 15 NR

Only essential corrections – a rejected draft CR will be marked in red

R1-1903355 Interoperability of Release 15 specifications TTA, KT, LG Uplus, SKT, LG Electronics, ETRI, ITI
Late submission
- The compatibility of devices and networks used for the first deployments should not be impacted by later version of Release 15 specifications.
- To ensure interoperability between previous version of Release 15 specifications, the CRs with the "backward compatibility issues" shall not be agreed.

Discussion: Also supported by Samsung
Decision: The document is noted as there was no concerns from the group to treat this late contribution.

R1-1903232 Correction of wrong implementation on frequency domain resource assignment bitwidth ETSI MCC
Decision: CR0006 to 38.212 is agreed.

R1-1902198 **Correction for higher layer parameter alignment NEC Corporation**
Decision: The document is noted. Consider similar updates for all specs. Discuss further offline
Wednesday conclusion:

- To be incorporated into the alignment CR

Editors to prepare alignment CRs by the end of Wed., to be shared by email and review on Thursday
Friday
R1-1903781 **Alignment of terminology across specifications Ericsson (rev of R1-1903641)**
Decision: CR0007R1 to 38.211 is agreed.

R1-1903642 **Corrections to TS38.212 Huawei**
Decision: CR0010 to 38.212 is agreed.

R1-1903644 **Corrections to TS38.214 Nokia**
Decision: CR to revise in R1-1903793 (38.214, CR0013, R1), revised and agreed in R1-1903796 (38.214, CR0013R2).
Post meeting: MCC noticed that 3644, 3793 and 3796 were wrongly recorded into 3GU – Impacted spec was 38.213 instead of 38.214 creating a conflict into the CR database. Final CR is agreed in R1-1903823 (38.214, CR0024) – only change concerns Tdoc# and CR# on CR cover sheet.

R1-1903643 **Corrections to TS38.213 Samsung**
Decision: CR to revise and agreed in R1-1903795 (38.213, CR0015R1).

7.1.1 Maintenance for Initial access and mobility

R1-1903356 **Feature lead summary for 7.1.1 SSB and RACH Ericsson**
Decision: The document is noted.
Wednesday
R1-1903498 **Summary of offline discussion for 7.1.1 SSB and RACH Ericsson**
Decision: The document is noted.
Thursday
R1-1903734 **Summary of offline discussion for 7.1.1 SSB and RACH Ericsson**
Decision: The document is noted.

R1-1902105 **Correction of SSB subcarrier spacing parameter name Ericsson**
No update at this point, wait till RAN2 has more complete specification

R1-1902223 **Draft CR on the notation for MSB of k_SSB for FR1 Samsung, CMCC**
The draft CR is endorsed in principle. To include in the alignment CR for 38.211

R1-1901652 Draft TS 38.213 CR on association between SSB and RACH occasion vivo
R1-1901875 Draft CR on the index n of SS/PBCH block mapping to 1/N PRACH occasionsZTE Corporation
R1-1902224 **Draft CR for SSB and PRACH occasion Samsung**
R1-1902643 **Correction to mapping of SSB to valid PRACH occasion in TS 38.213 Sharp**
R1-1903214 Correction on association of SSB and PRACH occasion Huawei, HiSilicon
Proposal: Endorse the draft 1 in R1-1902643
Monday conclusion: Discuss further offline for the above 5 draft CRs
Tuesday: proposal to endorse R1-1902224
Wednesday:
Agreements: Update draft CR from Samsung in R1-1902224 with:

- Remove 0=<n=<N-1 for the case of N<1
- Add "the" in from of SS/PBCH block
- Add statement

SS/PBCH block indexes provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* are…

- Update isolated impact analysis in cover page to "This CR makes essential clarifications to the existing text and does not introduce new or change functionality for either the gNB or the UE."

R1-1903542 **Draft CR on SSB-RO association Samsung**
Decision: Draft CR is endorsed and final CR is agreed in R1-1903546 (38.213, CR 0011)

R1-1901971 **Draft CR on the clarification of NR PRACH resource mapping CATT**
Discuss further offline
Wednesday conclusion:

- No longer applicable due to CR in R1-1903546

R1-1902527 **Removal of CSI request in RAR grant Ericsson**
Discuss further offline
Wednesday
Agreements:

- Agree CR in principle
- Update isolated impact analysis to "The specification of the feature is incomplete in Rel-15. Due to this, it is RAN1's understanding that a UE would not respond to a trigger for a CSI request for non-contention-based RACH."

R1-1903547 **Removal of CSI request in RAR grant Ericsson**
Decision: Draft CR is endorsed and final CR is agreed in R1-1903553 (38.213, CR0012)

R1-1902738 **Clarification on simultaneous PRACH and PUSCH/PUCCH/SRS transmission Spreadtrum Communications**
Discuss further offline
Wednesday: Updated in R1-1903473 – for further discussion
Thursday conclusion

- Remove the support of PRACH in the SUL carrier and SRS in the non-SUL carrier and vice versa in the *simultaneousTxSUL-NonSUL* UE capability

Draft CR is not pursued.

R1-1902555 **QCL properties of Msg4 in CONNECTED Mode Nokia, Nokia Shanghai Bell**
R1-1902556 **QCL properties of Msg4 in CONNECTED Mode Nokia, Nokia Shanghai Bell**
Discuss further offline
Thursday
R1-1903715 **QCL properties of Msg4 in CONNECTED Mode Nokia, Nokia Shanghai Bell**
Decision: Draft CR is endorsed. Final CR is agreed in R1-1903745 (38.213, CR0023)
R1-1903716 **QCL properties of Msg4 in CONNECTED Mode Nokia, Nokia Shanghai Bell**
Decision: Draft CR is endorsed. Final CR is agreed in R1-1903746 (38.214, CR0020)

R1-1902780 **CR on QCL assumption for receiving PDCCH for RAR NTT DOCOMO, INC.**
Discuss further offline
Wednesday
R1-1903506 **CR on QCL assumption for receiving PDCCH for RAR NTT DOCOMO, INC.**
Decision: Draft CR in R1-1902780 is endorsed. To update the cover sheet and final CR to be prepared in R1-1903550
Thursday decision: Draft CR in R1-1903550 is endorsed. Final CR is agreed in R1-1903749 (38.213, 0026)

R1-1903131 **Removal of UL transmision restrictions for paired spectrum Nokia, Nokia Shanghai Bell**
Discuss further offline
Thursday decision: Updated CR in R1-1903720 is endorsed. Final CR is agreed in R1-1903748 (38.213, CR0025). Note: the CR is not intended to change current UE implementation

R1-1903132 **Unnecesary UL-DL slot configuration restrictions in respect of pdcch-ConfigSIB1** **Nokia, Nokia Shanghai Bell**
Discuss further offline
Thursday conclusion: Draft CR is not pursued.

=======
R1-1903361 **Summary of AI7.1.1 on NR RMSI** **CATT**
Decision: The document is noted.

R1-1902106 **Correction of SIB1 parameter name** **Ericsson**
Conclusion:
- Use the term "*SIB1*" to represent the RMSI in RAN1 specs for the consistency with TS 38.331.
- Editors to replace the "*SystemInformationBlockType1*" with the "*SIB1*" in TS 38.213 and TS 38.214.

Discuss further offline on the corresponding CR
Thursday conclusion: to be included in the alignement CR

=======
R1-1903416 Summary of Rel-15 CRs for NR Mobility Intel
R1-1902321 **Draft CR on CSI-RS measurement for L3 mobility** **ZTE**
Draft CR is withdrawn

=======
R1-1901651 **Draft TS 38.213 CR on timing adjustment indicator** **vivo**
Discuss further offline
Tuesday
R1-1903444 **Draft TS 38.213 CR on timing adjustment indicator** **vivo**
The draft CR is endorsed. Discuss further offline for final CR w..r.t. cover page including "reason for change" & "isolated impact analysis"
Wednesday: Final CR is agreed in R1-1903504 (38.213, CR0010)

R1-1902645 **Correction to transmission timing adjustments in TS 38.213** **Sharp**
Discuss further offline
Wednesday
R1-1903529 **Offline discussion related to CR R1-1902645** **Panasonic**
Decision: The document is noted.
Thursday
R1-1903538 **Correction to transmission timing adjustments in TS 38.213** **Sharp**
Further updated to R1-1903752
Friday
R1-1903772 **Correction to transmission timing adjustments in TS 38.213** **Sharp** (rev of R1-1903752)
Decision: Draft CR is endorsed. Final CR is agreed in R1-1903814 (38.213, CR0034)

R1-1902225 **Draft CR on PRACH Power Ramping Counter Suspension** **Samsung**
Discuss further offline especially regarding whether or not there is the corresponding agreement, to handle under 7.1.4

R1-1901784 Open issues for paging in the connected mode MediaTek Inc.
Late submission
R1-1902644 Correction to SSB Case C in TS 38.213 Sharp
Withdrawn
R1-1903348 Periodicity of CSI-RS for radio link monitoring Ericsson

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Late submission

7.1.2 Maintenance for MIMO

R1-1903625 Chairman's notes of AI 7.1.2 Maintenance for MIMO Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

R1-1902448 Draft Reply to LS on SSB based BFD Intel Corporation

<Maintenance on CSI measurement>
R1-1903425 Summary of Maintenance for CSI Measurement ZTE

R1-1902120 Correction to aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS Ericsson
R1-1903379 Correction to aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS Ericsson, AT&T, T-Mobile USA, Sprint (Rev. of R1-1902120)
R1-1903615 Correction to aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS Ericsson, AT&T, T-Mobile USA, Sprint
No further discussion in Rel-15

R1-1902121 Motivation for correction to aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS Ericsson

<Maintenance on UL non-codebook based transmission>
R1-1903415 Summary of CRs on UL non-codebook based transmission Nokia, Nokia Shanghai Bell

R1-1901975 Corrections on non-codebook based UL transmission to TS38.214 CATT

R1-1901659 Draft TS 38.214 CR on aperiodic SRS transmission vivo
The draft CR in R1-1901659 is endorsed. Include in the alignment CR for TS38.214.

R1-1901661 Draft TS 38.212 CR on association between SRI and SRS resource vivo
R1-1902636 On bitwidth calculation for DCI fields using RRC parameter indicating maximum number of MIMO layers per serving cell Intel Corporation
R1-1903536 On bitwidth calculation for DCI fields using RRC parameter indicating maximum number of MIMO layers per serving cell Intel Corporation, Ericsson, Qualcomm
The draft CR in R1-1903536 is endorsed. Final CR is agreed as R1-1903733 (CR#0011, TS38.212)

R1-1901974 Corrections on SRS to TS38.211 CATT
R1-1903619 Corrections on SRS to TS38.211 CATT, Nokia, Huawei/HiSilicon, Ericsson, ZTE
The draft CR is endorsed. Include as part of alignment CR for TS38.211

<Maintenance on CSI acquisition>
R1-1903377 Maintenance for CSI acquisition Ericsson

R1-1901663 Draft TS 38.214 CR on NZP CSI-RS configured with repetition vivo
R1-1901664 Draft TS 38.214 CR on CPU occupancy for P/SP NZP-CSI-RS configured with repetition vivo
R1-1903584 Draft TS 38.214 CR on CPU occupancy for P/SP report for L1-RSRP vivo
The draft CR in R1-1903584 is endorsed. Include as part of alignment CR for TS38.214.

R1-1901972 Corrections on CSI acquisition to TS38.214 CATT

R1-1901973 Corrections on CSI reporting to TS38.212CATT
The draft CR in R1-1901973 is endorsed. To be captured in the alignment CR for TS38.212.

R1-1902118 Correction and clarification to CSI computation time Ericsson
R1-1903719 Correction and clarification to CSI computation time Ericsson
The draft CR in R1-1903719 is endorsed. To be captured in the alignment CR for TS38.214.

R1-1902119 Corrections to CSI reference resource Ericsson
The draft CR in R1-1902119 is endorsed. To be captured in the alignment CR for TS38.214.

R1-1902972 Maintenance for CSI Acquisition Qualcomm Incorporated

<Maintenance on beam management and QCL>
R1-1903382 Summary of draft CRs for beam management and QCL Ericsson

R1-1901653 Draft 38.214 CR on cross carrier aperiodic CSI-RS beam indication vivo

R1-1902634 Correction on QCL assumption of aperiodic CSI-RS for beam management Intel Corporation
R1-1901655 Draft 38.214 CR on default QCL for aperiodic CSI-RS vivo

R1-1903635 Draft CR on AP-CSI-RS with a large latency of beam switching ZTE

R1-1901755 Draft CR on QCL indication for PDSCH with slot aggregation ZTE
R1-1903729 Draft CR on QCL indication for PDSCH with slot aggregation ZTE
R1-1903744 Draft CR on QCL indication for PDSCH with slot aggregation ZTE
R1-1903729 and R1-1903744 are revised versions of R1-1901755.

R1-1902635 Correction on TCI indication for multi-slot PDSCH Intel Corporation
R1-1903606 Correction on TCI indication for multi-slot PDSCH Intel Corporation
The draft CR in R1-1903606 is endorsed. Final CR is agreed as R1-1903740 (CR#0018, TS38.214)

R1-1901656 Draft 38.214 CR on PDSCH beam indication vivo
R1-1901757 Draft CR on default QCL for PDSCH ZTE
Both draft CRs are related to the same issue. Draft CR in R1-1901656 is endorsed. Final CR is agreed as R1-1903738 (CR#0017, TS38.214)

R1-1902968 Draft CR on clarification of action time for A-CSI-RS as QCL source of PDSCH Qualcomm Incorporated
R1-1901759 Draft CR on AP CSI-RS as QCL source ZTE
Both draft CRs are related to the same issue.

R1-1901754 Draft CR on default QCL for AP-CSI-RS ZTE
R1-1903608 Draft CR on default QCL for AP-CSI-RS ZTE
The draft CR in R1-1903608 is endorsed. To be captured in the alignment CR for TS38.214.

R1-1901654 Draft 38.214 CR on PUSCH spatial relation vivo
The draft CR in R1-1901654 is endorsed. To be captured in the alignment CR for TS38.214.

R1-1903029 Draft CR on clarification of action time for A-CSI-RS as QCL source of spatial relation Qualcomm Incorporated

R1-1903030 Draft CR on clarification of action time for A-SRS as QCL source of spatial relation Qualcomm Incorporated

R1-1902969 **Draft CR on clarification of action time for A-CSI-RS as QCL source of spatial relation, Qualcomm Incorporated**
R1-1902970 **Draft CR on clarification of action time for A-SRS as QCL source of spatial relation, Qualcomm Incorporated**

<Maintenance on beam failure recovery>
R1-1903469 **Maintenance for Beam Failure Recovery 1 Asia Pacific Telecom**

R1-1901756 **Draft CR on CORESET#0 after gNB response for recovery ZTE**
R1-1903491 **Draft CR on latency after gNB response for recovery ZTE**
R1-1902633 **Correction on CORESET0 QCL assumption after beam failure recovery Intel Corporation**
R1-1903633 **Draft CR on latency after gNB response for recovery ZTE** (rev of R1-1903491)
Above three draft CRs have parts which are related to correcting the same issue. Draft CR in R1-1903633 is endorsed in R1-1903747 (CR#0024, TS38.213).

R1-1902561 **Failure Detection Resources for BFR Nokia, Nokia Shanghai Bell**

R1-1901657 **Draft 38.213 CR on PDCCH beam after BFR vivo**

R1-1902632 **Correction on QCL assumption of PDSCH during beam failure recovery Intel Corporation**

R1-1902631 **Correction on beam failure detection Intel Corporation**

R1-1902971 **Draft CR on clarification of PUSCH spatial relation after reception of BFR responseQualcomm Incorporated**

<Maintenance on multiplexing of different types of RSs>
R1-1903422 **Feature lead summary of maintenance for RS multiplexing Huawei, HiSilicon**

R1-1901762 **Discussion on potential collision between SRS and configured grant based PUSCH ZTE**
R1-1901763 **Draft CR on potential collision between SRS and configured grant based PUSCH ZTE**
No further discussion for Rel-15

<Maintenance on CSI-RS>
R1-1903418 **Maintenance for CSI-RS #1 Huawei, HiSilicon**

R1-1901760 **Draft CR for correction of ZP CSI-RS trigger in 38.212 ZTE**
R1-1903390 **Draft CR for correction of ZP CSI-RS trigger in 38.212 ZTE**
The draft CR in R1-1903390 is endorsed. To be included in the alignment CR for TS38.212.

R1-1901764 **Draft CR on description of ZP CSI-RS resource configuration ZTE**
The draft CR in R1-1901764 is endorsed with one modification. The part related to changing the RRC parameter '*CDMType*' should be '*cdm-Type*'. Include in the alignment CR for TS38.214.

R1-1902226 **Draft CR on NR CSI-RS Samsung**
The draft CR in R1-1902226 is endorsed with one additional modification. Change *slotconfig* to *slotConfig*. Include in the alignment CR for TS38.211.

R1-1901615 **Correction on AP-CSI-RS triggering offset in 38.214 Huawei, HiSilicon**
The draft CR in R1-1901615 is endorsed. Include in the alignment CR for TS38.214.

R1-1901617 **Correction on CSI-RS configuration in 38.214 Huawei, HiSilicon**
The draft CR in R1-1901617 is endorsed with one additional modification: '*CDMType*' should be '*cdm-Type*'. Final CR is agreed in R1-1903528 (38.214, CR#0009).

<Maintenance on DMRS>
R1-1903413 **Maintenance of DM-RS Qualcomm**

R1-1902227 **Draft CR on UE assumption on MU MIMO Samsung**
The draft CR in R1-1902227 is endorsed with revision. Revise draft CR with the following impact analysis:
"It is expected UEs and networks have interpreted the current text in 38.214 and have implemented in accordance to this CR and therefore no change is required on UE and network implementation."
Include in the alignment CR for TS38.214.

<Maintenance on PT-RS>
R1-1903387 **Maintenance of PT-RS Ericsson**

R1-1901614 **Correction on port indexing in 38.214 Huawei, HiSilicon**
R1-1901660 **Draft TS 38.214 CR on association between SRS port and PTRS port vivo**
R1-1903727 **Draft TS 38.214 CR on association between SRS port and PTRS port vivo**

The draft CR is endorsed with one modification. Include in the alignment CR for TS38.214.

<Maintenance on SRS>
R1-1903325 **Summary of Rel15 SRS maintenance Sony**

R1-1901961 **Correction to SRS offset indication Ericsson**
R1-1902967 **Draft CR on correction to frequency-domain starting position indication for SRS resource Qualcomm Incorporated**
R1-1903730 **Correction to frequency-domain starting position for SRS resource mapping Qualcomm**
No decision on the draft CR at this meeting.

R1-1901623 **Correction on SRS Carrier Switching Time in 38.214 Huawei, HiSilicon**
The draft CR is endorsed. Include in the alignment CR for TS38.214.

R1-1902593 **Correction to SRS/PUSCH/PUCCH transmission in NR CA Fujitsu**
Agreement: A modified version of the proposed corrections to be captured in alignment CR for TS38.214.

6.2.1.3 UE sounding procedure between component carriers
For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall not transmit SRS whenever SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *rf-RetuningTimeUL* and *rf-RetuningTimeDL)* on the carrier of the serving cell and PUSCH/PUCCH transmission carrying HARQ-ACK/positive SR/RI/CRI and/or PRACH happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in ~~the~~ Subclause 4.2.7.4 of ~~*SRS_capability*~~ [13, TS 38.306].
For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall not transmit a periodic/semi-persistent SRS whenever periodic/semi-persistent SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *rf-RetuningTimeUL* and *rf-RetuningTimeDL)* on the carrier of the serving cell and PUSCH transmission carrying aperiodic CSI happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in ~~the~~ Subclause 4.2.7.4 of ~~*SRS_capability*~~ [13, TS 38.306].
For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall drop PUCCH/PUSCH transmission carrying periodic CSI comprising only CQI/PMI, and/or SRS

transmission on another serving cell configured for PUSCH/PUCCH transmission whenever the transmission and SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *rf-RetuningTimeUL* and *rf-RetuningTimeDL)* on the serving cell happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in ~~the~~ Subclause 4.2.7.4 of ~~*SRS_capability*~~ [13, TS 38.306].
For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall drop PUSCH transmission carrying aperiodic CSI comprising only CQI/PMI whenever the transmission and aperiodic SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133]) as defined by higher layer parameters *rf-RetuningTimeUL* and *rf-RetuningTimeDL)* on the carrier of the serving cell happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in ~~the~~ Subclause 4.2.7.4 of ~~*SRS_capability*~~ [13, TS 38.306].

R1-1902594 **Correction to UE sounding procedure in NR** **Fujitsu**
R1-1903427 **Correction to UE sounding procedure in NR** **Fujitsu, Ericsson**
Both draft CRs relate to the same issue. The draft CR in R1-1903427 is endorsed with the modified text below and to be captured in the alignment CR for TS38.214:

The UE may~~can~~ be configured with one or more Sounding Reference Signal (SRS) resource sets as configured by the higher layer parameter *SRS-ResourceSet*. For each SRS resource set, a UE may be configured with $K \geq 1$ SRS resources (higher layer parameter *SRS-Resource*), where the maximum value of K is indicated by UE capability ~~[*SRS_capability* [13, 38.306]]~~. The SRS resource set applicability is configured by the higher layer parameter *usage* in *SRS-ResourceSet.* When the higher layer parameter *usage* is set to 'b~~B~~eamManagement', only one SRS resource in each of multiple SRS sets may~~can~~ be transmitted at a given time instant, but the SRS resources in different SRS resource sets with the same time domain behaviour in the same BWP may~~can~~ be transmitted simultaneously.

R1-1903118 **Corrections on the description of SRS request in 38.214** **Huawei, HiSilicon**
The draft CR in R1-1903118 is endorsed. Include in the alignment CR for TS38.214.

<Maintenance on TRS>
R1-1903414 Maintenance for TRS MediaTek
R1-1901782 **Discussion on TRS availability out of DRX active time** **vivo**

<Maintenance on other issues related to MIMO>
R1-1903507 **Summary of simultaneous Rx/Tx Intel Corporation** **(rev of R1-1903323)**

R1-1901658 **Draft 38.214 CR on simultaneous reception of DL and UL physical channels and RSs** **vivo**
R1-1901758 **Draft CR on priority rules for simultaneous Tx** **ZTE**
R1-1902637 **On QCL prioritization for PDSCH overlap** **Intel Corporation**
No further discussion in Rel-15.

R1-1901962 **Correction to PDSCH mapping to VRB** **Ericsson**
The draft CR in R1-1901962 is endorsed. Include as part of alignment CR for TS38.211.

R1-1902927 **Draft LS to RAN2 on introduction of UE capability for aperiodic CSI-RS triggering with mixed numerology** **Ericsson**
Further revised in R1-1903378.

7.1.3 Maintenance for Scheduling/HARQ aspects

R1-1903339 **Summary for PDCCH structure and search space** **NTT DOCOMO**
Decision: The document is noted.
R1-1903753 **Summary for PDCCH structure and search space** **NTT DOCOMO**

Decision: The document is noted.

R1-1901851 **Correction on search space sharing** **Ericsson**
The draft CR is endorsed in principle. Discuss further offline for final CR especially w.r.t. cover page (impact analysis)
Tuesday
R1-1903465 **Correction on search space sharing** **Ericsson**
Further update the cover page, to add a sentence indicating something like "no impact to current implementation due to common understanding in RAN1"
Wednesday
R1-1903492 **Correction on search space sharing** **Ericsson**
Decision: The CR (38.213, CR0009) is agreed.

R1-1901854 **Correction on PDCCH monitoring with pdcch-BlindDetectionCA Ericsson**
Discuss further offline
Wednesday
Agreements:

- If a UE supports CA across FR1 and FR2, the UE reports pdcch-BlindDetectionCA per FR. On the other hand, RAN1 spec describes BD/CCE limit determination based on single capability signalling of pdcch-BlindDetectionCA across all CCs. For handling the two values of pdcch-BlindDetectionCA for FR1 and FR2:
  - The value of pdcch-BlindDetectionCA for each FR denotes the BD capability across FR1 + FR2
    - The same value is reported in pdcch-BlindDetectionCA for FR1 and for FR2
      - Note: this means that the meaning of this capability signaling is modified
    - The value is not smaller than 4 (previous RAN1 agreement is across FR1 + FR2)
    - Send an LS to RAN2 about this decision – (Fred, NTT DOCOMO)

Thursday
R1-1903648 **Draft LS on pdcch-BlindDetectionCA** **NTT DOCOMO**
Decision: More time needed for review – revisit later on.
R1-1903751 **Draft LS on pdcch-BlindDetectionCA** **NTT DOCOMO**
Decision: The draft LS is endorsed and final version is approved in R1-1903754.

R1-1902233 **Draft CR on PDCCH monitoring for ScellSamsung**
Discuss further offline
Wednesday decision: not to pursue the CR

R1-1902974 **Draft CR on CORESET Size Smaller than AL** **Qualcomm Incorporated**
Discuss further offline
Wednesday decision: not to pursue the CR

R1-1902782 **Draft CR on QCL assumption for a CORESET other than 0** **NTT DOCOMO, INC., Ericsson, Nokia, NSB**
Discuss further offline
Friday decision: Draft in R1-1902782 is endorsed. Final CR agreed in R1-1903779 (38.213, CR0030)

R1-1903045 **Correction on physical downlink control channel** **ASUSTEK COMPUTER (SHANGHAI)**
Discuss further offline
Wednesday
R1-1903420 **Correction on physical downlink control channel** **ASUSTEK COMPUTER (SHANGHAI)**
Decision: The draft is endorsed in principle. Offline to further refine the wording, also including checking cover page
Thursday: Updated draft in R1-1903566 is endorsed. Final CR agreed in R1-1903682 (38.213, CR0020)

R1-1901853 **Correction on interpreting QCL TypeD across multiple CORESETs with different QCL TypeD properties Ericsson**
Discuss further offline
Wednesday decision: not to pursue the CR

R1-1902234 **Draft CR on QCL confliction Samsung**
Discuss further offline
Thursday: Updated draft in R1-1903564 is endorsed. Final CR agreed in R1-1903678 (38.213, 0018)

R1-1903205 **Correction on PDCCH selection among different QCL-TypeD property Huawei, HiSilicon**
Discuss further offline
Friday conclusion: Updated to **R1-1903690**.

- To incorporate the change in R1-1903690 in the alignment CR (38.213)

R1-1902238 PDCCH Monitoring for NN-DC Samsung
R1-1902239 **Draft CR on PDCCH Monitoring for NN-DC Samsung, Nokia, Nokia Shanghai Bell**
Discuss further offline
Wednesday decision: Postpone to next RAN1 meeting (to finalize NN-DC UE capability first)

R1-1902235 **Draft CR on cross-carrier scheduling Samsung**
Not to be considered in Rel-15

Thursday conclusion:

- It is RAN1's common understanding that for cross-carrier scheduling, on a non-scheduling cell, the UE does not monitor Type3-CSS set in Rel.15.
  - No specification change is required.

Email approval to confirm the companies' understanding on Table 10.1-1: Whether the number of PDCCH candidates for Type0/0A/2-CSS set follows Table 10.1-1 if the CSS set is not SS#0?, till 03/07 (Fred, NTT DOCOMO)

======
R1-1903362 **Summary of 7.1.3 - Maintenance of DCI contents and formats Ericsson**
Decision: The document is noted.
Wednesday
R1-1903462 **Offline discussion on maintenance of DCI contents and formats Ericsson**
Decision: The document is noted.
Thursday
R1-1903731 **Outcome of offline discussion on maintenance for DCI contents Ericsson**
Decision: The document is noted.

R1-1901666 **Draft TS 38.212 CR on zero-padding of DCI 1_1 in cross-carrier scheduling case vivo**
Check further offline especially regarding ensuring "no duplicate" description of the size-matching in multiple places
Thursday decision: R1-1901666 is endorsed in principle. Cover sheet to be updated in the final CR
Friday: Final CR is agreed in **R1-1903762** (38.212, CR0012)

R1-1902648 **Correction to bit width of FDRA in DCI format 1_0 in TS 38.212 Sharp**
R1-1902973 **Draft CR on FDRA in DCI Format Description Qualcomm Incorporated**
Check further offline whether or not some aspects in the above two CRs can be included in the alignment CR or not
Tuesday: the above two CRs are not needed

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R1-1902240 **Draft CR on PDCCH order for cross-carrier scheduling** **Samsung**
Not to be considered in Rel-15

R1-1902649 **Correction to DCI size alignment in TS 38.212** **Sharp**
Discuss further offline
Thursday conclusion:
- Include change 2 in the 38.212 alignment CR.
  - Change 2: 'In step 1, for zero padding for DCI format 0_0, clarify that padding bits are "generated for" (rather than "appended to") DCI format 0_0, i.e. same wording as in handling of DCI format 0_0 in step 0.'
- Changes 1, 3, 4 are not agreed.

R1-1903208 **Remaining issue on DCI format ambiguity** **Huawei, HiSilicon**
Discuss further offline
Wednesday conclusion:
- UE is not expected to handle the following case:
  - is configured to monitor a first PDCCH candidate for a DCI format 0_0 and a DCI format 1_0 from a CSS set and a second PDCCH candidate for a DCI format 0_1 and a DCI format 1_1 from a USS set in a CORESET with index zero on an active DL BWP, and
  - the DCI formats 0_0/1_0 associated with the first PDCCH candidate and the DCI formats 0_1/1_1 associated with the second PDCCH candidate have same size, and
  - the UE receives the first PDCCH candidate and the second PDCCH candidate over a same set of CCEs, and
  - the first PDCCH candidate and the second PDCCH candidate have identical scrambling, and
  - the DCI formats 0_0/1_0 for the first PDCCH candidate and the DCI formats 0_1/1_1 for the second PDCCH candidate have CRC scrambled by either C-RNTI, or MCS-C-RNTI, or CS-RNTI

Check whether a CR is necessary or not
Thursday conclusion: CR is not necessary

R1-1901836 **Draft CR on UE procedure for transmitting PUSCH without UL-SCH** **ZTE**
Discuss further offline
Wednesday conclusion:
- It's common understanding that UE will ignore "redundancy version" field and other non-applicable fields in this case (as in R1-1901836), and there is no need to have spec change

Decision not to pursue the CR

======
R1-1903364 **Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH** **Ericsson**
Decision: The document is noted.
Wednesday
R1-1903466 **Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH** **Ericsson**
Decision: The document is noted.
R1-1903784 **Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH** **Ericsson**
Decision: The document is noted.

R1-1901665 **Draft TS 38.213 CR on multiplexing HARQ-ACK/SR/CSI in PUCCH** **vivo**
Discuss further offline
Wednesday
To clarify HARQ-ACK bits are not dropped in case maxCoderate is not high enough to support all the HARQ-ACK bits in the configured number of PRBs.
  - UE utilizes the configured PRBs to transmit the HARQ-ACK bits. The code rate can be different from the maxCoderate

Check whether a CR is necessary or not

Thursday conclusion: Draft CR in R1-1901665 is not pursued
Further revised in 3718 (withdrawn)
Friday conclusion:
It is understood that if HARQ-ACK/SR and CSI bits are intended to be transmitted in a PUCCH resource with format 2, 3 or 4, it is not expected to drop all the CSI reports due to configuration of maxCoderate for the PUCCH resource.

- No spec update is necessary

R1-1901833 **Draft CR for CSI multiplexing with SR** **ZTE**
The draft CR is endorsed in principle. Discuss further offline for the final CR particularly cover page (adding isolated impact analysis)
Wednesday
R1-1903543 **CR for CSI multiplexing with SR ZTE**
Decision: The CR (38.212, CR0007) is noted, check further offline
Thursday decision: no need to update the current spec. The CR is not necessary.

R1-1901979 **Draft CR on UE procedure for reporting multiple UCI types** **CATT**
Discuss further offline
Thursday
R1-1903599 **Draft CR on UE procedure for reporting multiple UCI types** **CATT**
Friday decision: Updated draft CR in **R1-1903786** is endorsed. Final CR is agreed in R1-1903807 (38.213, CR0033)

R1-1901978 **Corrections to UCI feedback** **CATT**
Proposal 5 to be discussed whether to handle under MIMO CRs; proposal 6 to be discussed in CA CRs (by Aris)
Discuss further offline for proposals 1 to 4
Thursday
R1-1903755 **Draft CR on overlapping of SR and PUSCH without UL-SCH** **CATT** (rev of R1-1903600)
Decision: To incorporate the change in R1-1903755 in the alignment CR (38.213)
R1-1903756 **Draft CR on overlapping of CSI and PUSCH with slot aggregation** **CATT** (rev of R1-1903601)
Decision: Draft CR is endorsed. Final CR is agreed in R1-1903759 (38.213, CR0028)

======
R1-1903326 **Summary of RAN1#96 CRs on R15 PUCCH resource allocation** **OPPO**
Decision: The document is noted.
Wednesday
R1-1903471 **Offline summary for R15 CRs on PUCCH resource allocation** **OPPO**
Decision: The document is noted.

R1-1902069 **Correction to last PUCCH resource set configuration** **Ericsson**
Discuss further offline
Thursday decision: Draft CR is endorsed. Final CR is agreed in R1-1903680 (38.213, CR0019)

R1-1902558 **Determination of m_0 before dedicated PUCCH resource configuration** **Nokia, Nokia Shanghai Bell**
Discuss further offline
Thursday conclusion:

- To include the suggested text in R1-1902558 in the alignment CR (38.213)

R1-1903335 Correction to PUCCH resource set determining for UCI multiplexing OPPO
Late submission
Wednesday: Decision not to pursue the CR

======
R1-1903385 **Rel-15 CR summary on long format PUCCH Huawei**
Decision: The document is noted.

R1-1902646 Change Request for spreading factor of PUCCH format 4 in TS 38.211 Sharp
R1-1902691 **Correction on block-wise spreading for PUCCH format 4 NEC**
The draft CR is endorsed in principle. Discuss further offline for the final CR including possibility of inclusion in the alignment CR
Wednesday conclusion: To incorporate the changes in R1-1902691 in the alignment CR

R1-1901832 **Draft CR for PUCCH Format 1 ZTE**
The draft CR is endorsed in principle. Discuss further offline for the final CR including possibility of inclusion in the alignment CR
Wednesday
R1-1903548 **CR for PUCCH Format 1ZTE**
Decision: CR (38.211, CR0005) is agreed.

R1-1902232 **Draft CR on A-CSI Multiplexing in a PUSCH Transmission with Repetitions Samsung**
Not to be considered in Rel-15

R1-1902236 PUCCH Repetitions in NR Rel-15 Samsung
R1-1902237 **Draft CR on PUCCH Repetitions Samsung**
Not to be considered in Rel-15

======
R1-1903405 **Summary of CRs on UCI multiplexing on PUSCH Qualcomm**
Decision: The document is noted.

R1-1902071 **Correction to UCI multiplexing Ericsson**
The proposed text is commonly understood by RAN1. Discuss further offline for the final CR, clarification in Chairman's notes, or possibility of inclusion in the alignment CR
Wednesday decision: The draft CR is endorsed. Final CR to be prepared and agreed in R1-1903561 (38.212, 0008).

R1-1902557 **Number of HARQ-ACK coded modulation symbols used to determine CSI-part2 coded modulation symbolsNokia, Nokia Shanghai Bell**
Not necessary since the spec is already clear

R1-1902559 **Clarifications on CSI reporting on PUSCH Nokia, Nokia Shanghai Bell**
Discuss further offline particularly w.r.t. potential clarification of "code rate", and potential impact on other sections
Wednesday
R1-1903545 **Clarifications on CSI reporting on PUSCH Nokia, Nokia Shanghai Bell**
Thursday decision: Updated CR in R1-1903563 (38.214, CR0019) is agreed.

======
R1-1903363 **Summary of 7.1.3 - Maintenance of Resource allocation Ericsson**
Decision: The document is noted.
R1-1903611 **Outcome from offline discussion on maintenance of resource allocation Ericsson**
Decision: The document is noted.

R1-1901977 Draft CR on PUSCH scheduled by a RAR UL grant CATT

R1-1902651 **Change Request for alignment of frequency domain resource allocation with 38.213 for a PUSCH transmission scheduled by a RAR UL grant** **Sharp**
The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page.
Thursday decision: Updated CR is agreed in R1-1903590 (38.214, CR0013). Note: the CR is not intended to change current UE implementation.

R1-1902539 **Correction on uplink resource allocation type 1** **Nanjing Ericsson Panda Com Ltd**
The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page (isolated impact analysis) and possibility for inclusion in the alignment CR.
Thursday decision: Updated CR is agreed in R1-1903554 (38.214, CR0010).

R1-1903117 **Correction on PUSCH resource allocation** **Huawei, HiSilicon**
The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page and possibility for inclusion in the alignment CR.
Thursday decision: Updated CR is agreed in R1-1903558 (38.214, CR0012).

R1-1901618 **Correction on determination of the resource allocation table for PUSCH with SP CSI** **Huawei, HiSilicon**
The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page and possibility for inclusion in the alignment CR.
Thursday decision: Updated CR is agreed in R1-1903557 (38.214, CR0011).

R1-1902975 **Draft CR on default PDSCH TDRA Table for Type0/0A/2-PDCCH CSS** **Qualcomm Incorporated**
Discuss further offline
Thursday decision: draft CR is not pursued.

R1-1902650 **Correction to resource allocation type 1 in TS 38.214** **Sharp**
Discuss further offline
Thursday conclusion

- The suggested change below is to be included in the alignment CR (38.214)

5.1.2.2.2 Downlink resource allocation type 1
[…text omitted…]
When the DCI size for DCI format 1_0 in USS is derived from the size of DCI format 1_0 in CSS but applied to ~~another~~ an active BWP

Draft CR as such is not pursued

R1-1901835 **Draft CR on PDSCH mapping to virtual resource blocks** **ZTE**
The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page (e.g., isolated impact analysis), using changing marks, and possibility for inclusion in the alignment CR.
Thursday decision: Updated CR is agreed in R1-1903549 (38.211, CR0006).

======
R1-1903408 **Summary for Rel-15 CRs on DL/UL data scheduling and HARQ procedure** **Qualcomm** (rev of R1-1903389)
Decision: The document is noted.
R1-1903780 **Summary of offline discussion for Rel-15 CRs on DL/UL data scheduling and HARQ procedure** **Qualcomm**

R1-1901624 Correction on PDSCH/PUSCH scheduling Huawei, HiSilicon
R1-1901976 Draft CR on sequential PDSCH and PUSCH scheduling CATT
See draft CR_1 in R1-1903408
Discuss further offline
Thursday decision: Updated draft CR in **R1-1903647** is endorsed. Final CR is agreed in in R1-1903653 (38.214, 0014)

R1-1903552 Draft CR on out of HARQ order Huawei, HiSilicon, CATT, Qualcomm
Thursday decision: The draft CR is endorsed in principle. To prepare final CR with update to title & cover page
Thursday decision: CR is agreed in R1-1903654 (38.214, 0015).

R1-1903031 Draft CR on guard period for dynamic grant overriding configured grant Qualcomm Incorporated
Late submission
R1-1902894 Correction for handling of CG PUSCH when colliding with dynamic PUSCH of different HARQ processes Intel Corporation
Discuss further offline
Friday decision: The above two draft CRs are updated to **R1-1903774**, which is endorsed. Final CR is agreed in R1-1903783 (38.214, CR0022, Rev. 1)

R1-1903160 Clarification regarding non-full-duplex UE communication Nanjing Ericsson Panda Com Ltd
Discuss further offline. Updated to R1-1903620
Friday conclusion: Further updated to **R1-1903768** – revisit next meeting

R1-1902572 Correction to out of order PUSCH transmissions without UL-SCH Ericsson
Discuss further offline
Friday conclusion:

- It is understood that out-of-order restriction for PUSCH only applies to PUSCH with UL-SCH by reference to their HARQ process IDs, since UE is expected to ignore the HARQ process ID in the DCI scheduling the PUSCH without UL-SCH
    - No spec update is necessary

R1-1902976 Draft CR on correction for capability #2 RRC parameter naming Qualcomm Incorporated
The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page and possibility for inclusion in the alignment CR.
Friday decision: To be included in the alignment CR (38.214)

======
R1-1903340 Summary of contributions for UL transmission procedure NTT DOCOMO
Decision: The document is noted.
R1-1903640 Corrections for PUSCH with configured grant NTT DOCOMO
Decision: The document is noted.

R1-1901619 Correction on PUSCH with configured grant Huawei, HiSilicon
Discuss further offline
Thursday
R1-1903616 Correction on PUSCH with configured grant Huawei, HiSilicon
Friday decision: Updated draft CR in R1-1903813 is endorsed. Final CR is agreed in R1-1903815 (38.214, CR0023)

R1-1903617 Correction on physical resource mapping for PUSCH with configured grant Huawei, HiSilicon
Friday decision: Updated CR is agreed in R1-1903785 (38.211, CR0008)

R1-1901837 Draft CR on DMRS for configured grant PUSCH ZTE
Conclusion:

- It is common understanding that the higher layer parameter cg-DMRS-Configuration is for both PUSCH mapping type A and PUSCH mapping type B
  - No spec change is necessary

======
R1-1903391 Summary of Bandwidth Part Related Draft CRs MediaTek
Decision: The document is noted.
Wednesday
R1-1903474 Summary of Bandwidth Part Related Draft CRs MediaTek
Decision: The document is noted.
Thursday
R1-1903613 Summary#2 of Bandwidth Part Related Draft CRs MediaTek
Decision: The document is noted.

R1-1901667 Draft TS 38.213 CR on BD and CCE limits when active DL BWP switching occurs vivo
Proposed conclusion:

- It is understood that when a UE changes an active DL BWP of a cell, the number of PDCCH candidates and the number of non-overlapped CCEs that is currently applied by the UE for PDCCH monitoring remains valid until the new DL BWP becomes active
  - No spec change is necessary

Discuss further offline
Thursday decision: draft CR is not pursued.

R1-1901785 UE behavior clarification for BWP operation MediaTek Inc.
Draft CR regarding the first issue in R1-1901785 is withdrawn
Discuss further offline regarding the second issue in R1901785
Thursday decision: Updated draft CR in R1-1903588 is endorsed. Final CR is agreed in R1-1903651 (38.213, CR 0016)

R1-1901834 Draft CR on using CORESET#0 in dedicated DL BWP ZTE
Discuss further offline
Thursday decision: Updated draft CR in R1-1903612 is endorsed. Update the copied text format and final CR is agreed in R1-1903652 (38.213, CR 0017)

R1-1901852 Correction on BWP ID interpretation for DCI code point Ericsson
Discuss further offline
Thursday decision: draft CR is not pursued.

======
R1-1903334 Summary of Draft CRs on CA for Rel-15 NR Samsung
Decision: The document is noted.
R1-1903607 Offline Summary for Draft CRs on Rel-15 NR CA Samsung
Decision: The document is noted.

R1-1902070 Correction to Type-2 HARQ codebook Ericsson

The draft CR is endorsed. Discuss offline for the final CR especially regarding updating the cover page (isolated impact analysis) and possibility for inclusion in the alignment CR.
Thursday decision:
- To include R1-1902070 in the alignment CR

R1-1902592 **Correction to dynamic HARQ codebook in NR** **Fujitsu**
Discuss further offline
Thursday decision: Updated CR is agreed in R1-1903598 (38.213, 0014). Note: the CR is not intended to change current UE implementation

R1-1902638 Draft CR on PUCCH resource determination for carrying HARQ-ACK Intel Corporation
R1-1903206 Clarification on HARQ-ACK codebook and PUCCH resource determination Huawei, HiSilicon
Discuss further offline for the above two docs
Thursday conclusion:
- In Rel-15, a UE is not expected to detect two (or more) DCI formats (same or different) in PDCCHs received with a same first symbol in a slot and scheduling PDSCH reception(s) or SPS PDSCH release on a same cell and indicating a same slot for corresponding HARQ-ACK transmission.
  - No CR is necessary

R1-1902749 **Correction to Type-1 HARQ-ACK codebook for only one reception** **OPPO**
Discuss further offline
Thursday decision: draft CR is not pursued.

R1-1902867 **Draft CR on reference slot for PUCCH transmission with HARQ-ACK** **WILUS Inc.**
Discuss further offline
Thursday decision: draft CR is not pursued.
Note: the above draft CR may affect at least operation with normal CP in DL/UL and extended CP in UL/DL

R1-1902877 **On TYPE-1 HARQ-ACK CB** **Nokia, Nokia Shanghai Bell**
Discuss further offline
Thursday decision: draft CR is not pursued.

R1-1902781 Remaining issues on half-duplex UE behavior NTT DOCOMO, INC.
R1-1902878 **On half-duplex operation in CA** **Nokia, Nokia Shanghai Bell**
Discuss further offline
Thursday decision: The draft CR is endorsed in principle subject to UE capability discussion – revisit after UE feature session report (potential update/postpone to Rel-16 depending on UE feature discussion)
Friday decision: See agreements under 7.1.7. Postponed to Rel-16.

======
R1-1903365 **Summary of 7.1.3 - Maintenance of LBRM and Data Rate** **Ericsson**
Decision: The document is noted.

R1-1902229 **Draft CR on scheduling restriction by max data rate** **Samsung**
The correction "Correcting RRC parameter name for Capability#2" is endorsed in principle. To be included in the alignment CR
Other parts of the draft CR in R1-1902229 to be discussed further offline
Thursday decision: No further spec update is necessary

R1-1903581 **Draft CR on slot aggregation Huawei, HiSilicon**
Discuss further offline
Friday conclusion:
- It is understood that if a UE is configured with pdsch-AggregationFactor, according to current spec, the UE is not expected to be scheduled to receive more than one unicast PDSCH per slot per carrier.
  - No spec update is necessary

R1-1902228 Discussion on scheduling restriction and calculation of TBS_LBRM and max data rate Samsung
R1-1902230 **Draft CR on LBRM Samsung**
Huawei, Qualcomm, LG CR not needed, change the UE behaviour
Discuss further offline
Thursday decision: draft CR is not pursued.

R1-1902231 **Draft CR on calculation of max data rate Samsung**
CR related to RAN2 spec (technical content is under RAN1 responsibility)
Discuss further offline
Thursday decision: draft CR is not pursued.

R1-1902571 **Correction to LBRM restriction Ericsson**
The draft CR is endorsed in principle. Discuss offline for the final CR for potential refined wording.
Thursday decision: Updated draft CRin R1-1903655 is endorsed (to update by replacing the old equation with the new one for the change marks). Final CR is agreed in R1-1903685 (38.214, CR0016)

======
R1-1903464 **Summary on maintenance related to rate-matching in NR Nokia, Nokia Shanghai Bell**
Decision: The document is noted.

R1-1903240 **Maintenance for rate matching MediaTek Inc. (Revision of R1-1901786)**
Discuss further offline
Thursday conclusion:
- It is commonly understood that a gNB shall NOT configure/schedule a PDSCH where its DMRS would be colliding, even partially, with any RE(s) not available for PDSCH.

R1-1903565 **Draft CR on PDSCH DM-RS REs and REs not available for PDSCH MediaTek**
Thursday conclusion:
- The proposed change in R1-1903565 is to be included in the alignment CR (38.214)

Friday conclusion:
- To include the following in the alignment CR (38.213)

TS38.213 Section 10.1
….
If a UE is provided resourceblocks and symbolsInResourceBlock in RateMatchPattern, or if the UE is additionally provided periodicityAndPattern in RateMatchPattern, the UE can determine a set of RBs in symbols of a slot that are not available for PDSCH reception as described in [6, TS 38.214]. If a PDCCH candidate in a slot is mapped to one or more ~~subcarriers~~ REs that overlap with ~~subcarriers~~ REs of any RB in the set of RBs in symbols of the slot, the UE does not expect to monitor the PDCCH candidate.

R1-1902647 **Discussion on rate-matching for LTE CRS Sharp**
Nothing broken in the current spec – draft CR is not pursued

R1-1903029 Draft CR on DMRS port for Type 2 configured grant Qualcomm Incorporated

To be handled under 7.1.2
R1-1903030 Draft CR on PTRS and DMRS port association Qualcomm Incorporated
To be handled under 7.1.2

R1-1903207 **Correction on DCI format 2_3 for SUL cell in TS 38.213 Huawei, HiSilicon**
Discuss further offline
Friday decision: Updated draft CR in **R1-1903771** is endorsed. Final CR is agreed in R1-1903782 (38.213, CR0031)

R1-1903150 PHR timing for configured grant Nokia, Nokia Shanghai Bell
To be discussed under 7.1.5

R1-1902538 Correction on uplink resource allocation type 1 Nanjing Ericsson Panda Com Ltd
Withdrawn

7.1.4 Maintenance for NR-LTE co-existence

R1-1903626 **Chairman's notes of AI 7.1.4 Maintenance for NR-LTE co-existence Ad-hoc Chair (Ericsson)**
Decision: The document is endorsed, content incorporated below.

R1-1901620 **Correction on 10ms RTT for EN-DC with SUO Case 1 Huawei, HiSilicon**
R1-1902676 **Correction on UL HARQ operation for SUO case 1 Nokia, Nokia Shanghai Bell**
R1-1903479 **Correction on UL HARQ for EN-DC with SUO Case 1 Huawei, HiSilicon, Nokia, Nokia Shanghai Bell**
R1-1903592 **Correction on UL HARQ for EN-DC with SUO Case 1 Huawei, HiSilicon, Nokia, Nokia Shanghai Bell**
Final CR is agreed in R1-1903763 (TS36.213, CR1243, Rel-15) with ". And…" modified to ".. and …" at the end of the first paragraph in the CR for Section 8.3.

R1-1902107 **Reference for EUTRA-MBSFN-SubframeConfig Ericsson**
R1-1902464 **Multiple TA for synchronous intra-band EN-DC Intel Corporation**
R1-1902569 **Correction to align RAN1 and RAN4 specifications for EN-DC power control Ericsson**
Final CR is agreed in R1-1903710 (TS38.213, CR0021, Rel-15)

R1-1903209 **Clarification on UL/SUL indicator field and SRS request field in DCIs Huawei, HiSilicon**
The proposal is the common understanding. Further discussion needed on whether a CR is needed or a conclusion in the chairman's notes is enough.
R1-1903708 **Clarification on UL_SUL indicator field and SRS request field Huawei, HiSilicon**
Final CR is agreed in R1-1903799 (TS38.212, CR0013, Rel-15) without the changes to the last two bullets in Section 7.3.1.1.1.

R1-1903210 **Introduction of SUO Case 1 for NE-DC in TS 36.213 Huawei, HiSilicon**
Final CR is agreed in R1-1903477 (TS36.213, CR1229, Rel-15) with changes to the title noting that this is a late drop CR and with the CR category clarified
R1-1903211 **Introduction of SUO Case 1 for NE-DC in TS 36.212 Huawei, HiSilicon**
Final CR is agreed in R1-1903478 (TS36.212, CR0312, Rel-15) with changes to the title noting that this is a late drop CR and with the CR category clarified

R1-1903212 **Correction on DCI format 2_3 for SUL cell in TS 38.212 Huawei, HiSilicon**
Final CR is agreed in R1-1903602 (TS38.212, CR0009, Rel-15)

From AI 5:
//Co-ex/MR-DC
R1-1901493 LS reply on NR-LTE Co-existence RAN4, Intel Corporation

R1-1902449 [DRAFT] Reply LS on NR-LTE Co-existence Intel Corporation
R1-1902947 Draft reply to RAN4 LS on NR-LTE Co-existence Ericsson

R1-1903739 Discussion on capability signaling of dualpA-Architecture and pa-PhaseDiscontinuityImpactsIntel Corporation
Email discussion on Reply LS to RAN4 and RAN2 on capability signaling of dual PA architecture and phase discontinuity aspects until March 6, 2019 (Intel, Seunghee)

From AI 7.1.1:
R1-1902225 Draft CR on PRACH Power Ramping Counter Suspension Samsung
Final CR is agreed in R1-1903726 (TS38.213, CR0022, Rel-15)

R1-1903496 LS on MBSFN subframe pattern configuration for LTE CRS rate matching RAN2, Ericsson
Agreement:
Send an reply LS to RAN2 including the following:
The introduction of a new slot offset parameter in the configuration of MBSFN subframe pattern was discussed and multiple companies registered an interest in the introduction of such a parameter. However, due to the late stage of Rel-15 and potential impacts on implementation, there is no consensus in RAN1 to introduce such a parameter in Rel-15. It is RAN1's understanding that there is no UE requirement to detect any slot offset between LTE and NR for the purpose of determining MBSFN subframes.

Friday
R1-1903800 Draft reply LS on MBSFN subframe pattern configuration for LTE CRS rate matching Ericsson
Decision: The draft LS is endorsed and final LS is approved in R1-1903803.

7.1.5 Maintenance for UL power control

R1-1903627 Chairman's notes of AI 7.1.5 Maintenance for UL power control Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

R1-1902965 Discussion of RAN2 LS on PHR Procedure in Dual-Connectivity Qualcomm Incorporated
R1-1902966 Draft Response LS on PHR Procedure in Dual-Connectivity Qualcomm Incorporated

R1-1903399 Summary for Al 7.1.5 Maintenance for UL power control ZTE

R1-1901765 Draft CR on identifying transmission occasion after resetting a PC closed loop ZTE
R1-1903609 Draft CR on identifying transmission occasion after resetting a PC closed loop ZTE
R1-1903634 Draft CR on identifying transmission occasion after resetting a PC closed loop ZTE
The draft CR in R1-1903634 is endorsed. Final CR is agreed in R1-1903750 (CR#0027, TS38.213)

R1-1901668 Draft TS 38.213 CR on NE-DC power control vivo
Another CR proposing the same correction was handled in 7.1.4.

R1-1903458 Summary2 for Al 7.1.5 Maintenance for UL power control ZTE

R1-1902825 Discussion on Rel-15 SRS Power Scaling Ericsson
R1-1902830 Correction on SRS Power Scaling Ericsson Limited

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R1-1901622 Correction on PHR timing for configured grant Huawei, HiSilicon
R1-1903150 PHR timing for configured grant Nokia, Nokia Shanghai Bell
R1-1903743 Summary on PHR timing for configured PUSCH Huawei, HiSilicon
R1-1903742 Correction on PHR timing for configured grant Huawei, HiSilicon
The draft CR in R1-1903742 is endorsed with one modification: Remove the addition of the following sentence and modify the cover page accordingly:
"If an uplink is configured with active configured grant, a power headroom report for the uplink is based on an actual transmission, regardless whether the transmission is actually transmitted or not."
Final CR is agreed in R1-1903758 (CR#0029, TS38.213)

Agreement
If the power headroom report is reported on a configured PUSCH, the PHR timing for a UE to determine real PHR or virtual PHR is the moment that the first uplink symbol of the configured PUSCH transmission minus $T'_{proc,2}$
- $T'_{proc,2}=T_{proc,2}$ where $T_{proc,2}$ is determined according to [6, TS 38.214] assuming $d_{2,1}=1$, $d_{2,2}=0$, and μ_{DL} corresponding to the subcarrier spacing of the active downlink BWP for the scheduling cell of the configured PUSCH

R1-1902570 Correction to PUCCH power control Ericsson
The draft CR is endorsed. Include in the alignment CR for TS38.213.

R1-1901876 Correction on one port PUSCH power scaling Ericsson Limited

Conclusion
RAN1 confirms that a Rel-15 UE that supports a maximum number of SRS ports in one SRS resource, Ntx, that is configured with one SRS port and for codebook based operation transmits at most
- Pcmax,f,c(i) for DCI format 0_0, and
- Pcmax,f,c(i)/Ntx for DCI format 0_1

R1-1902842 Draft CR on TPC command accumulation for slot aggregation Motorola Mobility, Lenovo

R1-1902652 Correction on UL power control Sharp

R1-1901928 Draft CR on obtaining P0_Nominal for virtual PHR on SCell without RACH ZTE

R1-1902841 Draft CR on the number of closed-loop PC processes Motorola Mobility, Lenovo
No further discussion for Rel-15.

7.1.6 Maintenance for URLLC
None

7.1.7 Other
Including Rel-15 UE features

R1-1903628 Chairman's notes of AI 7.1.7 UE features list Ad-hoc Chair (NTT DOCOMO)
Decision: The document is endorsed, content incorporated below.

R1-1903151 On features mandatory without capability Nokia, Nokia Shanghai Bell

Conclusion
- Companies are encouraged to consider if/how/where to capture the mandatory features without capability signalling in the specifications.
- Companies are encouraged to consider if/how/where to capture requirement limitation/relazation without capability signalling in the specifications.

R1-1901621 **Clarification on Rel-15 NR UE features Huawei, HiSilicon**

Agreement

- Update 3-5b as follows. Companies are encouraged to check if the similar revisions are needed for 3-5a.

3-5b	All PDCCH monitoring occasion can be any OFDM symbol(s) of a slot for Case 2 with a span gap	PDCCH monitoring occasions of FG-3-1, plus additional ~~All~~ PDCCH monitoring occasion(s) after third symbol can be any OFDM symbol(s) of a slot for Case 2, and for any two PDCCH monitoring occasions, where at least one of them is not the monitoring occasions of FG-3-1 , in same or different search spaces, there is a minimum time separation of X OFDM symbols (including the cross-slot boundary case) between the start of two spans, where each span is of length up to Y consecutive OFDM symbols in which PDCCH is configured to be monitored with same start symbol. For the set of monitoring occasions which are within the same span: *[Unchanged parts omitted]* The number of different start symbol indices of spans for all PDCCH monitoring occasions per slot, including PDCCH monitoring occasions of FG-3-1, is no more than floor(14/X) (X is minimum among values reported by UE). The number of PDCCH monitoring occasions per slot including PDCCH monitoring occasions of FG-3-1, is no more than 7

Agreement

- Proposal 2 in R1-1901621 is agreed replacing "per carrier" by "per CC"

Conclusion

- Proposal 3in R1-1901621 is to be discussed in the main session.

R1-1902878 **On half-duplex operation in CA Nokia, Nokia Shanghai Bell**

Section 4 only.

Agreement

Agreements made during email discussion [95-NR-06] on directional collision handling for half duplex CA operation are postponed to Re1-16.

R1-1902733 Remaining issues on Rel-15 NR UE feature Spreadtrum Communications

R1-1901783 **Remaining Issues in R-15 UE Features MediaTek Inc.**

Agreement

- There is no consensus to support the following cases in Rel-15 UE features although Rel-15 specification supports the cases
  - For both NR CA UE and EN-DC UE with one NR PUCCH group, different numerologies across NR carriers within the same NR PUCCH groups up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is on the carrier with larger SCS for data/control channel at a given time
  - For NR CA UE with two NR PUCCH groups, different numerologies across NR carriers up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with larger SCS for data/control channel at a given time
  - For EN-DC UE with two NR PUCCH groups, different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1 wherein NR PUCCH is sent on the carrier with larger SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data/control channel at a given time
- Continue to discuss when to define the features in the future RAN1 meetings

R1-1902783 **Remaining issues on Rel-15 NR UE features NTT DOCOMO, INC.**

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Revisit component 8) of 4-1 in the main session
Thursday main session
Discuss further offline especially w.r.t. whether or not it is restricted to the same starting symbol for PUCCH vs. PUSCH – check Friday – see below

Agreement
On 6-5a, add the following note,
"If UE supports CA with more than 4 DL CCs, UE should report this capability"

R1-1903041 **UE capabilities for NR-NR dual connectivity** **Qualcomm Incorporated**

Agreement
- Define an additional optional UE capability for NR-NR DC.
  - While NR-NR CA is already optional, CA support should not automatically imply DC support even in the same band combination.

Companies are encouraged to provide details on the signaling at RAN1#96bis

Agreement
- The signaling should allow indication of DC support on the basis of band combination cell group partitioning.
  - In the DC capability signaling, MCG and SCG should be differentiated to allow signaling support of a particular configuration for MCG/SCG designation while signaling no support of the same configuration with MCG/SCG designation interchanged.

Thursday main session
R1-1903713 **RAN1 NR UE features** **NTT DOCOMO, INC.**
R1-1903714 **[draft] LS on RAN1 NR UE features update** **NTT DOCOMO, INC.**
Decision: The draft LS is endorsed. Final LS to be approved in R1-1903741 (assuming the correct attached tdoc # containing the final agreed updated RAN1 NR UE features)

Friday
R1-1903792 **RAN1 NR UE features** **NTT DOCOMO, INC.** **(rev of R1-1903713)**
Decision: The list is endorsed with the following update:
- (4-19) resources have the same starting symbols on the PUCCH resources in a slot while precluding the case of SR/HARQ-ACK by overlapping PUCCH resources with the same starting symbols on the PUCCH resources in a slot

Final version agreed in R1-1903817

R1-1903741 **[draft] LS on RAN1 NR UE features update** **NTT DOCOMO, INC.**
Decision: The draft LS is endorsed, revised in (with the correct attached tdoc # containing the final agreed updated RAN1 NR UE features), and approved in R1-1903820

R1-1902653 On UE specific channel bandwidth Sharp

7.2 NR in Release 16

7.2.1 Two step RACH for NR

NR_2step_RACH-Core; WID in RP-182894. Please refer to the WID for detailed scoping

R1-1901625 **Work plan for 2-step RACH** **ZTE**
Decision: The document is noted.

Email discussion focusing on potential link-level simulation assumptions for 2-step RACH till 03/15 – Li (ZTE)

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R1-1902027 Discussion on Channel Structure for 2-Step RACH CATT
R1-1902821 Use Cases and Scenarios for 2-Step RACH Ericsson
R1-1903147 Considerations on two-step RACH for NTN THALES

7.2.1.1 Channel Structure for Two-Step RACH

Including mapping between the PRACH preamble and the time-frequency resource of PUSCH in msgA+ DMRS, supported MCS(s) and time-frequency resource size(s) of PUSCH in msgA, etc.

R1-1901626 Considerations on the channel structure of msgA ZTE

- Proposal 1: The association of the time-frequency resources between preamble and payload should be defined.
  - Configurable time/frequency domain offset between each RO and PO should be supported.
  - The determination of the value(s) of offset should take into account the UE capability, flexibility, latency, etc.
- Proposal 2: Multiple groups of PUSCH resource in one occasion can be supported.
  - Mapping rule between preamble (group) and resource (group) should be defined.
  - Mapping rule between preamble index within each group and DMRS port should be defined.
- Proposal 3: Configurable number of PRBs and MCS level for payload transmission should be supported. Further downselection of configurations can be considered once the exact msgA content is decided.

Decision: The document is noted.

R1-1902466 Channel structure for two-step RACH Intel Corporation

- Observation 1
  - When carrying relatively small payload, the number of PRBs allocated for transmission of MsgA PUSCH can be limited with appropriate MCS.
  - When carrying relatively large payload, it is more desirable to assign MsgA PUSCH transmission with high MCS index, which can be targeted for cell center UEs with good channel condition.
- Proposal 1
  - Numerology of MsgA PUSCH transmission follows the configuration in initial or active UL BWP.
    - FFS restriction on subcarrier spacing combination of PRACH preamble and MsgA PUSCH for 2-step RACH.
  - Waveform of MsgA PUSCH follows that of Msg3 PUSCH.
- Proposal 2: Time domain resource allocation of MsgA PUSCH includes PUSCH mapping type, starting symbol and length, periodicity and slot offset between PRACH and associated MsgA PUSCH.
- Proposal 3
  - Same TA is applied for the transmission of PRACH preamble and MsgA PUSCH.
  - Guard period needs to be reserved for MsgA PUSCH transmission.
- Proposal 4: It may be desirable to employ repetition for MsgA PUSCH transmission in order to match coverage status of associated PRACH format.
- Proposal 5: Frequency domain resource allocation of MsgA PUSCH includes enabling/disabling frequency hopping, starting PRB and length of PRBs and frequency offset if frequency hopping is enabled.
- Proposal 6: Same Tx beam is applied for transmission of PRACH preamble and associated MsgA PUSCH.
- Proposal 7: Multiple DMRS APs can be defined for MsgA PUSCH transmission.
- Proposal 8: RA-RNTI for associated PRACH transmission is applied for initialization of scrambling sequence for MsgA PUSCH.
- Proposal 9
  - An MsgA PUSCH resource set is defined, which consists of multiple MsgA PUSCH resources. For each MsgA PUSCH resource, the following parameters are configured.
    - An MsgA PUSCH resource ID, time/frequency resource allocation, MCS, power related parameters, association with PRACH resource subset.
  - Association between PRACH resource set and MsgA PUSCH resource may be defined as many to one, one to one and one to many mapping.

Decision: The document is noted.

R1-1902977 Channel Structure for Two-Step RACH Qualcomm Incorporated

Observation 1: Two-step RACH can be supported for all cell sizes. Specifically,

- for small cell sizes, $T_{adj} = 0$ is sufficient;
- for large cell sizes:
  - $T_{adj} = 0$ can be used as long as sufficient gap is allowed for gNB to process preamble for timing and then use that information for further demodulation PUSCH;

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- T_{adj} ~= RTT can be used in the case of UE assistance (e.g., tracking timing related changes relative to last valid TA)
- UE-assisted timing adjustment can be applied to both preamble and payload of msgA, or to payload part only.

Observation 2: The design for msgB should accomplish at least the following goals:
- complete RACH procedure when both preamble and payload of msgA are correctly detected OR
- re-request re-transmission of payload on granted resources if msgA preamble is received but msgA payload is not.

Proposal 1: To support two-step RACH operation in both licensed spectrum (FR1 and FR2) and unlicensed spectrum (FR1), with or without a valid timing advance, the channel structure of msgA should include a preamble, a payload, as well as a transmission gap with configurable duration.
Proposal 2: Two-step RACH should support preamble formats specified in NR Rel-15 for both large cells and small cells.
Proposal 3: msgA of two-step RACH should support:
- both CP-OFDM and DFT-s-OFDM waveforms;
- low-order modulations such as pi/2 BPSK, BPSK and QPSK.

Proposal 4: The configuration of TxG should account for limits on UE implementation and cell deployment.
Proposal 5: For msgA transmission, the following rules can be considered:
- the bandwidth assigned for the transmission of preamble and payload can be similar or different, depending on the payload size and MCS;
- the transmission power for preamble and payload can be different, and the power offset can be dependent on MCS, bandwidth, traffic load and QoS;
- the resource allocation for msgA should be configurable, to support different MCS, QoS, traffic load, and payload size up to 1000 bits;
- the pool of preamble sequences used for two-step RACH can be partitioned into mutually exclusive subsets, and the index of each subset can be associated with a pre-configured ResourceSet with distinctive configurations, such as payload, MCS and QoS;
- depending on the traffic load of RACH, the pool of preamble sequences can be shared between two-step RACH and four-step RACH procedures;
- the association between preamble sequences and payload ResourceSet can be based on one-to-one or one-to-many mapping, and the mapping rule can be indicated by SI.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Li (ZTE)

Thursday session

R1-1903435 **Offline Summary of Channel Structure for Two-step RACH** **ZTE**

Decision: The document is noted.

Agreements:
- PUSCH occasion for 2-step RACH is defined as
  - the time-frequency resource for payload transmission ~~associated with a PRACH preamble in msgA~~
- Consider the following methods for PUSCH occasion of msgA transmission:
  - Opt 1: PUSCH occasions are separately configured from PRACH occasions
    - For one PUSCH occasion, it is derived based on:
      - Alt 1: reuse the resource allocation for NR configured grant in principle
      - Alt 2: other potential configurations (e.g., reuse semi-static SFI + BWP, reuse PRACH RO, etc.)
    - FFS detailed association rule between the PRACH and PUSCH for msgA transmission
  - Opt 2: Specify/configure the relative location (in time and/or frequency) of the PUSCH occasion with respect to the associated PRACH occasion
    - Alt 1: Time/frequency relation between PRACH preambles in PRACH occasion(s) and PUSCH occasions are single specification fixed value.
    - Alt 2: Time/frequency relation between each PRACH preamble in PRACH occasion(s) to the PUSCH occasion is single specification fixed value. Different preambles in different PRACH occasions can have different values.
    - Alt 3: Time/frequency relation between PRACH preambles in PRACH occasion(s) and PUSCH occasions are single semi-statically configured value.
    - Alt 4: Time/frequency relation between each PRACH preamble in PRACH occasion(s) to the PUSCH occasion is semi-statically configured value. Different preambles in different PRACH occasions can have different values.
    - Note: The time and frequency relation is not required to be the same alternative.
  - FFS detailed mapping between preamble and PUSCH resource + DMRS

Agreements:

- Both DFT-s-OFDM and CP-OFDM are supported for the payload transmission in msgA
  - FFS how to indicate/configure the waveform
- Consider the following numerology for msgA PUSCH (for possible down-selection)
  - Alt 1: follow the numerology configured for the UL BWP
    - FFS initial vs. active UL BWP
  - Alt 2: same as msgA preamble numerology at least for some cases
    - E.g., when short preamble is used (L=139)

R1-1901669	Discussion on channel structure for 2-step RACH	vivo
R1-1901793	On channel structure for two-step RACH	MediaTek Inc.
R1-1902133	Channel Structure for Two-Step RACH Considerations	Sierra Wireless, S.A.
R1-1902135	On 2-step RACH Channel Structure	Nokia, Nokia Shanghai Bell
R1-1902165	On Channel Structure for Two-Step RACH	Sony
R1-1902241	Channel Structure for Two-Step RACH	Samsung
R1-1902326	Discussion on channel structure for two-step RACH	CMCC
R1-1902393	Discussion on channel structure for 2-step RACH	Panasonic Corporation
R1-1902533	Discussion on 2step RACH Structure	LG Electronics
R1-1902582	On Signal Structure for Two-Step RACH	InterDigital, Inc.
R1-1902747	On Channel Structure for 2-step RACH	OPPO
R1-1902784	Discussion on Channel Structure for Two-Step RACH	NTT DOCOMO, INC.
R1-1902822	Channel Structure for Two-step RACH	Ericsson
R1-1902917	Considerations on Resource Pool Design for PUSCH in MsgA of 2-step RACH	CAICT
R1-1902961	Discussion on channel structure for two-step RACH	KDDI Corporation
R1-1903056	Channel structure for 2-step RACH	Huawei, HiSilicon

7.2.1.2 Procedure for Two-step RACH

Including power control for Msg A, msg content for Msg A & Msg B, fallback procedure, etc.

R1-1902136 On 2-step RACH Procedure Nokia, Nokia Shanghai Bell

- Observation 1: The size of MsgA is use case dependent, depending on the fields making up MsgA and the size of each field for each use case.
- Proposal 1: Study the allowed MsgA payload size considering MsgA content from RAN2 for the different 2-step RACH use cases.
- Observation 2: The size of MsgB is use case dependent, depending on the fields making up MsgB and the size of each field for each use case.
- Proposal 2: Study the allowed MsgB payload size considering MsgB content from RAN2 for the different 2-step RACH use cases.
- Proposal 3: MsgB doesn't included UL grant field.
- Proposal 4: For timing advance in MsgB, the granularity of the TA is based on the subcarrier spacing of the data part of MsgA according to:

TA granularity for 2-step RACH.

Subcarrier Spacing (kHz) of the msgA data part	*Unit*
15	*16*64 Tc*
30	*8*64 Tc*
60	*4*64 Tc*
120	*2*64 Tc*

- Observation 3: With a one symbol gap between consecutive time resources for the data part of MsgA, consecutive transmissions from UEs in a cell of radius 10 km at 15 khz don't overlap.
- Proposal 5: Study various options for 2-step RACH MsgB transmission.
- Proposal 6: When a PRACH occasion is shared between 2-step and 4-step RACH procedures, the preamble indices for the 4-step RACH procedure are unique from those of the 2-step RACH procedure.

- Proposal 7: For a PRACH occasion that contains 2-step RACH preambles, the following PRACH preamble configurations are supported:
  - The PRACH preambles are divided between the 4-step PRACH procedure and 2-step PRACH procedure
  - All PRACH preambles are allocated to the 2-step RACH procedure
- Proposal 8: MsgA configuration is provided to the UE by System Information.
- Proposal 9: For the initial transmission, the power of MsgA data part relative to the power of the preamble is given by:
$$P_{MsgA,Data} = max\left(P_{CMAX}, P_{MsgA,Pre} + P_O + 10\log_{10}(M_{RB}^{PUSCH}) + \Delta_{TF}\right)$$
- Proposal 10: If the UE doesn't receive MsgB in response to a MsgA transmission, the UE increments the power of MsgA preamble by Δ_{pre} and keeps the same power offset between the MsgA preamble and MsgA data part if the preamble is retransmitted with the same spatial filter.
- Proposal 11: If the network receives the preamble transmitted by the UE, but doesn't receive the data part of MsgA, as indicated in the MsgB reply to the UE, and if the UE retransmits MsgA using the same spatial filter, the UE keeps the same power of the MsgA preamble and increments the power of MsgA data by Δ_{data}.
- Proposal 12: For 2-step RACH, the network configures an association between DL reference signals (e.g. SS/PBCH Block and/or CSI-RS) and the PRACH preambles/PRACH occasions for the preambles of MsgA.
- Observation 4: The data part of MsgA has less coverage than the preamble part of MsgA. Data part of MsgA suffers a higher collision rate than the preambles of MsgA.
- Observation 5: Using narrow beams can improve coverage and reduce the probability of collision at the expense of higher system overhead.
- Proposal 13: 2-Step RACH supports beam refinement when receiving the data part of MsgA.
- Proposal 14: For 2-step RACH, and for UEs in RRC CONNECTED state, the network configures CSI-RS resources that are QCL Type-D with the corresponding SS/PBCH blocks. Each preamble associated with a SS/PBCH Block indicates a CSI-RS resource QCLed with that SS/PBCH Block.
- Observation 6: The response time for MsgB, Msg2, or a signal that triggers 4-step RACH can be different leading to different reception windows at the UE.
- Proposal 15: Study different options for having the gNB direct the UE to fall back from the 2-step RACH procedure to the 4-step RACH procedure when the preamble is detected by the gNB but the MsgA data signal is not detected.

Decision: The document is noted.

R1-1902785 **Discussion on Procedure for Two-step RACH** **NTT DOCOMO, INC.**

- Proposal 1: For the start timing of RAR window for 2-step RACH, following two options can be considered.
  - Alt 1: The window starts after the MsgA preamble
  - Alt 2: The window starts after the MsgA PUSCH
- Proposal 2: It should be studied whether Msg2 window and MsgB window are common or independent.
- Proposal 3: It should be studied whether or not gNB can differentiate 2-step RACH from 4-step RACH based on the MsgA preamble reception.
- Proposal 4: It should be considered how to validate 2-step RACH even in case of the cell with the cell radius larger than the value calculated by Rel-15 PUSCH CP duration.

Decision: The document is noted.

R1-1903057 **Discussion on 2-step RACH procedure** **Huawei, HiSilicon**

- Proposal 1: Consider 56 and 72 bits as starting point for the payload size of 2-step RACH MsgA.
- Proposal 2: Power control for PRACH in MsgA should follow that for Msg1 in Rel-15 4-step RACH.
- Proposal 3: At least support open loop power control for PUSCH in MsgA for 2-step RACH.
- Proposal 4: At least for the Msg2-like content in MsgB, the RAR mechanism in 4-step RACH can be reused in 2-step RACH.
- Proposal 5: Time window for MsgB reception can start after the completion of MsgA transmission.
- Proposal 6: Retransmission of MsgA or PUSCH indicated by MsgB can be supported.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Li (ZTE)

Thursday session

R1-1903436 **Offline Summary of Procedures for Two-step RACH** **ZTE**

Decision: The document is noted.

Agreements:

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- For the relation of PRACH resources between 2-step and 4-step RACH, further study the following options (for possible down-selection or combination(s) of the options)
  - Option 1: Separate ROs are configured for 2-step and 4-step RACH
  - Option 2: Shared RO but separate preambles for 2-step and 4-step RACH
  - Option 3: Shared RO and shared preambles for 2-step and 4-step RACH

Agreements:
- The beam association rule between SSB and RACH occasion of 4-step RACH is to be used for 2-step RACH
  - FFS beam association for PUSCH

Agreements:
- At least open loop power control for PUSCH transmission in MsgA should be supported
  - FFS PC for preamble vs. PC for PUSCH

R1-1901627 Considerations on 2-step RACH procedures ZTE
R1-1901670 Discussion on 2-step RACH procedure vivo
R1-1901794 On procedure for two-step RACH MediaTek Inc.
R1-1902134 Procedure for Two-Step RACH Considerations Sierra Wireless, S.A.
R1-1902166 Discussion on Procedure for 2-step RACH Sony
R1-1902242 Procedure for Two-step RACH Samsung
R1-1902327 Discussion on procedure for two-step RACH CMCC
R1-1902394 Discussion on 2-step RACH procedure Panasonic Corporation
R1-1902467 Procedure for two-step RACH Intel Corporation
R1-1902534 Discussion on 2step RACH Procedure LG Electronics
R1-1902583 Perspectives on operation of Two-Step RACH InterDigital, Inc.
R1-1902748 On Procedure for 2-step RACH OPPO
R1-1902823 Procedure for Two-step RACH Ericsson
R1-1902843 2-step RACH procedure Motorola Mobility, Lenovo
R1-1902918 A scheme of fallback from 2-step RACH to 4-step RACH CAICT
R1-1902964 Discussion on procedure for two-step RACH KDDI Corporation
R1-1903321 Procedures for Two-step RACH Qualcomm Incorporated (rev of R1-1902978)
R1-1903186 Discussion on 2-step RACH for NR Fraunhofer HHI, Fraunhofer IIS

7.2.1.3 Other

R1-1901671 Views on 2-step RACH design vivo
R1-1902535 Discussion on preamble selection for 2-step RACH LG Electronics
R1-1902824 Evaluation methodology and metrics for Two-Step RACH Ericsson
R1-1902979 Other Considerations for Two-Step RACH Qualcomm Incorporated
R1-1903058 Other issues for 2-step RACH Huawei, HiSilicon
R1-1903059 Deployment scenarios and design target for 2-step RACH Huawei, HiSilicon

7.2.2 NR-based Access to Unlicensed Spectrum

NR_unlic-core; WID in RP-182878. Please refer to the WID for detailed scoping

R1-1903629 Chairman's notes of AI 7.2.2 Study on NR-based Access to Unlicensed Spectrum Ad-hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1902980 Email discusion summary on response LS to ETSI BRAN and IEEE Qualcomm Incorporated
Revised in **R1-1903402 Discussion of ETSI TC BRAN LS on NR-U Qualcomm Incorporated**
R1-1902981 Draft LS to ETSI BRAN on short control signaling Qualcomm Incorporated
Revised in **R1-1903403 [DRAFT] LS to ETSI BRAN on EN 301 893 Qualcomm Incorporated**
Further revised in:
R1-1903576 [DRAFT] LS to ETSI BRAN on EN 301 893 Qualcomm Incorporated

Final LS is approved in R1-1903757 with the following modifications:

- Replace the last sentence in the third paragraph with "Hence, it is RAN1's understanding that for the case where more than one grant is provided to a responding device, 3GPP Rel-14/15 LTE-LAA specifications allow behaviour that is consistent with the provided clarifications and this is also expected to be the case for NR-U specifications currently being developed."
- Replace the last two sentences of the second last paragraph with, "There is no consensus on the proposal to (1) ban the use of no LBT transmissions and (2) to restrict the use of short LBT transmissions so that it can only be used 1% of time rather than 5% as currently defined in the clause on Short Control Signalling Transmissions. There is also no consensus on limiting NR-U DRS transmissions to a 1% limit. Furthermore, reducing 5% transmission limit to 1% transmission limit would not be consistent with the behaviour of a device implementing LTE-LAA and is not preferred."
- Modify the action as "RAN1 kindly requests ETSI TC BRAN to take the above information and requests for clarifications into account."

R1-1903732 **[DRAFT] LS to IEEE 802.11 on the use of no/short LBT** **Qualcomm Incorporated**

7.2.2.1 Physical Layer Signals and Channels

7.2.2.1.1 Initial access signals/channels

DRS design, PRACH under OCB requirement, identify if 60KHz PRACH is needed

R1-1901522	Initial access signal and channels in NR unlicensed band	Huawei, HiSilicon
R1-1901606	Considerations on initinal access signals and channels for NR-U	ZTE, Sanechips
R1-1903238	Discussion on initial access signals and channles	vivo (Revision of R1-1901672)
R1-1901795	On Initial Access Signals and Channels for NR-U	MediaTek Inc.
R1-1901881	Design of initial access signals and channels for NR-based access to unlicensed spectrum	AT&T
R1-1901919	Initial access signals/channels for NR-U	OPPO
R1-1901938	Consideration on PRACH in NR-U	Fujitsu
R1-1901990	Discussion of NR-U Initial access signals/channels	CATT
R1-1902037	Physical layer design of initial access signals and channels for NR-U	LG Electronics
R1-1902167	Initial access signals and channels for NR-U	Sony
R1-1902254	Initial access signals and channels for NR-U	Samsung
R1-1902322	NR-U PRACH design	Panasonic Corporation
R1-1902435	Initial Access Signals and Channels for NR-U	Nokia, Nokia Shanghai Bell
R1-1902438	Consideration on NR-U DRS design	ETRI
R1-1903372	Initial access signals/channels for NR-unlicensed	Intel Corporation (Revision of R1-1902468)
R1-1902584	Initial access signals and channels for NR-U	InterDigital, Inc.
R1-1902654	Initial access signals/channels for NR-U	Sharp
R1-1902682	Discussion on initial access in NR-U	NEC
R1-1902736	Discussion on DRS in NR-U	Spreadtrum Communications
R1-1902786	Initial access signals and channels for NR-U	NTT DOCOMO, INC.
R1-1902852	On NR-U initial access signals/channels	Xiaomi
R1-1902868	Discussion on initial access signals and channels for NR-U	WILUS Inc.
R1-1902880	Initial access signals and channels	Ericsson
R1-1902982	Initial access signals and channels for NR-U	Qualcomm Incorporated
R1-1903149	On Additional RACH Opportunities for NR-U	Convida Wireless

R1-1903404 **Feature lead summery on initial access signals and channels for NR-U** **Qualcomm Incorporated**

Agreement:

- Down-select from the following options for SSB pattern (symbol index starts at 0)
  - Option 1: SSBs are at symbols (2,3,4,5) and (8,9,10,11) in the slot
  - Option 2: SSBs are at symbols (2,3,4,5) and (9,10,11,12) in the slot

- The down-selected pattern applies no matter if SSB SCS is indicated by higher layer or not, and no matter if RMSI is transmitted or not.

Agreement:

- The SCS for all SSBs and Coreset #0 on a carrier is always the same for operation of NR in unlicensed spectrum.
- CORESET #0 frequency domain resource configuration should be 48 RBs for 30KHz SCS and 96 RBs for 15KHz SCS.

Agreement:

- For PRACH evaluations, following metrics should be provided:

Parameter	Value	Notes
Scheme		Eg. Alt4-ZC139x2
SCS		15KHz or 30KHz
PRACH sequence length (L_RA)		Eg. 139,
# of repetition (R)		If repetition of sequence is used in freq domain
N_cs		Eg. 11
# of RBs used for one RO (N_RB)		# of RBs occupied by PRACH. Eg. 12 for ZC139 design
# of interlaces used by one RO (N_interlace)		# of uniform interlaces (M=5 for 30KHz and M=10 for 15KHz) with RBs used for one PRACH RO
RACH frequency occupancy (MHz)		The actually used bandwidth with one RO, SCS*L_RA*R
Noise level, Np (dBm)		Np= -174+10*log10(SCS*L_RA*R)+NF NF=-5dB
SNR (dB)		SNR needed at 1% misdetection, read from simulation curve
P_max (dBm)		Maximum allowed transmit power under PSD limit of 10dBm/MHz measured in any 1MHz chunk and considers the RBs used by the proposed scheme
Backoff (dB)		Backoff is computed as 95% percentile of CCDF of [cubic metric] over the preambles in the RO. Note: If cubic metric is not used, information on the backoff metric used should be provided.
P_TX (dBm)		P_TX=min(P_max, 23- Backoff) is maximum allowed transmit power for the waveform considering backoff
MCL (dB)		MCL = P_TX-SNR-Np
N_FDM		# of ROs in 20MHz
Capacity		Across all ROs in 20MHz. Should report any constraints on ISD for the scheme evaluated.

7.2.2.1.2 DL signals and channels

Impact to PDCCH, dynamic PDCCH monitoring, impact to PDSCH to support flexible starting point due to LBT, mechanism to detect COT start for UE power saving, COT structure indication

R1-1901523 DL channels and signals in NR unlicensed band Huawei, HiSilicon
R1-1901607 Considerations on DL reference signals and channels design for NR-U ZTE, Sanechips
R1-1901673 Discussion on physical DL channel design in unlicensed spectrum vivo
R1-1901796 DL Signals and Channels for NR-U operation MediaTek Inc.
R1-1901874 On Initial Signal Design Charter Communications
R1-1901882 Design of DL signals and channels for NR-based access to unlicensed spectrum AT&T
R1-1901920 DL signals and channels for NR-U OPPO
R1-1901939 Initial slot with flexible starting positions for NR-U Fujitsu
R1-1902038 Physical layer design of DL signals and channels for NR-U LG Electronics
R1-1902168 DL Signals and Channels for NR unlicensed operation Sony
R1-1902255 DL signals and channels for NR-U Samsung
R1-1903241 On DL signals and channels Nokia, Nokia Shanghai Bell (Revision of R1-1902436)
R1-1902469 DL signals and channels for NR-unlicensed Intel Corporation
R1-1902530 DL signals and channels for NR-U PANASONIC
R1-1902585 DL signals and channels for gNB initiated COT InterDigital, Inc.
R1-1902655 Downlink structure and procedure for NR-U operation Sharp

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R1-1902732 Discussion on DL signals and channels for NR-U Spreadtrum Communications
R1-1902759 On DL signals for NR-U Apple Inc.
R1-1902787 DL signals and channels for NR-U NTT DOCOMO, INC.
R1-1902827 Discussion on PDCCH monitoring after a COT initiated by gNB in NR-U ITRI
R1-1902862 Discussion on DL signals and channels in NR unlicensed Google Inc.
R1-1902881 DL signals and channels for NR-U Ericsson
R1-1902907 DL signals and channels for NR-U Xiaomi
R1-1902919 Discussions on DL signals and channels design in NR-U CAICT
R1-1902955 DL Frame Structure and COT Aspects for NR-U Motorola Mobility, Lenovo
R1-1902983 DL signals and channels for NR-U Qualcomm Incorporated
R1-1903049 DL signals and channels for NR-U ASUSTEK COMPUTER (SHANGHAI)

R1-1903578 Feature lead summary for NR-U DL Signals and Channels Motorola Mobility, Lenovo
R1-1903687 Feature lead summary for NR-U DL Signals and Channels Motorola Mobility, Lenovo

7.2.2.1.3 UL signals and channels

Block interlaced PUCCH design, block interlaced PUSCH design, flexible starting point for PUSCH due to LBT, SRS enhancement

R1-1901524 UL channels and signals in NR unlicensed band Huawei, HiSilicon
R1-1901608 Considerations on UL reference signals and channels design for NR-U ZTE, Sanechips
R1-1901674 Discussion on physical UL channel design in unlicensed spectrum vivo
R1-1901797 UL Signals and Channels for NR-U operation MediaTek Inc.
R1-1901883 Design of UL signals and channels for NR-based access to unlicensed spectrum AT&T
R1-1901921 UL signals and channels for NR-U OPPO
R1-1902039 Physical layer design of UL signals and channels for NR-U LG Electronics
R1-1902108 NR-U enhancements for uplink signals and channels Nokia, Nokia Shanghai Bell
R1-1902151 UL signals and channels for NR-U Lenovo, Motorola Mobility
R1-1902256 UL signals and channels for NR-U Samsung
R1-1902323 NR-U UL signals and channels Panasonic Corporation
R1-1902470 UL signals and channels for NR-unlicensedIntel Corporation
R1-1902586 Discussion on uplink signals and channels for NR-U InterDigital, Inc.
R1-1902656 UL signals and channels for NR-U Sharp
R1-1902683 Discussion on UL Signals and Channels in NR-U NEC
R1-1902728 Discussion on UL Signals and Channels in NR-U Spreadtrum Communications
R1-1902788 UL signals and channels for NR-U NTT DOCOMO, INC.
R1-1902869 Discussion on UL channels for NR-U WILUS Inc.
R1-1902882 UL signals and channels for NR-U Ericsson
R1-1902920 Discussions on UL signals and channels design in NR-U CAICT
R1-1902984 UL signals and channels for NR-U Qualcomm Incorporated
R1-1903152 Flexible starting point for PUSCH due to LBT Convida Wireless

R1-1903338 Feature lead summary for UL Signals and Channels Ericsson

Agreement:

- Support short and long PUCCH durations based on enhancements of at least Rel-15 PUCCH formats PF2 and PF3. The enhancements include at least the following aspects:
  - For a 20 MHz carrier bandwidth, support mapping to physical resources of at least one full interlace
  - Mechanism to support user multiplexing for both data and reference symbols of PUCCH
  - The following aspects are FFS:
    - Support for small payloads (1 and 2 bits)
      - Alt-1: Support both small payloads and larger payloads (> 2 bits) for enhanced PF2 and enhanced PF3
      - Alt-2: Small payloads are supported by enhanced PF0 and/or enhanced PF1

- Whether or not to replace DFT-s-OFDM with CP-OFDM for the enhanced PF3

Agreement:
Suppport configuration of an SRS resource in additional OFDM symbol locations other than the last 6 symbols of a slot with PUSCH and SRS time division multiplexed as in Rel-15.

- FFS: which symbols locations.

Agreement:
Sub-PRB interlace design for PUSCH and PUCCH is not supported.

7.2.2.2 Physical Layer Procedure

7.2.2.2.1 Channel access procedures

channel access mechanisms for LBE and FBE, potential LBT requirement exceptions (notes in TR for channel access); extension to channel access mechanisms, CWS adjustment enhancement, possible extension on top of ED for coexistence, CG COT sharing and CWS update, channel access mechanism for wideband operation.

R1-1901525 Coexistence and channel access for NR unlicensed band operations Huawei, HiSilicon
R1-1901609 Discussion on Channel access procedure for NR-U ZTE, Sanechips
R1-1901675 Discussion on the channel access procedures vivo
R1-1901798 On channel access procedure MediaTek Inc.
R1-1901873 LBT for Control Transmissions without multiplexed data Charter Communications
R1-1901884 Design of channel access procedures for NR-based access to unlicensed spectrum AT&T
R1-1901922 Channel access procedures for NR-U OPPO
R1-1902040 Channel access procedure for NR-U LG Electronics
R1-1902109 Channel access and co-existence for NR-U operation Nokia, Nokia Shanghai Bell
R1-1902169 Channel access for NR unlicensed operations Sony
R1-1902257 Channel access procedures for NR-U Samsung
R1-1902471 Channel access mechanism for NR-unlicensed Intel Corporation
R1-1902547 Receiver-assisted LBT for NR-U TCL Communication Ltd.
R1-1902587 Contention window adjustment and coexistence in NR-U InterDigital, Inc.
R1-1902657 Channel access procedure for NR-U Sharp
R1-1902789 Channel access procedures for NR-U NTT DOCOMO, INC.
R1-1902863 Discussion on channel access procedure Google Inc.
R1-1902870 Discussion on channel access procedures for NR-U WILUS Inc.
R1-1902883 Channel access mechanisms for NR-U Ericsson
R1-1902962 Extensions for Channel Access Procedures Motorola Mobility, Lenovo
R1-1902985 Channel access procedures for NR unlicensed Qualcomm Incorporated
R1-1903370 Discussion on short fixed duration LBT for transmissions outside a COT Broadcom
Revision of R1-1903145

R1-1903371 Discussion on the use of 802.11 preamble for NR-U Broadcom (rev of R1-1903146)
Conclusion:
A common preamble and a common energy detection threshold between NR-U and other technologies for 5 and 6 GHz was discussed. There is no consensus on these aspects at this stage.

R1-1903499 Feature Lead's Summary on Channel Access Procedures Nokia, Nokia Shanghai Bell
Conclusion:
Cat 2 is not used for initiating a UE transmission outside of a gNB COT for the following channels/signals (or any combination of them):

- PUSCH (with or without UCI),
- SRS-only,
- PUCCH-only

Note:

- Cat 4 for these channels was already agreed during the study item

- This does not preclude the use of Cat 2 for transmission on a LBT bandwidth if it is allowed for the case of transmission on multiple LBT bandwidths

R1-1903705 **Feature Lead's Summary #2 on Channel Access Procedures** **Nokia, Nokia Shanghai Bell**

Agreement:
For initiation of a gNB transmission:
- LBT other than Cat 4 is not used for DRS multiplexed with unicast data
- LBT other than Cat 4 is not used for PDCCH and/or PDSCH transmission outside of DRS.

Note:
- This does not preclude the use of Cat 2 for transmission on a LBT bandwidth if it is allowed for the case of transmission on multiple LBT bandwidths

Agreement:
LBT other than Cat4 is not considered for UL transmissions that are part of a RACH procedure that initiate a channel occupancy
- Note: This does not preclude the use of Cat 2 for transmission on a LBT bandwidth if it is allowed for the case of transmission on multiple LBT bandwidths

7.2.2.2.2 Enhancements to initial access procedure

DRS transmission, frame timing and QCL from detected SSB, 4-step RACH enhancement, SR enhancements, RLM/RRM, etc.

R1-1901526 Initial access in NR unlicensed Huawei, HiSilicon
R1-1901610 Discussion on enhancement of the initial access procedure for NR-U ZTE, Sanechips
R1-1901676 Discussion on initial access procedure for NR-U vivo
R1-1901799 Enhancements to initial access procedure MediaTek Inc.
R1-1901871 Views on Random Access Enhancements Charter Communications
R1-1901885 Design of initial access procedures for NR-based access to unlicensed spectrum AT&T
R1-1901923 Enhancements to initial access procedure for NR-U OPPO
R1-1901940 Enhancements to initial access procedure and scheduling request procedure for NR-U Fujitsu
R1-1901991 Discussion of NR-U initial access procedure CATT
R1-1902041 Initial access and mobility for NR-U LG Electronics
R1-1902125 On Enhancements to Initial Access Procedures for NR-U Nokia, Nokia Shanghai Bell
R1-1902170 Enhancements to initial access procedure for NR-U Sony
R1-1902258 Enhancements to initial access procedure for NR-U Samsung
R1-1902324 NR-U PRACH resource enhancement Panasonic Corporation
R1-1903322 Enhancements to initial access and mobility for NR-unlicensed Intel Corporation (rev of R1-1902472)
R1-1902588 Initial access and mobility procedures in NR-U InterDigital, Inc.
R1-1902658 Initial access procedure for NR-U Sharp
R1-1902737 Discussion on initial access and mobility in NR-U Spreadtrum Communications
R1-1902790 Enhancements to initial access procedure for NR-U NTT DOCOMO, INC.
R1-1902853 NR-U initial access procedure enhancements Xiaomi
R1-1902871 Discussion on enhancement to initial access procedure for NR-U WILUS Inc.
R1-1902884 Enhancements to initial access procedure Ericsson
R1-1902928 On Enhancement to Initial Access Procedure for NR-U Potevio
R1-1902963 Initial access procedure for NR-U Motorola Mobility, Lenovo
R1-1902986 Initial access and mobility procedures for NR-U Qualcomm Incorporated
R1-1903050 Enhancement to initial access for NR-U KT Corp.

R1-1903221 **Feature lead summary #2 of Enhancements to initial access procedure** **Charter Communications**

Agreement:

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- At least the functionalities of Rel-13 LTE-LAA RSSI and channel occupancy reporting as a baseline should be supported
- FFS:
  - Enhanced RSSI metrics, for e.g., sub-band-level interference measurements in a wideband operation scenario
  - Reporting of a new medium contention/load metric other than channel occupancy
  - Any modification of the parameters of the Rel-15 SMTC for operation in unlicensed spectrum

R1-1903646 **Feature lead summary #3 of Enhancements to initial access procedure** **Charter Communications**

Agreement:
- For a given cell, UE may assume SS/PBCH blocks in the same candidate position within the DRS transmission window are QCL across DRS transmission windows
  - Alt1: The PBCH DMRS sequence index is also the same
  - Alt2: The PBCH DMRS sequence index may be different
  - Note: The first candidate position of the DRS transmission window is located at the first half slot of a half frame
- FFS: QCL assumption for SSBs in different candidate positions within a DRS transmission window and across DRS transmission windows

Agreement:
- An RLM measurement window for serving cell RLM measurements based on SSBs in the DRS is supported for in-sync and out-of-sync evaluations.
  - FFS: How RLM measurement window is indicated or determined and relation to DRS transmission window
  - FFS: Whether or not an SSB can fall outside the measurement window and, if so, whether it can be used for in-sync and out-of-sync evaluations.
  - FFS: Any relationship of RLM measurements based on CSI-RS to the measurement window.
- FFS: Mechanism to handle missing RLM-RS due to LBT failure

7.2.2.2.3 HARQ enhancement

NR HARQ enhancements, additional A/N transmission opportunities, multi-TTI grants

R1-1901527 HARQ enhancement in NR unlicensed Huawei, HiSilicon
R1-1901611 Discussion on scheduling and HARQ for NR-U ZTE, Sanechips
R1-1901677 Discussion on HARQ operation for NR-U vivo
R1-1901800 Enhancements to HARQ for NR-U operation MediaTek Inc.
R1-1901872 HARQ Enhancements and UL Scheduling Charter Communications
R1-1901886 Design of HARQ procedures for NR-based access to unlicensed spectrum AT&T
R1-1901924 HARQ enhancements for NR-U OPPO
R1-1901941 Scheduling/HARQ enhancements for NR-U Fujitsu
R1-1902042 HARQ procedure for NR-U LG Electronics
R1-1902116 NR-U enhancements for HARQ scheduling and feedback Nokia, Nokia Shanghai Bell
R1-1902152 HARQ enhancement for NR-U Lenovo, Motorola Mobility
R1-1902171 Consideration on HARQ enhancement for NR-U Sony
R1-1902259 HARQ enhancement for NR-U Samsung
R1-1902325 HARQ enhancement for NR-U Panasonic Corporation
R1-1902473 Enhancements to HARQ for NR-unlicensed Intel Corporation
R1-1902589 Enhanced HARQ procedures for NR-U InterDigital, Inc.
R1-1902659 HARQ enhancement for NR unlicensed operation Sharp
R1-1902719 Discussion on HARQ enhancements for NR-U Spreadtrum Communications
R1-1902791 HARQ enhancement for NR-U NTT DOCOMO, INC.
R1-1902828 HARQ enhancements for NR-U ITRI
R1-1902885 Potential HARQ enhancements for NR-U Ericsson
R1-1902908 HARQ enhancement for NR-U Xiaomi

R1-1902987 Enhancements to Scheduling and HARQ Operation for NR-U Qualcomm Incorporated

R1-1903423 Feature lead summary of HARQ enhancements for NR-U Huawei

Agreement:
Scheduling PUSCH over multiple slots/mini-slots by single DCI supports at least multiple continuous PUSCHs with separate TBs

- Each TB is mapped to at most one slot or one mini-slot

7.2.2.2.4 Configured grant enhancement

R1-1901528 Transmission with configured grant in NR unlicensed band Huawei, HiSilicon
R1-1901612 Discussion on configured grant for NR-U ZTE, Sanechips
R1-1901678 Discussion on the enhancements to configured grants vivo
R1-1901801 Discussion on NR-U configured grant MediaTek Inc.
R1-1901925 On configured grant for NR-U OPPO
R1-1902043 Discussion on configured grant for NR-U LG Electronics
R1-1902110 On support of UL transmission with configured grants in NR-U Nokia, Nokia Shanghai Bell
R1-1902172 Enhancements to Configured Grants in NR-U Sony
R1-1902260 Configured grant enhancement for NR-U Samsung
R1-1902474 Enhancements to configured grants for NR-unlicensed Intel Corporation
R1-1902543 Discussion on multiplexing issues for configured grants in NR-U TCL Communication Ltd.
R1-1902590 Discussion on configured grant enhancement for NR-U InterDigital, Inc.
R1-1902684 Discussion on configured grant enhancement in NR-U NEC
R1-1902854 Configured grant enhancements for NR-U Panasonic Corporation
R1-1902886 Configured UL grant for NR-U Ericsson
R1-1902988 Enhancements to configured grants for NR-U Qualcomm Incorporated
R1-1903409 Feature lead summary for Configured grant enhancement vivo

R1-1903476 Outcome of offline discussion on Configured grant enhancement Vivo

Agreement:
For PUSCH transmitted using CG, CBG-based retransmission is supported at least by using dedicated scheduled resource allocated by an UL grant.

- FFS: CBG-based retransmission using a configured grant
- Note: Include this agreement in an LS to RAN2 informing them of relevant RAN1 agreements

Agreement:
For initial transmission on configured grant resource, HARQ retransmission on configured grant resource upon configured grant timer expiration (assume NACK if no ACK is received) is supported

- Note: Include this agreement in an LS to RAN2 informing them of relevant RAN1 agreements

Agreement:
When a UE initiates a channel occupancy with a transmission using a configured grant, it can signal at least the following

- The duration that the gNB is allowed to transmit in the channel occupancy initiated by the UE
- FFS:
  - How the duration is signalled
  - Whether the UE should signal continued use of the COT for its own transmissions
  - LBT priority class

7.2.2.2.5 Wide-band operation

Including wide band operation for DL/UL with multiple serving cells, and wideband operation for DL/UL with one serving cell, except channel access mechanisms

R1-1901529 NRU wideband BWP operation Huawei, HiSilicon

R1-1901613 Discussion on Wide-band operation for NR-U ZTE, Sanechips
R1-1901679 Discussion on wideband operation in NR-U vivo
R1-1901802 Wideband operation for NR-U MediaTek Inc.
R1-1901887 Wideband operation for NR-based access to unlicensed spectrum AT&T
R1-1901926 Wideband operation for NR-U OPPO
R1-1901942 On wideband operation for NR-U Fujitsu
R1-1902033 Wideband operation in NR unlicensed PANASONIC
R1-1902044 Wide-band operation for NR-U LG Electronics
R1-1902153 Wide-band operation for NR-U Lenovo, Motorola Mobility
R1-1902173 Wideband operation for NR Unlicensed Sony
R1-1902261 Wide-band operation for NR-U Samsung
R1-1902437 On wideband operation in NR-U Nokia, Nokia Shanghai Bell
R1-1902475 Wideband operation for NR-unlicensed Intel Corporation
R1-1902544 Wideband carrier usage for NR-U TCL Communication Ltd.
R1-1902591 NR-U wideband operation InterDigital, Inc.
R1-1902660 Wideband operation and UL/DL indication for NR-U Sharp
R1-1902792 Wide-band operation for NR-U NTT DOCOMO, INC.
R1-1902872 Discussion on wideband operation for NR-U WILUS Inc.
R1-1903324 Wideband operation for NR-U Ericsson (Revision of R1-1902887)
R1-1902909 Wideband operation for NR-U Xiaomi
R1-1902989 Wideband operation for NR-U operation Qualcomm Incorporated

R1-1903392 Summary on wide-band operation for NR-U LG Electronics

R1-1903595 Summary #2 on wide-band operation for NR-U LG Electronics

7.2.2.3 Other

R1-1901530 Generic design of spectral-domain modulation sequences for 5G NR-U PRACH waveform Huawei, HiSilicon
R1-1901927 Discussion on SS rasters for NR-U OPPO
R1-1902111 On preambles for NR-U Nokia, Nokia Shanghai Bell
R1-1902262 Draft LS on SCS of SSB and SS raster for NR-U bands Samsung
R1-1902263 Discussion on Wi-Fi preamble Samsung
R1-1902264 Evaluation results for directional LBT Samsung
R1-1902265 Discussion on HARQ-ACK codebook design Samsung
R1-1902266 Discussion on time/freq-domain enhancements for RACH resources Samsung
R1-1902267 Discussion on multple msg.1 transmisson procedure Samsung
R1-1902661 Considerations on use of Wi-Fi preamble in NR-U system Sharp
R1-1903360 Evaluation results for enhanced PRACH design Ericsson (Revision of R1-1902888)
R1-1902889 Enhanced PUCCH design details Ericsson
R1-1903060 Spectrum utilization in unlicensed bands Huawei, HiSilicon
R1-1903061 Performance evaluation of initial signals Huawei, HiSilicon
R1-1903062 Inband leakage and blocking in wideband operation Huawei, HiSilicon
R1-1903063 Further evaluation of coexistence in 6GHz Huawei, HiSilicon
R1-1903064 Discussion on the LS reply to ETSI BRAN and IEEE Huawei, HiSilicon

7.2.3 Integrated Access and Backhaul for NR

NR_IAB-core; WID in RP_182882. Please refer to the WID for detailed scoping

7.2.3.1 SSB/RMSI periodicity for NR initial access

Thursday session

R1-1903573 Summary for 7.2.3.1 SSB periodicity for IAB NR initial access Qualcomm

Decision: The document is noted.

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Agreements:

- Existing NR mechanisms are used by the network to signal to IAB MTs the SSB periodicity for cell re-selection.
- The IAB-node MT initial access assumption that half frames with SS/PBCH blocks occur with a periodicity of 16 frames does not have an impact on cell re-selection.

Agreement:

- The IAB-node MT initial access assumption that half frames with SS/PBCH blocks occur with a periodicity of 16 frames does not have an impact on backhaul link rerouting to a new parent node in response to a failure in the link to the current parent node.

Send an LS to RAN2/3 capturing agreements from this meeting and RAN1 AdHoc1901 – R1-1903692 Luca (Qualcomm)
Friday
R1-1903692 [Draft] LS on initial access SSB periodicity assumption for IAB MT Qualcomm
Decision: The draft LS is endorsed and final LS is approved in R1-1903809.

R1-1901889 Enhancements to support IAB node initial access AT&T
R1-1902077 Discussion on SSB/RMSI periodicity for NR initial access LG Electronics
R1-1902141 Discussion on IAB-assumed SSB periodicity in stage-1 initial access ZTE, Sanechips
R1-1902268 SSB/RMSI Periodicity for Initial Access in IAB Samsung
R1-1902409 SSB periodicity at initial access 7.2.3.1 Ericsson
R1-1902430 SSB periodicity for IAB initial access Nokia, Nokia Shanghai Bell
R1-1902476 SSB/RMSI periodicity for NR initial access Intel Corporation
R1-1902743 SSB/RMSI periodicity for NR initial access OPPO
R1-1902793 SSB/RMSI periodicity for IAB initial access NTT DOCOMO, INC.
R1-1903065 Remaining issues on SSB periodicity for IAB Huawei, HiSilicon

7.2.3.2 Extensions of SSBs for inter-IAB-node discovery and measurements

R1-1901890 Enhancements to support inter-IAB node discovery and measurements AT&T

- Proposal 1: Specify additional SMTC periodicities for inter-IAB node discovery and measurement beyond the values supported in Rel. 15.
- Proposal 2: Introduce time-domain mapping patterns for SSBs based on hop order which are orthogonal for up to 3 hops.
- Proposal 3: Support configuration of different periodicities/half-frame offsets/SSB indices to enable both intra- and inter-hop discovery.

Decision: The document is noted.

R1-1902794 Extensions of SSBs for inter-IAB-node discovery and measurements NTT DOCOMO, INC.

- Observation 1: One of the important principles of Rel-15 SMTC configuration is that target cells/SSBs to be measured in each occasion of periodic window are not changed, and hence Rel-15 specification supports up to two SMTC configurations for intra-frequency measurement per carrier.
  - Joint configuration approach based on TX configuration with muting pattern and single SMTC approach do not comply with this principle.
- Proposal 1: An IAB-node DU is configured with at least one SSB transmission configuration for access UE's measurement, and can be configured with another SSB transmission configuration for inter-IAB-node measurement.
  - In case that IAB-node DU is configured with two SSB transmission configurations, at least following parameters are separately provided for each transmission configuration.
    - SSB frequency
    - Periodicity and offset
      - In SSB transmission configuration for inter-IAB-node measurement, potentially candidate periodicity value(s) longer than 160ms may be included
    - SSB indices to be transmitted
- Proposal 2: An IAB node reports the number of SSB transmissions (i.e., number of beams for SSB transmission) to its parent IAB-node/donor or CU.
- Proposal 3: An IAB-node MT is configured with up to N SSB reception configurations, i.e., up to N periodic SMTC windows, for inter-IAB-node measurement.
  - At least following parameters are separately provided for each reception configuration.
    - Periodicity and offset of the SMTC window
    - Duration of the SMTC window
    - SSB indices to be measured in the SMTC window

- N is [6] for Rel-16 IAB.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Luca (Qualcomm)

Thursday session

R1-1903574 Summary for 7.2.3.2 Extensions of SSBs for IAB Qualcomm

Decision: The document is noted.

Agreements:

- The SSBs for IAB inter-node discovery and measurements are defined with a framework using the characteristics of the Rel 15 SMTC framework with the following enhancements:
  - The maximum number of SMTC windows that can be configured for an IAB node, referred as max(N_{RX}), is at least 3
    - FFS whether max(N_{RX}) needs to be greater than 3
    - FFS whether or not to extend existing SMTC window configuration
  - Each SMTC window is provided its own independent configuration (e.g. periodicity, offset, duration)
  - Introduction of SSB transmission configurations (STC) indicating SSB transmission(s)
    - FFS details
  - FFS how to resolve potential collision between SMTC and STC

R1-1901531	SSB-based discovery and measurement for IAB	Huawei, HiSilicon
R1-1901680	Discussion on extension of SSBs for inter-IAB-node discovery and measurements	vivo
R1-1902078	Discussion on SSBs for inter-IAB-node discovery and measurements	LG Electronics
R1-1902154	Discussion on discovery and measurement for IAB network	Lenovo, Motorola Mobility
R1-1902197	Discussion of SSB for inter-IAB-node discovery and measurements	ZTE, Sanechips
R1-1902269	Support of SSBs for IAB Node Discovery and Measurement	Samsung
R1-1902328	Discussion on extensions of SSBs for inter-IAB-node discovery and measurements	CMCC
R1-1902410	SSB-based IAB node discovery and measurement	Ericsson
R1-1902431	SSB TX/RX for IAB stage 2 discovery	Nokia, Nokia Shanghai Bell
R1-1902477	SSBs for inter-IAB-node discovery and measurements	Intel Corporation
R1-1902921	Discussion on extensions of SSBs for inter-IAB-node discovery and measurements	CAICT
R1-1902990	Proposal for SSB extensions for IAB	Qualcomm Incorporated

7.2.3.3 Extension of RACH occasions and periodicities for backhaul RACH resources

R1-1902270 Support of RACH Occasions and Periodicity for IAB RACH Samsung

- Observation 1: semi-static UL/DL configuration in the IAB DU should fulfill the half duplex constraint against the parent link before RACH configuration.
- Observation 2: Using CDMed access RACH resource for IAB RACH resource by further partitioning the preamble group may have significant impact to Rel-15 access UE.
- Observation 3: Using TDMed methods for IAB RACH resource could have negligible impact to Rel-15 access UE.
- Observation 4: the application of TDMed methods may face certain constraints in FR1 but may not be in FR2.
- Observation 5: Using FDMed methods for IAB RACH resource could have negligible impact to Rel-15 access UE and encounter a few constraints compared to TDMed manner.
- Proposal 1: the configuration of backhaul RACH mainly based on TDM to the access RACH could be supported in FR2 but needs further carefully study for FR1.
- Proposal 2: the configuration of backhaul RACH mainly based on FDMed manner to the access RACH can be supported if same preamble formats are used for access UE and IAB node.
- Proposal 3: PRACH configuration offset should be achieved by the IAB node itself based on its own PRACH configuration index and if offset is needed, it can be broadcasted by the IAB node with PRACH configuration index in the system information.
- Proposal 4: Separate configuration of RACH frame location could help to fulfil the half duplex constraints thus should be considered.
- Proposal 5: Configuring a different preamble format with adjustment rule could be considered for backhaul RACH.

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- Proposal 6: NR should consider multiple sets of RACH parameters for RACH multiplexing and a flag signal can be considered to indicate such configuration and broadcasted in system information.

Decision: The document is noted.

R1-1902411 **IAB Enhancements for RACH resources Ericsson**

- Observation 1: The RACH occasion (RO) extension is not to separate ROs between access and backhaul links but to separate ROs between parent backhaul link and child access/backhaul links.
- Proposal 1: In case of offset-based extensions of RACH occasions (ROs) for IAB, UEs and IAB nodes served by the same parent node share the same basic Rel-15 PRACH configuration, with the backhaul ROs being modified by IAB-specific time-domain offsets and scaling factors.
- Proposal 2: To create backhaul-specific RACH occasions, both frame-level offsets and subframe/slot-level offsets should be supported.
- Proposal 3: If specifying new configurations for backhaul RACH resources, two aspects is to be considered: 1) the possibility to (partially) overlap the backhaul RACH occasions (ROs) with the access ROs that are under the same parent IAB node; 2) the possibility to have the parent backhaul ROs orthogonal to both ROs configured for child access and backhaul links.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Luca (Qualcomm)

Thursday session

R1-1903575 **Summary for 7.2.3.3 Extensions of RACH for IAB Qualcomm**

Decision: The document is noted.

Agreements:

- New RACH configurations specific to IAB nodes are derived with extension of existing Rel 15 RACH configurations obtained by:
  - scaling the parameter 'x' from the PRACH configuration table, and
  - by adding an offset y_offset to the parameter 'y' (frame-based offset) and/or adding an offset to the slot/subframe number (slot/subframe-based offset) from the PRACH configuration table.
- FFS values and ranges for scaling factor applicable to 'x' and for y_offset.
- FFS whether a simple extension rule can be generally applied to all existing configurations leaving it up to the network to not use resulting configurations that may not fit other system constraints.

R1-1901532 RACH design for IAB Huawei, HiSilicon
R1-1901891 Enhancements to support IAB node RACH AT&T
R1-1902079 Discussion on RACH occasions and periodicities for backhaul RACH resources LG Electronics
R1-1902142 Discussion on backhaul RACH resources configuration ZTE, Sanechips
R1-1902329 Discussions on PRACH enhancements to support NR Backhaul links CMCC
R1-1902432 Enhancements on RACH for IAB Nokia, Nokia Shanghai Bell
R1-1902478 RACH enhancements for NR IAB Intel Corporation
R1-1902744 Extension of RACH configuration for backhaul link OPPO
R1-1902795 Extension of RACH occasions and periodicities for backhaul RACH resources NTT DOCOMO, INC.
R1-1902922 Discussion on RACH occassions and periodicities for backhaul RACH resources CAICT
R1-1902991 Proposal for RACH extension for IAB Qualcomm Incorporated

7.2.3.4 Mechanisms for resource multiplexing among backhaul and access links

R1-1902433 **Mechanisms for resource multiplexing among backhaul and access links Nokia, Nokia Shanghai Bell**

- Observation 1: There are six different IAB behaviors for the case of TDM between Child and Parent links.
- Observation 2: Existing RRC signaling can be used for configuring semi-static resources for MT part of the IAB node
- Observation 3: DCI 2_0 enhancement related to IAB has smooth coexistence with access link UEs.
- Observation 4: From resource allocation point of view, it is possible to introduce support for FDM/SDM scenarios, as well as full duplex scenarios at any time.
- Proposal 1: Only flexible resources for MT can be used as soft resources for DU.

- Proposal 2: A new F1AP signaling is defined supporting configuration of 7 resource types explicitly for DU part of the IAB node.
- Proposal 3: Default resource types for IAB node are the following:
  - MT part: Flexible
  - DU part: Flexible Soft
- Proposal 4: Semi-static resource configuration is per-DU.
- Proposal 5: In the case of separate configuration for DU/MT resources, consider the following rules for avoiding conflicts across multiple hops:
  - For the resources where DU configuration is NA or Soft with no indication available to use soft resources.
    - IAB node sets its DU configuration to "Null"
    - IAB node follows its MT configuration in Parent link
  - For the resources where DU configuration is Hard or Soft with an indication available to use soft resources.
    - IAB node sets its MT configuration to "Null"
    - IAB node follows its DU configuration in Child link(s).
- Proposal 6: Resource configuration rules for IAB-nodes and associated behaviors regarding time resource utilization shall be discussed considering following situations.
  - Intra-IAB DU/MT resource configuration rules. Between MT and DU of the IAB node.
  - Inter-IAB DUs resource configuration rules. Between parent DU and child DU.
  - Inter-IAB DU/MT resource configuration rules. Between parent DU and child MT.
- Proposal 7: Inter-IAB DU conflicts can be avoided by the following rules,
  - When the parent DU resource configured as hard, IAB DU resource can be configured as NA or soft resources.
  - When the parent DU resource configured as NA, IAB DU resource can be configured as hard or NA resources.
  - When the parent DU resource configured as soft, IAB DU resource can be NA or soft resources.
- Proposal 8: Inter-IAB DU/MT conflicts can be avoided by the following rules,
  - When the parent DU resource configuration is hard, child MT configuration on DL, UL, and F resources should match to the parent DU's DL, UL, and F resources.
  - When the parent DU resource configuration is NA, child MT configuration should be F.
  - When the parent DU resource configuration is soft,
    - parent DU is soft-DL, child MT resource should be F (or DL).
    - parent DU is soft-UL, child MT resource should be F (or UL).
    - parent DU is soft-F, child MT resource should be F.
- Proposal 9: MT determines resource usage for flexible time resources according to rules defined in TS 38.213 (Section 11.1) and based on received DCI and/or higher layer configuration.
- Proposal 10: IAB MT supports explicit and implicit determination for the availability of soft time resources
- Proposal 11: Explicit indication is based on DCI 2_0. For that purpose, introduce four new SFIs to support dynamic capacity allocation between parent and child links
  - Child DL
  - Child UL
  - Child Flexible
  - Operation according to semi-static MT & DU configuration.
- Proposal 12: Explicit indication related to soft time resources needs to support also interference coordination between parent node and child node(s). This can be done based DCI 2_0.

Decision: The document is noted.

R1-1902992 **IAB resource management framework** **Qualcomm Incorporated**

- Observation1: For semi-static channel allocation or dynamic multi-slot allocation, some of channel allocations may fall into "NA/Soft" resources if no restrictions are imposed, which may cause in-consistent behaviour between DU and child UE/MT.
- Observation2: Depending on channel type, the performance loss of having some allocation falling into "NA/Soft" resources may or may not be acceptable.
- Observation3: The "Hard||Hard" and "Soft||Hard" alignments between parent and child DUs may violate capability of child IAB-node on half-duplex constraint and/or supporting simultaneous FDM/SDM TX or RX.
- Observation4: An IAB-node may have conflicting TX/RX operation between co-located MT/DU that violates half-duplex constraint and/or simultaneous SDM/FDM TX or RX capability of the IAB-node.
- Proposal1: All or part of following types of interaction rules shall be considered in the spec:
  - Type1: interaction rules for a DU between configuration of "Hard/Soft/NA" and other configurations (e.g. TDD slot configuration and physical channel allocation)
  - Type2: interaction rules between parent and child DUs regarding pattern alignments.
  - Type3: interaction rules between co-located MT/DU to handle potential conflicting TX/RX operations
- Observation5: If "NA/Soft" resources are indicated as "flexible" in semi-static TDD config, existing SFI framework can be used to cancel (most of) UE/MT's TX/RX at "NA/Soft" resources.

- Proposal2: The following cases shall be considered for a channel type
  - Case1: higher priority than "Hard/Soft/NA": allocated symbols shall not be indicated as "NA/Soft" for DU over its child links with this channel allocation.
    - The higher priority channel type shall include SSB used for initial access.
    - FFS: other channel types.
  - Case2: lower priority than "Hard/Soft/NA": allocated symbols are allowed to fall into any "Hard/NA/Soft" resource types.
    - FFS: Constrain the semi-static TDD-config corresponding to "NA/Soft" resources as "Flexible"
- Proposal3: The "Hard||Hard" and/or "Soft||Hard" pattern alignment across parent and child nodes shall be allowed by the spec, and conflicting resolution rules between co-located DU and MT shall be considered.
  - FFS: support of feedback coordination message from child IAB-node.
- Proposal4: Expected behaviour of co-located DU and MT summarized by TR 38-874 under all combinations of (DU's resource type, MT's resource type) shall be captured in the spec.
  - FFS: exception cases with different behaviors, e.g. co-located MT shall have a higher priority to transmit PRACH than DU to receive PRACH over overlapping PRACH occasions.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Thomas (ATT)

Thursday session

R1-1903582 **Summary of 7.2.3.4 Mechanisms for resource multiplexing among backhaul and access links**
AT&T

Decision: The document is noted.

Agreements:

- If a resource is configured as not available, the DU cannot assume it can use the resource
- In case of hard DU resources, the DU can assume it can use the resource regardless of the MT's configuration
  - FFS: Exception cases for specific signals/channels to be transmitted or received by the MT in the same resource (e.g. SS/PBCH blocks, SI reception, RACH)
- In case of soft DU resources:
  - If the soft resource is indicated as available, the DU can assume it can use the resource
  - If the soft resource is not indicated as available, the DU cannot assume it can use the resource
  - The use of soft resources at least corresponds to transmission/reception of specific signals and channels (e.g. PDSCH/PUSCH) at the DU
    - FFS the use of soft resources in case of cell-specific (e.g. SS/PBCH blocks, SI reception, RACH) signals and channels to be potentially transmitted/received at the DU
  - Both implicit and explicit indication of the availability of soft resources at an IAB node is supported
    - In case of implicit indication of DU soft-resource availability, the IAB node knows that the DU resource can be used without impacting the MTs ability to transmit/receive according to its configuration and scheduling based on indirect means. Examples of such means may include:
      - the lack of uplink scheduling grant at the MT
      - no data available for MT transmission
      - the configured MT search space,
      - configured RS measurement occasions (e.g. SSB/CSI-RS)
      - FFS: consider whether the parent should be able to always be aware of/control the outcome of implicit indications at child nodes
    - Explicit indication that a resource is available is based on DCI indication. The following options can be considered:
      - SFI-like indication via DCI Format 2_0
      - Use of 2 SFI indications (e.g. based on multi-slot scheduling mechanism)
      - Define a new DCI format
      - Other options are not precluded
      - FFS: whether an explicit indication that a resource is available always has priority over any implicit determination of the availability of a resource
  - Further consider factors impacting the usage of soft resources at a child DU, including:
    - MT's decoding delay

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- Information exchange delay between MT and DU
- DU's PDSCH preparation time
- UE PUSCH preparation time
- Accumulated delay across hops

Agreements:

- Inter-IAB node conflict resolution can be supported by the following options (to be down-selected)
  - Alt1: the parent node is aware of all of the DU resource configurations (D/U/F/H/S/NA) of its child IAB node DUs,
  - Alt2: the parent node may be made aware of a subset of the DU resource configurations (D/U/F/H/S/NA) of its child IAB node DUs
  - FFS: whether the indication of the child DU resources at the parent is via explicit (e.g. F1-AP signaling) or implicit (e.g. based on child MT configuration) means

Agreement:

- Both slot and symbol-level multiplexing of access and backhaul links are supported.

Proposal:

- Define additional SFIs for IAB in Rel-16 which support patterns which begin with uplink slots, uplink symbols, or flexible symbols.

Continue discussion till next meeting

R1-1901533	Resource multiplexing between backhaul and access in IAB	Huawei, HiSilicon
R1-1901681	Discussion on resource multiplexing among backhaul and access links	vivo
R1-1901892	Mechanisms for supporting access and backhaul link multiplexing	AT&T
R1-1902080	Discussions on resource multiplexing among backhaul and access links	LG Electronics
R1-1902143	Resource multiplexing among backhaul and access links	ZTE, Sanechips
R1-1902155	Discussion on resource partitioning for IAB network	Lenovo, Motorola Mobility
R1-1902271	Resource Multiplexing between Backhaul and Access Links	Samsung
R1-1903226	IAB resource configuration and assignment	Ericsson (Revision of R1-1902412)
R1-1902479	Mechanisms for resource multiplexing among backhaul and access links	Intel Corporation
R1-1902685	Discussion on IAB	NEC
R1-1902796	Mechanisms for resource multiplexing among backhaul and access links	NTT DOCOMO, INC.

7.2.3.5 Mechanism to support the "case-1" OTA timing alignment

R1-1901534 DL transmission timing alignment for IAB Huawei, HiSilicon

- Observation 1: The DL TX synchronization error can be mitigated by averaging the DL TX timing of multiple parent nodes.
- Proposal 1: Specify the value range and granularity of T_delta according to table 1.

Table 1. Value range and granularity of T_delta

Frequency range	Range	granularity	Notes
FR2	[-5.5μs, 2μs]	32 Tc	8 bits after quantization
FR1 (TA_offset~=13μs)	[-29.5μs, 1.5μs]	128 Tc	8 bits after quantization
FR1 (TA_offset~=20μs)	[-26μs, 5μs]	128 Tc	8 bits after quantization

- Proposal 2: The additional timing offset T_delta should be indicated to the IAB node by dedicated signaling.
- Proposal 3: The IAB node should trigger its DL TX timing adjustment by TA/2 + T_delta when it receives the timing offset T_delta indication from its parent node.
- Proposal 4: After setting the initial DL TX timing, the DL TX timing for IAB node DU should be adjusted by reconfiguring T_delta, but not the TA update. Besides, the requirements for the timing adjustment should be specified by RAN4.
- Proposal 5: The IAB node should re-adjust its local DL TX timing in case of local crystal oscillator drift, and the requirements for the timing adjustment should be specified by RAN4.

- Proposal 6: In case of route switching, to enable synchronization error average among multiple parent nodes, the child IAB node should send the gap between the DL TX timing from the old parent node and DL RX timing from the new parent node.

Decision: The document is noted.

R1-1902144 **Discussion on OTA timing alignment mechanism ZTE, Sanechips**

- Proposal 1: From RAN1 perspective, there is no need for the parent node to periodically update the values of Tdelta for the child nodes. It is not excluded that RAN4 may require the parent node update the Tdelta at least once per one period of time for each child node.
- Proposal 2: Upon successful reception of the Tdelta notification, the IAB node chooses one of following two behaviors:
  - Discard Tdelta without updating the DL Tx timing; or
  - Update DL Tx timing using notified Tdelta within a pre-determined time window that is known to the parent node.
- Proposal 3: Two separate granularities are defined for Tdelta in FR1 and Tdelta in FR2.
- Proposal 4: The range of Rel-15 TA command in MAC CE can be used as a reference to decide the range of Tdelta.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Thomas (ATT)

Thursday session

R1-1903583 **Summary of 7.2.3.5 Mechanism to support the "case-1" OTA timing alignment AT&T**

Decision: The document is noted.

Agreements:

- T_delta is indicated by a parent to the child node independently from the existing Rel.15 TA indication from the parent node used to set the UL Tx timing of the child IAB node's MT
  - T_delta is updated on an aperiodic basis determined by the parent node
  - The child IAB node should trigger its DL TX timing adjustment by TA/2 + T_delta after it receives the timing offset T_delta indication from its parent node, if it is using OTA Timing Case 1 to obtain its DL timing.
    - FFS: behavior if TA/2 + T_delta results in an effective negative timing offset
    - FFS: delay between receiving T_delta and application of T_delta at the child node
  - Separate value ranges/granularities may be considered for T_delta in FR1 and T_delta in FR2
- Send LS to RAN4 asking them to determine the exact values and granularity of T_delta and provide confirmation on RAN1's assumption on the DL timing accuracy requirements for IAB nodes in case of OTA Case 1 timing is applied across multiple hops – R1-1903693 (Xinghua, Huawei)

Friday

R1-1903693 **[Draft] LS on OTA timing alignment for IAB Huawei**

Decision: The draft LS is endorsed and final LS is approved in R1-1903810.

R1-1901893 Mechanisms for supporting IAB node timing alignment AT&T
R1-1902081 Discussions on timing alignment for IAB nodes LG Electronics
R1-1902272 Support of Case 1 OTA Timing Alignment Samsung
R1-1902413 IAB OTA Timing Alignment Ericsson
R1-1902434 IAB Case #1 timing Nokia, Nokia Shanghai Bell
R1-1902480 Mechanism to support the "case-1" OTA timing alignment Intel Corporation
R1-1902797 Mechanism to support the "case-1" OTA timing alignment NTT DOCOMO, INC.
R1-1902993 IAB node synchronization framework Qualcomm Incorporated

7.2.3.6 Other

Including RAN1 aspects related to signalling for L2 transport and resource management as in the WID

R1-1901535 On backhaul link radio link failure handling for IAB Huawei, HiSilicon
R1-1901894 Mechanisms for resource coordination and radio-aware scheduling for IAB AT&T

R1-1902082 Discussion on scenario with same cell ID among IAB nodes LG Electronics
R1-1902415 Resource for IAB up-stream (MT) transmission Ericsson

7.2.4 Study on NR V2X

FS_NR_V2X; SID in RP-182491. Please refer to the SID for detailed scoping

R1-1902864 **TR 38.885 v1.0.1 Study on Vehicle-to-EverythingHuawei Tech.(UK) Co., Ltd**
Decision: The draft TR is endorsed, except the 3rd paragraph in Section 5.3.1.1, & the changes in Section 5.3.1.2/3 (to be checked further offline, revisit later)

Friday
R1-1903593 **TR 38.885 v1.0.2 Study on Vehicle-to-EverythingHuawei Tech.(UK) Co., Ltd**
Decision: The TP in R1-1903593 is endorsed

R1-1903791 **Combined TP for TR 38.885 Conclusions Huawei**
Decision: The conclusions in R1-1903791 are agreed.

R1-1903773 **TP for TR 38.885 on LTE Uu evaluation and enhancementHuawei, HiSilicon**
Decision: The TP in x3773 is endorsed

Email approval for TR update till March 7th (including updated evaluations, submitted no later than March 6th) – Matthew (Huawei)

R1-1901929 Text proposal for the conclusion of TR 38.885 LG Electronics
R1-1903189 TP for TR 38.885 Conclusions Huawei, HiSilicon
R1-1903213 TP for TR 38.885 Section 11: Evaluations Huawei

7.2.4.1 Sidelink design

R1-1901752 **Performance requirements for ProSe D2D communications within the scope of NR V2X sidelink FirstNet, AT&T, SyncTechno, Bittium, VIRVE, The Police of Netherlands, Norwegian Communications Authority, French MOI, UIC (International union of railways)**

- The public safety community wants to ensure that 3GPP is aware of requirements established for sidelink (capabilities matching or exceeding that of LTE) in 5G NR. The intention of this paper is not to add any additional burden to NR V2X progress in Release-16, but to clarify that public safety intends to use 5G NR sidelink as already defined in R16. We believe that the performance requirements to satisfy minimal D2D services (1 to 1 and 1 to many, both in-coverage and out-of-coverage deployment scenarios) can be met without any changes to the current design of the Rel-16 NR V2X sidelink.
- Hence, we request the working group to include the following text in the final report of NR V2X sidelink in the concluding section of the report:
- It may also be inferred that the technical solutions identified in this technical report can be used for use cases other than V2X as long as the service requirements can be met - one such service could be public safety.

Decision: The document is noted. Discuss offline how it can be incorporated.

7.2.4.1.1 Physical layer structure

Including waveform, RS, control/data mux, resource pool, etc.

R1-1903366 **Feature lead summary for agenda item 7.2.4.1.1 Physical layer structure LG Electronics**
Decision: The document is noted.

Agreement:
- Rel-16 NR sidelink supports CP-OFDM only.

Agreements:
- For PSCCH/PSSCH in FR2, NR V2X supports normal CP for 60 kHz, 120 kHz, and extended CP for 60 kHz.

- Note: it is understood that PSFCH follows the same CP as PSCCH/PSSCH

Agreements:
- For the operation regarding PSSCH, a UE performs either transmission or reception in a slot on a carrier.
- NR sidelink supports for a UE:
  - A case where all the symbols in a slot are available for sidelink.
  - Another case where only a subset of consecutive symbols in a slot is available for sidelink
    - Note: this case is not intended to be used for the ITS spectra, if there is no forward-compatibility issue. Finalize in the WI phase whether there is such an issue or not
    - The subset is NOT dynamically indicated to the UE
    - FFS the supported slot configuration(s)
    - FFS whether/how to operate it in partial coverage scenarios

Proposals:
- For PSCCH/PSSCH multiplexing
  - Working assumption: Option 1B is supported.
    - Option 1B design will not assume transient period between PSCCH and PSSCH symbols. Confirmation of this working assumption will be based on the RAN4 LS regarding the need of transient period between PSCCH and PSSCH symbols.

Proposal for agreement (discussed but no consensus reached):
- It is supported that a UE decodes a single SCI to receive a PSSCH.
  - FFS whether to support the case where a UE decodes two SCI to receive a PSSCH.

Discuss further offline – especially regarding the details of 2-stage, applicability to different transmissions (unicast/broadcast/groupcast), etc.

Thursday session

R1-1903596 **Feature lead summary#2 for agenda item 7.2.4.1.1 Physical layer structure LG Electronics**

Decision: The document is noted.

Proposals:
- For decoding a PSSCH,
  - A UE receives an SCI:
    - This SCI includes at least the following:
      - Information necessary to receive the other SCI described below (if/when needed).
      - All the information necessary to receive broadcast transmissions.
      - Information used for sensing
      - FFS other information
    - This SCI is received based on blind detection/decoding.
    - FFS if this SCI is sent in PSCCH or an RS
  - The UE may receive another SCI carries the remaining information to be decoded only the target UEs.
    - Receiving this SCI does not require blind detection/decoding.
    - FFS if this SCI is sent in PSCCH or PSSCH

Proposals:
- It is supported that a UE decodes a single SCI to receive a PSSCH
  - Can still discuss in the WI phase whether or not to additionally support 2-stage SCI

Agreement:
- At least for sidelink HARQ feedback, NR sidelink supports at least a PSFCH format which uses last symbol(s) available for sidelink in a slot.

Agreement:
- RAN1 concludes that no additional physical channel needs to be defined for the purpose of discovery in Rel-16.

Friday session

R1-1903769 **Feature lead summary#3 for agenda item 7.2.4.1.1 Physical layer structure LG Electronics**
Decision: The document is noted.

R1-1901536	Sidelink physical layer structure for NR V2X	Huawei, HiSilicon
R1-1901682	Physical layer structure for NR sidelink	vivo
R1-1901809	On sidelink physical layer structure	MediaTek Inc.
Late submission		
R1-1901830	Views on physical layer design for NR V2X sidelink	Mitsubishi Electric RCE
R1-1901842	Design and Analysis of NR V2X Physical Layer Structure	Fraunhofer HHI, Fraunhofer IIS
R1-1901895	Physical layer structure for NR sidelink design	AT&T
R1-1901930	Discussion on physical layer structure for NR V2X	LG Electronics
R1-1901943	Discussion on physical layer structure for NR sidelink	Fujitsu
R1-1901992	Discussion on physical layer structure in NR V2X	CATT
R1-1902137	Discussion on NR sidelink physical layer structure	ZTE, Sanechips
R1-1902156	Physical layer structures in NR V2X	Lenovo, Motorola Mobility
R1-1902201	Discussion on physical layer structure for NR V2X	Panasonic
R1-1902273	On physical layer structures for NR V2X	Samsung
R1-1902385	Physical layer structure for NR-V2X	OPPO
R1-1902439	Discussion on NR V2X Sidelink Design	ETRI
R1-1902481	Sidelink physical structure for NR V2X communication	Intel Corporation
R1-1902541	Discussion on physical layer structure for NR sidelink	Sony
R1-1902545	On Sidelink DMRS Design for NR V2X	TCL Communication Ltd.
R1-1902573	Discussions on NR V2X Sidelink Physical Layer Structures	Nokia, Nokia Shanghai Bell
R1-1902595	Discussion on Physical Layer Structure for NR V2X Sidelink	InterDigital, Inc.
R1-1902679	Remaining issues on NR Sidelink PHY structure for V2X	HEPTA 7291
R1-1902692	Physical layer structure for NR V2X	NEC
R1-1902710	Discussion on physical layer structure for NR V2X	Xiaomi Communications
R1-1902723	Discussion on NR V2X physical layer structure	Spreadtrum Communications
R1-1902798	Sidelink physical layer structure for NR V2X	NTT DOCOMO, INC.
R1-1902891	Physical layer structure for NR V2X	ITL
R1-1902911	Discussion on PSFCH in NR V2X	ASUSTEK COMPUTER (SHANGHAI)
R1-1902994	Considerations on Physical Layer aspects of NR V2X	Qualcomm Incorporated
R1-1903163	Remaining details on physical structure for NR SL	Ericsson

7.2.4.1.2 Physical layer procedures

Including HARQ feedback, CSI acquisition, etc.

R1-1903367 **Feature lead summary for agenda item 7.2.4.1.2 Physical layer procedures LG Electronics**
Decision: The document is noted.

Agreement:
- (Pre-)configuration indicates the time gap between PSFCH and the associated PSSCH for Mode 1 and Mode 2.

Agreements:
- In mode 1 for unicast and groupcast, it is supported for the transmitter UE via Uu link to report an indication to gNB to indicate the need for retransmission of a TB transmitted by the transmitter UE.
  - FFS the format of the indication, e.g., in the form of HARQ ACK/NACK, or in the form of SR/BSR, etc.
- RAN1 continues discussion on whether to support report from the receiver UE.
  - No inter-BS communication will be considered.

To discuss aspects related to 1st sub-bullet & 2nd bullet during this week -revisit later

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Agreement:
- Sidelink HARQ ACK/NACK report from UE to gNB is not supported in Rel-16.

Agreements:
- For unicast RX UEs, SL-RSRP is reported to TX UE
- For sidelink open loop power control for unicast for the TX UE, TX UE derives pathloss estimation
    - Revisit during the WI phase w.r.t. whether or not there is a need regarding how to handle pathloss estimation for OLPC before SL-RSRP is available for a RX UE

Agreement:
- TPC commands for SL PC are not supported

R1-1901537 **Sidelink physical layer procedures for NR V2X Huawei, HiSilicon**
R1-1903164 **Remaining details on PHY procedures for Rel. 16 NR V2XEricsson**

Thursday session
R1-1903597 **Feature lead summary#2 for agenda item 7.2.4.1.2 Physical layer procedures LG Electronics**
Decision: The document is noted.

Proposals:
- For sidelink groupcast, it is supported to use TX-RX distance/RSRP in deciding whether to send HARQ feedback.
    - Details to be discussed during WI phase, including whether the information on TX-RX distance is explicitly signaled or implicitly derived, whether/how this operation is related to resource allocation

Supported by: LGE, Hepta, Fujitsu, Qualcomm, Ericsson, FH, Panasonic, Convida, Xiaomi, AT&T, Mitsubishi, InterDigital, Samsung, APT, ZTE
Objected by: Huawei, HiSilicon

Friday Agreements:
- For sidelink groupcast, it is supported to use TX-RX distance and/or RSRP in deciding whether to send HARQ feedback.
    - Details to be discussed during WI phase, including whether the information on TX-RX distance is explicitly signaled or implicitly derived, whether/how this operation is related to resource allocation, accuracy of distance and/or RSRP, the aspects related to "and/or", etc.
    - This feature can be disabled/enabled

Proposals:
- For unicast, the following CSI reporting is supported based on aperiodic CSI reporting mechanism assuming no more than 4-port:
    - CQI
    - RI
    - PMI
- CSI reporting can be enabled and disabled by configuration.
    - It is supported to configure a subset of the above metric for CSI reporting.
- NR sidelink CSI strives to reuse the CSI framework for NR Uu.
    - Discuss details during WI phase

Friday Working assumption:
- For unicast, the following CSI reporting is supported based on non-subband-based aperiodic CSI reporting mechanism assuming no more than 4-port:
    - CQI
    - RI
    - PMI
- CSI reporting can be enabled and disabled by configuration.
    - It is supported to configure a subset of the above metric for CSI reporting.
- There is no standalone RS transmission dedicated to CSI reporting in Rel-16
- NR sidelink CSI strives to reuse the CSI framework for NR Uu.
    - Discuss details during WI phase

Agreements:
- RAN1 concludes the following regarding beam management:
  - Beam management is beneficial
  - RAN1 has conducted limited study on the beam management.
  - In FR1, it is feasible to support V2X use cases without beam management.
  - In FR2, it is feasible to support some V2X use cases without beam management in some scenarios.
    - Panel selection is necessary to improve the communication range in FR2.

Conclusion:
- There is no consensus in supporting beam management for normative work for NR V2X in Rel-16.

R1-1903428 Text proposal on 2 Rx Antennas for NR V2X General Motors, Volkswagen AG
Further revised to **R1-1903704**
Decision: Discuss till RAN1#96bis

R1-1903591 TP to update mmWave results in TR 38.885 AT&T
Decision: The TP is endorsed.

R1-1901683 Physical layer procedure for NR sidelink vivo
R1-1901810 Discussion on Physical layer procedure MediaTek Inc.
R1-1901843 Physical Layer Procedures for Unicast and Groupcast Fraunhofer HHI, Fraunhofer IIS
R1-1901896 Physical layer procedures for NR sidelink design AT&T
R1-1901931 Discussion on physical layer procedure for NR V2X LG Electronics
R1-1901944 Discussion on HARQ-ACK feedback for NR-V2X Fujitsu
R1-1901993 Discussion on physical layer procedures in NR V2X CATT
R1-1902132 A Reliable Groupcast HARQ feedback scheme for NR V2X Kyocera Corporation
R1-1902138 Discussion on PHY procedures for NR V2X ZTE, Sanechips
R1-1902157 Physical layer procedures in NR V2X Lenovo, Motorola Mobility
R1-1902174 Discussion on HARQ feedback for NR V2X communication Sony
R1-1902202 Discussion on PSFCH channel design in NR V2X Panasonic
R1-1902274 On physical layer procedures for NR V2X Samsung
R1-1902330 Discussion on HARQ feedback for NR V2X CMCC
R1-1902386 Physical layer procedure for NR-V2X OPPO
R1-1902401 Sidelink Physical Procedures for NR V2X ITRI
R1-1902445 Discussion on sidelink physical layer procedure on NR V2X ASUSTEK COMPUTER (SHANGHAI)
R1-1903450 Physical layer procedures for NR V2X sidelink design Intel Corporation (rev of R1-1902482)
R1-1902574 On Sidelink physical layer procedures Nokia, Nokia Shanghai Bell
R1-1902596 Discussion on Physical Layer Procedures for NR V2X Sidelink InterDigital, Inc.
R1-1902662 Discussion on physical layer procedures in NR V2X Sharp
R1-1902680 Remaining issues on NR Sidelink PHY layer procedures for V2X HEPTA 7291
R1-1902693 Physical layer procedures for NR V2X NEC
R1-1902711 On HARQ operation for V2x communications Xiaomi Communications
R1-1902724 Discussion on NR V2X physical layer procedure Spreadtrum Communications
R1-1902760 Considerations on NR V2X physical layer procedure Apple Inc.
R1-1902799 Sidelink physical layer procedure for NR V2X NTT DOCOMO, INC.
R1-1902892 Physical layer procedure for NR V2X ITL
R1-1902995 Physical layer procedures for HARQ operation for groupcast and unicast transmissions Qualcomm Incorporated
R1-1903153 Discussion on Sidelink Procedures Convida Wireless

7.2.4.1.3 Synchronization mechanism

R1-1903484 Summary of V2X Sidelink Synchronization CATT
Decision: The document is noted.

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R1-1903736 Summary of V2X Sidelink Synchronization CATT
Decision: The document is noted.

Agreements:

- Whether GNSS-based synchronization or gNB/eNB-based synchronization is used is (pre)-configured.
  - The following table is a working assumption

GNSS-based synchronization	gNB/eNB-based synchronization
• P0: GNSS • P1: the following UE has the same priority: • UE directly synchronized to GNSS • P2: the following UE has the same priority: • UE indirectly synchronized to GNSS • P3: the remaining UEs have the lowest priority.	• P0: gNB/eNB • P1': UE directly synchronized to gNB/eNB • P2': UE indirectly synchronized to gNB/eNB • P3': GNSS • P4': UE directly synchronized to GNSS • P5': UE indirectly synchronized to GNSS • P6': the remaining UEs have the lowest priority.

R1-1903811 Summary of V2X Sidelink Synchronization CATT
Decision: The document is noted.

Agreements:

- NR V2X supports using a sidelink RS for synchronization purpose
  - Applicable only on unlicensed (ITS) carrier with no network deployment on this carrier
  - This RS is not a standalone RS and not part of SLSS.
  - This RS will not appear in the synchronization procedure for the selection of sync sources.
  - RS used for the synchronization purpose would not impact any sidelink RS design
  - FFS: Whether this RS is DM RS or other RS
  - FFS: Whether this could be achieved by UE implementation
  - FFS: Specification impact

R1-1901539 Sidelink synchronization mechanisms for NR V2X Huawei, HiSilicon
R1-1903336 NR sidelink synchronization mechanism vivo (rev of R1-1901684)
R1-1901811 Discussion on sidelink based synchronization mechanism MediaTek Inc.
Late submission
R1-1901897 Synchronization mechanism for NR sidelink AT&T
R1-1903760 Discussion on synchronization mechanism for NR V2X LG Electronics (rev of R1-1901932)
R1-1901994 Further design and evaluation of S-SSB for NR V2X Sidelink CATT
R1-1902139 Discussion on synchronization mechanism in NR V2X ZTE, Sanechips
R1-1903493 On synchronization mechanisms for NR V2X Samsung (rev of R1-1902275)
R1-1902387 Discussion of synchronization mechanism for NR-V2X OPPO
R1-1902402 Discussion for NR V2X Sidelink Synchronization Issues and Mechanisms ITRI
R1-1902440 Discussion on NR V2X sidelink synchronization ETRI
R1-1903393 Synchronization for NR V2X sidelink communication Intel Corporation (rev of R1-1902483)
R1-1902575 Discussion on NR V2X Sidelink Synchronization Nokia, Nokia Shanghai Bell
R1-1902597 On Synchronization Mechanism and Procedures for NR V2X InterDigital, Inc.
R1-1902681 Remaining issues on NR Sidelink synchronization for V2X HEPTA 7291
R1-1902694 Synchronization mechanism for NR V2X NEC
R1-1902712 On Synchronization for NR V2X Xiaomi Communications
R1-1902726 Discussion on synchronization mechanism for NR V2X Spreadtrum Communications
R1-1902761 Considerations on NR V2X Synchronization mechanism Apple Inc.
R1-1902800 Sidelink synchronization mechanism for NR V2X NTT DOCOMO, INC.
R1-1902896 Considerations on sidelink synchronization for NR V2X Sequans Communications

R1-1902910 Considerations on sidelink synchronization mechanism for NR V2X ITL
R1-1902929 Views on the synchronization signal for NR V2X KT Corp.
R1-1902996 Synchronization design for NR V2X Qualcomm Incorporated
R1-1903155 Design Considerations for NR V2X Synchronization Convida Wireless
R1-1903165 On Synchronization for NR Sidelink Ericsson

7.2.4.1.4 Resource allocation mechanism

From Tuesday offline:
Proposals:

- NR V2X Mode-2 supports the following scheme(s) for sidelink resource selection
  - Dynamic scheme: sidelink PSSCH resource(s) are selected for transmission of one TB [or two TBs if supported by MIMO scheme]
  - Semi-persistent scheme: sidelink PSSCH resource(s) are selected for transmission of multiple TBs
    - Detailed SPS scheme to be finalized in the WI phase
- The following candidate options are identified for further analysis:
  - Option 1: Initial transmission and retransmission(s) use dynamic scheme for resource selection
  - Option 2: Initial transmission and retransmission(s) use semi-persistent scheme for resource selection
  - Option 3: Initial transmission uses semi-persistent scheme and retransmission uses dynamic scheme for resource selection
  - Option 4: Initial transmission uses dynamic scheme and retransmission uses semi-persistent scheme for resource selection

Wednesday session
R1-1903623 **Feature Lead Summary for NR-V2X AI - 7.2.4.1.4 Resource Allocation Mechanism Intel**
Decision: The document is noted.

Agreements:

- Blind retransmissions of a TB are supported for SL by NR-V2X
  - Details are for the WI phase

Agreements:

- NR V2X Mode-2 supports reservation of sidelink resources at least for blind retransmission of a TB
  - Whether reservation is supported for initial transmission of a TB is to be discussed in the WI phase
  - Whether reservation is supported for potential retransmissions based on HARQ feedback is for the WI phase

Proposals:

- Mode-2 sensing procedure utilizes the following sidelink measurements
  - SL-RSRP
    - SL-RSRP is non L3-filtered
    - PSSCH DMRS are used for SL-RSRP measurements
    - FFS PSCCH DMRS for SL-RSRP measurements

Thursday session
Agreements:

- Mode-2 sensing procedure utilizes the following sidelink measurement
  - L1 SL-RSRP based on sidelink DMRS when the corresponding SCI is decoded
    - FFS whether/which measurement is used if the corresponding SCI is not decoded e.g. SL-RSRP after blind DMRS detection, SL-RSSI

Proposals:
NR sidelink supports that a UE (S-UE) provides resource pool configuration(s) to other UEs within the same group:

- High layer signaling is used for S-UE to provide resource pool configuration(s) to other UEs.
- The resource pool configuration(s) are provided by the gNB using higher layer signaling or pre-configured to the S-UE
  - The S-UE is not allowed to modify the provided resource pool configuration(s)
- It is assumed that the resource pool(s) configured by gNB will have higher priority than the resource pool(s) configured the S-UE.
- It is assumed that group formation is handled by network or higher layers.
  - Selection of the S-UE and member UE(s) are performed by the gNB

Friday
Agreements:

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In the context of Mode-2(d), NR V2X supports the following functionality:

- A UE informs gNB about group members and gNB provides individual resource pool configuration and/or individual resource configuration through the same UE to each group member UE within the same group. It does not require connection between member UE and gNB
  - The UE cannot modify the configuration provided by gNB
  - Higher layer signaling is to be used to provide the configuration. No physical layer signaling is used
- FFS if one or both options are supported (i.e. resource pool configuration(s) or resource configuration)
- FFS which functionality defined as a part of Mode-2 is applicable for this feature
- This functionality is up to UE capability(ies)

R1-1901540 Sidelink resource allocation mode 2 Huawei, HiSilicon
R1-1903337 Discussion on sidelink resource allocation mechanism vivo (rev of R1-1901685)
R1-1901812 On sidelink resource allocation mechanism MediaTek Inc.
R1-1901844 Evaluation of NR V2X Mode 2 Resource Allocation Fraunhofer HHI, Fraunhofer IIS
R1-1901880 Analysis of Mode 2 resource schemes on sidelink ZTE, Sanechips
R1-1901898 Resource allocation mechanism and performance analysis AT&T
R1-1901933 Discussion on resource allocation mechanism for NR V2X LG Electronics
R1-1901945 Geographic Information based Dynamic TFRP Resource Selection Procedure in NR-V2X Fujitsu
R1-1901995 Discussion on resource allocation mechanism in NR V2X CATT
R1-1902131 Support for Reservation in Mode 2 Kyocera Corporation
R1-1902158 Resource allocation mechanism in NR V2X Lenovo, Motorola Mobility
R1-1902175 Discussion on NR V2X resource allocation mechanism Sony
R1-1902203 Discussion on resource allocation mechanism in NR V2X Panasonic
R1-1902276 On resource allocation mechanisms for NR V2X Samsung
R1-1902389 Discussion on UE autonomous RA in NR-V2X OPPO
R1-1902403 Discussion on Sidelink resource management techniques for NR V2X communication ITRI
R1-1902446 Consideration on Mode 2 NR-V2X sidelink communication ASUSTEK COMPUTER (SHANGHAI)
R1-1902484 Resource allocation schemes for NR V2X sidelink communication Intel Corporation
R1-1902576 On Sidelink Resource Allocation Nokia, Nokia Shanghai Bell
R1-1902598 Sidelink Resource Allocation Mechanism for NR V2X InterDigital, Inc.
R1-1902639 Discussion on sidelink resource allocation Asia Pacific Telecom co. Ltd
R1-1902695 Resource allocation mechanism for NR V2X NEC
R1-1902697 Remaining issues on NR Sidelink resource allocation for V2X HEPTA 7291
R1-1902713 On resource allocation of V2x communications Xiaomi Communications
R1-1902722 Discussion on resource allocation for Mode-2 Spreadtrum Communications
R1-1902762 Considerations on NR V2X Resource allocation mechanism Apple Inc.
R1-1902801 Sidelink resource allocation mechanism for NR V2X NTT DOCOMO, INC.
R1-1902900 Discussion on SL resource allocation KDDI Corporation (rev of R1-1902831)
R1-1903345 Sidelink resource allocation mechanism for NR V2X Qualcomm Incorporated (rev of R1-1902997)
R1-1903156 On Sidelink Resource Allocation Convida Wireless
R1-1903166 Resource allocation procedures for Mode 2 Ericsson
R1-1903397 Feature Lead Summary for NR-V2X AI - 7.2.4.1.4 Resource Allocation Mechanism Intel

7.2.4.1.5 Other

Including any other aspects necessary for sidelink unicast/groupcast/broadcast

R1-1901538 Discussion on reference signal for sidelink control and data channel design Huawei, HiSilicon
R1-1901541 System level evaluations on sidelink for NR V2X Huawei, HiSilicon
R1-1901542 Link level evaluations on sidelink for NR V2X Huawei, HiSilicon
R1-1901686 System level evaluations on sidelink for NR V2X vivo
R1-1901831 Waveform evaluations for V2X sidelink Mitsubishi Electric RCE
R1-1901899 Additional field trial results from 39GHz vehicle to vehicle communication AT&T
R1-1901946 Discussion on basic resource allocation methods for NR V2X sidelink communication Fujitsu
R1-1901947 Further considerations on NR V2X resource selection procedure of mode 2(a) in mixture scenario Fujitsu

R1-1901948 Further considerations on Mode 1 resource allocation for NR-V2X Fujitsu
R1-1902277 On AGC settling issues with evaluation results for NR V2X Samsung
R1-1902278 Considerations on sidelink HARQ procedure Samsung
R1-1902279 Considerarions on Sidelink CSI Samsung
R1-1902280 On low-latency sidelink resouce allocation and scheduling Samsung
R1-1902281 Considerations on sidelink RLM Samsung
Late submission
R1-1902282 On DMRS design for NR V2X Samsung
Late submission
R1-1902283 System level evaluations for NR V2X sidelink resource allocation Samsung
R1-1902285 Considerations on channel structures in sensing slots for NR V2X sidelink Samsung
R1-1902286 Considerations on Sidelink power control Samsung
R1-1902287 On sidelink feedback channel format Samsung
R1-1902404 Considerations on Design issues for NR V2X unicast, groupcast, broadcast ITRI
R1-1902542 System level simulation results on NR sidelink communication Sony
R1-1902577 Discussions on DMRS for NR sidelink Nokia, Nokia Shanghai Bell
R1-1902599 On Waveform for NR V2X Sidelink InterDigital, Inc.
R1-1902600 Performance Evaluation of NR V2X S-SSB Structures InterDigital, Inc.
R1-1902601 Performance Evaluation of DMRS for NR V2X InterDigital, Inc.
R1-1902763 Considerations on NR V2X scheduling mechanism Apple Inc.
R1-1902916 Discussion on Sidelink groupcast HARQ Nokia, Nokia Shanghai Bell
R1-1902923 Considerations on Scrambling Issue for NR V2X Unicast Sidelink CAICT
R1-1903068 Sidelink discovery for NR V2X Huawei, HiSilicon
R1-1903069 Frame and slot structure for sidelink Huawei, HiSilicon
R1-1903070 Sidelink CSI Huawei, HiSilicon
R1-1903071 Design and contents of PSCCH and PSFCH Huawei, HiSilicon
R1-1903072 BWP operation for V2X sidelink Huawei, HiSilicon
R1-1903074 Power control and power sharing for V2X sidelink Huawei, HiSilicon
R1-1903075 Beamforming for V2X sidelink for FR1 and FR2 Huawei, HiSilicon
R1-1903076 Sidelink measurements Huawei, HiSilicon, Samsung
R1-1903167 System level evaluations of NR V2X sidelink Ericsson
R1-1903168 Clustering and Cluster Head Election Schemes for In-Coverage and Out-of-Coverage UEs Ericsson
R1-1903173 On SCI and SFCI formats Ericsson
R1-1903174 Configuration details for NR V2X scenarios Ericsson
R1-1903175 Details on CSIT acquisition for SL unicast Ericsson
R1-1903176 On L1 measurements for sidelink Ericsson
R1-1903178 On the NR sidelink discovery Ericsson
R1-1903180 Link level evaluations of NR PSCCH Ericsson
R1-1903181 Link level evaluations of NR PSSCH Ericsson
R1-1903185 On link adaptation for sidelink groupcast Ericsson

7.2.4.2 Evaluation of Uu for advanced V2X use cases

R1-1903380 Feature lead summary on Evaluation of Uu for advanced V2X use cases Ericsson
R1-1903490 Feature lead summary#2 on Evaluation of Uu for advanced V2X use cases Ericsson
Decision: The document is noted.

Conclusion:

- For type 1 configured grant, discuss signalling details during WI (if included in the WI).

Agreement:

- UE reports of assistance information to the gNB include, at least: traffic periodicity, timing offset, and message size for Uu V2X and sidelink V2X traffic (at least for periodic traffic).

Conclusion:
- Capture in TR 38.885 that NR Uu broadcast/multicast are beneficial at least in terms of resource utilization for V2X use cases in some scenarios.

Conclusion
- To include for TR conclusion section:
  - In terms of supporting advanced V2X uses cases over the LTE Uu interface, some possible enhancements were studied but none are recommended.

Conclusion:
- Add a reference in TR 38.885 stating that the remote driving use case is handled in TR 38.824.

R1-1901543	NR Uu and LTE Uu support and enhancement for advanced V2X use cases	Huawei, HiSilicon
R1-1901687	Discussion on NR Uu enhancements for NR-V2X	vivo
R1-1901813	Enhancements to NR Uu for advanced V2X use cases	MediaTek Inc.
R1-1901934	Discussion on NR Uu for advanced V2X use cases	LG Electronics
R1-1901996	Further considerations on Uu enhancement in NR V2X	CATT
R1-1902140	About Uu enhancements for advanced V2X use cases	ZTE, Sanechips
R1-1902288	On Uu for advanced V2X use cases	Samsung
R1-1902390	Further enhancements on NR Uu for NR-V2X	OPPO
R1-1902485	Analysis of NR Uu interface to support advanced V2X use cases	Intel Corporation
R1-1902578	On Uu for advanced V2X use cases	Nokia, Nokia Shanghai Bell
R1-1902602	On NR Uu enhancements for advanced V2X use cases	InterDigital, Inc.
R1-1902998	Uu for advanced V2X use cases	Qualcomm Incorporated
R1-1903169	NR Uu enhancements for advanced V2X use cases	Ericsson

7.2.4.3 Uu-based sidelink resource allocation/configuration

Including LTE/NR controlling NR sidelink & NR Uu controlling LTE sidelink

R1-1903572 **Feature lead summary#2 for AI 7.2.4.3: Uu-based sidelink resource allocation/configuration** **Huawei**

Decision: The document is noted.

Agreements:
- Scheduling by gNB using RRC for LTE sidelink scheduled mode is supported from RAN1 perspective under the premise that there is sufficient time for coordination between the NR and LTE modules. No DCI to activate/release
  - RRC message delivers the SPS grant configuration and releases the SPS configuration.
  - Support of this scheduling mode is subject to UE capability (may or may not have capability for both LTE & NR)
  - Note: some specification LTE change is needed to support the reception of a grant through RRC
    - RRC message contains mode 3 grant content and timing
    - Up to the Editor to capture it as mode 3 or new LTE sidelink mode
  - No intention to have additional NR & LTE specification change (other than those described above) for this function in Rel-16
- RAN1 studied the feasibility of SPS scheduling by gNB for LTE sidelink with DCI activation/release, but there is no consensus to support it

R1-1901949 **Dynamic Sidelink Bi-mode Transmission in NR-V2X** **Fujitsu**
- Observation-1: In the periodic traffic mode, the communication range based bi-mode mechanism can almost perfectly control the PRR with the controllable latency.
- Observation-2: In the aperiodic traffic mode, the communication range based bi-mode mechanism can roughly control the PRR with the controllable latency. The performance can be further improved by the dynamical resource pool control mechanism.
- Proposal-1: The dynamic SL bi-mode transmission procedure, by involving SL HARQ feedback mechanism, should be standardized, in order to fulfill both latency and reliability requirements. The mode switching is dynamically performed

either between mode-2(a) and mode-1 if SL retransmission is controlled by gNB, or between mode-2(a) and mode-2(d) if SL retransmission is controlled by scheduling UE.

- Proposal-2: Dynamical resource pool for bi-mode transmission, relying on long/short-term control mechanism, should be considered in the scenarios of both gNB and scheduling UE controlled SL initial transmission and retransmission. The long-term resource pool Δ_m as a RRC configuration parameter and the short-term resource offset $\Delta_{m,n}$ as a L1-control parameter should be newly standardized.
- Proposal-3: The resource pool $\Delta_{\text{init},m}$ originally configured for initial transmission can be temporarily selected for retransmission, once the transmitter UE is not able to utilize the resource pool $\Delta_{\text{retx},m}$.

Decision: The document is noted.

R1-1901544	Discussion on Uu-based sidelink resource allocation/configuration	Huawei, HiSilicon
R1-1901688	Enhancements of Uu link to control sidelink	vivo
R1-1901814	Uu based SL configuration and resource allocation	MediaTek Inc.
R1-1901845	NR V2X Uu-based Resource Allocation	Fraunhofer HHI, Fraunhofer IIS
R1-1901879	Discussion on Uu based resource allocation/configuration for NR V2X	ZTE, Sanechips
R1-1901900	Enhancements of NR Uu to control sidelink	AT&T
R1-1901935	Discussion on Uu-based sidelink resource allocation/configuration	LG Electronics
R1-1901997	Discussion On Uu-based sidelink resource allocation/configuration in NR V2X	CATT
R1-1902159	Discussion on Uu-based sidelink resource allocation	Lenovo, Motorola Mobility
R1-1902204	Discussion on sidelink resource allocation in mode 1 for NR V2X	Panasonic
R1-1902289	On Uu-based sidelink resource allocation and configuration	Samsung
R1-1902331	Discussion on Uu-based sidelink resource allocation/configuration	CMCC
R1-1902388	Discussion of Uu-based sidelink resource allocation and configuration	OPPO
R1-1902405	Considering on NR Uu for Resource Configuration on controlling NR sidelink	ITRI
R1-1902486	Uu-based sidelink resource allocation for V2X use cases	Intel Corporation
R1-1902579	On Uu-based sidelink resource allocation/configuration	Nokia, Nokia Shanghai Bell
R1-1902603	Discussion on Uu-based Sidelink Resource Allocation and Configuration	InterDigital, Inc.
R1-1902725	Consideration on NR Uu-based sidelink resource allocation	Spreadtrum Communications
R1-1902802	Uu-based NR sidelink resource allocation/configuration for NR V2X	NTT DOCOMO, INC.
R1-1902999	Enhancements of LTE Uu and NR Uu to control NR sidelink	Qualcomm Incorporated
R1-1903170	Remaining details on Uu based resource allocation for SL	Ericsson

7.2.4.4 QoS management

Including congestion control

R1-1903330	Feature Lead Summary for 7.2.4.4 QoS Management	Nokia

Decision: The document is noted.

Conclusion:

- It is deemed beneficial to report Sidelink Congestion Metrics(s) to a gNB
  - Consequently, it is recommended to specify the corresponding details in the WI phase

Proposal:

- Include a "priority/QoS" field in PHY (e.g., in the SCI, for resource selection, etc.) for NR V2X sidelink.

Friday

R1-1903649	**Feature Lead Summary #2 for 7.2.4.4 QoS Management**	**Nokia**

Decision: The document is noted.

R1-1901545	QoS management for NR V2X	Huawei, HiSilicon
R1-1901829	Discussion on QoS management for NR V2X	vivo
R1-1901877	Discussion on QoS management	ZTE, Sanechips

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R1-1901901 On congestion level indication in resource pool configuration AT&T
R1-1901936 Discussion on QoS management for NR V2X LG Electronics
R1-1901998 QoS management in NR V2X CATT
R1-1902104 QoS Management for NR V2X Fraunhofer IIS, Fraunhofer HHI
R1-1902205 Discussion on QoS management for NR V2X Panasonic
R1-1902290 On QoS management for NR V2X Samsung
R1-1902391 Further considerations on QoS management for NR-V2X OPPO
R1-1902406 Considerations on issue for resource sharing among different QoS levels ITRI
R1-1902487 QoS and congestion control for NR V2X sidelink communication Intel Corporation
R1-1902580 On QoS Management Nokia, Nokia Shanghai Bell
R1-1902604 Discussion on QoS Management InterDigital, Inc.
R1-1902715 Considerations on sidelink QoS management Spreadtrum Communications
R1-1903000 Design aspects and requirements for QoS Qualcomm Incorporated
R1-1903171 Remaining RAN1 issues for NR SL QoS Ericsson

7.2.4.5 Coexistence

Including feasibility of coexistence mechanisms & advanced V2X services provided by NR V2X under co-existence

R1-1903594 **Summary of Coexistence Aspects in NR-V2X Study Qualcomm**
Decision: The document is noted.

Agreements:
- From RAN1 point of view, short term TDM solutions for NR and LTE V2X in-device coexistence is considered to be feasible for a UE when the load for the UE from LTE side and from NR side is at or below an acceptable level
- For each occurrence of Tx/Tx overlap and of Tx/Rx overlap, one RAT is prioritized over another
  - High-level principles of prioritization (e.g., BSM is deemed to have a higher priority, etc.) of LTE/NR can be discussed during the WI phase, while it is expected that detailed solutions may be left for implementation

GM has concerns over the "e.g." in the agreements above.

Agreements:
- From RAN1 point of view, for both intra-band and inter-band Tx/Tx FDM solutions for in-device coexistence are considered to be feasible, at least if the following conditions are met:
  - For the intra-band case for dynamic power sharing, NR and LTE transmissions are fully overlapped in the time domain, i.e., NR transmissions have to span the entire LTE TTI such that the total power across the transmissions is constant.
- For intra-band and inter-band FDM dynamic power sharing solutions, the following additional conditions apply:
  - Subframe boundary alignment is required between LTE and NR V2X sidelinks
  - Both LTE and NR V2X sidelinks are aware of the time resource index (e.g., DFN for LTE) in both carriers
- For purposes of dynamic power sharing between LTE and NR Tx,
  - High-level principles of prioritization (e.g., BSM is deemed to have a higher priority, etc.) of LTE/NR can be discussed during the WI phase, while it is expected that detailed solutions may be left for implementation

Agreements:
- Rx/Rx coexistence are feasible for intra- & inter-band from RAN1 point of view
  - High-level principles of Rx/Rx coexistence of LTE/NR can be discussed during the WI phase, while it is expected that detailed solutions may be left for implementation

Agreements:
- Based on the study from physical layer specification perspective, in-device coexistence of LTE and NR sidelink is feasible for intra- & inter-band under the respective conditions & solutions for TX/TX, TX/RX, & RX/RX
  - In the TR, also provides a reference to the respective sections

R1-1901546 Discussion on co-existence for NR V2X and LTE V2X Huawei, HiSilicon
R1-1901689 On coexistence of NR and LTE sidelink for V2X vivo

R1-1901815 Coexistence mechanisms between NR-V2X and LTE-V2X MediaTek Inc.
R1-1901878 Coexistence between NR V2X and LTE V2X ZTE, Sanechips
R1-1901937 Discussion on coexistence mechanism for NR V2X LG Electronics
R1-1901999 Discussion on coexistence of NR V2X and LTE V2X CATT
R1-1902160 Discussion on co-existence for NR-V2X and LTE-V2X Lenovo, Motorola Mobility
R1-1902206 Discussion on coexistence between LTE sidelink and NR sidelink for NR V2X Panasonic
R1-1902291 On Coexistence between LTE and NR PC5 Samsung
R1-1902392 Further considerations on NR and LTE V2X coexistence OPPO
R1-1902488 In-device coexistence for NR V2X sidelink communication Intel Corporation
R1-1902581 Discussion on coexistence between NR sidelink and LTE sidelink Nokia, Nokia Shanghai Bell
R1-1902605 Discussion on Coexistence Between LTE and NR Sidelinks InterDigital, Inc.
R1-1902696 Discussion on the coexistence between NR and LTE sidelinks NEC
R1-1902803 Updated views on LTE and NR sidelink coexistence NTT DOCOMO, INC.
R1-1903001 Co-existence aspects for NR-V2X and LTE-V2X Qualcomm Incorporated
R1-1903172 Remaining details on in-device coexistence issues for SL V2X Ericsson

7.2.4.6 Other

Including any remaining aspects of simulation assumptions

R1-1902554 On Coexistence Between LTE and NR Side-links DISH Network
R1-1903066 LTE Uu support for advanced V2X use cases. Huawei, HiSilicon
R1-1903067 Discussion on NR Uu to control LTE sidelink Huawei, HiSilicon
R1-1903073 Discussion on LTE Uu to control NR sidelink Huawei, HiSilicon, Vodafone
R1-1903562 V2X antenna model and pathloss correction Fraunhofer HHI, Fraunhofer IIS, Huawei, HiSilicon (rev of R1-1903130)
R1-1903177 On NR sidelink resources Ericsson
R1-1903179 On HARQ support for mode-1 Ericsson
R1-1903182 Text Proposal for TR Conclusion Ericsson
R1-1903183 Discussion on NR V2X Work Item scope Ericsson
R1-1903184 On Interface Selection Ericsson
R1-1903579 TP for TR 38.885 on Uu multicast/broadcast Huawei, HiSilicon, Samsung (rev of R1-1903188)

7.2.5 Cross Link Interference (CLI) handling and Remote Interference Management (RIM) for NR

NR_CLI_RIM-core; WID in RP-182864. Please refer to the WID for detailed scoping

R1-1903630 Chairman's notes of AI 7.2.5 Cross Link Interference (CLI) handling and Remote Interference Management (RIM) for NR Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

Friday
Editors to prepare Rel-16 CRs for CLI/RIM WI by March 27th, for comments and endorsement by RAN1 by April 3rd
Email discussion/approval on RRC & backhaul parameters & LSs by 03/06, to be commented and endorsed 03/13 (Xiaodong, CMCC).

7.2.5.1 Cross-link interference measurements and reporting at a UE

R1-1903453 Offline Discussion Summary#1 of CLI topics LG Electronics

Agreement
In order to perform SRS transmission for CLI measurement,
- The TA value applied to the corresponding UL symbol is the same as the latest TA for regular UL symbols transmitted to the gNB.

Conclusion

For SRS-RSRP measurement, the UE is not required to perform time tracking or time adjustment other than a constant offset relative to its own DL timing.

- The constant offset is derived by UE implementation.

Agreement

For CLI measurement, PDSCH rate matching can be applied. For PDSCH rate matching configuration,

- Rel-15 functionalities for PDSCH rate matching are applied, and no new PDSCH rate matching configuration is introduced in Rel-16 for CLI measurement.

Note: Existing rate matching resources can be re-used.

Note: Depending on UE capability discussions, UE may not be required to assume that PDSCH is FDMed with SRS measurement resource

Agreement

In information element of resource configuration for CLI-RSSI measurement, at least following parameters are included

- Number of PRBs and start PRB index for subband indication
  - Note: Configured PRBs are contiguous.
  - Note: The exact number of PRBs is up to RAN4.
- Number of OFDM symbols and first OFDM symbol index in a slot
  - Note: Configured OFDM symbols are contiguous.
  - Note: The exact number of OFDM symbol is up to RAN4.

Note: Depending on UE capability discussions, UE may not be required to assume that PDSCH is FDMed with CLI-RSSI measurement resource(s)

R1-1903454 **Offline Discussion Summary#2 of CLI topics** **LG Electronics**

Agreement

In information element of resource configuration for CLI-RSSI measurement, following values for slot configuration is used.

- slots10 INTEGER (0..9), slots20 INTEGER (0..19), slots40 INTEGER (0..39), slots80 INTEGER (0..79), slots160 INTEGER (0..159), slots320 INTEGER (0..319), slots640 INTEGER (0..639)}
- Note: Network configures slot duration for CLI-RSSI measurement which is corresponded with one value of periodicity among the periodicity set (i.e. {10ms, 20ms, 40ms, 80ms, 160ms, 320ms, 640ms})

Table. CLI-RSSI measurement periodicity

SCS(kHz) Slot duration	15k Hz	30 kHz	60 kHz	120 kHz
10 slots	10 msec			
20 slots	20 msec	10 msec		
40 slots	40 msec	20 msec	10 msec	
80 slots	80 msec	40 msec	20 msec	10 msec
160 slots	160 msec	80 msec	40 msec	20 msec
320 slots	320 msec	160 msec	80 msec	40 msec
640 slots	640 msec	320 msec	160 msec	80 msec

Agreement

In information element of resource configuration for CLI-RSSI measurement, reference subcarrier spacing for CLI-RSSI measurement is included.

- All subcarrier spacings supported in Rel-15 NR for FR1, FR2
- Subcarrier spacing is a reference unit of time/frequency resource configuration.
- UE operates CLI measurement within the active BWP.
  - The subcarrier spacing for CLI-measurement resource configuration can be same or different from the SCS of the active BWP.

Agreement

One or multiple resources for CLI-RSSI measurement can be configured

- Maximum number of measurement resource for CLI-RSSI measurement is 64.

Agreement

For SRS transmission for SRS-RSRP measurement purpose, no new SRS resource set usage is introduced

Agreement
For SRS-RSRP measurement, one or more SRS resource per serving cell can be configured

Agreement
For SRS-RSRP, the total number of SRS resources to be monitored by a UE should not exceed 32.

Agreement
QCL assumption on CLI-RSSI and SRS-RSRP interference measurement resources is up to UE implementation

R1-1903455 **Offline Discussion Summary#3 of CLI topics** **LG Electronics**

Conclusion
When UE performs CLI-RSSI measurement, the measurement timing could be derived by UE implementation within OFDM symbols configured for CLI-RSSI measurement.
- No RAN1 specification impact

R1-1903639 **[DRAFT] LS on UE-UE CLI measurement/reporting and Network coordination mechanism for CLI** **LG Electronics**
Agreement: The draft LS is endorsed and final LS is approved in R1-1903677 with the following modification:
- Change the following text:

"For futher discussion
When UE performs CLI-RSSI measurement, the measurement timing could be derived by UE implementation within OFDM symbols configured for CLI-RSSI measurement."
To
"Conclusion
When UE performs CLI-RSSI measurement, the measurement timing could be derived by UE implementation within OFDM symbols configured for CLI-RSSI measurement.
- No RAN1 specification impact"

R1-1901549 Discussion on UE-UE measurement and reporting for CLI management Huawei, HiSilicon
R1-1901690 UE-to-UE CLI measurements vivo
R1-1901902 UE-UE CLI measurements and reporting AT&T
R1-1901969 Discussion on remaining issues of CLI measurement and reporting ZTE Corporation
R1-1902000 Details on UE CLI measurement and reporting CATT
R1-1902083 Discussion on remaining issue of UE-to-UE CLI measurement and reporting at a UE LG Electronics
R1-1902292 Cross-link interference measurements and reporting at a UE Samsung
R1-1902332 Discussion on UE-UE cross link interference measurements CMCC
R1-1902489 CLI measurement and reporting at a UE Intel Corporation
R1-1903219 On UE-to-UE cross-link interference measurement and reporting CEWiT (rev of R1-1902525)
R1-1902672 Details of UE CLI measurements Nokia, Nokia Shanghai Bell
R1-1902706 Discussion on CLI measurement and reporting OPPO
R1-1903002 Signal transmission and measurement for UE-to-UE CLI Qualcomm Incorporated
R1-1903032 Remaining issues for CLI measurement and reporting Ericsson
R1-1903452 Feature Lead Summary of CLI topics LG Electronics

7.2.5.2 Network coordination mechanism(s) for CLI

Agreement
For "Intended DL/UL configuration", per-slot based OFDM symbol level DL/UL region indication is supported.
- Periodicity and numerology (i.e. subcarrier spacing, CP length) are configured.
- A list containing multiple entries of the following:

- Information for indicating slot within a periodicity is configured.
- DL/UL region indication (i.e. all DL or all UL or number of DL symbols and/or number of UL symbols in a slo t) is configured for each slot

R1-1901550	Discussion on network coordination mechanisms for CLI management	Huawei, HiSilicon
R1-1901691	Network coordination for CLI management	vivo
R1-1901903	Network coordination for CLI mitigation	AT&T
R1-1901970	Discussion on remaining issues of network coordination mechanisms	ZTE Corporation
R1-1902084	Discussion on remaining issue of network coordination and information exchange for CLI	LG Electronics
R1-1902293	Network coordination mechanism(s) for CLI	Samsung
R1-1902333	Discussion on backhaul information exchange for CLI management	CMCC
R1-1902490	Network coordination mechanisms for CLI	Intel Corporation
R1-1902526	On Network coordination mechanisms for CLI measurement	CEWiT
R1-1902673	Network-based coordination of UL/DL configurations	Nokia, Nokia Shanghai Bell
R1-1902707	Discussion on network coordination mechanism(s) for CLI	OPPO
R1-1903003	Network coordination and gNB information exchange for CLI	Qualcomm Incorporated
R1-1903033	Remaining issues for network coordination mechanism	Ericsson

7.2.5.3 RIM RS resource and configurations

R1-1903407 Proposal summary for NR RIM CMCC

R1-1903589 Final Proposal summary for NR RIM CMCC

Agreement
Proposal 1 in R1-1903589 is agreed.

Agreement
Proposal 2 in R1-1903589 is agreed.

Agreement
Proposal 3 in R1-1903589 is agreed.

Agreement
Proposal 4 in R1-1903589 is agreed.

Agreement
Proposal 5 in R1-1903589 is agreed.

Agreement
Proposal 6 in R1-1903589 is agreed. The agreement is further updated to Proposal 6 in R1-1903614.

R1-1903614 Final Proposal summary for NR RIM CMCC

R1-1901547	Discussion on RIM-RS configuration	Huawei, HiSilicon
R1-1902001	Remaining details on RIM RS design	CATT
R1-1902028	Discussion on RIM RS resource and configurations	ZTE Corporation
R1-1902085	Discussion on remaining issue of RIM RS resource and configuration	LG Electronics
R1-1902294	RIM RS resource and configurations	Samsung
R1-1902334	Further discussion on configuration of RIM RS	CMCC
R1-1902491	Remaining details of RIM-RS configuration	Intel Corporation
R1-1902674	Discussion on RIM-RS configurations	Nokia, Nokia Shanghai Bell

R1-1903034 On RIM-RS resource and configurations Ericsson

7.2.5.4 OAM functions to support RIM operation

Agreement
Proposal 7 in R1-1903589 is agreed.

Agreement
Proposal 8 in R1-1903589 is agreed. The agreement is further updated to Proposal 8 in R1-1903614.

R1-1901548 Discussion on OAM functions and RIM mechanisms Huawei, HiSilicon
R1-1902029 Discussion on remaining issues of OAM functions to support RIM ZTE Corporation
R1-1902086 Discussion on remaining issue of OAM functions to support RIM operation LG Electronics
R1-1902295 OAM functions to support RIM operation Samsung
R1-1902335 Further discussion on OAM functions to support RIM operation CMCC
R1-1902492 Remaining details of OAM functions for RIM Intel Corporation
R1-1902675 Discussion on OAM functions for NR RIM Nokia, Nokia Shanghai Bell
R1-1903035 On OAM functions to support RIM operation Ericsson
R1-1903681 Configuration of RIM-RS monitoring Intel

7.2.5.5 Other

R1-1902068 Update of evaluation results CATT
R1-1903036 Evaluation results for CLI mitigation schemes Ericsson
R1-1903037 Multi-slot CQI for CLI measurement Ericsson
R1-1903215 Introduction of CLI RSSI and SRS-RSRP measurement in TS 38.215 Huawei, HiSilicon

7.2.6 Study on Physical Layer Enhancements for NR URLLC

FS_NR_L1enh_URLLC; SID in RP-182089. Please refer to the SID for detailed scoping

R1-1901616 Text proposal on capturing examples of detailed use case and requirements for Rel-16 NR URLLC in TR 38.824 Huawei, HiSilicon
Decision: The document is noted. Discuss further offline
Thursday
R1-1903531 Text proposal on capturing examples of detailed use case and requirements for Rel-16 NR URLLC in TR 38.824 Huawei
Decision: The document is endorsed.

R1-1902932 TR 38.824 Study on physical layer enhancements for NR ultra-reliable low latency communication (URLLC) Huawei
Updated TR 38.824 to reflect the agreements reached in RAN1#AH 1901 meeting.
Discussion: Ericsson commented that TR includes more scenarios than effectively evaluated by RAN1 – What's the meeaning of having these extra materials. Also a couple of editorials
Decision: The document is endorsed with one change in Section 6.3.2 "within a slot" – the new endorsed TP is captured in R1-1903438 as version 1.0.2.

Friday
R1-1903798 TR 38.824 v1.1.0 for Study on physical layer enhancements for NR ultra-reliable low latency communication (URLLC) Huawei

Agreements:
- To include the following recommendations in the TR:

For PDCCH enhancement, it is recommended to support the following in Rel-16:
- DCI format(s) with configurable sizes for some fields and potential reduction of the number of bits for some field(s) compared to Rel-15 DCI, while enabling the minimum DCI size target a reduction of 10~16 bits less than the DCI format size of Rel-15 fallback DCI and the maximum DCI size can be larger than Rel-15 fallback DCI, and provide the possibility to align with the size of the Rel-15 fallback DCI (including possible zero padding if any).
- Increased PDCCH monitoring capability on at least the maximum number of non-overlapped CCEs per slot for channel estimation for Rel-16 NR URLLC for at least one SCS subject to some restrictions, including at least explicit limitation on the maximum number of BDs/non-overlapping CCEs per monitoring occasion and/or per monitoring span, and the set of applicable SCS(s).

For UCI enhancement, it is recommended to support the following in Rel-16:
- More than one PUCCH for HARQ-ACK transmission within a slot.
- At least two HARQ-ACK codebooks can be simultaneously constructed for a Rel-16 UE, intended for supporting different service types for a UE.

For enhancements to scheduling/HARQ, it is recommended to support the following in Rel-16:
- Out-of-order HARQ-ACK: HARQ-ACK associated with the second PDSCH with HARQ process ID x received after the first PDSCH with HARQ process ID y (x != y) can be sent before the HARQ-ACK of the first PDSCH on the active BWP of a given serving cell
- Out-of-order PUSCH scheduling: A UE can be scheduled with a second PUSCH associated with HARQ process x starting earlier than the ending symbol of the first PUSCH associated with HARQ process y (x != y) with a PDCCH that does not end earlier than the ending symbol of first scheduling PDCCH on the active BWP of a given serving cell

For inter UE Tx prioritization/multiplexing, it is recommended to support UL cancelation scheme and enhanced UL power control scheme in Rel-16.

For enhanced UL configured grant transmission, it is recommended to support multiple active configured grant type 1 and type 2 configurations for a given BWP of a serving cell in Rel-16.

For PUSCH enhancements, it is recommended to support enhancements for both grant-based PUSCH and configured grant based PUSCH in Rel-16, to enable one UL grant scheduling two or more PUSCH repetitions that can be in one slot, or across slot boundary in consecutive available slots.

Email approval for TR update till March 7th – Chengyan (Huawei)

7.2.6.1 Layer 1 enhancements

7.2.6.1.1 Potential enhancements to PDCCH

R1-1903349 **Summary of 7.2.6.1.1 Potential enhancements to PDCCH Huawei**
Decision: The document is noted.

Agreements:
Support increased PDCCH monitoring capability on at least the maximum number of non-overlapped CCEs per slot for channel estimation for Rel-16 NR URLLC for at least one SCS subject to the following restrictions:
- Explicit limitation on the maximum number of BDs/non-overlapping CCEs per monitoring occasion and/or per monitoring span, and
- The set of applicable SCS(s) to be finalized during the WI phase
- Additional restrictions (e.g., impact # of CCs if any, potential limitations on PDSCH/PUSCH processing, impact of wideband RS for CCE counting if any, etc.) can be considered during the WI phase

Agreement:
- Enhancements for PDCCH monitoring capability on the maximum number of monitored PDCCH candidates per slot (with potential restrictions) for Rel-16 NR URLLC can be further considered in work item phase.

Wednesday session
R1-1903532 **Summary of 7.2.6.1.1 Potential enhancements to PDCCH Huawei**
Decision: The document is noted.

Agreements:
For the DCI format(s) (may or may not be new format, to be finalized in the WI phase) scheduling Rel-16 NR URLLC,

- Support configurable sizes for some fields, while
  - The maximum DCI size can be larger than Rel-15 fallback DCI
  - The minimum DCI size target a reduction of 10~16 bits less than the DCI format size of Rel-15 fallback DCI
  - Provide the possibility to align with the size of the Rel-15 fallback DCI (including possible zero padding if any)
- Support at least one of the following configurable fields – the set of configurable field(s) including bitwidths to be finalized during the WI phase (which may further depend on DL vs. UL assignments)
  - Antenna port(s) [0~2 bits]
  - Transmission configuration indication [0~3 bits]
  - Rate matching indicator [0~2 bits]
  - SRS request [0~3 bits]
  - PRB bundling size indicator [0~1 bit]
  - Carrier indicator [0~3 bits]
  - CSI request [0~3 bit]
  - ZP CSI-RS triggering [0~2 bits]
  - Beta offset indicator [0~2 bits]
  - SRS resource indicator [0~4 bits]
  - Repetition factor [0~2 bits]
  - Priority indication [0~3 bits]
  - Note: Other field(s) can be considered if needed
- Note: This doesn't imply the necessity to increase the DCI size budget (i.e. "3 +1") compared to Rel-15

Proposal:

- Reduce the SPS periodicities for PDSCH to down to 1 slot

R1-1901557	PDCCH enhancements for URLLC	Huawei, HiSilicon
R1-1901593	PDCCH Enhancements for NR URLLC	Ericsson
R1-1901692	PDCCH enhancements for URLLC	vivo
R1-1901767	On PDCCH enhancements for URLLC	ZTE
R1-1901822	Evaluations and enhancements of NR PDCCH for URLLC	MediaTek Inc.
R1-1901909	On Potential enhancements to PDDCH for URLLC	AT&T
R1-1901950	On the PDCCH enhancements for NR URLLC	Nokia, Nokia Shanghai Bell
R1-1902002	PDCCH enhancements for URLLC	CATT
R1-1902045	PDCCH enhancements for NR URLLC	LG Electronics
R1-1902126	PDCCH enhancements for URLLC	Sequans Communications
R1-1902176	Remaining considerations on compact DCI	Sony
R1-1902296	DL Control Enhancements for URLLC	Samsung
R1-1902399	PDCCH enhancements for NR URLLC	Panasonic Corporation
R1-1902414	PDCCH enhancements for NR URLLC	Asia Pacific Telecom co. Ltd
R1-1902416	PDCCH enhancement for URLLC	OPPO
R1-1902441	PDCCH enhancements for URLLC	ETRI
R1-1902493	On PDCCH enhancements for eURLLC	Intel Corporation
R1-1902606	On Potential PDCCH enhancements for URLLC	InterDigital, Inc.
R1-1902716	Discussion on PDCCH enhancements for URLLC	Spreadtrum Communications
R1-1902804	Potential enhancements to PDCCH	NTT DOCOMO, INC.
R1-1903004	PDCCH Enhancements for eURLLC	Qualcomm Incorporated

7.2.6.1.2 Potential enhancements to UCI

R1-1903431 Summary of offline discussion on UCI enhancements for URLLC OPPO (rev of R1-1903327)
Further revised in R1-1903443
Decision: The document R1-1903443 is noted.

Agreements:

Samsung Exhibit 1026, Page 211 of 900

- Rules for the two HARQ-ACK codebooks for supporting different service types should be specified in R16 if the two HARQ-ACK codebooks are due to trranmit in resources overlapping in time
    - FFS details, e.g., multiplexing and/or prioritizing or parallel tx – revisit later this week

Wednesday session

R1-1903472 **Summary offline discussion on UCI enhancements for URLLC** **OPPO**

Decision: The document is noted.

Proposals:

For supporting multiple PUCCHs for HARQ-ACK within a slot in R16, consider following options in the potential WI, with consideration on simultaneous HARQ-ACK codebooks for different service types.

- Opt.1: Sub-slot-based HARQ-ACK feedback procedure
- Opt.2: PDSCH grouping
- Opt.3: Combination of Opt.1 and Opt.2
- FFS: "Codebook-less HARQ" as a complementary to above options

Agreements:

When at least two HARQ-ACK codebooks are simultaneously constructed for supporting different service types for a UE, a HARQ-ACK codebook can be identified based on some PHY indications/properties.

- FFS in potential WI the details of the PHY identification

Thursday session

R1-1903605 **Summary offline discussion on UCI enhancements for URLLC** **OPPO**

Decision: The document is noted.

Proposals:

Capture the observations on A-CSI report on PUCCH triggered by DL-scheduling DCI in the TR:

- Regarding the enhancements over R15 P-CSI,
    - Some companies (Huawei[1])(ZTE[4])(AT&T[6]) observed that A-CSI report is more effient than P-CSI for URLLC.
        - One source (Huawei[1]) observed that 12.7% ~ 15.7% more users can satisfy the 4ms latency with A-CSI reporting triggered by DL-scheduling DCI.
        - Another source (AT&T[6]) showed link-level spectrum efficiency improvement.
    - Two companies (Samsung, Intel) questioned the necessity of A-CSI for URLLC considering:
        - Reliability of CSI reception.
        - Impact of measurement and quantization.
- Regarding the enhancements over R15 A-CSI on PUSCH,
    - Some companies (Huawei[1]) (ZTE[5]) (Sequens[16]) observed that A-CSI report on PUCCH triggered by DL-scheduling DCI can avoid unnecessary UL-scheduling DCI overhead when no UL data needs to be scheduled, and thus reduce DCI overhead.
        - One source (Huawei[1]) observed that 3.1% (with 100p/s packet frequency) or 9.4% (with 200p/s packet frequency) more users can satisfy the 4ms latency requirement if triggering A-CSI reporting via a DL-scheduling DCI rather than via a UL-scheduling grant.
    - Some companies (Intel[16])(LGE[9])(Samsung[13])(MTK[5]) expressed their concerns about A-CSI report on PUCCH triggered by DL-scheduling DCI, including:
        - It only benefits for PDSCH re-transmission and consequent initial transmission for some services, e.g. transport service, thus cannot provide meaningful system benefit.
            - One source (Samsung[13]) observed that, if using CSI feedback for re-transmission, up to 8.8% gain on average throughput and 20.1% gain on 5% throughput can be obtained.
            - Another source (MTK[5]) observed that, the gain of DMRS/PDSCH/PDCCH-based A-CSI measurements on user percentage satisfying latency requirement depend on specific settings of packet size, bandwidth, initial BLER, traffic pattern and load (e.g. in case of a periodic traffic pattern, requests for initial transmissions from four UE's arrive at the same OS from period to period. Each initial transmission have BLER=3%).

- It will increase DL-scheduling DCI overhead.
- It may increase demands to DL processing time, and thus increase the UE complexity.
- It needs to be considered how to multiplex with other UCIs.
- Two companies (Samsung, Intel) assume that the likelihood of link adaptation for PDCCH being correct while link adaptation for PDSCH being incorrect is small. Other companies believe PDCCH and PDSCH have different reliability targets and different interference loading conditions.

Proposal:
- No consensus for supporting A-CSI on PUCCH in R16.

Friday session

R1-1903794 Summary offline discussion on UCI enhancements for URLLC OPPO

Decision: The document is noted.

Agreements:

Observation 1:
- Regarding the benefit of A-CSI,
  - One source (Samsung, R1-1902297) observed that compared to link adaptation only using wideband CSI, 0.1% ~ 8.8% gain on average throughput and -0.7% ~ 20.1% gain on 5% throughput can be obtained by using A-CSI for link adaptation, depending on different cell loadings and code-book-based or ideal precoding is assumed.
  - Two companies (Samsung, Intel) also questioned the value of A-CSI for URLLC considering:
    - Reliability of CSI reception.
    - Impact of measurement and quantization.

Observation 2:
- Regarding the performance gain of DMRS/PDSCH/PDCCH-based A-CSI measurement,
  - One source (AT&T, R1-1901910) observed that CSI estimation based on DMRS+CSI-RS showed 15% and 45% link-level spectrum efficiency improvement at SINR=10dB over conventional CSI estimation based on CSI-RS, with 10 msec and 20 msec reporting period respectively.
  - One source (MTK, R1-1903530) observed that the gain of DMRS/PDSCH/PDCCH-based is beneficial in very limited cases (it depends on specific settings of packet size, bandwidth, initial BLER, traffic pattern and load (e.g. in case of a periodic traffic pattern, requests for initial transmissions from four UE's arrive at the same OS from period to period. Each initial transmission have BLER=3%)).

Observation 3:
- Regarding the performance gain of CSI-RS-based A-CSI reporting on PUCCH triggered by DL-scheduling,
  - One source (Huawei, R1-1903234) observed that 12.7% (with 100p/s packet frequency) or 15.7% (with 200p/s packet frequency) more users can satisfy the 4ms latency over R15 P-CSI reporting, and 3.1% (with 100p/s packet frequency) or 9.4% (with 200p/s packet frequency) more users can satisfy the 4ms latency requirement over R15 A-CSI reporting on PUSCH.

Observation 4:
- One source (Nokia, R1-1901914) evaluated the benefits of the CQI report mode of wideband CQI combined with worst-M CQI, and observed that it leads to reduction of latency and BLER for 1st transmission over standard frequency-selective CQI.

Conclusion:
- No consensus in RAN1 for supporting A-CSI on PUCCH in R16.

R1-1903234 UCI enhancements for URLLC Huawei, HiSilicon (Revision of R1-1901558)
R1-1901594 UCI Enhancements for NR URLLC Ericsson
R1-1901693 UCI enhancements for URLLC vivo
R1-1901768 UL control enhancements for URLLC ZTE
R1-1903530 Enhancements to UCI for URLLC MediaTek Inc. (rev of R1-1901823)

R1-1901910 UCI Enhancements for NR AT&T
R1-1901914 On UCI Enhancements for URLLC Nokia, Nokia Shanghai Bell
R1-1902003 UL control enhancements for URLLC CATT
R1-1902046 UCI enhancements for NR URLLC LG Electronics
R1-1902072 UCI enhancements for URLLC Fujitsu
R1-1902128 UL control enhancements for NR URLLC Sequans Communications
R1-1902177 Considerations on UCI enhancements for URLLC Sony
R1-1902297 UL Control Enhancements for URLLC Samsung
R1-1902395 Discussion on UCI and PUCCH enhancement for URLLC Panasonic Corporation
R1-1902417 UCI enhancement for URLLC OPPO
R1-1902494 On enhancements to UCI for eURLLC Intel Corporation
R1-1902531 UCI enhancements for NR URLLC NEC
R1-1902607 On the support of multiple HARQ-ACK codebooks within a slot InterDigital, Inc.
R1-1902663 URLLC HARQ-ACK feedback enhancements Sharp
R1-1902729 Discussion on UCI enhancement on URLLC Spreadtrum Communications
R1-1902805 UCI enhancements for URLLC NTT DOCOMO, INC.
R1-1902844 UCI enhancement for URLLC Motorola Mobility, Lenovo
R1-1902873 On UCI enhancement for NR URLLC WILUS Inc.
R1-1902924 Potential enhancements to UCI for URLLCCAICT
R1-1903005 UCI Enhancements for eURLLC Qualcomm Incorporated

7.2.6.1.3 Potential enhancements to PUSCH

R1-1903368 Summary of contributions on potential enhancements for PUSCH for NR URLLC (AI 7.2.6.1.3)
Nokia, Nokia Shanghai Bell

R1-1903480 Summary of Tuesday offline discussion on potential enhancements for PUSCH for NR URLLC (AI 7.2.6.1.3) Nokia, Nokia Shanghai Bell

Decision: The document is noted.

Proposals:
One UL grant scheduling two or more PUSCH repetitions that can be in one slot, or across slot boundary in consecutive available slots.

- The number of the repetitions (FFS dynamically or semi-statically signalled) represents the "nominal" number of repetitions. The actual number of repetitions can be larger than the nominal number.
- The time domain resource assignment field in the DCI indicates the resource for the first repetition.
- The time domain resources for the remaining repetitions are derived based at least on the resources for the first repetition and the UL/DL direction of the symbols.
  - FFS the detailed interaction with the procedure of UL/DL direction determination
- If a "nominal" repetition goes across the slot boundary or DL/UL switching point, this "nominal" repetition is splitted into two PUSCH repetitions, with one PUSCH repetition in each UL period.
- No DMRS sharing across multiple PUSCH repetitions
- No special handling of orphan symbols

Thursday session

R1-1903700 Summary of Thursday offline discussion on potential enhancements for PUSCH for NR URLLC (AI 7.2.6.1.3) Nokia, Nokia Shanghai Bell

Proposals:

- Down-select between option 4-1, option 5, and option 6-1 in R1-1903700
  - Each option can be further re-fined
- If no down-selection is possible by end of Friday
  - Alt 1: support a combination version of option 1 & option 2, with conditions explicitly defined (the selection option 1 vs. option 2 is NOT by RRC configuration), and provide concrete definitions of potential options
  - Alt 2: no support of this feature

Friday session

R1-1903797 **Summary of Friday offline discussion on potential enhancements for PUSCH for NR URLLC (AI 7.2.6.1.3)** **Nokia, Nokia Shanghai Bell**

Decision: The document is noted.

Agreement:

- Capture the descriptions of option 1 to 6 (see R1-1903797 and previous agreements) in the TR.

Conclusion:

- Finalize the details regarding how to use "option 1" vs. "option 2" during the WI phase using option 4, 5, and 6 (as in R1-1903797) as a starting point.

Agreement:

- Capture the simulation results in Section 3 in the TR.

R1-1901559	PUSCH enhancements for URLLC	Huawei, HiSilicon
R1-1901595	PUSCH Enhancements for NR URLLC	Ericsson
R1-1901694	PUSCH enhancements for URLLC	vivo
R1-1901769	Grant-based PUSCH enhancements for URLLC	ZTE
R1-1901824	Enhancements of NR PUSCH for URLLC	MediaTek Inc.
R1-1901911	On Frequency Hopping for PUSCH	AT&T
R1-1901915	On PUSCH enhancements for NR URLLC	Nokia, Nokia Shanghai Bell
R1-1902004	On PUSCH enhancements for URLLC	CATT
R1-1902047	PUSCH enhancements for NR URLLC	LG Electronics
R1-1902178	Considerations on PUSCH enhancements for URLLC	Sony
R1-1902298	Potential enhancements for PUSCH for URLLC	Samsung
R1-1902418	PUSCH enhancement for URLLC	OPPO
R1-1902443	Potential enhancements to PUSCH	ETRI
R1-1902447	On PUSCH enhancements for NR URLLC	Panasonic
R1-1902495	On enhancements to PUSCH for eURLLC	Intel Corporation
R1-1902546	DMRS Overhead Reduction for Intra Slot Repetitions	TCL Communication Ltd.
R1-1902608	On Potential PUSCH enhancements for URLLC	InterDigital, Inc.
R1-1902664	Views on potential enhancements to PUSCH for eURLLC	Sharp
R1-1902717	Discussion on PUSCH enhancements for URLLC	Spreadtrum Communications
R1-1902806	PUSCH enhancements for URLLC	NTT DOCOMO, INC.
R1-1902874	On PUSCH enhancement for NR URLLC	WILUS Inc.
R1-1902925	Potential enhancements to PUSCH for URLLC	CAICT
R1-1903006	PUSCH enhancements for eURLLC	Qualcomm Incorporated

7.2.6.1.4 Potential enhancements to Scheduling/HARQ/CSI Processing timeline

R1-1903459 **Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline** **Qualcomm**

Decision: The document is noted.

Agreements:

The following observations are made based on the agreement in [25] and collected results in [26] (as cited in R1-1903459).

- Observation 1: For downlink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 1-6.
- Observation 2: For downlink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 1-6.
- Observation 3: For downlink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 7-12.
- Observation 4: For downlink, two HARQ transmissions can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 7-8.

- Observation 5: For downlink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 9-12.
- Observation 6: For downlink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenarios 13-18.
- Observation 7: For downlink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenarios 13-18.
- Observation 8: For SR-based uplink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 1, 2 and 4.
- Observation 9: For SR-based uplink, a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 3, 5 and 6.
- Observation 10: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 1-6.
- Observation 11: For SR-based uplink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 7-12.
- Observation 12: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 7-12.
- Observation 13: For SR-based uplink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenarios 13-18.
- Observation 14: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenarios 13-18.
- Observation 15: For GF uplink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 1-6.
- Observation 16: For GF uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenarios 1-6.
- Observation 17: For GF uplink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 7-12.
- Observation 18: For GF uplink, two HARQ transmissions can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 7-10.
- Observation 19: For GF uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenarios 11-12.
- Observation 20: For GF uplink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenarios 13-18.
- Observation 21: For GF uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenarios 13-18.

Agreements:

- To capture the following tables in the TR:

DL Scenarios

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	SCS	# PDCCH MOs	PDSCH Duration
Scenario 1	30	4	2
Scenario 2	30	7	2
Scenario 3	30	4	4
Scenario 4	30	7	4
Scenario 5	30	4	7
Scenario 6	30	7	7
Scenario 7	60	4	2
Scenario 8	60	7	2
Scenario 9	60	4	4
Scenario 10	60	7	4
Scenario 11	60	4	7
Scenario 12	60	7	7
Scenario 13	120**	4	2
Scenario 14	120**	7	2
Scenario 15	120**	4	4
Scenario 16	120**	7	4
Scenario 17	120**	4	7
Scenario 18	120**	7	7

** For Scenario 13-18, the assumed TDD UL/DL configuration is [D,D,D,D,D,D,F,F,U,U,U,U,U,U];

SR-Based PUSCH Scenarios

	SCS	# PDCCH MOs	PUSCH Duration
Scenario 1	30	4	2
Scenario 2	30	7	2
Scenario 3	30	4	4
Scenario 4	30	7	4
Scenario 5	30	4	7
Scenario 6	30	7	7
Scenario 7	60	4	2
Scenario 8	60	7	2
Scenario 9	60	4	4
Scenario 10	60	7	4
Scenario 11	60	4	7
Scenario 12	60	7	7
Scenario 13	120**	4	2
Scenario 14	120**	7	2
Scenario 15	120**	4	4
Scenario 16	120**	7	4
Scenario 17	120**	4	7
Scenario 18	120**	7	7

** For Scenario 13-18, the assumed TDD UL/DL configuration is [D,D,D,D,D,D,F,F,U,U,U,U,U,U];

GF-Based PUSCH Scenarios

	SCS	# PDCCH MOs	PUSCH Duration
Scenario 1	30	4	2
Scenario 2	30	7	2
Scenario 3	30	4	4
Scenario 4	30	7	4
Scenario 5	30	4	7
Scenario 6	30	7	7
Scenario 7	60	4	2
Scenario 8	60	7	2
Scenario 9	60	4	4
Scenario 10	60	7	4
Scenario 11	60	4	7
Scenario 12	60	7	7
Scenario 13	120**	4	2
Scenario 14	120**	7	2
Scenario 15	120**	4	4
Scenario 16	120**	7	4
Scenario 17	120**	4	7
Scenario 18	120**	7	7

** For Scenario 13-18, the assumed TDD UL/DL configuration is [D,D,D,D,D,D,F,F,U,U,U,U,U,U];

Potential recommendation for enhancements (processing, OoO, etc.)

Thursday session

R1-1903711 **Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline** **Qualcomm**

Decision: The document is noted.

Agreements:

- Observation: For downlink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19.
- Observation: For downlink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19.
- Observation: For downlink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 20.
- Observation: For downlink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 20.
- Observation: For downlink, one source [vivo] has shown that a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 21.
- Observation: For downlink, one source [vivo] has shown that two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 21.
- Observation: For downlink, one source [vivo] has shown that a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenario 22.
- Observation: For downlink, one source [vivo] has shown that two HARQ transmissions can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenario 22.
- Observation: For downlink, one source [DCM] has shown that a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 23-25.
- Observation: For downlink, one source [DCM] has shown that two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 23-25.
- Observation: For downlink, a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 23-25.
- Observation: For downlink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 23-25.

Proposals:

- Observation: For SR-based uplink, a single source has shown that a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19-21.
- Observation: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19-21.
- Observation: For SR-based uplink, a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 19-21.
- Observation: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 19-21.

For offline discussion, the TP in Section 7 of R1-1903711

Friday session

R1-1903777 Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline **Qualcomm**

Decision: The document is noted.

Agreements:

Capture the following DL scenario description into the TR:

- (*1) Scenario 19 is the same as scenario 1 except that the gNB's processing time for the initial PDSCH is N2 + X (CATT).

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- (*2) Scenario 20 is the same as scenario 3 except that the gNB's processing time for the initial PDSCH is N2 + X (CATT).
- (*3) Scenario 21 is the same as scenario 2, but 14 PUCCHs and PDCCH MOs per slot are considered (vivo).
- (*4) Scenario 22 is the same as scenario 8, but 14 PUCCHs and PDCCH MOs per slot are considered (vivo).
- (*5) Scenario 23 is the same as scenario 2, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*6) Scenario 24 is the same as scenario 4, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*7) Scenario 25 is the same as scenario 6, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*8) Scenario 26 is the same as scenario 14, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*9) Scenario 27 is the same as scenario 16, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*10) Scenario 28 is the same as scenario 18, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).

Agreements:
Capture the following Conclusions in the TR:

- Conclusion: For downlink, two HARQ transmissions cannot be completed within 1ms under any of the considered scenarios for SCS = 30KHz and FDD.
- Conclusion: For downlink, single-shot transmission can be completed within 1ms under all of the considered scenarios for SCS = 30KHz and FDD.
- Conclusion: For downlink, under some considered FDD scenarios, two HARQ transmissions can be completed within 1ms for SCS = 60KHz.
- Conclusion: For downlink, under all considered FDD scenarios, a single-shot transmission can be completed within 1ms for SCS = 60KHz.
- Conclusion: For downlink, two HARQ transmissions cannot be completed within 1ms under any of the considered TDD scenarios for SCS = 120KHz.
- Conclusion: For downlink, a single-shot transmission can be completed within 1ms under all of the considered TDD scenarios for SCS = 120KHz.

Agreements:
Capture the following scenario description in the TR:

- (*1) Scenario 19 is the same as scenario 2, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*2) Scenario 20 is the same as scenario 4, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*3) Scenario 21 is the same as scenario 6, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*4) Scenario 22 is the same as scenario 14, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*5) Scenario 23 is the same as scenario 16, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*6) Scenario 24 is the same as scenario 18, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).

Agreements:
Capture the following observations in the TR:

- Observation: For SR-based uplink, a single source [DOCOMO] has shown that a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19-21.
- Observation: For SR-based uplink, a single source [DOCOMO] has shown that a two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19-21.
- Observation: For SR-based uplink, a single source [DOCOMO] has shown that a a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 19-21.
- Observation: For SR-based uplink, a single source [DOCOMO] has shown that a two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 19-21.

Agreements:
Capture the following scenario description in the TR:

- (*1) Scenario 19 is the same as scenario 2, but GF-PUSCH duration and periodicity of 1 symbol and 14 PDCCH MOs per slot are assumed (vivo)
- (*2) Scenario 20 is the same as scenario 8, but GF-PUSCH duration and periodicity of 1 symbol and 14 PDCCH MOs per slot are assumed (vivo)
- (*3) Scenario 21 is the same as scenario 2, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*4) Scenario 22 is the same as scenario 4, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*5) Scenario 23 is the same as scenario 6, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*6) Scenario 24 is the same as scenario 14, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).

- (*7) Scenario 25 is the same as scenario 16, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).
- (*8) Scenario 26 is the same as scenario 18, but TDD DL/UL configuration of {D10,G2,U2} is considered (DOCOMO).

Agreements:

Capture the following observations in the TR:

- Observation: For GF uplink, a single source [vivo] has shown that a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19.
- Observation: For GF uplink, a single source [vivo] has shown that two HARQ transmissions can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 19.
- Observation: For GF uplink, a single source [vivo] has shown that a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenario 20.
- Observation: For GF uplink, a single source [vivo] has shown that two HARQ transmissions can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 60KHz in scenario 20.
- Observation: For GF uplink, a single source [DCM] has shown that a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 21.
- Observation: For GF uplink, a single source [DCM] has shown that a single-shot transmission cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 22-23.
- Observation: For GF uplink, a single source [DCM] has shown that a two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 30KHz in scenario 21-23.
- Observation: For GF uplink, a single source [DCM] has shown that a single-shot transmission can be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 24-26.
- Observation: For GF uplink, a single source [DCM] has shown that a two HARQ transmissions cannot be completed within 1ms by considering the Rel. 15 timing capability for SCS = 120KHz in scenario 24-26.

Agreements:

Capture the following conclusions in the TR:

- Conclusion: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms under any of the considered scenarios for SCS = 30KHz and FDD.
- Conclusion: For SR-based uplink, a single-shot transmission can be completed within 1ms under some of the considered scenarios for SCS = 30KHz and FDD.
- Conclusion: For SR-based uplink, , two HARQ transmissions cannot be completed within 1ms under any of the considered scenarios for SCS = 60KHz and FDD.
- Conclusion: For SR-based uplink, under all considered FDD scenarios, a single-shot transmission can be completed within 1ms for SCS = 60KHz.
- Conclusion: For SR-based uplink, two HARQ transmissions cannot be completed within 1ms under any of the considered TDD scenarios for SCS = 120KHz.
- Conclusion: For SR-based uplink a single-shot transmission can be completed within 1ms under any of the considered TDD scenarios for SCS = 120KHz.
- Conclusion: For GF uplink, a single-shot transmission can be completed within 1ms under all of the considered scenarios for SCS = 30KHz and FDD.
- Conclusion: For GF uplink, , two HARQ transmissions can be completed within 1ms under some of the considered scenarios for SCS = 60KHz and FDD.
- Conclusion: For GF uplink, under all considered FDD scenarios, a single-shot transmission can be completed within 1ms for SCS = 60KHz.
- Conclusion: For GF uplink, two HARQ transmissions cannot be completed within 1ms under any of the considered TDD scenarios for SCS = 120KHz.
- Conclusion: For GF uplink a single-shot transmission can be completed within 1ms under some of the considered TDD scenarios for SCS = 120KHz.

Agreements:

For a Rel. 16 eURLLC UE and dynamic downlink scheduling, on the active BWP of a given serving cell, the HARQ-ACK associated with the second PDSCH with HARQ process ID x received after the first PDSCH with HARQ process ID y (x != y) can be sent before the HARQ-ACK of the first PDSCH. Specify based on the following solutions:

- Solution 1: The UE always processes the second PDSCH. The UE may or may not drop the processing of the first channel.
- Solution 2: The UE processes both the first and second PDSCHs as a UE capability with no condition.
- Solution 3: The UE processes both the first and second channels under some conditions, e.g. using the CA capability. The conditions are reported as a UE capability. If the conditions are not satisfied, the UE behavior is not defined.
    - FFS: The details of the UE capability.

- Solution 4:
  - A UE drops (terminates) the processing of the first PDSCH.
    - Alt1: The UE always drops the first PDSCH.
    - Alt2: Some scheduling conditions should be defined. If not satisfied, the UE drops the processing of the first channel.
    - FFS how to define the scheduling conditions, e.g., based on the number of RBs, TBS, number of layers, the gap between the first and second PDSCHs, the gap between the two PUCCHs carrying HARQ-ACK, etc.
  - The UE behavior, e.g., decision on dropping the first channel and timing capability associated with the second channel, is determined, and is fixed, after decoding the PDCCH associated with the first and the second PDSCH.
  - When the UE drops the processing of the first channel, increasing the minimum PDSCH processing procedure time (N1) of the second PDSCH by d symbols can be considered.
    - FFS the value of d.
    - Dropping the processing of the first PDSCH can be done in one of the two ways:
      - Alt1: dropping the processing of the first PDSCH on the same serving cell
      - Alt2: dropping the processing of a PDSCH(s) on the same cell or a different serving cell.
- The UE only expects a maximum of one OOO PDSCH-to-HARQ-ACK flow on the active BWP of a given serving cell when applicable
- FFS whether or not, out-of-order operation is allowed across PDSCHs with PDSCH-to-HARQ gap compatible with PDSCH processing time (N1) for capability X.

R1-1903804 Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline Qualcomm

Decision: The document is noted.

Agreement:

Capture the following text in the TR:

- [R1-1903706] evaluated the possible latency reduction by allowing the PDSCH/PUSCH to cross the slot boundary.

R1-1903706 Study and valuation of scheduling, HARQ and CSI processing timeline MediaTek Inc.

Agreements:

For a Rel. 16 UE, on the active BWP of a given serving cell, the UE can be scheduled with a second PUSCH associated with HARQ process x starting earlier than the ending symbol of the first PUSCH associated with HARQ process y (x != y) with a PDCCH that does not end earlier than the ending symbol of first scheduling PDCCH. Specify based on the following solutions:

- Solution 1: The UE always processes the second scheduled PUSCH. The UE may or may not drop the processing of the first schedeuled PUSCH.
- If the first scheduled and second scheduled PUSCHs are not colliding in the time domain:
  - Solution 2: The UE processes both the first scheduled and second scheduled PUSCHs as a UE capability with no condition.
  - Solution 3: The UE processes both the first scheduled and second scheduled PUSCHs under some conditions. The conditions are reported as a UE capability.
    - FFS: The details of the UE capability.
  - Solution 4:
    - A UE drops (terminates) the processing of the first scheduled PUSCH.
      - Alt1: The UE always drops the first scheduled PUSCH.
      - Alt2: Some scheduling conditions should be defined. If not satisfied, the UE drops the processing of the first scheduled PUSCH.
        - FFS how to define the scheduling conditions, e.g., based on the number of RBs, TBS, number of layers, the gap between the first and the second PUSCHs, etc.

  - The UE behavior, e.g., decision on dropping the first scheduled PUSCH and timing capability associated with the second scheduled PUSCH, is determined, and is fixed, after decoding the PDCCH associated with first and the second scheduled PUSCHs.
  - When the UE drops the processing of the first scheduled PUSCH, increasing the minimum PUSCH preparation procedure time (N2) of the second PUSCH by d symbols can be considered.
    - FFS the value of d.
  - Dropping the processing of the first scheduled PUSCH can be done in one of the two ways:
    - Alt1: dropping the processing of the first scheduled PUSCH on the same serving cell
    - Alt2: dropping the processing of a PUSCH(s) on the same cell or different serving cell.
- The UE only expects a maximum of one OOO PDCCH-to-PUSCH flow on the active BWP of a given serving cell when applicable.
- FFS whether or not out-of-order operation is allowed across PUSCHs with PDCCH-to-PUSCH gap compatible with PUSCH processing time (N2) for capability X.
- If the first scheduled PUSCH and the second scheduled PUSCH are colliding in the time domain, the UE drops the processing and the transmission of the first scheduled PUSCH.
  - For dropping, the scheduling limitations do not apply. The UE always drops the first scheduled PUSCH.
  - Other details of dropping are as those of the solution 4.

Agreements:

Capture the following TP for TR 38.824 Section 6.4.1.5 (a new subsection):

- A non-periodic SR scheme has been discussed in [m], [n] for latency reduction and overhead reduction.

[m] R1-1901589, "Additional Results for Underlay Scheduling Request for NR Rel. 16," Idaho National Laboratory, RAN1#96 meeting, Feb-March, 2019, Athens, Greece.
[n] R1-1900015, "Underlay Scheduling Request for NR Rel. 16 and Latest Results," Idaho National Laboratory, RAN1 AH January 2019 meeting, Taipei, Taiwan.

R1-1903227	Enhancements to scheduling/HARQ/CSI processing timeline for URLLC (Revision of R1-1901560)	Huawei, HiSilicon
R1-1901589	Additional Results for Underlay Scheduling Request for NR Rel. 16	Idaho National Laboratory
R1-1901695	Enhancement for Scheduling/HARQ/CSI Processing timeline	vivo
R1-1901770	On scheduling/HARQ processing timeline for URLLC	ZTE
R1-1901825	Study and valuation of scheduling, HARQ and CSI processing timeline	MediaTek Inc.
R1-1901912	HARQ Enhancements to URLLC	AT&T
R1-1902005	Scheduling and processing timeline enhancements for URLLC	CATT
R1-1903242	Scheduling/HARQ processing timeline enhancements for NR URLLC	LG Electronics (rev of R1-1902048)
R1-1902299	Potential enhancements for scheduling/HARQ/CSI Processing timeline	Samsung
R1-1903457	Enhancements on scheduling and HARQ processing timeline	OPPO (rev of R1-1902419)
R1-1903352	On enhancements to Scheduling/HARQ/CSI processing	Intel Corporation (rev of R1-1902496)
R1-1902520	On NR URLLC scheduling and UL cancellation processing timeline	Panasonic
R1-1903328	Views on potential enhancements to Scheduling/HARQ/CSI Processing timeline	Sharp (rev of R1-1902665)
R1-1902740	Discussion on scheduling_HARQ_CSI processing timeline	Spreadtrum Communications
R1-1902742	Enhancement on HARQ-ACK feedback for URLLC	III
R1-1902807	Enhancements to Scheduling/HARQ/CSI Processing timeline for URLLC	NTT DOCOMO, INC.
R1-1902829	Scheduling/HARQ processing timeline enhancement for URLLC	ITRI
R1-1902930	On timing between SRS and CSI-RS in non-codebook based UL	CEWiT
R1-1903007	Processing timeline enhancements for eURLLC	Qualcomm Incorporated
R1-1903039	Scheduling/HARQ Processing Timeline Enhancements for NR URLLC	Fraunhofer HHI, Fraunhofer IIS
R1-1903482	Scheduling/HARQ/CSI Processing Timeline Enhancements for NR URLLC	Ericsson
R1-1903488	Considerations on enhancement to HARQ processing for URLLC	Sony
R1-1903570	Enhancements to scheduling/HARQ/CSI processing timeline for NR URLLC	Nokia, Nokia Shanghai Bell
R1-1903776	Email discussion on collecting the results for eURLLC processing timeline	Qualcomm

7.2.6.1.5 Other

R1-1901601	Physical Layer Enhancements for Intra-UE Prioritization and Multiplexing	Ericsson
R1-1901771	Discussion on resource allocation for URLLC	ZTE
R1-1902422	Discussions on intra-UE multiplexing	OPPO
R1-1902423	Resource allocation enhancements for NR URLLC	OPPO
R1-1902424	On eMBB and URLLC data differentiation	OPPO
R1-1902609	Preliminary performance evaluations for AR/VR	InterDigital, Inc.
R1-1902764	NR URLLC enhancement for cell edge UE	Apple Inc.
R1-1902913	Discussion on resource allocation enhancement on URLLC	ASUSTEK COMPUTER (SHANGHAI)
R1-1903077	Compact DCI for URLLC	Huawei, HiSilicon
R1-1903078	Enhanced CSI measurement and reporting for URLLC	Huawei, HiSilicon
R1-1903235	Evaluation result about A-CSI on PUCCH for URLLC	Huawei, HiSilicon (rev of R1-1903190)

7.2.6.2 UL inter UE Tx prioritization/multiplexing

R1-1903401 **Summary of UL inter UE Tx prioritization/multiplexing vivo**

Decision: The document is noted.

Agreements:

Update the observations for link level simulations for TR38.824 section 7.1 "performance evaluation"

- For URLLC with low MCS level
  - Three sources (source 1/2/3) observed 0.2dB~1dB required SNR loss for URLLC BLER target 10^{-4} when URLLC PUSCH uses MCS#0 and collides with another eMBB PUSCH transmission, compared to the baseline with URLLC only PUSCH transmission using MCS#0, assuming MMSE-IRC receiver is used at the gNB and 0dB power offset.
    - Two sources (source 2/3) observed the loss can be reduced to 0.2dB~0.5dB, when URLLC power is 3dB higher than eMBB
    - One source (source 1) observed the loss can be negligible if MMSE-SIC receiver is used at the gNB (eMBB and URLLC are decoded with two hypothesis) and 0 dB power offset assuming orthogonal DMRS between eMBB and URLLC
  - One source (source 19) observed 1.5dB required SNR loss for URLLC BLER target 10^{-4} when URLLC PUSCH uses MCS#3 and collides with another eMBB PUSCH transmission, compared to the baseline with URLLC only PUSCH transmission using MCS#3, assuming MMSE-IRC receiver is used at the gNB and 0dB power offset, and the loss can be reduced to 0.7dB when URLLC power is 3dB higher than eMBB.
- For URLLC with medium MCS level
  - ~~Two~~ Three sources (source 2/3/13) observed 1.8dB~6dB required SNR loss for URLLC BLER target 10^{-4} when URLLC PUSCH uses MCS#6 and collides with another eMBB PUSCH transmission, compared to the baseline with URLLC only PUSCH transmission using MCS#6, assuming MMSE-IRC receiver (source 2/3) or MMSE receive (source 13) is used at the gNB.
    - The same two sources observed the loss can be reduced to 0.4dB~2dB, when URLLC power is 3dB higher than eMBB
    - One source (Source 13) observed the loss cannot be reduced if MMSE-SIC receiver is used assuming case 1 DMRS assumption between eMBB and URLLC
- For URLLC with higher MCS level
  - One source (source 1) observed about 3.2dB required SNR loss for URLLC BLER target 10^{-4} when URLLC PUSCH uses MCS#14 and collides with another eMBB PUSCH transmission using MCS#14 or 23 (for the higher SE table), compared to the baseline with URLLC only PUSCH transmission using MCS#14, assuming MMSE receiver is used at the gNB and 0dB power offset.
    - The same source observed that when no power offset is applied to the URLLC, if MMSE-SIC receiver is used at the gNB (eMBB and URLLC are decoded with two hypothesis), the loss can be reduced to 0.5dB for the case with URLLC MCS#14 and eMBB MCS#14, assuming orthogonal DMRS between eMBB and URLLC. However, the loss cannot be reduced by MMSE-SIC receiver for the case with URLLC MCS#14 and eMBB MCS#23.
  - ~~One~~ Two sources (source 3/19) observed URLLC error floor at 10^{-1}~~10^{-2}~~ 10^{-3} when URLLC PUSCH uses MCS#10 or 14 and collides with another eMBB PUSCH transmission using 16QAM or 64QAM, compared

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to the baseline with URLLC only PUSCH transmission using MCS#10 or 14, assuming MMSE-IRC receiver is used at the gNB and 0dB or 3dB power offset between URLLC and eMBB

Note: For SIC receiver, if eMBB transmission ends later than URLLC, the latency performance of URLLC may be impacted if the eMBB is decoded first.

- For eMBB with lower MCS level (QPSK modulation)
  - Two sources (source 1/8) observed up to 0.5dB required SNR loss for eMBB BLER target 10-1 when eMBB PUSCH uses MCS#0 or 2 and collides with another URLLC PUSCH transmission, compared to the baseline with eMBB only PUSCH transmission assuming MMSE-IRC (source 1) or MMSE (source 8) receiver is used at the gNB and 0dB power offset.
    - One source (source 1) observed the loss can be negligible, if MMSE-SIC receiver (eMBB and URLLC are decoded with two hypothesis) is used assuming case-1 DMRS between eMBB and URLLC.
  - One source (source 8) observed 0.3dB~2dB required SNR loss for eMBB BLER target 10^{-1} when eMBB PUSCH uses MCS#6 and collides with another URLLC PUSCH transmission, compared to the baseline with eMBB only PUSCH transmission assuming MMSE receiver is used at the gNB and 0dB power offset.
- For eMBB with higher MCS level (16QAM or 64QAM)
  - ~~One~~ Three source (source 1/13/19) observed 0.9~~1~~dB~1.6dB required SNR loss for eMBB BLER target 10^{-1} when eMBB PUSCH uses MCS#10, 12, 14 or 23 and collides with another URLLC PUSCH transmission, compared to the baseline with eMBB only PUSCH transmission assuming MMSE-IRC receiver (source 1/19), or MMSE receiver (source 13) is used at the gNB and 0dB power offset. Another source (source 4) observed 8dB loss. One source (source 19) observed 2.5dB loss for eMBB when URLLC has 3dB higher power than eMBB. One source (source 19) observed eMBB error floor, (i.e. 10^{-1} BLER cannot be reached) when eMBB using MCS#12 has a full bandwidth collision with URLLC using MCS#3 during 2 OFDM symbols.
    - ~~One~~ Two source (source 1/13) observed that the loss can be reduced to 0.2~0.3dB, if MMSE-SIC receiver is used at the gNB (eMBB and URLLC are decoded with two hypothesis), assuming case-1 DMRS between eMBB and URLLC.

Agreements:

Capture additional link level simulation results in TR38.824 section 7.1 "performance evaluation"

Comparison of required SNR for single URLLC transmission with 10^{-4} BLER target

	Required SNR for URLLC 10^{-4} BLER (URLLC only, baseline)	Required SNR for URLLC 10^{-4} BLER when colliding with eMBB (0dB power offset)	Required SNR for URLLC 10^{-4} BLER when colliding with eMBB (3dB power offset)	Key Assumptions
Source 13: CATT (R1-1902006)	-4dB	-2dB (2dB loss)	N/A	URLLC MCS#6(120/1024, QPSK) eMBB MCS#10 (340/1024,16QAM) MMSE receiver Case-1 DMRS assumption
Source 13: CATT (R1-1902006)	-4dB	1.7dB (5.7dB loss)	N/A	URLLC MCS#6(120/1024, QPSK) eMBB MCS#10 (340/1024,16QAM) MMSE receiver Case-2 DMRS assumption
Source 13: CATT (R1-1902006)	-4dB	-2.2dB (1.8 dB loss)	N/A	URLLC MCS#6(120/1024, QPSK) eMBB MCS#10 (340/1024,16QAM) MMSE-SIC receiver (CRC-based hard IC) Case-1 DMRS assumption
Source 19: LG (R1-1903243)	-7.2dB	-5.7dB (1.5dB loss)	-6.5dB (0.7dB loss)	URLLC MCS #3 (64/1024, QPSK) eMBB MCS#12 of existing 64QAM table MMSE-IRC receiver Case-2 DMRS assumption
Source 19: LG (R1-1903243)	1.3dB	Error floor	Error floor	URLLC MCS #10 (308/1024, QPSK) eMBB MCS#12 of existing 64QAM table

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				MMSE-IRC receiver Case-2 DMRS assumption

Comparison of required SNR for single eMBB transmission with 10^{-1} BLER target

	Required SNR for eMBB 10^{-1} BLER (eMBB only, baseline)	Required SNR for eMBB 10^{-1} BLER when colliding with URLLC (0dB power offset)	Required SNR for eMBB 10^{-1} BLER when colliding with URLLC (3dB power boost)	Key Assumptions
Source 13: CATT (R1-1902006)	0.9dB	1.9dB (1dB loss)	N/A	URLLC MCS#6(120/1024, QPSK) eMBB MCS#10 (340/1024,16QAM) MMSE receiver Case-1 DMRS assumption
Source 13: CATT (R1-1902006)	0.9dB	2dB (1.1dB loss)	N/A	URLLC MCS#6(120/1024, QPSK) eMBB MCS#10 (340/1024,16QAM) MMSE receiver Case-2 DMRS assumption
Source 13: CATT (R1-1902006)	0.9dB	1.1dB (0.2dB loss)	N/A	URLLC MCS#6(120/1024, QPSK) eMBB MCS#10 (340/1024,16QAM) MMSE-SIC receiver (CRC-based hard IC) Case-1 DMRS assumption
Source 19: LG (R1-1903243)	2.5dB	3.4 dB (0.9 dB loss)	5dB (2.5 dB loss)	URLLC MCS #10 (308/1024, QPSK) eMBB MCS#12 of existing 64QAM table MMSE-IRC receiver Case-2 DMRS assumption
Source 19: LG (R1-1903243)	2.5dB	Error floor	Error floor	URLLC MCS #3 (64/1024, QPSK) eMBB MCS#12 of existing 64QAM table MMSE-IRC receiver Case-2 DMRS assumption

Wednesday session

R1-1903571 Summary of UL inter UE Tx prioritization/multiplexing vivo

Decision: The document is noted.

Observations:

- From URLLC perspective,
  - Comparing enhanced schemes with Rel-15 baseline scheme
    - Two sources (source 5/10) show better URLLC performance (URLLC capacity or percentage of URLLC UEs satisfying the requirement) in UMa scenario for UL cancelation scheme, compared to a Rel-15 baseline scheme using semi-static power setting of eMBB and URLLC. One source (source 10) shows degraded URLLC performance (percentage of URLLC UEs satisfying the requirement) in InH scenario for UL cancelation scheme, compared to a Rel-15 baseline case where URLLC has 8dB higher power than eMBB using semi-static power setting.
    - One source(source 6) show better URLLC performance (URLLC capacity or percentage of URLLC UEs satisfying the requirement) for enhanced schemes, compared to a Rel-15 baseline scheme using orthogonal scheduling of eMBB and URLLC in UMa scenario. One source (source 1) shows almost the same URLLC performance for enhanced schemes compared to a Rel-15 baseline scheme using orthogonal scheduling of eMBB and URLL in UMa scenario. The enhanced schemes include UL cancelation and enhanced dynamic power control.
    - Two sources (source 9/10) show that 100% URLLC UE satisfying the requirement can only be achieved when the URLLC traffic load is low and the colliding eMBB transmission power is 5dB or 8dB lower than URLLC using semi-static power setting, while for higher URLLC traffic loads, source 9 shows that it is not possible to reach the URLLC performance requirement without removing the colliding eMBB transmission.
    - One source (source 7) shows better URLLC performance for enhanced schemes, compared to a Rel-15 baseline using orthogonal scheduling of eMBB and URLLC. The percentage of packets satisfying

reliability and latency requirements is used as the URLLC performance metric, which is different from the agreed URLLC performance metric option 1 or option 2.

- Comparing UL cancelation scheme and enhanced power control scheme
  [to refine the following 3 subbullets by adding the detailed EPC scheme – revisit later]
  - Two sources (source 5/6) show better URLLC performance (URLLC capacity or percentage of URLLC UEs satisfying the requirement) for UL cancelation scheme than enhanced dynamic power control scheme. The URLLC performance metric include throughput or percentage of URLLC UEs fulfilling the requirement.
  - Two sources (source 1/8) shows almost the same URLLC performance (percentage of URLLC UEs satisfying the requirement) between UL cancelation scheme and enhanced dynamic UL power control scheme
  - One source (source 7) shows almost the same URLLC performance between UL cancelation scheme and enhanced dynamic UL power control scheme. The percentage of packets satisfying reliability and latency requirements is used as the URLLC performance metric, which is different from the agreed URLLC performance metric option 1 or option 2.

- From eMBB perspective,
  - Comparing enhanced schemes with Rel-15 baseline scheme,
    - Two sources (source 1/6/10) show degraded eMBB throughput in UMa scenario for UL cancelation, compared to orthogonal scheduling of eMBB and URLLC when TB-level retransmission is used for eMBB.
    - One (source 6) shows degraded eMBB throughput in UMa scenario for enhanced dynamic power control, compared to Rel-15 baseline.
    - One source (source 10) shows improved eMBB throughput in InH scenario for UL cancelation with CBG-level retransmission, compared to Rel-15 baseline using orthogonal scheduling of eMBB and URLLC, or semi-static power setting.
    - One source (source 10) shows improved eMBB throughput in UMa scenario for UL cancelation with CBG-level retransmission, compared to semi-static power setting.
  - Comparing UL cancelation scheme and enhanced power control scheme
    - Two sources (source 1/8) show better eMBB throughput for enhanced dynamic power control, compared to UL cancelation.
    - One source (source 6) shows better eMBB throughput for UL cancelation, compared to enhanced dynamic power control.
  - Note: in the above observations, the corresponding additional overhead to support the enhanced scheme(s) was not reported and summmarized

Agreements:

- Capture the following system level evaluation results in TR38.824 section 7.1 “performance evaluation”

Source	Simulated cases/schemes	URLLC performance	eMBB performance	Resource utilization	Simulated scenario and key assumptions	Observations
Source 1 (Huawei R1-1901561)	Case 1: Orthogonal scheduling (Rel-15 baseline) eMBB 4OS, URLLC 4OS	Ratio of URLLC users fulfilling URLLC requirements =0.70202	1.7867 bps/Hz	URLLC RU =0.034	R15 enabled use case, Urban macro with 500m ISD 40MHz BW@ 4GHz, 30 kHz SCS URLLC: Low URLLC traffic arriving rate, FTP model 3 with 120 p/s arrival rate, 32Bytes URLLC target: 1ms, 99.999% eMBB: Full buffer No retransmissions BS receiver: MMSE Number of generated packets per URLLC user in the simulation is 10^6	No evident gain for UL cancelation
	Case 2 UL cancelation for Embb eMBB 12OS URLLC 4OS	Ratio of URLLC users fulfilling URLLC requirements =0.71728	1.6939 bps/Hz	URLLC RU=0.033		
	Case 3 Dynamic URLLC power boosting eMBB 12OS URLLC 4OS	Ratio of URLLC users fulfilling URLLC requirements =0.70000	1.7959bps/Hz	URLLC RU=0.033		

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Source 5 (Qualcomm R1-1903008)	Case 1 UL cancelation for eMBB	100% packets fulfills URLLC requirements, URLLC throughput : 16.13Mbps for 20MHz BW 5.38Mbps for 10MHz BW 1.08Mbps for 5MHz BW	N/A	URLLC RU 63.9% for 20MHz BW 41.7% for 10MHz BW 17.3% for 5MHz BW	Macro with 200m ISD 20MHz /10MHz/5MHz@2 GHz 30KHz/NCP Retransmission: IR Target URLLC requirement : 1e-5 with 1ms latency bound URLLC traffic arrival: Poisson with 32-byte packets (FTP3), swept over a wide range to find the largest one that is supported in the network eMBB: full buffer BS receiver: L-MMSE eMBB 14OS URLLC 2OS Number of generated packets per URLLC user in the simulation is 4.5x10^5	1. Semi-static power control of eMBB UEs significantly degrades the URLLC performance, unless the target received data SNR of eMBB is very low, resulting in significantly degraded eMBB performance. 2. FDM-ing URLLC and eMBB is also not a good idea as the capacity drops super-linearly as the URLLC frequency resources are reduced.
	Case 2 Semi-static power control with 18dB offset between URLLC and eMBB	100% packets fulfills URLLC requirements, URLLC throughput : 15.05Mbps for 20MHz BW 5.38Mbps for 10MHz BW 1.08Mbps for 5MHz BW	N/A	URLLC RU 63.8% for 20MHz BW 44.5% for 10MHz BW 18.6%for 5MHz BW		
	Case 3: Semi-static power control with 12dB offset between URLLC and eMBB	100% packets fulfills URLLC requirements, URLLC throughput : 11.83Mbps for 20MHz BW 4.3Mbps for 10MHz BW 0Mbps for 5MHz BW	N/A	URLLC RU 58.8% for 20MHz BW 41.3% for 10MHz BW 0% for 5MHz BW		
	Case 4: Semi-static power control with 6dB offset between URLLC and eMBB	100% packets fulfills URLLC requirements, URLLC throughput : 5.38Mbps for 20MHz BW 2.15Mbps for 10MHz BW 0Mbps for 5MHz BW	N/A	URLLC RU 39.4%for 20MHz BW 28.1% for 10MHz BW 0% for 5MHz BW		
	Case 5: Semi-static power control with 0dB offset between URLLC and eMBB	100% packets fulfills URLLC requirements, URLLC throughput : 2.15Mbps for 20MHz BW 0Mbps for 10/5MHz BW	N/A	URLLC RU 25.4% for 20MHz BW 0% for 10/5MHz BW		
Source 5 (Qualcomm R1-1903008)	Case 1: UL cancellation for URLLC	95% of the users satisfying the requirements: URLLC per UE packet arrival rate per second at capacity: 4100	N/A	40MHz BW: URLLC RU 21% @1500 arrival rate, 24% @1700 arrival rate, and 58% @4100 arrival rate	R15 enabled use case, Urban macro with 500m ISD, 40MHZ @4GHz and SCS = 30KHz eMBB traffic: full buffer, BS receiver: MMSE eMBB 14OS URLLC 2OS Number of generated packets per URLLC user in the simulation is around 4.5x10^5	ULPI gain over TPC ranges from 2.41x to 2.73x. It is observed that RU for URLLC with ULPI is much less than that of with power control. For example, at the same arrival rate, URLLC's RU with ULPI is almost half of that with power boosting. This shows ULPI not only benefits URLLC but also eMBB UE, as more resources will be left for eMBB utilization
	Case 2: TPC without power boosting and the same target SNR for both eMBB and URLLC	95% of the users satisfying the requirements: URLLC per UE packet arrival rate per second at capacity: 1500	N/A	40MHz BW: URLLC RU 43% @1500 arrival rate		
	Case 3: TPC with power boosting; URLLC has 3dB higher target SNR than eMBB	95% of the users satisfying the requirements: URLLC per UE packet arrival rate per second at capacity: 1700	N/A	40MHz BW: URLLC RU 44% @1700 arrival rate		
Source 6 (ZTE, R1-1901772)	Case 1: Rel-15 baseline	% of URLLC UEs fulfil the latency and reliability requirement =87.14%	Mean UPT = 0.3143Mbps 5% UPT = 0.0773 Mbps 50% UPT = 0.3288Mbps 95% UPT = 0.5490Mbps	eMBB RU =0.8092	Macro with 500m ISD 80% of users are outdoors and 20% of users are indoors 40MHz @ 4GHz, 30 kHz SCS 1ms (air interface delay)/99.999 eMBB: FTP Model 3 with Poisson arrival $\lambda = 1800$ - Packet size: 50~600 bytes Pareto distribution, with shaping parameter alpha = 1.5.	1. UL cancelation mechanism with resuming and group common signaling has a better performance compared to UL cancelation mechanism with UE-specific rescheduling signaling. 2. UL cancelation mechanism with resuming and group common signaling has a better performance
	Case 2: UL cancelation with UE-specific re-scheduling	% of URLLC UEs fulfil the latency and reliability requirement =93.81%	Mean UPT = 0.2258Mbps 5% UPT = 0.0732 Mbps 50% UPT = 0.1857Mbps	eMBB RU =0.7465		

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			95% UPT = 0.4605Mbps		URLLC: - Periodic with arrival rate of 1 packet per 2ms - Packet size: 32bytes BS receiver: MMSE-IRC eMBB 14OS URLLC 4OS Number of generated packets per URLLC user in the simulation is around 5x10^5	compared to UL power control mechanism.
	Case 3: UL cancelation with resuming and GC-PDCCH	% of URLLC UEs fulfil the latency and reliability requirement =95.24%	Mean UPT = 0.3086Mbps 5% UPT = 0.0762 Mbps 50% UPT = 0.3191Mbps 95% UPT = 0.5352Mbps	eMBB RU =0.7648		
	Case 4: Dynamic power control for URLLC (+6dB power boosting for URLLC)	% of URLLC UEs fulfil the latency and reliability requirement =89.05%	Mean UPT = 0.2900Mbps 5% UPT = 0.0760 Mbps 50% UPT = 0.2722Mbps 95% UPT = 0.5212Mbps	eMBB RU =0.8141		
Source 7 (MediaTek, R1-1901826)	Case 1: No enhanced scheme	% of URLLC packets fulfil the latency and reliability requirement =94.42% Note: The used metric is not aligned with the agreed metric option 1 and 2	N/A	> 80%	Power distribution 100 MHz @ 4 GHz, 30KHz SCS URLLC: ftp model 3 with 2ms arrival interval, 100 bytes eMBB: ftp model 3 with 1ms arrival interval, 1500 bytes Retransmisison: Chase combining URLLC latency requirement: 2ms BS receiver: MRC Power control for URLLC: absolute only with TPC steps [-3, -1, 1, 3] dB Simulation time: 5s eMBB 14OS URLLC 4OS Number of generated packets per URLLC user in the simulation is 2500	Power control solution achieves better latency performance than PI.
	Case 2: Dynamic power control for URLLC	% of URLLC packets fulfil the latency and reliability requirement =99.55% Note: The used metric is not aligned with the agreed metric option 1 and 2	N/A	> 80%		
	Case 3: UL cancelation for eMBB	% of URLLC packets fulfil the latency and reliability requirement =99.01% Note: The used metric is not aligned with the agreed metric option 1 and 2	N/A	> 80%		
Source 8 (Samsung, R1-1901284)	Case 1: Dynamic power control	% of URLLC UEs fulfil the latency and reliability requirement =90.3%	Average eMBB SE 0.7751 bps/Hz	52%	Power distribution, 500m ISD 40MHz BW@4GHz, 30KHz SCS URLLC: 100 bytes, FTP model 3 with arrival interval 100 ms, Generated URLLC packets: 1500 eMBB: FTP model 3 with 0.5 Mbytes URLLC requirement: 99.9999%, 2ms latency BS receiver: MMSE-IRC eMBB 14OS URLLC 2OS Number of generated packets per URLLC user in the simulation is around 1500	1. Power control shows improved average eMBB spectral efficiency relative to UL cancelation indication by about 15% 2.Power control shows a slightly worse performance than UL cancelation indication by about 2% regarding percentage of UEs satisfying reliability and latency requirements under ideal assumptions for UL cancelation indication.
	Case 2: UL cancelation (ideal)	% of URLLC UEs fulfil the latency and reliability requirement =92.5%	Average eMBB SE 0.6571 bps/Hz	52%		

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Source 9 (Nokia, R1-1900931)	Case 1: URLLC only, low URLLC load	URLLC outage = 0	N/A	1.5%	Macro, 500m ISD 10 MHz @ 4GHz, 15KHz FTP Model 3 with average arrival interval of 100 ms for each URLLC UE, 32 bytes Full-buffer for eMBB UEs Number of URLLC UEs per cell: 10 for low URLLC load, and 300 for high URLLC load Number of eMBB UEs per cell: 0 (no eMBB interference baseline), 1 (single UE) and 2 (simultaneous MU-MIMO streams) Open loop power control with full path-loss compensation for URLLC (α=1), and fractional path-loss compensation for eMBB (α=0.7 or α=1) BS receiver: MMSE-IRC eMBB 14OS URLLC 2OS Number of generated packets per URLLC user in the simulation is around $5x10^{\wedge 5}$ for high load and ~$1.7x10^{\wedge 4}$ for low load	1.Having colliding URLLC and eMBB transmission is only feasible for low URLLC loads with at maximum one co-scheduled eMBB user, when using 5 dB lower Po value for eMBB, and accepting the eMBB performance loss from this. 2. For higher URLLC loads, or if more than one eMBB user is (MU-MIMO) co-scheduled, the URLLC targets are only achieved when not colliding with eMBB. 3.Presented performance results therefore confirm our hypothesis that it is beneficial to avoid eMBB transmission to overlap with URLLC transmissions.
	Case 2: URLLC and 1 eMBB user, low URLLC load	URLLC outage = 0 when eMBB α=1, P0=-113; URLLC outage = 2.5e-5 when eMBB α=1, P0=-108; URLLC outage = 2.4e-5 when eMBB α=0.7, P0=-78;	N/A	100%		
	Case 3: URLLC and 1 eMBB user, low URLLC load	URLLC outage = 2.6e-5 when eMBB α=1, P0=-113; URLLC outage = 2.6e-4 when eMBB α=1, P0=-108; URLLC outage = 3e-4 when eMBB α=0.7, P0=-78;	N/A	100%		
	Case 4: URLLC only, High URLLC load	URLLC outage = 1.2e-5	N/A	35%		
	Case 5: URLLC and 1 eMBB user, High URLLC load	URLLC outage = 8e-5 when eMBB α=1, P0=-113; URLLC outage = 2.6e-4 when eMBB α=1, P0=-108; URLLC outage = 2.3e-4 when eMBB α=0.7, P0=-78;	N/A	100%		
	Case 6: URLLC and 2 eMBB user, High URLLC load	URLLC outage = 2e-4 when eMBB α=1, P0=-113; URLLC outage = 1.1e-3 when eMBB α=1, P0=-108; URLLC outage = 1.2e-3 when eMBB α=0.7, P0=-78;	N/A	100%		
Source 10 (Intel, R1-1902497)	Case 1 URLLC Only	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 100% @ 1.2Mbps URLLC load, Ratio of satisfied URLLC UEs is 100%	N/A	@ 0.4Mbps URLLC RU = 10.8%, @1.2Mbps URLLC RU = 32.3%	**Rel 15 InH** BS: 4 Rx UE: 1 Tx, 20MHz, SCS = 30kHz, NCP Resource granularity: 7OS Link adaptation: URLLC (fixed low MCS), eMBB (LA with outer loop) Retransmission: TB/CBG-based. Target URLLC requirement : 1e-4 with 1ms latency bound URLLC traffic arrival: Poisson with 32-byte packets (FTP3), 10 URLLC UEs eMBB: full buffer, 2 eMBB UEs BS receiver: L-MMSE URLLC: P0 to achieve target SNR = 20 dB, alpha = 0.8. Power boost of 0, 4, 8 dB eMBB: P0 to achieve target	**From URLLC performance perspective, in InH scenario** **1.** In case of dynamic scheduling, URLLC capacity is worse than URLLC-only scenario and is limited by inter-cell interference from full-buffer eMBB transmissions 2.Overlapped transmissions with same power control setting drops URLLC performance significantly. 3. Moderate power boosting (4 dB) restores URLLC performance to similar level as non-overlapped scheduling. 4. High power boosting (8 dB) results in URLLC capacity similar to URLLC-only scenario by overcoming inter-cell
	Case 2 eMBB only	N/A	14.3Mbps	eMBB full buffer		
	Case 3 No overlap. This case includes Case 3-1) dynamic scheduling with same scheduling granularity (both 7 OS), Case 3-2) UL cancellation by PI. eMBB transmission is dropped for the overlapping part. For Case 3-2), eMBB retransmission can be Case 3-2-1) TB-based or Case 3-2-2) CBG-based.	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 95% @ 1.2Mbps URLLC load, Ratio of satisfied URLLC UEs is 94%	Case 3-1) @ 0.4Mbps eMBB throughput = 11.8 Mbps @ 1.2Mbps eMBB throughput = 7.8Mbps	@ 0.4Mbps URLLC RU = 10.8%, @1.2Mbps URLLC RU = 32.3%		
			Case 3-2-1) @ 0.4Mbps eMBB throughput = 8 Mbps @ 1.2Mbps eMBB throughput = 3.7 Mbps			
			Case 3-2-2) @ 0.4Mbps eMBB throughput = 12 Mbps @ 1.2Mbps			

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			eMBB throughput = 8.1 Mbps		SNR = 20 dB, alpha = 0.8 eMBB 7OS URLLC 7OS Number of generated packets per URLLC user in the simulation is around $10^{\wedge 5}$	interference limitation from full buffer eMBB transmissions **From eMBB performance perspective, in InH scenario** **1.**Usage of UL cancellation indication together with TB-based retransmissions provides worst performance among the considered schemes due to resource wastage when only a part of a TB was cancelled 2.Usage of UL cancellation indication together with CBG-based retransmissions provides performance comparable / better than dynamic scheduling with same timescale 3. Overlapped transmissions with same power control setting leads to eMBB performance comparable to dynamic scheduling and UL cancellation 4. Power boosting of URLLC degrades eMBB performance down to the case of cancellation with TB-based retransmissions
	Case 4: Overlap with same power setting	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 75% @ 1.2Mbps URLLC load, Ratio of satisfied URLLC UEs is 71%	@ 0.4Mbps eMBB throughput = 11.8 Mbps @ 1.2Mbps eMBB throughput = 9 Mbps	@ 0.4Mbps URLLC RU = 10.8%, @1.2Mbps URLLC RU = 32.3%		
	Case 5: Semi-static power control with 4dB offset between eMBB and URLLC	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 96% @ 1.2Mbps URLLC load, Ratio of satisfied URLLC UEs is 93%	@ 0.4Mbps eMBB throughput = 10 Mbps @ 1.2Mbps eMBB throughput = 6 Mbps	@ 0.4Mbps URLLC RU = 10.8%, @1.2Mbps URLLC RU = 32.3%		
	Case 6: Semi-static power control with 8dB offset between eMBB and URLLC	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 100% @ 1.2Mbps URLLC load, Ratio of satisfied URLLC UEs is 98%	@ 0.4Mbps eMBB throughput = 8 Mbps @ 1.2Mbps eMBB throughput = 3.9 Mbps	@ 0.4Mbps URLLC RU = 10.8%, @1.2Mbps URLLC RU = 32.3%		
Source 10 (Intel, R1-1902497)	Case 1 URLLC Only	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 88% @ 1.0Mbps URLLC load, Ratio of satisfied URLLC UEs is 77%	N/A	@ 0.4Mbps URLLC RU = 6.3%, @1.0Mbps URLLC RU = 25.9%	**Rel 15 UMa** BS: 4 Rx UE: 1 Tx, 40MHz, SCS = 30kHz, NCP Resource granularity: 7OS Link adaptation: URLLC (fixed low MCS), eMBB (LA with outer loop) Retransmission: TB/CBG-based. Target URLLC requirement : 1e-4 with 1ms latency bound URLLC traffic arrival: Poisson with 32-byte packets (FTP3), 10 URLLC UEs eMBB: full buffer, 2 eMBB UEs BS receiver: L-MMSE URLLC: P0 to achieve target SNR = 20 dB,	**From URLLC performance perspective, in UMa scenario** 1. In case of dynamic scheduling, URLLC capacity is worse than in URLLC-only scenario and is limited by inter-cell interference from full-buffer eMBB transmissions 2. Overlapped transmissions with same power control setting and even with power boosting degrades URLLC performance significantly due to significant power limitation in UMa compared to InH 3. High power boosting (8 dB) only slightly improves URLLC capacity and but still quite inferior
	Case 2 eMBB only	N/A	51.8 Mbps	eMBB full buffer		
	Case 3 No overlap. This case includes Case 3-1) dynamic scheduling with same scheduling granularity (both 7 OS), Case 3-2) UL cancellation by PI. eMBB transmission is dropped for the overlapping part. For Case 3-2), eMBB retransmission can be Case 3-2-1) TB-based	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 76% @ 1.0Mbps URLLC load, Ratio of satisfied URLLC UEs is 67.5%	Case 3-1) @ 0.4Mbps eMBB throughput = 44 Mbps @ 1.0Mbps eMBB throughput = 35 Mbps Case 3-2-1) @ 0.4Mbps eMBB throughput = 27 Mbps @ 1.0Mbps eMBB throughput = 12.5 Mbps Case 3-2-2) @ 0.4Mbps eMBB	@ 0.4Mbps URLLC RU = 6.7%, @1.0Mbps URLLC RU = 26.6%		

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	or Case 3-2-2) CBG-based.		throughput = 40 Mbps @ 1.0Mbps eMBB throughput = 28 Mbps		alpha = 0.8. Power boost of 0, 4, 8 dB eMBB: P0 to achieve target SNR = 20 dB, alpha = 0.8 eMBB 7OS URLLC 7OS Number of generated packets per URLLC user in the simulation is around 10^5	to orthogonal URLLC transmission in URLLC-only and No overlap cases. **From eMBB performance perspective, in UMa scenario** 1. Usage of UL cancellation indication together with TB-based retransmissions provides worst performance among the considered schemes due to resource wastage when only a part of a TB was cancelled 2. Dynamic scheduling with same time scale as URLLC provides better performance compared to both PI-based and overlapped transmission. 3. PI with CBG-based retransmissions provide performance better than overlapped transmission with URLLC power boosting and PI with TB-based retransmission, and comparable performance to overlapped transmission with same power setting. 4. Overlapped transmissions leads to eMBB performance improvement compared to PI with TB-based retransmission.
	Case 4: Overlap with same power setting	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 57% @ 1.0Mbps URLLC load, Ratio of satisfied URLLC UEs is 54%	@ 0.4Mbps eMBB throughput = 39 Mbps @ 1.0Mbps eMBB throughput = 28 Mbps	@ 0.4Mbps URLLC RU = 7.2%, @1.0Mbps URLLC RU = 28.7%		
	Case 5: Semi-static power control with 4dB offset between eMBB and URLLC	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 61.5% @ 1.0Mbps URLLC load, Ratio of satisfied URLLC UEs is 59.2%	@ 0.4Mbps eMBB throughput = 37.5 Mbps @ 1.0Mbps eMBB throughput =27 Mbps	@ 0.4Mbps URLLC RU = 7.1%, @1.0Mbps URLLC RU = 28.5%		
	Case 6: Semi-static power control with 8dB offset between eMBB and URLLC	@ 0.4Mbps URLLC load, Ratio of satisfied URLLC UEs is 63 % @ 1.0Mbps URLLC load, Ratio of satisfied URLLC UEs is 61 %	@ 0.4Mbps eMBB throughput = 36.8 Mbps @ 1.0Mbps eMBB throughput = 24.8 Mbps	@ 0.4Mbps URLLC RU = 7.1%, @1.0Mbps URLLC RU = 28.5%		

Proposals:

- Recommend both UL cancelation scheme and enhanced UL power control scheme to be specified

Friday session

R1-1903699 Summary of UL inter UE Tx prioritization/multiplexing vivo

Decision: The document is noted.

Agreements: Update the agreed the observation as the following to clarify the simulated enhanced power control schemes

Observations:

- From URLLC perspective,
  - Comparing enhanced schemes with Rel-15 baseline scheme
    - Two sources (source 5/10) show better URLLC performance (URLLC capacity or percentage of URLLC UEs satisfying the requirement) in UMa scenario for UL cancelation scheme, compared to a Rel-15 baseline scheme using semi-static power setting of eMBB and URLLC. One source (source 8) shows almost the same performance between the two cases. One source (source 10) shows degraded URLLC performance (percentage of URLLC UEs satisfying the requirement) in InH scenario for UL cancelation

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scheme, compared to a Rel-15 baseline case where URLLC has 8dB higher power than eMBB using semi-static power setting.
- One source(source 6) show better URLLC performance (URLLC capacity or percentage of URLLC UEs satisfying the requirement) for enhanced schemes, compared to a Rel-15 baseline scheme using orthogonal scheduling of eMBB and URLLC in UMa scenario. One source (source 1) shows almost the same URLLC performance for enhanced schemes compared to a Rel-15 baseline scheme using orthogonal scheduling of eMBB and URLL in UMa scenario. The enhanced schemes include UL cancelation and enhanced dynamic power control.
- Two sources (source 9/10) show that 100% URLLC UE satisfying the requirement can only be achieved when the URLLC traffic load is low and the colliding eMBB transmission power is 5dB or 8dB lower than URLLC using semi-static power setting, while for higher URLLC traffic loads, source 9 shows that it is not possible to reach the URLLC performance requirement without removing the colliding eMBB transmission.
- One source (source 7) shows ~~better~~ almost the same URLLC performance for enhanced schemes, compared to a Rel-15 baseline using ~~orthogonal scheduling of eMBB and URLLC~~ TPC. The percentage of packets satisfying reliability and latency requirements is used as the URLLC performance metric, which is different from the agreed URLLC performance metric option 1 or option 2.

  - Comparing UL cancelation scheme and enhanced power control scheme

~~[to refine the following 3 subbullets by adding the detailed EPC scheme – revisit later]~~
- ~~Two~~ One source~~s~~ (source ~~5/~~6) show better URLLC performance (URLLC capacity or percentage of URLLC UEs satisfying the requirement) for UL cancelation scheme than enhanced dynamic power control scheme using enhanced TPC range of up to 6dB. The URLLC performance metric include throughput or percentage of URLLC UEs fulfilling the requirement.
- ~~Two sources (source 1/8) shows almost the same URLLC performance (percentage of URLLC UEs satisfying the requirement) between UL cancelation scheme and enhanced dynamic UL power control scheme.~~
- One source (source 1) shows almost the same URLLC performance (percentage of URLLC UEs satisfying the requirement) between UL cancelation scheme and enhanced UL power control scheme. In the evaluation by source 1, the enhanced UL power control is such that URLLC is always power boosted by 6dB higher than eMBB since eMBB and URLLC are assumed to always collide in the evaluation.
- ~~One source (source 7) shows almost the same URLLC performance between UL cancelation scheme and enhanced dynamic UL power control scheme. The percentage of packets satisfying reliability and latency requirements is used as the URLLC performance metric, which is different from the agreed URLLC performance metric option 1 or option 2.~~

- From eMBB perspective,
  - Comparing enhanced schemes with Rel-15 baseline scheme,
    - Two sources (source 1/6/10) show degraded eMBB throughput in UMa scenario for UL cancelation, compared to orthogonal scheduling of eMBB and URLLC when TB-level retransmission is used for eMBB.
    - One (source 6) shows degraded eMBB throughput in UMa scenario for enhanced dynamic power control, using enhanced TPC range of up to 6dB, compared to Rel-15 baseline.
    - One source (source 10) shows improved eMBB throughput in InH scenario for UL cancelation with CBG-level retransmission, compared to Rel-15 baseline using orthogonal scheduling of eMBB and URLLC, or semi-static power setting.
    - One source (source 10) shows improved eMBB throughput in UMa scenario for UL cancelation with CBG-level retransmission, compared to semi-static power setting.
  - Comparing UL cancelation scheme and enhanced power control scheme
    - ~~Two~~ One sources (source 1~~/8~~) show better eMBB throughput for enhanced power control, compared to UL cancelation. In the evaluation by source 1, the enhanced UL power control is such that URLLC is always power boosted by 6dB higher than eMBB since eMBB and URLLC are assumed to always collide in the evaluation.
    - One source (source 6) shows better eMBB throughput for UL cancelation, compared to enhanced dynamic power control, using enhanced TPC range of up to 6dB.

Note: in the above observations, the corresponding additional overhead to support the enhanced scheme(s) was not reported and summmarized

Agreement:
To document the following in the TR section "7.1.1 Link level simulation".
[2129 Sequans][2420 OPPO][3008 Qualcomm] provided the link level evaluation for the signalling of UL cancelation.

Agreement:
- Recommend both UL cancelation scheme and enhanced UL power control scheme to be specified.

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R1-1901561	UL inter-UE transmission prioritization and multiplexing	Huawei, HiSilicon
R1-1901597	Inter-UE Prioritization and Multiplexing of UL Transmissions	Ericsson
R1-1901696	UL inter UE Tx prioritization for URLLC	vivo
R1-1901772	UL inter-UE multiplexing between eMBB and URLLC	ZTE
R1-1901826	Uplink inter-UE prioritization and multiplexing	MediaTek Inc.
R1-1901913	On UL Inter UE Tx Prioritization/multipelxing	AT&T
R1-1901951	Remaining details of UL inter-UE eMBB and URLLC multiplexing	Nokia, Nokia Shanghai Bell
R1-1902006	Remaining details on inter-UE UL multiplexing	CATT
R1-1903243	Discussion on UL inter UE Tx prioritization	LG Electronics (rev of R1-1902049)
R1-1902073	Discussion on UL preemption indication	Fujitsu
R1-1902129	Considerations on UL inter-UE multiplexing for URLLC	Sequans Communications
R1-1902180	Considerations on UL Inter-UE Tx Multiplexing	Sony
R1-1902300	Uplink inter UE multiplexing/prioritization for enhanced URLLC	Samsung
R1-1902336	Discussion on UL inter UE Tx prioritization/multiplexing	CMCC
R1-1902420	Consideration on UL inter UE Tx prioritization and multiplexing	OPPO
R1-1902444	UL inter UE Tx prioritization/multiplexing	ETRI
R1-1902497	On inter-UE UL multiplexing for eURLLC	Intel Corporation
R1-1902521	On NR URLLC UL inter UE Tx prioritization/multiplexing	Panasonic
R1-1902532	UL inter-UE Tx prioritisation and multiplexing	NEC
R1-1902610	Potential enhancements for UL inter-UE multiplexing	InterDigital, Inc.
R1-1902625	UL inter-UE multiplexing between eMBB and URLLC	China Telecommunications
R1-1902750	Discussion on power control mechanism for UL inter UE Tx multiplexing	ASUSTEK COMPUTER (SHANGHAI)
R1-1902765	Considerations on URLLC UL Inter UE Tx prioritization/multiplexing	Apple Inc.
R1-1902808	UL inter-UE transmission prioritization/multiplexing	NTT DOCOMO, INC.
R1-1902838	Views on pre-emption for UL inter UE Tx multiplexing	Mitsubishi Electric Co.
R1-1902846	UL inter UE Tx prioritization/multiplexing for URLLC operation	Motorola Mobility, Lenovo
R1-1902875	On UL inter-UE multiplexing for NR URLLC	WILUS Inc.
R1-1902879	Discussion on UL Inter UE Tx multiplexing	III
R1-1903008	UL Inter-UE Tx Multiplexing and Prioritization	Qualcomm Incorporated
R1-1903052	Considerations on UL inter UE Tx multiplexing	KT Corp.

Late submission

7.2.6.3 Enhanced UL grant-free transmissions

R1-1903341 Summary of 7.2.6.3 Enhanced configured grant PUSCH transmissions NTT DOCOMO

Decision: The document is noted.

W.r.t proposal 1 in R1-1903341, option 3 is already agreed

Proposed conclusion:

- The necessity of explicit HARQ-ACK for configured grant PUSCH for this SI is not justified.

Companies are encouraged to check the results summarized in Table 1 as in R1-1903341

Wednesday session

R1-1903585 Summary for Enhanced configured grant PUSCH transmissions NTT DOCOMO

Decision: The document is noted.

Proposal:

- Conclusion: there is no consensus on the necessity of explicit HARQ-ACK for configured grant PUSCH for this SI.

Thursday session

R1-1903707 Offline discussions for enhanced configured grant PUSCH transmissions NTT DOCOMO

Decision: The document is noted.

Conclusion:
- Capture the simulation results in Table 1-1 in R1-1903707 into the TR section 8.1 "performance evaluation" as the outcome of the study.

Conclusion:
- There is no consensus on the necessity of explicit HARQ-ACK for configured grant PUSCH for this SI.

R1-1901562	Enhanced UL configured grant transmissions	Huawei, HiSilicon
R1-1901598	Enhancement of Configured Grant for NR URLLC	Ericsson
R1-1901697	Enhanced UL grant-free transmissions for URLLC	vivo
R1-1901773	Enhancements for UL grant-free transmissions	ZTE
R1-1901827	Evaluation and enhancements of configured-grant for URLLC	MediaTek Inc.
R1-1903502	On Configured Grant enhancements for NR URLLC	Nokia, Nokia Shanghai Bell (rev of R1-1901952)
R1-1902007	On enhancements to configured UL grant	CATT
R1-1902050	Discussion on enhancement for grant-free transmission	LG Electronics
R1-1902127	Enhancements for grant free transmissions	Sequans Communications
R1-1902181	Consideration on enhanced UL grant-free transmissions	Sony
R1-1902301	Potential enhancement for UL grant-free transmission	Samsung
R1-1902396	Discussion on URLLC enhancements for grant-free transmission	Panasonic Corporation
R1-1903698	UL grant free transmission enhancement	OPPO (rev of R1-1902421)
R1-1902498	On enhancements to configured grant PUSCH for eURLLC	Intel Corporation
R1-1902611	Potential enhancements for UL configured grant	InterDigital, Inc.
R1-1902718	Discussion on UL grant-free transmission enhancements for URLLC	Spreadtrum Communications
R1-1902809	Enhanced UL transmission with configured grant for URLLC	NTT DOCOMO, INC.
R1-1902931	Discussion on Configured Grant Enhancements	III
R1-1902951	Discussion on enhanced UL grant-free transmissions	KDDI Corporation
R1-1903009	Enhanced Grant-Free Transmissions for eURLLC	Qualcomm Incorporated

7.2.6.4 Other

Including any remaining details for evaluation assumptions, handling LS as in R1-1814342

R1-1903535 **Summary of Wednesday offline discussion on UL/DL intra-UE prioritization/multiplexing Nokia, Nokia Shanghai Bell**

Decision: The document is noted.

Wednesday session

Conclusion:
- It is recommended to support the handling of scenario 1 as listed in R1-1814342 in the Rel-16 WI.
- It is recommended to allow the prioritization of configured grant over dynamic grant under some conditions in case of collision in scenario 2 as listed in R1-1814342 in the Rel-16 WI.

Friday session

Conclusion:
- It is recommended to support the handling of scenario 3 as listed in R1-1814342 in the Rel-16 WI.
- It is recommended to support enhancements for scenario 4 and 5 as listed in R1-1814342 in the Rel-16 WI.

Agreements:

For scenario 2 as listed in R1-1814342, in case the collision between configured grant and dynamic grant occurs in physical layer, options to determine the prioritization between configured grant and dynamic grant include at least – to be further investigated during the WI phase:

- Priority at PHY is determined by MAC layer for the purpose of PHY prioritization.
  - Note: this may or may not have any RAN1 impact
- Priority at PHY is determined via using PHY channel(s)/signal(s)/parameters for the purpose of PHY prioritization.
- It is configurable as part of the configured grant configuration whether it should have higher priority than dynamic grant in case of conflict.
- Other options are not precluded.

R1-1903350 Summary of remaining details on evaluation assumptions and evaluation results Huawei

R1-1903586
Companies are encouraged to check

R1-1903437 Text proposal for TSN requirements evaluation Nokia, Nokia Shanghai Bell
Decision: The document is noted. Companies are encouraged to check

Thursday session
R1-1903723 Summary of remaining details on evaluation assumptions and evaluation results Huawei (rev of R1-1903586)
Decision: The document is noted.

Agreements:
- To Capture Table 2.1-1 in R1-1903723 in TR 38.824.
- Agree on the corresponding observations (2.1-1 to 2.1-8)
- Agree on observations (2.1-9 and 2.1-10)

Agreements:
- To Capture the update as in Table 2.2-1 in R1-1903723 in TR 38.824.
- Agree on the corresponding observations (2.2-1 and 2.2-2)

Agreements:
- To Capture the update as in Table 2.3-1 in R1-1903723 in TR 38.824.
- Agree on the corresponding observations (2.3-1 and 2.3-2)

Agreements:
- To Capture the update as in Table 2.4-1 in R1-1903723 in TR 38.824.
- Agree on the corresponding observations (2.4-1 and 2.4-2)

R1-1903712 Text proposal for TSN requirements evaluation Nokia, Nokia Shanghai Bell (rev of R1-1903437)
Decision: The document is endorsed. To send an LS in R1-1903721 to RAN2 – Quang (Nokia)
Friday
R1-1903721 [Draft] LS on text proposal to TR 38.825 on TSN requirements evaluation Nokia
Decision: The draft LS is endorsed and final LS is approved in R1-1903790.

R1-1903636 Summary#2 of discussion on Combinations of Uu QoS characteristics values for V2X services Huawei
Decision: The document is noted.

Conclusion:
- No need to handle LS R1-1900012 in RAN1 96, it will start to be handled in RAN1 96b.

Friday session

R1-1903766 Summary of Thursday offline discussion on UL/DL intra-UE prioritization/multiplexing Nokia, Nokia Shanghai Bell
Decision: The document is noted.

Agreements:
For Scenario 4 and 5, RAN1 recommends considering the prioritization and/or multiplexing behaviour among URLLC/eMBB HARQ-ACK/SR/CSI and URLLC/eMBB PUSCH, including the cases with UCI on PUCCH and UCI on PUSCH.
Note: RAN1 has not conclude whether to support prioritization, or multiplexing, or both

LS to RAN2 to capture the above in R1-1903789 (Sigen, Nokia)
R1-1903789 [Draft] LS on text proposal for TR 38.825 on UL/DL intra-UE prioritization/multiplexing Nokia
Decision: The draft LS is endorsed and final LS is approved in R1-1903819.

R1-1903767 Text proposal on UL/DL intra-UE prioritization/multiplexing for TR 38.825 Nokia, Nokia Shanghai Bell
Decision: The TP is endorsed.

R1-1901553 Baseline performance achievable with Rel-15 URLLC for transport industry Huawei, HiSilicon
R1-1903233 Baseline performance achievable with Rel-15 URLLC for power distribution Huawei, HiSilicon (rev of R1-1901554)
R1-1901555 Baseline performance achievable with Rel-15 URLLC for factory automation Huawei, HiSilicon
R1-1901556 Baseline performance achievable with Rel-15 URLLC for R15 enabled cases Huawei, HiSilicon
R1-1901599 Evaluation of URLLC Power Distribution Scenario Ericsson
R1-1901600 Evaluation of URLLC Transport Industry Scenario Ericsson
R1-1901602 On Two Proposed 5QI Values Ericsson
R1-1901603 Initial Transmission Opportunity in UL Configured Grant Ericsson
R1-1901604 Channel Model for Factory Automation Scenario Ericsson
R1-1901605 URLLC Use Cases and Deployments for Beyond 52.6 GHz Ericsson
R1-1901698 UL intra UE Tx prioritization for URLLC vivo
R1-1901699 DL intra UE Tx prioritization for URLLC vivo
R1-1901700 Power control enhancements for UL intra-UE multiplexing vivo
R1-1901774 Discussion on intra-UE multiplexing ZTE
R1-1901775 Performance evaluation for factory automation ZTE
R1-1901828 Intra-UE multiplexing and prioritization between mixed traffic priorities MediaTek Inc.
R1-1901917 On intra-UE DL/UL prioritization for NR URLLC Nokia, Nokia Shanghai Bell
R1-1901918 Text proposal for TSN requirements evaluation Nokia, Nokia Shanghai Bell
R1-1902008 Discussion on intra-UE multiplexing scenarios CATT
R1-1903400 Performance evaluation of the factory automation scenario CATT (rev of R1-1902009)
R1-1902010 On configured DL assignments for URLLC CATT
R1-1902051 Intra-UE prioritization for NR URLLC LG Electronics
R1-1902182 Considerations on UL Intra-UE Tx Multiplexing Sony
R1-1902302 Discussion on intra-UE multiplexing Samsung
R1-1902337 Discussion on intra-UE multiplexing CMCC
R1-1902398 Discussion on intra-UE Tx prioritization/multiplexing Panasonic Corporation
R1-1902442 Views on intra-UE DL prioritization for URLLC ETRI
R1-1902499 On enhancements to intra-UE multiplexing for IIoT Intel Corporation
R1-1902612 Intra-UE Prioritization / Multiplexing for Scenarios 2-5 InterDigital, Inc.
R1-1902613 L1/PHY Impacts for Intra-UE prioritization/multiplexing scenarios 6-7 InterDigital, Inc.
R1-1903447 Evaluation of URLLC Factory Automation Scenario at 4 GHz Ericsson (rev of R1-1902754)
R1-1903448 Evaluation of URLLC Factory Automation Scenario at 30 GHz Ericsson (rev of R1-1902755)
R1-1903449 Evaluation of Rel-15 Enabled URLLC Use Cases Ericsson (rev of R1-1902756)
R1-1902757 Evaluation of URLLC Urban Macro Scenario at 700 MHz Ericsson

R1-1902758 Rel-16 Work Item Scope for eURLLC Ericsson
Late submission
R1-1902810 UL intra-UE transmission prioritization/multiplexing NTT DOCOMO, INC.
R1-1902839 Views on pre-emption for UL intra UE Tx multiplexing Mitsubishi Electric Co.
R1-1902876 UL intra-UE transmission prioritization and multiplexing for NR URLLC WILUS Inc.
R1-1903451 System level evaluations of eURLLC use cases Intel Corporation (rev of R1-1902895)
R1-1903010 PHY-layer differentiation for Intra-UE multiplexing Qualcomm Incorporated
R1-1903079 Discussion on explicit HARQ-ACK feedback for configured grant transmission Huawei, HiSilicon
R1-1903080 Detailed design on multiple active configurations for configured grant transmission Huawei, HiSilicon
R1-1903081 Intra-UE transmission prioritization and multiplexing Huawei, HiSilicon
R1-1903082 DL intra-UE transmission prioritization and multiplexing Huawei, HiSilicon
R1-1903083 Discussion on differentiation of eMBB and URLLC services Huawei, HiSilicon
R1-1903084 Scheduling reliable retransmission Huawei, HiSilicon
R1-1903157 On Intra-UE prioritization Convida Wireless
R1-1903350 Summary of remaining details on evaluation assumptions and evaluation results Huawei
R1-1903369 Summary of contributions on UL/DL intra-UE prioritization/multiplexing Nokia, Nokia Shanghai Bell
R1-1903818 Summary of Friday offline discussion on UL/DL intra-UE prioritization/multiplexing Nokia, Nokia Shanghai Bell

7.2.7 Study on Self Evaluation towards IMT-2020 Submission

FS_5G_eval; SID in RP-181318. Please refer to the SID for detailed scoping

Note: no online time intended for this agenda item during this meeting

R1-1902500 Considerations for IMT-2020 Self-Evaluations Intel Corporation

7.2.7.1 Evaluation methodology

R1-1901565 Consideration on IMT-2020 evaluation towards final submission in June 2019 Huawei, HiSilicon
R1-1902011 Discussions on calculation of shadow fading margin for link budget in LOS cases CATT
R1-1902320 Discussion on evaluation methodology for Dense Urban eMBB scenario Samsung
R1-1902666 Clarifications on uplink system level evaluation for IMT-2020 self-evaluation Sharp
R1-1902897 Self-evaluation results for Rural and Dense Urban - eMBB for IMT-2020 CEWiT

7.2.7.2 Other

Including evaluation results

R1-1901632 IMT-2020 Reliability Evaluation Results (URLLC) Nokia, Nokia Shanghai Bell
R1-1902012 Self-evaluation on LTE Spectrum Efficiency in Indoor Hptspot-eMBB CATT
R1-1902013 Self-evaluation on LTE Spectrum Efficiency in Dense Urban-eMBB CATT
R1-1902014 Self-evaluation on LTE Area Traffic Capacity in Indoor Hptspot-eMBB CATT
R1-1902015 Self-evaluation on LTE User Experienced Data Rate in Dense Urban-eMBB CATT
R1-1902016 Self-evaluation on Mobility for LTE CATT
R1-1902017 Further Self-Evaluation on Link Budget for NR CATT
R1-1903470 Link Budget on eMBB for IMT-2020 self-evaluation ZTE (rev of R1-1902034)
R1-1902035 Reliability for IMT-2020 self-evaluation ZTE
R1-1902087 Evaluation results of Dense Urban-eMBB for IMT-2020 self-evaluation LG Electronics
R1-1902088 Evaluation results of Rural-eMBB for IMT-2020 self-evaluation LG Electronics
R1-1902089 Evaluation results of Indoor Hotspot-eMBB for IMT-2020 self-evaluation LG Electronics
R1-1902626 Updated results on spectral efficiency and user experienced data rate of Dense Urban-eMBB China Telecommunications
R1-1902627 Updated results on spectral efficiency and area traffic capacity of Indoor Hotspot-eMBB China Telecommunications
R1-1902628 Updated results of rural-eMBB for NR and LTE in TDD China Telecommunications

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R1-1902629 Initial results on FDD eMBB spectrum efficiency for IMT-2020 self-evaluation China Telecommunications
R1-1902667 Evaluation results of mobility in Indoor Hotspot - eMBB in FR1 for IMT-2020 self-evaluation Sharp
R1-1902668 Evaluation results of mobility in Dense Urban – eMBB in FR1 for IMT-2020 self-evaluation Sharp
R1-1902669 Evaluation results of mobility in Dense Urban – eMBB in FR2 for IMT-2020 self-evaluation Sharp
R1-1902670 Evaluation results of mobility in Rural – eMBB for IMT-2020 self-evaluation Sharp
R1-1903085 Considerations and evaluation results for IMT-2020 for eMBB spectral efficiency in NR Huawei, HiSilicon
R1-1903086 Consideration on self evaluation of IMT-2020 for area traffic capacity in NR Huawei, HiSilicon
R1-1903087 Consideration on LTE evaluation features and parameters for IMT-2020 self evaluation on eMBB spectral efficiency Huawei, HiSilicon
R1-1903088 Considerations and evaluation results for IMT-2020 for eMBB spectral efficiency in LTE Huawei, HiSilicon
R1-1903089 Consideration on self evaluation of IMT-2020 for area traffic capacity in LTE Huawei, HiSilicon
R1-1903119 IMT-2020 self-evaluation: mMTC coverage, data rate, latency & battery life Ericsson
R1-1903120 IMT-2020 self-evaluation: mMTC non-full buffer connection density for LTE-MTC and NB-IoT Ericsson
R1-1903121 IMT-2020 self-evaluation: CP latency Ericsson
R1-1903191 Considerations and evaluation results for IMT-2020 for mMTC connection density Huawei, HiSilicon

7.2.8 Enhancements on MIMO for NR

NR_eMIMO-Core; WID in RP-182863. Please refer to the WID for detailed scoping
Evaluation methodology, if necessary, can be discussed in each respective sub-agenda.

R1-1903631 Chairman's notes of AI 7.2.8 Enhancements on MIMO for NR Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

7.2.8.1 CSI Enhancement for MU-MIMO Support

R1-1902304 Summary of CSI enhancement for MU-MIMO Samsung

Agreement
Proposal 1 from R1-1902304 is agreed

Agreement
Extend the Type II DFT-based compression (designed for RI=1-2) to RI=3-4 with the following design principle:
- The resulting overhead for RI=3-4 is at least comparable to that for RI=2

Agreement
On subset selection for layer 0, agree on the following:
- Unrestricted (polarization-independent) subset selection which requires a size-2LM bitmap in UCI part 2
- $\beta \in \left\{\frac{1}{4}, \frac{1}{2}, \frac{3}{4}\right\}$
  - FFS: Further down selection of supported combinations of FD compression parameters

Agreement
On LCC quantization, agree on the following:
- The description of each of the five alternatives above is final (in R1-1902304, section 2.5)
- Further discuss to select one of the five alternatives later this week (in RAN1#96)
  - Any new alternative (including merged/compromise proposals) will not be considered for Rel-16

Agreement
On subset selection for RI=2, agree on the following

- SD basis selection (selection of L out of N1N2 SD DFT vectors) is layer-common
- Terms:
  - "FD basis subset selection" refers to the selection of M out of N_3 FD DFT vectors
  - "Coefficient subset selection" refers to the selection of K_{NZ} (# non-zero coefficients) out of 2LM where $K_{NZ} \leq K_0$
- The size-K_0 subset design for layer 0 is also applied to layer 1
- K_0 is the maximum number of non-zero coefficients for each layer.

R1-1903501 **Summary of Offline Email Discussion on MU-MIMO CSI Samsung**

Agreement
On LCC quantization, agree on Alt2 (differential per polarization) per the description in R1-1902304

Agreement
For RI=2, the following is supported
- Layer-independent FD basis subset selection
- Layer-independent coefficient subset selection

Agreement
On the values of N_3, further discuss and clarify/refine both of the available alternatives with $N_3 = (N_{SB} \times R)$ as the evaluation baseline

R1-1903500 **Summary of Tuesday Offline Session on MU-MIMO CSI Samsung**

Agreement
For RI∈{3,4}, different layers are independently quantized just as RI=1 and 2

Agreement
On SD and FD basis selection for RI∈{3,4}
- The parameter *R* is layer-common and RI-common
- For the higher-layer setting of SD/FD basis parameters (*L*, *p*):
  - Down select among the following alternatives for the higher-layer setting of SD/FD basis parameters (*L*, *p*):
    - Alt1 RI-common for RI∈{1,2,3,4}, layer-common
    - Alt2 RI-common for RI∈{1,2,3,4}, layer-/layer-group-specific
    - Alt3 RI-common for RI∈{3,4}, layer-common
    - Alt4 RI-common for RI∈{3,4}, layer-/layer-group-specific
    - Alt5 RI-specific for RI∈{3,4}, layer-common
    - Alt6 RI-specific for RI∈{3,4}, layer-/layer-group-specific
  - Note: For RI=1 and 2, RI-common, layer-common setting has been agreed
  - Note: No other alternatives will be considered

Email discussion by 15th of March: Companies to provide more details on the alternatives listed above. Strive to converge on a single set of parameters for each alternative. (Eko, Samsung)

Agreement
On the max # NZ coefficients for RI∈{3,4}, down select from the following alternatives (no other alternatives will be considered)
- Alt0. For RI∈{1,2,3,4}, there is only one β value
- Alt1. Total max # NZ coefficients across all layers ≤ $2K_0$ (the K_0 value set for RI∈{1,2})
- Alt2. For RI∈{3,4}, there is only one value of max # NZ coefficients per layer < K_0 where the K_0 value is set for RI∈{1,2}
- Alt3. Total max # NZ coefficients across all layers ≤ $2\alpha K_0$ (the K_0 value set for RI∈{1,2}) where α is fixed and RI-specific
  - FFS: value of α per agreement that the overhead for RI=3 or 4 should at least be comparable to RI=2
- Alt4. For RI∈{3,4}, there is only one value of max # NZ coefficients per layer < αK_0 where the K_0 value is set for RI∈{1,2} where α is fixed and RI-specific

- FFS: value of α per agreement that the overhead for RI=3 or 4 should at least be comparable to RI=2
- Note: For RI∈{1,2}, there is only one K_0 value (=max # NZ coefficients per layer)

Agreement
Decide in RAN1#96bis whether to support L=6 (in addition to L=2 and 4) taking into account RI∈{3,4} and/or 32 ports
- Also consider possible restriction(s) on the use case for supporting the additional value(s) of L

R1-1901566 Discussion on CSI enhancement Huawei, HiSilicon
R1-1903343 CSI Enhancement for MU-MIMO Support ZTE (rev of R1-1901633)
R1-1901701 Further discussion on type II CSI compression and feedback parameters vivo
R1-1903223 CSI Enhancement for MU-MIMO Support MediaTek Inc. (rev of R1-1901788)
R1-1901905 On Type2 CSI Enhancements for MIMO AT&T
R1-1902018 Discussions on Type II CSI enhancement CATT
R1-1902090 Discussion on overhead reduction for Type II codebook LG Electronics
R1-1902123 Enhancements on Type-II CSI reporting Fraunhofer IIS, Fraunhofer HHI
R1-1903359 CSI enhancement for MU-MIMO Samsung (rev of R1-1902303)
R1-1902400 CSI enhancement for MU-MIMO Asia Pacific Telecom co. Ltd
R1-1902501 Type II CSI feedback compression Intel Corporation
R1-1902562 CSI Overhead reduction for Type II codebook up to rank 2 Nokia, Nokia Shanghai Bell
R1-1902686 Discussion on CSI Reporting NEC
R1-1902700 Enhancements on overhead reduction for type II CSI feedback OPPO
R1-1902720 Discussion on Type II CSI overhead reduction Spreadtrum Communications
R1-1902766 Considerations on CSI enhancement for MU-MIMO support Apple Inc.
R1-1902811 Type II CSI overhead reduction NTT DOCOMO, INC.
R1-1903505 On MU-MIMO CSI Enhancements Motorola Mobility, Lenovo (rev of R1-1902847)
R1-1903376 On CSI enhancements for MU-MIMO Ericsson (rev of R1-1903038)
R1-1903042 CSI enhancement for MU-MIMO support Qualcomm Incorporated

7.2.8.2 Enhancements on Multi-TRP/Panel Transmission

R1-1903541 **Summary of AI: 7.2.8.2 Enhancements on Multi-TRP/Panel Transmission of Offline Discussion** **Huawei, HiSilicon**

Agreement
For multi-DCI based multi-TRP/panel transmission, the total number of CWs in scheduled PDSCHs, each of which is scheduled by one PDCCH, is up to 2.

Agreement
For a UE supporting multiple-PDCCH based multi-TRP/panel transmission and each PDCCH schedules one PDSCH, at least for eMBB with non-ideal backhaul, support following restrictions:
- The UE may be scheduled with fully/partially/non-overlapped PDSCHs at time and frequency domain by multiple PDCCHs with following restrictions:
  - The UE is not expected to assume different DMRS configuration with respect to actual number of front loaded DMRS symbol(s), the actual number of additional DMRS, the actual DMRS symbol location and DMRS configuration type if the UE may be scheduled with full/partially overlapping PDSCHs by multiple PDCCHs.
  - The UE is not expected to have more than one TCI index with DMRS ports within the same CDM group for fully/partially overlapped PDSCHs
  - Full scheduling information for receiving a PDSCH is indicated and carried only by the corresponding PDCCH.
  - The UE is expected to be scheduled with the same active BWP bandwidth and the same SCS if the UE is expected to receive multiple PDSCHs simultaneously at given symbols.
  - The number of active BWPs for a UE is 1 per CC
  - FFS: PDSCH mapping type from two co-scheduled PDSCHs
  - FFS: Alignment of PRG-level grid from multiple TRPs
  - FFS: How to ensure the same active BWP between multiple TRPs
  - Note that rate matching mechanisms (if need) to support multi-DCI based NCJT will be discussed separately.

Agreement

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For multiple-PDCCH based multi-TRP/panel transmission, rate matching, puncturing, and pre-emption mechanisms shall be studied/enhanced if need, e.g. ratematchpattern, DMRS ports, ZP/NZP CSI-RS, SSB, configured CORESET, lte-CRS-ToMatchAround, pre-emption indications.

- to be discussed and down-selected in RAN1#96bis

Agreement
For TCI state configuration in order to enable one or two TCI states per a TCI code point,

- MAC-CE enhancement to map one or two TCI states for a TCI code point where further detailed design is determined in RAN2.
- FFS whether increasing the number of bits of TCI field in DCI

Include in LS to RAN2

R1-1903637 **Draft LS on support of Enhancements on multi-TRP/panel transmission**
Decision: The draft LS is endorsed. Final LS is approved in R1-1903697 with updates on new RAN1 agreements.

R1-1903610 **Offline Discussion for Multi-TRP/Panel Transmission and General plan for RAN1 96bis** **Huawei, HiSilicon**

Agreement
To support multiple-PDCCH based multi-TRP/panel transmission with intra-cell (same cell ID) and inter-cell (different Cell IDs), following RRC configuration can be used to link multiple PDCCH/PDSCH pairs with multiple TRPs

- one CORESET in a "PDCCH-config" corresponds to one TRP
  - FFS whether to increase the number of CORESETs per "PDCCH-config" more than 3

FFS: UE monitoring/decoding behavior for multiple PDCCHs.
Include in LS to RAN2

Agreement
For separate ACK/NACK payload/feedback for received PDSCHs where multiple DCIs are used,

- PUCCH resources conveying ACK/NACK feedback can be TDM with separated HARQ-ACK codebook.
  - FFS TDM within a slot
  - FFS: the format of PUCCH from multiple TRP shall be same or different

For issues related to PUCCH resources, study including:

- FFS: if PUCCH resources conveying ACK/NACK feedback are overlapped at time, whether predefined dropping rule is needed to drop ACK/NACK feedback.
- FFS: how to handle ACK/NACK overlapping with CSI reporting for different TRPs
- FFS: how to handle PUCCH overlapping with PUSCH at the time domain for different TRPs
- FFS: whether the UE can assume simultaneous ACK/NACK transmission from multiple PUCCH resources, and associated details of configurations/indication/UE capability.

Include in LS to RAN2

For further consideration in future meetings:
To facilitate further down-selection for one or more schemes in RAN1#96bis, schemes for multi-TRP based URLLC scheduled by single DCI at least are clarified as following:

- Scheme 1 (SDM): n ($n<=N_s$) TCI states within the single slot, with overlapped time and frequency resource allocation across different spatial layers, i.e., layer sets
  - For multiple layers/layer sets transmission
    - Each layer set is associated with one TCI and one set of DMRS port(s)
    - single RV (lower coding rate) or multiple RVs (higher coding rate) can be used across layer sets
      - In case of single RV, different coded bits are mapped to different layer sets with the same mapping rule as in Rel-15
      - In case of multiple RVs, the RVs corresponding to different layer sets can be the same or different
    - Same MCS is used
  - For single layer transmission
    - The layer is associated with n TCI
- Scheme 2 (FDM): n ($n<=N_f$) TCI states within the single slot, with non-overlapped frequency resource allocation
  - Resource allocation associated with TCI states
  - Single RV (lower coding rate) or multiple RVs (higher coding rate) can be used across RB sets

        - In case of single RV, different coded bits are mapped to different RB sets with the same mapping rule as in Rel-15
        - In case of multiple RVs, the RVs corresponding to different RB sets can be the same or different
    - Same MCS with same single or multiple DMRS port(s) are used.
- Scheme 3 (TDM): n (n<=N_{t1}) TCI states within the single slot, with non-overlapped time resource allocation
    - Each transmission occasion of the TB has one TCI and one RV with the time granularity of mini-slot.
    - All transmission occasion (s) within the slot use a common MCS with same single or multiple DMRS port(s).
    - RV/TCI state can be same or different among transmission occasions.
    - FFS channel estimation interpolation across mini-slots with the same TCI index
- Scheme 4 (TDM): n (n<=N_{t2}) TCI states with K (n<=K) different slots.
    - Each transmission occasion of the TB has one TCI and one RV.
    - All transmission occasion (s) across K slots use a common MCS with same single or multiple DMRS port(s)
    - RV/TCI state can be same or different among transmission occasions.
    - FFS channel estimation interpolation across slots with the same TCI index

Note that M-TRP/panel based URLLC schemes shall be compared in terms of improved reliability, efficiency, and specification impact.
Note: Support of number of layers per TRP may be discussed
Email discussion to converge on the descriptions of scheme 1 and scheme 2 by 15th of March (Min, Huawei)

R1-1901567	Enhancements on multi-TRP/panel transmission	Huawei, HiSilicon
R1-1901634	Enhancements on Multi-TRP/Panel Transmission	ZTE
R1-1901702	Further discussion on multi TRP transmission	vivo
R1-1901789	Enhancements on Multi-TRP/Panel Transmission	MediaTek Inc.
R1-1901906	Multi-TRP/Panel Enhancements for Release 16 MIMO	AT&T
R1-1902019	Consideration on multi-TRP/panel transmission	CATT
R1-1902091	Enhancements on multi-TRP/panel transmission	LG Electronics
R1-1902161	Discussion of multi-panel/TRP transmission	Lenovo, Motorola Mobility
R1-1902183	Considerations on Multi-TRP/Panel Transmission	Sony
R1-1902305	Enhancements on multi-TRP/panel transmission	Samsung
R1-1902338	Discussion on multi-TRP/panel transmission	CMCC
R1-1902502	On multi-TRP/multi-panel transmission	Intel Corporation
R1-1902522	On multi-TRP enhancements for NR MIMO in Rel. 16	Panasonic
R1-1902540	On multi-TRP and multi-panel	Ericsson
R1-1902551	Discussion on enhancements for multi-TRP/panel transmission	Fraunhofer HHI, Fraunhofer IIS
R1-1902563	Enhancements on Multi-TRP/Panel Transmission	Nokia, Nokia Shanghai Bell
R1-1902614	Performance Evaluation of Multi-TRP Schemes	InterDigital, Inc.
R1-1902671	Discussion on multi-TRP/panel techniques for URLLC	Sharp
R1-1902689	Discussion on multi-TRP transmission	NEC
R1-1902701	Enhancements on multi-TRP and multi-panel transmission	OPPO
R1-1902739	Discussion on multi-TRP transmission	Spreadtrum Communications
R1-1902767	Considerations on PDCCH design for NCJT design	Apple Inc.
R1-1902812	Enhancements on multi-TRP/panel transmission	NTT DOCOMO, INC.
R1-1902865	Enhancements on Multi-TRP/Panel Transmission	Beijing Xiaomi Electronics
R1-1902926	Discussion on URLLC reliability/robustness enhancement with multi-TRP/panel	CAICT
R1-1903043	Multi-TRP Enhancements	Qualcomm Incorporated
R1-1903046	Enhancements on multiple TRP or panel transmission	ASUSTEK COMPUTER (SHANGHAI)

7.2.8.3 Enhancements on Multi-beam Operation

R1-1903244	**Feature lead summary of Enhancements on Multi-beam Operations**	**LG Electronics**

For purpose of further discussion on this topic for RAN1#96 and future meetings
Following multi-panel UE (MPUE) categories can be used for discussions on possible enhancements over Rel-15, if needed.

- **MPUE-Assumption1:** Multiple panels are implemented on a UE and **only one** panel can be activated at a time, with panel switching/activation delay of [X] ms

- **MPUE-Assumption2:** Multiple panels are implemented on a UE and **multiple** panels can be activated at a time and one or more panels can be used for transmission
- **MPUE-Assumption3:** Multiple panels are implemented on a UE and **multiple** panels can be activated at a time but only one panel can be used for transmission

Note: Above does not imply the support of either one or both of the categories but is only for efficient discussions at least for this meeting, which may also be updated further. Whether to support either one or both categories will depend on subsequent discussions
Note: There is no consensus among the companies in RAN1 whether MPUE-Assumption2 is in the work scope of Rel-16 WI

Agreement
If RAN1 cannot agree on the support of at least one of MPUE-Assumption1, MPUE-Assumption2, MPUE-Assumption3, enhancements on panel-specific beam selection for uplink will not be supported in Rel-16.

- Deadline for decision: RAN1#96bis

R1-1903544 **Summary on SCell BFR and L1-SINR** **Intel**

Agreement

- For SCell BFR, BFRQ shall be conveyed if UE declares beam failure
  - UE shall convey new beam information during BFR procedure if new candidate beam RS and corresponding threshold is configured and at least if channel quality of new beam is above or equal to threshold
    - FFS: whether no new beam identified could be included as a state of new beam information
    - FFS: details if no new beam is above or equal to threshold

Agreement
For interference measurement of L1-SINR, down select one of the following in RAN1#96bis

- Alt 1: dedicated ZP IMR
- Alt 2: dedicated NZP IMR
- Alt 3: dedicated ZP IMR and dedicated NZP IMR

Companies are encouraged to provide use cases and benefit, e.g. throughput and gNB/UE complexity benefit for different alternatives

- L1-RSRP/CSI based beam selection could be baseline

R1-1903650 **Summary on SCell BFR and L1-SINR** **Intel**

R1-1903686 **Feature lead summary of Enhancements on Multi-beam Operations** **LG Electronics**

Agreement
For signaling overhead reduction on updating/configuring spatial relation for PUCCH, support simultaneous spatial relation update/configuration for multiple PUCCH resources

- FFS signaling details to be decided in next meeting, including down-selection/merging among the following options
  - Spatial relation update for all PUCCH resources in a CC by one MAC CE
  - Spatial relation update per Rel-15 PUCCH resource set
  - Spatial relation update per group of PUCCH (which might need to be introduced for Rel-16)
  - PUCCH spatial relation info configured in a BWP could be applied across different BWP or different cells
  - Other options are not precluded.

Agreement
In RAN1#96bis, determine whether to support the configuration of up to 64 candidate beams for BFR by RRC signaling.

- FFS signaling details including whether MAC-CE message can choose a subset of the candidate beams as active resources for new beam identification in Rel-16

Working Assumption
For UL beam management latency and overhead reduction, support MAC CE based spatial relation update for aperiodic SRS per resource level

- FFS: Whether this is a UE optional feature

- Note: Qualcomm prefers to have this as a UE optional feature

R1-1901568	Enhancements on multi-beam operation	Huawei, HiSilicon
R1-1901635	Enhancements on Multi-beam Operation	ZTE
R1-1901703	Further discussion on multi beam operation	vivo
R1-1901790	Enhancements on Multi-beam Operation	MediaTek Inc.
R1-1901904	Enhancements on multi-beam operation	AT&T
R1-1902020	On multi-beam operation enhancements	CATT
R1-1902074	Enhancement on multi-beam operation	Fujitsu
R1-1902092	Discussion on multi-beam based operations and enhancements	LG Electronics
R1-1902122	Enhancements on UE multi-beam operation	Fraunhofer IIS, Fraunhofer HHI
R1-1902162	Discussion of multi-beam operation	Lenovo, Motorola Mobility
R1-1902184	Enhancements on multi-beam operation	Sony
R1-1902306	Enhancements on multi-beam operation	Samsung
R1-1902339	Enhancements on multi-beam operation	CMCC
R1-1902408	Enhancements on UL Multi-beam Operation	Asia Pacific Telecom co. Ltd
R1-1902503	On beam management enhancement	Intel Corporation
R1-1902523	On enhancements for multi-beam operations for NR MIMO in Rel. 16	Panasonic
R1-1903231	Enhancements to multi-beam operation	Ericsson (rev of R1-1902529)
R1-1902564	Enhancements on Multi-beam Operation	Nokia, Nokia Shanghai Bell
R1-1902615	Enhancement for multi-beam uplink operation	InterDigital, Inc.
R1-1902630	Enhancements on multi-beam operation for multi-panel transmission	China Telecommunications
R1-1902687	Discussion on multi-beam operation	NEC
R1-1902704	Discussion on Multi-beam Operation Enhancements	OPPO
R1-1902714	Discussion on multi-beam operation	Spreadtrum Communications
R1-1902768	Considerations on beam measurement and reporting enhancement	Apple Inc.
R1-1902813	Discussion on multi-beam enhancement	NTT DOCOMO, INC.
R1-1902833	Views on multi-beam operation	Mitsubishi Electric Co.
R1-1902866	Enhancements on beam management	Beijing Xiaomi Electronics
R1-1902954	Discussion on multi-beam operation	KDDI Corporation
R1-1903044	Enhancements on Multi-beam Operation	Qualcomm Incorporated
R1-1903047	Enhancements on multi-beam operation	ASUSTEK COMPUTER (SHANGHAI)
R1-1903159	On Beam Failure Recovery for SCell	Convida Wireless

7.2.8.4 Full TX Power UL transmission

R1-1903410	Feature lead summary on Full TX Power UL transmission	vivo
R1-1903445	**Outcome of offline discussion on Full TX Power UL Transmission**	**vivo**

Agreement
Note: UE capability 1, 2, 3 agreed in RAN1#AH1901 mean the PA architectures.
At least for PC3, UE capability 1, 3 can support full power transmission.
Working assumption: For PC3, UE capability 2 can support full power transmission.

- Companies to check for any implementation issues and/or performance of Rel-16 full power transmission compared to Rel-15 non-coherent codebook subset uplink transmission)

Agreement
Down select among the following two alternatives by RAN1#96bis. As part of UE capabilities signalled the following is included:
Alt1: UE capability signaling of supported one or group of TPMI precoder(s)
Alt3: UE capability signaling of power scaling schemes for full uplink power transmission

- Note: This does not imply any restriction on UE antenna virtualization
- FFS: Whether full uplink power transmission needs to be supported for all precoders

R1-1901569	Enhancements on UL MIMO with multiple PAs to allow full power transmission	Huawei, HiSilicon

R1-1901636 Full TX Power UL transmission ZTE
R1-1901704 Further discussion on full TX power for codebook based UL transmission vivo
R1-1901791 Full TX Power UL transmission MediaTek Inc.
R1-1901908 On Full Transmit Power for UL Transmission AT&T
R1-1902021 Full Tx power UL transmission CATT
R1-1902093 Discussion on full Tx power uplink transmission LG Electronics
R1-1902307 View on full power UL transmission Samsung
R1-1902504 On full power uplink transmissionIntel Corporation
R1-1902565 On the Full TX Power UL transmission Nokia, Nokia Shanghai Bell
R1-1902616 Discussion on Solutions and UE Capabilities for Full TX Power UL InterDigital, Inc.
R1-1902705 Discussion on the Full TX power UL transmission OPPO
R1-1902727 Discussion on full TX power for UL transmission Spreadtrum Communications
R1-1902814 Full Tx Power UL transmission NTT DOCOMO, INC.
R1-1902826 On full power UL transmission Ericsson
R1-1903011 Full Tx power for UL transmissions Qualcomm Incorporated

7.2.8.5 Low PAPR RS

R1-1903388 Feature lead summary of low PAPR RS Ericsson

Agreement
When Rel-16 sequence for pi/2 BPSK PUSCH DMRS is configured, the Rel-16 sequence is used for all sequence lengths.

Agreement
For the case of CGS sequence in case of two adjacent symbol DMRS, the same CGS sets are used for both single and two symbol DMRS for pi/2 BPSK modulation.

- FFS: Whether or not to support deterministic sequence hopping pattern

Agreement
For CP-OFDM, if Rel.16 DMRS is configured by RRC, it only applies when scheduled by DCI formats 0_1 and 1_1 or with a PUSCH transmission with configured grant.

- Note: It is up to the editor whether/how to capture this agreement

Agreement
If Rel-16 DMRS is configured by RRC for PUSCH with pi/2 BPSK modulation, the Rel-16 DMRS applies when scheduled by DCI formats 0_1 and 0_0 and using at least C-RNTI, CS-RNTI, SP-CSI-RNTI and MCS-C-RNTI, when applicable or PUSCH transmission with configured grant

- Search space for DCI format 0_0: Rel-16 DMRS for at least USS is supported

Agreement
The PUSCH multiplexing capacity when Rel-16 DMRS is configured for pi/2 BPSK PUSCH is up to two ports for one OFDM symbol, four ports (TD-OCC across OFDM symbols) for two OFDM symbols.
Note: Qualcomm showed strong concern on the benefits of pi/2 BPSK due to this agreement

Agreement
The PUCCH multiplexing capacity when Rel-16 DMRS is configured for pi/2 BPSK PUCCH is a single port
Note: Qualcomm showed strong concern on the benefits of pi/2 BPSK due to this agreement

R1-1903580 Outcome of offline discussion #2 for low PAPR RS Ericsson

Agreement

- For PUSCH DMRS with pi/2-BPSK modulation, two RRC parameters ScramblingID0 and ScramblingID1 can be configured by RRC as for CP-OFDM DMRS (16 bit per ID)
- Used in c_{init} for length ≥30 as n_ID^{n_SCID=0}, n_ID^{n_SCID=1}

- For length<30, these parameters are used as N_ID^PUSCH is configured as either ScramblingID0 or ScramblingID1 depending on DCI
- DCI indicates n_SCID={0,1} dynamically, without increasing DCI size to select the above parameter
    - Antenna port indication is re-used for n_SCID indication as follows:
        - DMRS port 1000,1002,1004 and 1006 are interpreted as port 1000,1002,1004 and 1006, respectively, with n_SCID=0
        - DMRS port 1001,1003,1005 and 1007 are interpreted as port 1000,1002,1004 and 1006, respectively, with n_SCID=1

Agreement

- Rel.16 DMRS is not supported for MSG3 transmissions, Rel.15 behavior is used for MSG3

R1-1901570 Discussion on DMRS sequence design for low PAPR Huawei, HiSilicon
R1-1901637 Low PAPR RS ZTE
R1-1901705 Further discussion on remaining issues on low PAPR RS vivo
R1-1901792 Low PAPR RS MediaTek Inc.
R1-1901907 Remaining Issues of PAPR in NR AT&T
R1-1902094 Discussion on low PAPR RS LG Electronics
R1-1902308 View on Low PAPR RS Samsung
R1-1902505 Low PAPR reference signals Intel Corporation
R1-1902524 On low PAPR RS for NR MIMO in Rel. 16 Panasonic
R1-1902536 Remaining details on low PAPR RS Ericsson
R1-1902566 Discussion on Low PAPR RS Nokia, Nokia Shanghai Bell
R1-1902617 On Low PAPR RS InterDigital, Inc.
R1-1902690 Discussion on low PAPR RS NEC
R1-1902702 Discussion on RS enhancement for PAPR reduction OPPO
R1-1902730 Discussion on power imbalance for DMRS Spreadtrum Communications
R1-1903468 Lower PAPR reference signals Qualcomm Incorporated (rev of R1-1903012)

7.2.8.6 Other

R1-1901638 Details and evaluation results on multi-TRP/Panel for URLLC ZTE
R1-1901639 Additional considerations on beam management for multi-TRP ZTE
R1-1901640 Additional details of latency and overhead reduction for beam management ZTE
R1-1901641 Details and evaluation on UL simultaneous transmission for multi-panel operation ZTE
R1-1903398 Details and evaluation on L1-SINR measurement and reporting ZTE (rev of R1-1901642)
R1-1901643 Discussion on UL power control for multi-panel operation ZTE
R1-1903569 Performance evaluation on type II CSI compression vivo (rev of R1-1901706)
R1-1901707 Performance evaluation on multi PDCCH based multi TRP transmission vivo
R1-1901708 Discussion multi-TRP based URLLC transmission vivo
R1-1902022 Evaluation results of multi-TRP/panel transmission CATT
R1-1902095 Evaluation and analysis on simultaneous multi-panel Tx LG Electronics
R1-1903357 Evaluation on quantization methods for Type II overhead reduction LG Electronics (rev of R1-1902096)
R1-1902097 Discussion on supporting rank 3 and 4 for Type II codebook LG Electronics
R1-1902098 Discussion on DMRS port indication for NCJT LG Electronics
R1-1902124 Enhancements on Type-II CSI: Doppler Approach Fraunhofer IIS, Fraunhofer HHI
R1-1902163 Discussion of UL transmission with multi-TRP Lenovo, Motorola Mobility
R1-1903224 Discussion on quantization schemes MediaTek Inc. (rev of R1-1902199)
R1-1903225 Discussion on FD component selection and coefficient subset selection MediaTek Inc. (rev of R1-1902200)
R1-1902309 SLS evaluation on Multi-TRP/panel transmission Samsung
R1-1902310 SLS evaluation on MU-MIMO CSI: FD compression parameters Samsung
R1-1902311 SLS evaluation on MU-MIMO CSI: subset selection for FD compression Samsung
R1-1903434 SLS evaluation on MU-MIMO CSI: LC coefficient quantization Samsung (rev of R1-1902312)

R1-1902313	SLS evaluation on MU-MIMO CSI: RI=2 subset selection	Samsung
R1-1902314	Preliminary SLS evaluation on Type II rank 3-4 extension	Samsung
R1-1902315	Evaluation on SINR metrics for beam selection	Samsung
R1-1902316	On UCI design and CBSR for DFT-based compression	Samsung
R1-1902506	On Type II CSI higher rank extension	Intel Corporation
R1-1902537	Further observations on time-domain DMRS for pi/2-BPSK	Ericsson
R1-1902568	On phase rotations and FD compression	Nokia, Nokia Shanghai Bell
R1-1902688	Discussion on multi-TRP operation	NEC
R1-1902703	Enhancements on rank extension for type II CSI feedback	OPPO
R1-1902769	Considerations on separate DL and UL beam reporting	Apple Inc.
R1-1902848	Interrupted transmission indication for Multi-TRP Transmission	Motorola Mobility, Lenovo
R1-1902849	Power control for multi-panel uplink transmission	Motorola Mobility, Lenovo
R1-1902857	Additional evaluation results for NC-JT with 4Tx ports per TRP under indoor scenario	Ericsson
R1-1902858	NC-JT performance with layer restriction between TRPs	Ericsson
R1-1902859	Multi-TRP diversity strategies at 4 GHz	Ericsson
R1-1902860	On the number of TRPs for high reliability at 4 GHz	Ericsson
R1-1902861	On MAC-CE signaling impact of Rel-16 TCI indication framework	Ericsson
R1-1902912	Discussion on preemption indication enhancement	ASUSTEK COMPUTER (SHANGHAI)
R1-1902956	Improvements to SRS-based UL beam selection	Ericsson
R1-1902957	Latency analysis of SCell BFR solutions	Ericsson
R1-1902958	On event-driven reporting for beam management	Ericsson
R1-1902959	Performance of beam selection based on L1-SINR	Ericsson
R1-1903230	Further simulation results for UL multi-panel transmission	Ericsson (rev of R1-1902960)
R1-1903013	Comparison between Single-CW and Multi-CW for Multi-TRP	Qualcomm Incorporated
R1-1903014	Comparison between SFN and other multi-TRP schemes for PDSCH reliability	Qualcomm Incorporated
R1-1903090	UL/DL BM for latency/overhead reduction	Huawei, HiSilicon
R1-1903091	Panel-based UL beam selection	Huawei, HiSilicon
R1-1903092	Beam measurement and reporting using L1-SINR	Huawei, HiSilicon
R1-1903093	Beam failure recovery for SCell	Huawei, HiSilicon
R1-1903094	Evaluation results of multi-beam operation	Huawei, HiSilicon
R1-1903095	Evaluation results of DFT-based compression codebook	Huawei, HiSilicon
R1-1903096	Discussion of high resolution codebook design for rank 3 and 4	Huawei, HiSilicon
R1-1903097	Phase Randomization and Correction for CSI quantization in frequency domain	Huawei, HiSilicon
R1-1903098	Evaluation results for multi-TRP/panel transmission	Huawei, HiSilicon
R1-1903099	Single PDCCH based multi-TRP/panel transmission	Huawei, HiSilicon
R1-1903100	CSI measurement enhancement for multi-TRP/panel transmission	Huawei, HiSilicon
R1-1903101	Reliability/robustness enhancement with multi-TRP/panel	Huawei, HiSilicon
R1-1903102	Evaluation results of sequence design for Pi/2-BPSK DFT-S-OFDM	Huawei, HiSilicon
R1-1903103	Evaluation results of full power transmission for UL MIMO with multiple PAs	Huawei, HiSilicon
R1-1903104	Discussion on RAN2 impacts for NR-MIMO enhancements in Rel-16	Huawei, HiSilicon
R1-1903105	Discussion on CW to layer mapping in single-DCI based multi-TRP transmission	Huawei, HiSilicon
R1-1903106	Evaluation methodology for multi-beam enhancements	Huawei, HiSilicon

7.2.9 Study on UE Power Saving for NR

FS_NR_UE_pow_sav; SID in RP-181463. Please refer to the SID for detailed scoping

R1-1902023 **Update of TR38.840 UE Power Saving** **CATT**

Decision: The document (TR 38.840 v0.1.1) is endorsed.

7.2.9.1 Evaluation Results

Including any remaining issues on evaluation methodology

R1-1903432 **Summary for UE Power Saving Evaluation** **Qualcomm**

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Decision: The document is noted.

Agreements:
Update the AH1901 agreement as follows:

- For evaluation, when BWP transition duration is one slot or longer, the slot-average power level is 50 power units
  - In case when BWP transition duration is <one slot (if defined), up to each company to report the power level assumed
  - Companies to report the type of BWP transition time (type 1 and/or type 2) assumed in the evaluation
  - Note: When BWP adaptation power scaling is applied, the resultant power should not be smaller than the above power level. Justification should be provided if a different assumption is made (for example, UE is assumed to be in a state that is not fully active).

Agreements:
Update Table 15 (in Section 8.1.3) of TR38.804 as follows:

BWP Bandwidth (DL)	Scaling of X MHz = 0.4 + 0.6 * (X - 20) / 80. Linear interpolation for intermediate bandwidths. Valid only for X = 10, 20, 40, 80, and 100. Above scaling is applicable for FR1 only. In case scaling is needed for FR2, companies can report the assumed scaling factor.	For 10MHz BW, only AL up to 8 can be used for PDCCH The transition time is the same as DCI-based BWP switching delay for Rel-15. ~~FFS: transition energy for BWP switching~~ If the power after scaling is smaller than the BWP transition power, assume the BWP transition power as the output of scaling unless otherwise justified.
BWP Bandwidth (UL)	No scaling at 0dBm or 23dBm Above scaling is applicable for FR1 only. In case scaling is needed for FR2, companies can report the assumed scaling factor.	

Companies are encouraged to check 3.2 & 3.3 of R1-1903432

Tuesday session

R1-1903486 Summary for UE Power Saving Evaluation Qualcomm

Decision: The document is noted.

Agreements:

- To capture the following calibration results in the TR:

	Power States	HW [R1-1903194]	Vivo	MTK	ZTE	Intel	LGE	CATT	SS	OPPO [R1-1900304]	Sony [R1-1900379]	E/// [R1-1901165]	QCOM	Nokia [R1-1901187]	Apple [R1-1902770]
FTP, w/o C-DRX	PDCCH only	99.79%	99.75 %	99.75 %	99.73 %	99.75 %	99.75 %	99.71 %	99.75 %	99.74%	99.75%	99.80%	99.75 %	99.75%	99.75%
	PDCCH+PDSCH	0.21%	0.25%	0.25%	0.27%	0.25%	0.25%	0.29%	0.25%	0.26%	0.25%	0.20%	0.25%	0.25%	0.25%
	Micro sleep	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Light sleep	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Deep sleep	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FTP, w/ C-DRX	PDCCH only	34.96%	34.68 %	34.62 %	35%	34.96 %	35.27 %	37.92 %	32.85 %	35.65%	34.50%	35.11%	35.01 %	34.95%	35.44%
	PDCCH+PDSCH	0.21%	0.25%	0.20%	0.27%	0.25%	0.26%	0.29%	0.20%	0.293%	0.25%	0.21%	0.25%	0.25%	0.21%
	Micro sleep	0.02%	0.01%	0.02%	0.03%	0.02%	0.02%	0.00%	0.01%	0.0248%	0.02%	0.01%	0.01%	0.02%	0.04%
	Light sleep	0.15%	0.13%	0.17%	0%	0.15%	0.17%	0.00%	0.14%	0293%	0.15%	0.12%	0.15%	0.14%	0.07%
	Deep sleep	64.66%	64.94 %	64.99 %	65%	64.62 %	64.28 %	61.85 %	66.80 %	63.9%	65.09%	64.55%	64.58 %	64.64%	64.57%
VoIP, w/o C-DRX	PDCCH only	98.92%	98.59 %	98.56 %	98.43 %	98.75 %		98.70 %	98.46 %		98.73%	98.50%	98.60 %		98.7%
	PDCCH+PDSCH	1.08%	1.41%	1.44%	1.57%	1.25%		1.31%	1.54%		1.27%	1.50%	1.40%		1.3%

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	Micro sleep	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%	0.00%		0.00%	0.00%	0.00%		0.00%
	Light sleep	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%	0.00%		0.00%	0.00%	0.00%		0.00%
	Deep sleep	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%	0.00%		0.00%	0.00%	0.00%		0.00%
VoIP, w/ C-DRX	PDCCH only	22.09%	22.40 %	21.46 %	19.31 %	18.72 %		14.43 %	20.16 %		20.20%	22.50%	22.31 %		20.36%
	PDCCH+PDSCH	1.08%	1.09%	1.09%	0.78%	1.25%		0.40%	1.96%		0.96%	1.11%	1.08%		0.84%
	Micro sleep	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%	0.00%		0.00%	0.0%	0.00%		0.00%
	Light sleep	1.37%	0.61%	0.41%	0.00%	0.00%		0.00%	0.34%		0.83%	0.54%	0.54%		0.00%
	Deep sleep	75.45%	75.90 %	77.04 %	79.92 %	80.03 %		85.16 %	77.54 %		78.02%	75.85%	76.07 %		78.78%

Agreements:

- Remove brackets [] from the following in the TR:

In Section 8.1.3:

- For evaluation purpose, it is assumed that a periodicity of max(DRX cycle, [160 msec]) is the baseline for periodic activities, e.g. time/frequency, channel or beam tracking (if applicable)
  - Other periodicity values are not precluded – companies to report if other values are assumed
  - Companies to report detailed assumptions, e.g. the resources used, the relative timing relationship between DRX cycle and periodic activity, whether and how UL reporting is done, etc.
- For "PDCCH-only" and "SSB or CSI-RS processing" concurrent in a slot, the slot-averaged power is 0.85x the sum of the respective power, at least for FR1
  - For FR1, 0.85*(100+100) = 170
  - For FR2, 0.85*(175+175) = [300]
- For "SSB processing" and "CSI-RS processing" concurrent in a slot, the slot-averaged power is 0.85x the sum of the respective power, at least for FR1
  - For FR1, 0.85*(100+100) = 170
  - For FR2, 0.85*(175+175) = [300]
  - 2-SSB within a slot is assumed

In Section 8.1.4:

- For inter-band
  - Up to [2] frequency layers and
  - Gap pattern ID = 0 defined in TS 38.133 (i.e., measurement gap length of 6msec and measurement gap periodicity of 40msec)

In Section 8.1.4.2:

- *Pt* is the switching power consumption
  - [Assume micro sleep power for Pt]
- Tt is 0.5ms for FR1 and 0.25ms for FR2 (from RAN4)

In Section 8.2:

- I-DRX cycle 1.28 sec
  - Group paging rate (for a PO): [10%]
    - P-RNTI is detected but PDSCH decoding results in no match
    - Note: Statistics for the matching case may be further considered based on use case

Friday

R1-1903806 Summary for UE Power Saving Evaluation Qualcomm

Decision: The document is noted.

Agreements:

Update the following text in Section 8.1.1 in TR 38.804:

- The following additional transition energy and total transition time for the three sleep types are adopted as working assumption for power saving SI:
  - Both ramp down and ramp up transitions are included.
  - Additional processing time for acquiring synchronization is not included in total transition time.
  - There is always a non-sleep power state between adjacent sleeps.
  - ~~FFS: Specify the times and relative power values for the ramp down and ramp up transitions separately.~~

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Remove the FFS in the following table/Section in TR 38.804:
In the following row in the table in Section 8.1.2 because the power state is already defined:

PDCCH + PDSCH	PDCCH + PDSCH. ACK/NACK in long PUCCH is modeled by UL power state. ~~FFS the power scaling for PDSCH only slot.~~	300	350

In the following row in the table in Section 8.1.3 because the scaling is already defined, at least for the cross-slot scheduling case.

PDCCH-only	Power of cross-slot scheduling is 0.7x same-slot scheduling ~~FFS for the scaling w.r.t. # of blinding decoding~~	Applicable for FR1 and FR2

In the following row in the table in Section 8.1.3 because the scaling is already defined for RRM power modeling.

CSI-RS	FFS for scaling w.r.t. # of symbols for CSI-RS ~~FFS for neighbor cell measurement~~ ~~FFS for #measured cells~~	

Agreement:
- To include section 3.2 (some tables are updating the existing tables) of R1-1903806 in the TR

R1-1903429 Evaluation results of UE power saving Huawei, HiSilicon (rev of R1-1901571)
R1-1901709 Detailed Evaluation Results for UE power saving vivo
R1-1901803 Evaluation results for NR power saving designs MediaTek Inc.
R1-1902024 Evaluation Results of UE Power Saving Schemes CATT
R1-1902030 Evaluation results of UE power consumption ZTE Corporation
R1-1902052 Numerical results for UE power saving schemes LG Electronics
R1-1902185 Evaluation results for power saving techniques Sony
R1-1902317 Evaluation results on UE power saving Samsung
R1-1902507 System level evaluation of UE power saving schemes Intel Corporation
R1-1902618 Evaluation of UE Power Saving Techniques InterDigital, Inc.
R1-1902734 Remaining issues on evaluation methodology for UE power saving Spreadtrum Communications
R1-1902770 Evaluation of UE power saving techniques Apple Inc.
R1-1902934 Evaluations and modeling of UE power consumption Ericsson
R1-1903374 Evaluation Methodology and Results for UE Power Saving Qualcomm Incorporated (rev of R1-1903015)
R1-1903133 Comparison of DRX with WUS and GTS schemes Nokia, Nokia Shanghai Bell

7.2.9.2 Potential Techniques for UE Power Saving

R1-1903411 **Summary of UE power saving schemes** **CATT**
Decision: The document is noted.

Conclusion:
- Mechanism, if introduced, for switching to/from power saving scheme(s) is to be discussed in the WI phase.

Agreements:
Update previous agreements as follows:

The UE BWP adaptation is to dynamically switch the BWP by gNB based on, e.g., the traffic to support efficient operation of BWP switching in reducing the UE power consumption.
The UE adaptation to the CA/DC is to fast activation/deactivation of the SCell by gNB based on, e.g., the traffic to support efficient operation for fast SCell activation/deactivation in achieving UE power saving.
The UE power saving schemes for the UE adaptation in frequency domain in the ~~for further~~ study are as follows,
- BWP - UE adaptation to different BWP
  - RS to assist UE channel tracking and measurements to assist BWP switching
    - The assistance may also include CSI measurements (UE supports and processes one BWP at a time)
  - Enhancement of L1 signaling, e.g., power saving signal or DCI for power saving, in triggering the BWP switching
  - Association of BWP and DRX

- UE assistance information could be considered
- CA/DC –
  - Quick activation/de-activation (e.g.,L1 signaling, MAC CE enhancement)
  - Adaptation of PDCCH monitoring/search space on activated SCell
    - Including cross carrier scheduling
  - ~~Power a~~Adaptation based on the operation in a group of cells in power efficient way
    - Including group of cells in bundle operation
  - CSI/RRM measurements and beam management at non-active SCell
  - UE assistance information could be considered
  - Including the combined operation with the BWP switching

Agreements:

Update previous agreements as follows:

The UE power saving schemes with UE adaptation to the traffic arrival in the time domain includes cross slot scheduling, single slot scheduling with a gap between PDCCH and PDSCH reception, and multi-slot scheduling. For both cross-slot scheduling and single slot scheduling, the UE may achieve power consumption by switching to micro sleep after PDCCH reception. For multi-slot scheduling, the UE may achieve power consumption by skipping the PDCCH monitoring at subsequent slots of PDSCH/PUSCH transmission.

- Cross-slot scheduling
  - Minimum K0 > 0 and aperiodic CSI-RS triggering offset is not within the duration - UE could switch to micro sleep after PDCCH reception – no addition PDSCH and CSI-RS signals reception within the given duration (e.g. the same slot)
    - It is known to the UE at PDCCH decoding
    - Extended micro sleep time and reduce the PDCCH processing in reducing UE power consumption
    - Minimum K2 > 0 is essential to avoid the requirements of fast PDCCH processing
    - UE assistance information can be considered
  - The general procedure for the study of the power saving scheme when cross-slot scheduling is used
    - gNB semi-statically configures TDRA to the UE, subject to UE capability (if any)
    - All schedulable TDRA values have K0 > = x and K2 >= x where x > 0
      - Determination of value x is FFS (which may also be done in the WI phase), e.g., may also be impacted by BWP switching triggered by DCI (jointly with cross-slot scheduling, if supported), etc.
    - All aperiodic CSI-RS triggering offsets are not smaller than the value x
    - UE decodes PDCCH and retrieves the index of schedulable TDRA value
    - UE could go to micro sleep after reception of last PDCCH symbol
    - UE processes PDSCH at the indicated starting time from TDRA value
    - Note: DRX cycle assumed in the evaluation results summarized in the table below is not necessilary long DRX cycle; detailed DRX cycle assumption can be found in each reference
- Same slot scheduling
  - Adaptation of TDRA configurations to achieve UE power saving – ensure the gap between PDCCH reception and PDSCH transmission known to the UE
  - Adjustment of TDRA configuration
    - Selection of TDRA entry in the TDRA table **Error! Reference source not found.**.
    - Note: cross-slot scheduling could be incorporated in the TDRA configuration
  - Power model for TDRA power saving scheme is the slot-averaged power for a slot with N-symbol PDSCH aligned to the end of the slot and PDCCH at the beginning of the slot reported by the proposed scheme.
  - UE assistance information can be considered
- The general procedure for the study of the power saving scheme when same slot scheduling is used
  - gNB semi-statically configures TDRA to the UE, subject to UE capability (if any).
  - All schedulable TDRA values with K0=0 include at least Y symbols between the last PDCCH symbol and the first PDSCH symbol
    - Y is FFS
      - Note: the value of Y is necessary for power modelling in evaluation, although the specification (if specified) of Y value may also be done in the WI phase
    - Note: in case there is a TDRA entry with K0>0, it is assumed that the gap between the last PDCCH symbol in a first slot and the first PDSCH symbol in a second slot is no less than Y
  - All aperiodic CSI-RS triggering offsets are greater than Y symbols
  - UE decodes PDCCH and retrieves the index of schedulable TDRA value

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- UE could go to micro sleep after reception of last PDCCH symbol
- UE processes PDSCH at the indicated starting time from TDRA value

- Multi-slot scheduling – PDCCH decoding in one slot (e.g., one DCI, multiple DCI) supports scheduled PDSCH/PUSCH transmission over multiple slots.
  - Achieving UE power consumption reduction by potentially skipping PDCCH monitoring at subsequent slots of PDSCH/PUSCH transmission.

Tuesday session

R1-1903483 **Summary of UE power saving schemes CATT**

Decision: The document is noted.

Proposal

- Same slot scheduling
  - Adaptation of TDRA configurations to achieve UE power saving –
    - If there is a gap between the last symbol of PDCCH and the first symbol of the corresponding PDSCH,
    - or, when decoding PDCCH, the UE also has knowledge of latest possible last symbol of PDSCH

Discuss further offline

Wednesday session

R1-1903494 **Summary of UE power saving schemes CATT**

Decision: The document is noted.

Agreements:

Update previous agreement as follows:

- The UE power saving schemes with UE adaptation to the traffic is to reduce the number of antenna/panels or maximal number of MIMO layers indicated by the network semi-statically or dynamically to achieve the UE power saving. This may be done with potential UE assistance information. The dynamic approach may also be associated with a transition time, a timer, etc.

Observation:

- The power saving schemes with UE adaptation to the number of MIMO layers or number of Tx/Rx antenna (panels) provides up to [20-30%] power saving gain for the dynamic antenna adaptation and up to [20%] for the semi-static antenna adaptation with some impact to the system performance, such as [4%] latency increase for dynamic antanna adaptation, when reduced antenna operation is used mainly during periods of low scheduling activity and additional network resources are used for the compensation of the loss of multi-antenna processing gain. It was shown by one source that there is a corresponding [10%-58%] UPT degradation for the RRC configured antenna reduction without adaptation for FTP traffic. It is noted that with a set of simulation assumptions (such as traffic model and SCS) not aligned with the agreed ones for evaluation, it was observed by one source that the negative power saving gain and latency up to [760 %] over Rel-15 4Rx antenna for the RRC configured antenna reduction without adaptation for FTP traffic was observed. It was observed by one source that the resulting additional overhead in terms of DL resource usage for the dynamic antenna adaptation is up to [2%].

Observation:

- The power saving schemes for reducing PDCCH monitoring shows [0.5%-85%] power saving gains with different detailed schemes comparing to the assumed baseline scheme of Rel-15 PDCCH monitoring for the purpose of evaluation, although each of the different detailed schemes offers various power saving gains. Lower power saving gains [0.5-15%] were observed for the continuous traffic. High power saving gains [50-85%] were observed for sporadic traffic arrival. This comes at the expense of reduced UPT throughput in the range of [xx-yy%], and increased latency in the range of [??-??%] (which does not necessarily result in exceeding the corresponding delay budget). This also comes at the expense of additional overhead in the range of [??-??%] in terms of DL resource usage.

Thursday session

R1-1903622 **Summary of UE power saving schemes CATT**

Decision: The document is noted.

Observation:

- The power saving schemes for Scell operation show [12.36% - 67.33%] power saving gain if the baseline settings exhibit a large amount of PDCCH monitoring without data scheduling due to sporadic traffic or long data inactivity in SCell(s). Smaller power saving gain in the range of [1.82% - 13.82%] is observed for the case of less PDCCH monitoring without data scheduling in SCell(s). The average latency increase is in the range of [0.09% - 3.2%]. One source reports that the corresponding additional overhead in terms of DL resource usage is negligible.

Observation:

- Rel-15 DCI and timer based BWP adaptation between full bandwidth and a narrow bandwidth can achieve power saving gain in the range [8.5% - 31%]. The power saving schemes with UE adaptation to BWP bandwidth show [16% - 45%] power saving gain if suitable BWP bandwidth is applied. The power saving schemes with UE adaptation to BWP switching show the power saving gains ranged from [23% - 45%] from the Rel-15 BWP opration without adaptation. The higher power saving gain of [45%] comes from suitable BWP adaptation, e.g., selection of BWP based on UE assistance informaiton. Smaller power saving of [8.5%] is provided from one source, assuming 15-ms CSI acquisition delay for the DCI triggering BWP adaptation. The average latency increase of the power saving schemes is up to [4%]. One source showed that the power saving signal triggering BWP switching with additional RS for CSI measurements shows [25%-55%] power saving gains in relation to Rel-15 BWP adaptation with UPT improvement of [17%] and [7-21%] overhead.

Observation:

- The power saving schemes with cross slot scheduling show [X% - 25.4 %] power saving gain and UPT degradation [%, %] for minimum K0= 1, [% - %] power saving gain and UPT degradation [%, %] for 1< minimum K0 < 4 and [5% - 6%] power saving gain for minimum K0 >= 4 and UPT degradation up to [%]. When [minimum K0>1], the power saving gain decreases and UPT degrades as the K0 increases. Smaller power saving gain in the range [0% - 1.1%] is observed when the amount of PDCCH monitoring without data scheduling is limited because of high scheduling activity or going to DRX OFF by MAC-CE. The average latency increase is up to [4%] if minimum K0 value is less than 4 and C-DRX is assumed. Larger latency increases up to [30%] is observed for larger minimum K0 values or C-DRX is not applied.
- The power saving schemes with same slot scheduling show by one source [15%-17%] power saving gain for small data using evaluations, and by another source [16%-30%] power saving gain for small data using numerical analysis, such as the instant message or VoIP traffic. [93%] overhead increase is observed for the instant message. For large data, such as FTP traffic, one source shows power saving gain of [-5.9%] and [55%] latency incease and [100%] overhead increase due to the longer PDSCH transmission and reception time that is used to compensate the reduced PDSCH symbol number in a slot. It is noted that there is no consensus on the power model of same slot scheduling.
- For the power saving schemes with multi-slot scheduling, [21.6% - 38.1%] power saving gain and [30-70%] UPT degradation are shown in combination of PDCCH monitoring reduction. The other source shows [0.65% - 1.9%] power saving gain.

Observation:

- The power saving schemes with UE adaptation to the DRX operation include UE adaptation of its behavior to the DRX operation, and dynamic DRX configuration. Based on the evaluation, the schemes of power saving signal/channel triggering wake-up for CDRX show power saving gain in a range of [??% - ??%] comparing to the baseline with the agreed C-DRX reference configuration. The latency increase/UPT degradation is in the range of [0% - ??%]/[%, %]. It is shown the power saving gain tends to be higher when the C-DRX cycle is shorter, but it is smaller when C-DRX ON duration is shortened, For longer C-DRX cycle and/or high traffic load, smaller gain in the range of [??% - ??%] is observed. The power saving gain shown by the power saving signal/channel triggering UE adapation to the DRX operation has very little dependency on the assumed power consumption level of the power saving signal/channel.
- Additional gain [% %] of the power saving scheme with UE adaptation to the DRX operation with the help of the preparation period is observed on top of the power saving gain from UE wake-up by power saving signal/channel. The corresponding additional overhead was not reported and summarized. The corresponding system impact (if any) was not analysed and summarized.

- Dynamic DRX configuration schemes show power saving gain in the range of [??% - ??%] with latency increase [ ]. When the DRX configuration and/or parameters are closely adapted to the traffic type, high power saving gain is observed. One source shows the power saving gain [% , %] over the agreed baseline with Rel-15 DRX configuration selection adapt to the traffic with suitable short DRX.

Proposed Observation:

- PDCCH monitoring periodicity configurations can be dynamically adapted based on explicit/implicit signaling, and works with or without C-DRX. The power saving gain over the agree baseline in the range of [5% ~ 85%] is observed, with latency increase in the range of [0.5% ~ 164%]. The high latency is due to the not-fully-flexible PDCCH monitoring. Generally, the larger the PDCCH monitoring periodicity, the larger the power saving gain but the associated latency increase would be higher.
- Reduction of PDCCH monitoring can also be achieved explicit/implicit information for UE to skip monitoring PDCCH. A related approach, "go-to-sleep" signaling where the gNB can signal the UE to go to the DRX OFF state or skip the PDCCH monitoring, is considered. Power saving gain in the range of [9%~83%] is observed, with latency increase in the range of [0.4%~40%] with one source showing [124%] and overhead [% - %]. Generally, the gain is higher for for scenarios with CDRX configuration with larger DRX inactivity timer duration and for lower traffic load, and higher latency increase is associated with higher gain.
- PDCCH blind decoding limit reduction can also be used to potentially reduce the UE power consumption. Power saving gain of 15% is shown when the number of blind decoding candidates is reduced by half, with system level impact in terms of higher DL control blocking probability (e.g. assuming that 1/4 of the UEs are to be scheduled in a CORESET with reduced blind decoding limit, the average blocking probability would increase by 50%).
- In relation to above power saving schemes aforementioned, some Rel-15 C-DRX schemes are also evaluated compared to the agreed baseline. In one source, Rel-15 MAC-CE based DRX command is evaluated, and the gain is observed to be [42%~56%] with latency increase of [59%~77%] across three traffic types. In another source, short DRX supported in Rel-15 is evaluated and power saving of [30%~280%] is observed with latency increase of [31%~97%].

Friday
R1-1903737 Summary of UE power saving schemes CATT
Decision: The document is noted.

Agreements:
Observations:

- PDCCH monitoring periodicity configurations can be dynamically adapted based on explicit/implicit signaling, and works with or without C-DRX. The power saving gain over the agreed baseline in the range of [5% ~ 68%] is observed, with latency increase in the range of [0.5% ~ 20%] and overhead [% - %]. One source shows [85%] gain with latency [118%]. The high latency is due to the not-fully-flexible PDCCH monitoring. If non-adaptive PDCCH periodicity is applied, one source shows [32% - 50%] power saving gain subject to [56% - 116%] latency increase. Generally, the larger the PDCCH monitoring periodicity, the larger the power saving gain but the associated latency increase would be higher.
- Reduction of PDCCH monitoring can also be achieved with explicit/implicit information for UE to skip monitoring PDCCH. A related approach, such as power saving signal/channel triggering/enabling PDCCH monitoring or "go-to-sleep" signaling where the gNB can signal the UE to go to the DRX OFF state or skip the PDCCH monitoring, is considered. Power saving gain in the range of [9%~83%] is observed, with latency increase in the range of [0.4%~20%] with one source showing [124%] and overhead [% - %]. Generally, the gain is higher for for scenarios with CDRX configuration with larger DRX inactivity timer duration and for lower traffic load, and higher latency increase is associated with higher gain.
- PDCCH blind decoding reduction can also be used to potentially reduce the UE power consumption. Power saving gain of [2.2%-15%] is shown when the number of blind decoding candidates is reduced by half, with system level impact in terms of higher DL control blocking probability (e.g. assuming that 1/4 of the UEs are to be scheduled in a CORESET with such reduced blind decoding limit, the average blocking probability would increase by 50%). One source shows power saving gain of [29%] with single blind decoding candidate without showing the results of latency and expected high blocking probability.
- In relation to above power saving schemes aforementioned, some Rel-15 C-DRX schemes are also evaluated compared to the agreed baseline. In one source, Rel-15 MAC-CE based DRX command is evaluated, and the gain is observed to be [42%~56%] with latency increase of [59%~77%] across three traffic types. In another source, short DRX supported in Rel-15 is evaluated and power saving of [30%~280%] is observed with latency increase of [31%~97%].

Agreements:
Observation:

- Some UE assistance information has been used by the power saving schemes to adapt to the traffic resulting in power saving gain. Power saving schemes including UE assistance information in the evaluation show power saving gain of [9%-45%] for UE adaptation to BWP switching, [4%-80%] for UE adaptation to DRX operation, and [5%-43%] for SCell operation.

Agreements:
Observations:

- Power saving signal/channel used as the UE wakeup in triggering UE adaptation to the DRX operation shows the power saving gains [4%-97 %] with some overheads [0% -3.5%].
- Power saving signal/channel triggering to assist the BWP switching shows the power saving gain [25% - 55%] with the overhead of [7%-21%] from the additional RS.
- Power saving signal/channel triggering/enabling PDCCH monitoring reduction achieves the power saving gain [50%-66%] with [1.7%] overhead.
- The 0.1% miss detection performance of different power saving signal/channel, such as PDCCH-based, TRS, CSI-RS, DMRS, SSS-like, new sequence type, such as OOK, Gold sequence, had been shown with the reqired SINR range [-6 to 5.7] dB with false alarm probability at 1%. Fewer resource used by power saving signal/channel or beam degradation would require higher SINR operating point. The power saving signal/channel also has the multiplexing capability ranged 1-16 UEs in the evaluation depending on the power saving signal/channel type. The power saving signal/channel may carry additional information bits in addition to the triggering for UE adaptation. The power saving signal/channel detection performance shows that it is adequate for triggering the UE adaption to the power consumption.

Agreements:

- To include in the conclusion section of the TR:

The UE power saving study completes the UE power consumption model for evaluation based on the inputs from many sources. Evaluation results have been shown based on the UE power consumption model through calibration and subsequent evaulations. The UE power model could be used as the reference model in evaluating the UE power consumption for any other features if applicable.
RAN1's study shows the following power saving gains over the agreed baseline in UE power saving schemes with UE adaptation in frequency domain, time domain, antenna domain, DRX operations, and reducing PDCCH monitoring with different traffic types, such as FTP, IM, web browsing, video streaming, gaming and VoIP, and network configurations,

- The power saving schemes with UE adaptation to BWP switching show the power saving gains ranged from [16% - 45%] over the agreed baseline configuration. The power saving schemes with UE adaptation to SCell operation show[12.36% - 67.33%] power saving gain with average latency increase [0.09% - 3.2%]
- The power saving schemes with cross-slot scheduling shows up to [5-25%] power saving gains with UPT degradation [2.9%-18.4%]. The power saing gain decreases and the UPT degradation increases as the K0 increase. The power saving gain [15%-17%] and [0% -93%] overhead increase is observed for same-slot scheduling only with small packet. The power saving gain less than 2% is observed for multi-slot scheduling.
- The power saving schemes with UE adaptation to the number of MIMO layers or number of Tx/Rx antenna (panels) provides up to [20%-30%] power saving gain and [4%] latency increase for dynamic antenna adaptation. The power saving gain [20%] is observed for semi-static antenna adaptation with expected latency and UPT degradation. Additional network resource is used for compensation of the loss of multi-antenna processing gain.
- The power saving schemes with UE adaptation to the DRX operation shows [9%~83%] power saving gains with latency increase in the range of [0.4%~20%] . The power saving gain for dynamic DRX configuration/adaptation is [8%-50%] with latency increase [2% - 95%]. Rel-15 enabled DRX operation shows up to [47 %] power saving gain over the agreed baseline.
- The power saving schemes for dynamic adaption of UE PDCCH monitoring shows [8% - 50%] power saving gains with the latency increase/UPT degradation in the range of [0% - ??%].

It is noted that the combined power saving techniques (as listed above) may not necessarily provide linear addition of individual power saving gains. It is noted that the power saving gains shown in the specific context as cited above are relative numbers, while it is understood that the absolute percentage of power consumption for a specific context may vary depending on the actual usage.

The UE assistance information provides the gNB additional information in faciliating UE adaptation to the traffic and reducing the power consumption of some respective power saving schemes shown aforementioned. UE preferred configurations are fed back to the gNB to help the network optimizing the resource utilization and assisting UE in achieving power consumption reduction. The power saving schemes with the power saving signal/channel triggering UE adaptation shows the power saving with adaptation in different domains, such as DRX operation, BWP switching, and reducing PDCCH monitoring aforementioned.

Conclusion:
- To include Table 9 in R1-1903737 as part of email approval of TR update

R1-1901572 Power saving schemes Huawei, HiSilicon
R1-1901710 UE adaptation to traffic and power consumption characteristics vivo
R1-1903353 NR UE power saving designs MediaTek Inc. (rev of R1-1901804)
R1-1902025 UE Power saving schemes and power saving signal/channel CATT
R1-1902031 Dicussion on potential techniques for UE power saving ZTE Corporation
R1-1902053 Discussion on potential techniques for UE power saving LG Electronics
R1-1902186 Power saving techniques for NR Sony
R1-1902318 On UE power saving techniques Samsung
R1-1903344 Discussion on UE power saving schemes with adaption to UE traffic CMCC (rev of R1-1902340)
R1-1902425 Discussion on UE power saving schemes Hisense
R1-1902508 On potential techniques for UE power saving Intel Corporation
R1-1902548 Discussion on UE power saving and traffic adaptation Panasonic
R1-1902619 On UE Power Saving Techniques InterDigital, Inc.
R1-1902735 Discussion on potential techniques for UE power saving Spreadtrum Communications
R1-1902745 UE Adaptation to the Traffic and UE Power Consumption Characteristics OPPO
R1-1902753 PDSCH resource allocation restriction for power saving ASUSTEK COMPUTER (SHANGHAI)
R1-1902771 UE power saving techniques Apple Inc.
R1-1902815 Discussion on Potential Techniques for UE Power Saving NTT DOCOMO, INC.
R1-1902850 UE power saving schemes Motorola Mobility, Lenovo
R1-1902935 Techniques for NR UE power saving Ericsson
R1-1903016 Potential Techniques for UE Power Saving Qualcomm Incorporated
R1-1903134 On UE adaptation to the traffic Nokia, Nokia Shanghai Bell

7.2.9.3 UE power Consumption Reduction in RRM Measurements

R1-1903424 Summary of UE power consumption reduction in RRM measurements vivo
Decision: The document is noted. Companies are encouraged to check Tables 1-5 in R1-1903424

Tuesday session
R1-1903481 Summary#2 of UE power consumption reduction in RRM measurements vivo
Decision: The document is noted.

Agreements:
- Capture Table 1 in R1-1903481 to TR38.840 section 5.3.1
  - With the following additional information provided and updated
    - Assumptions for measurement activities (e.g., loop convegernce, synchronization and etc) for baseline and enhancement.
  - To further capture the results for performance impact aspetcs – revisit later (**Thursday:** see next agreements)
- Capture Table 2 in R1-1903481 to TR38.840 section 5.3.2
  - With the following additional information provided and updated
    - Assumptions for measurement activities (e.g., loop convegernce, synchronization and etc) for baseline and enhancement.
- Capture Table 3 in R1-1903481 to TR38.840 section 5.3.3
  - With the following additional information provided and updated
    - Assumptions for measurement activities (e.g., loop convegernce, synchronization and etc) for baseline and enhancement.

Thursday session
R1-1903559 Summary#3 of UE power consumption reduction in RRM measurements vivo
Decision: The document is noted.

Agreements:
- Update Table 1 in R1-1903559 to TR38.840 section 5.3.1

  - For RSRP accuracy, capture Figure 1 in R1-1903430, Figure 2 in R1-1901711 and Figure 1 in R1-1902026 I TR38.840 section 5.3.1
  - Note: the handover failure rate is already embedded in the table.
- Update Table 2 in R1-1903559 to TR38.840 section 5.3.2
- Update Table 3 in R1-1903559 to TR38.840 section 5.3.3

Agreements:

For adapting/relaxing RRM measurement in time domain, the followings are observed from simulation results,

- For RRC CONNECTED state,
  - Among the results, [11.1% - 26.6%] power saving gain is shown for extending measurement period 4 times, and [7.4% - 17.8%] power saving gain is shown for extending measurement period 2 times, comparing with the baseline assumption.
- For RRC IDLE/INACTIVE state,
  - By increasing measurement period, the UE power saving gain at least depends on the number of I-DRX/paging cycles to be skipped for measurement and the number of SSB burst sets to be used for measurement and periodic activities. When measurement is performed once every 4 paging cycles, the gain is [17.9%-19.7%] (one SSB burst set for measurement and periodic activities), [0.89%-5.36%] (two or three SSB burst sets for measurement and periodic activities).
- While at the same time, for stationary or low mobility case, the mobility performance impact of increasing measuremenrt period (e.g., handover failure rate, RSRP difference between two adjacent samples) is shown as follow,
  - Observations for handover failure to be further summarized - revisit later – see below
  - the (5%-tile, 95%-tile) of the RSRP measurement error is within the range of ([-4dB, 4dB]) .
- It is shown that relaxing the number of samples within measurement period provides [2.57% - 36%] power saging gain for RRC CONNECTED. For stationary or low mobility case, 1 source results show the (5%-tile, 95%-tile) of the RSRP measurement error is within the range of ([-2dB], [3dB]) for both 3km/h and 30km/h .

Observations:

- For adapting/relaxing RRM measurement for intra-frequency measurement by reducing the number of measured cells, the followings are observed from simulation results,
  - By assuming number of neighbouring cells to be measured is reduced, it is shown that about [4.7% - 7.1%] power saving gain can be observed if reducing the number of measured cells for IDLE state. 1 source shows that about [1.8% - 21.3%] power saving gain can be observed if reducing the number of measured cells for CONNECTED state.
  - In additional to that, by also assuming that UE can limit the processing for measurement within a constrained time period and/or with reduced complexity, [26.43% - 37.5%] power saving gain is shown.
  - The corresponding performance impact was not reported and summarized

Proposals:

- For additional resources for RRM measurement, the followings are observed from simulation results,
  - [4 sources] shown that additional resources provide [21%~81%] power saving gain by skipping measurement/paging. [1 source] shows [3.8%-11.8%] power saving gain by assuming additional RS to reduce the offset between DRX ON and SSB measurement to increase the opportunities for UE deep sleep instead of light sleep.
- For these schemes,
  - 1 source evaluated CSI-RS based RRM for RRC IDLE state by reducing the active time for measurement.
  - 1 source evaluated allowing UE performs multiple RRM measurements (e.g. 5 measurements in a consecutive period) when UE is triggered to wake up at a given DRX-ON period.
  - 1 source evaluated multiplexed SSS-only signal as additional RS before each SSB (measurement occasion) for paging indication which can assist sync, RRM, and AGC tuning for RRC IDLE/INACTIVE state.
  - 1 source provides results based on PSS, SSS and wake-up singalling/paging transmitted in single frequency network as additional resources for measurement and shows benefits reducing UE power saving due to reducing the number of UE wake-up occasions for measurement, loop convergence and paging monitoring, reducing the frequency of performing neighbor cell search, and reducing the neighboring cell measurement , and reducing the paging monitoring.

- 1 source evaluate additional RS to reduce the offset between DRX ON and SSB measurement.
- System overhead may or may not be increased a lot by additional resource depending on the specific additional resourcedesign. Reusing existing transmitted RS (e.g, TRS, CSI-RS) for IDLE UEs does not increase system overhead, increasing the period of the additional RS can reduce the system overhead.

Friday

R1-1903764 Summary#4 of UE power consumption reduction in RRM measurements vivo

Decision: The document is noted.

Agreements:

Obversations:

Update the handover failure rate part as follows,

The handover failure rate for RRC CONNECTED state is

- with 4 times relaxing the measurement period, changed as follows:
  - [0% -> 0.26%] for 3km/h, [0% ->0.41%] and [2.08% ->2.81%] for 30km/h, [0% ->1%] for 60km/h, [0.17% ->3.14%] and [9.03% -> 10.07%] for 120km/h
- with 16 times relaxing the measurement period, changed as follows:
  - [0% -> 0.5%] for 3km/h, [0% -> 11.33%] for 30km/h, [0% -> 25.89%] for 60km/h, [0.17% -> 56.74%] for 120km/h

Agreements:

The followings are proposed to be captured as observations in TR38.840 section 5.3.3

- For RRC IDLE/INACTIVE, by using additional resources for RRM measurement, the UE power saving is [19%~38%]. Analysis on network impact, higher-layer/PHY-layer signaling overhead and network energy consumption is not provided. Two sources report [1.6%] of SSB overhead for 160ms additional reference signals periodicity assuming that SSB burst set periodicity is 20ms. If static UE specific signals (e.g., CSI-RS for connected mode UEs) can be reused as additional resource for RRM for RRC IDLE/INACTIVE, reference signal overhead may not increase.
- For RRC CONNECTED, one source showed that, by having CSI-RS repetition for CSI-RS based RRM in FR2, the UE power saving is [11.8%~20.7%] assuming that CSI-RS overhead of baseline is identical to CSI-RS overhead with enhancement. The analysis on handover failure rate is not provided under the assumed overhead.

R1-1903805 Summary#5 of UE power consumption reduction in RRM measurements vivo

Decision: The document is noted.

Conclusion:

- To include Table 3 in section 2.3.1 in R1-1903805 as part of TR update for email approval
- To include Table 4 in R1-1903805 as part of TR update for email approval

Agreements:

- Add new section in TR38.840 "5.3.4 Adapting/relaxing RRM measurement for inter-frequency measurement"

The followings are proposed to be captured as observations in TR38.840 section 5.3.4

2 sources show that reducing the number of measured inter-frequency layers can provide [21~38%] power saving gain for RRC CONNECTED states, and 1 source shows [xx~xx%] power saving gain for RRC IDLE states by assuming reducing inter-frequency layers from 6 to 3. The mobility performance impact is not provided.

Agreement:

- Capture the Table 5 in R1-1903805 in a separate table in TR38.840 section 5.3.4

Email discussion/approval for the following till March 6th

The followings to be captured as observations in TR38.840 section 5.3.4

For IDLE state, one source shows that [36%~64%] power saving gain is shown for reducing RRM measurement for SSBs by considering adjacent directional beams of each SSB can be provided by gNB to reduce SSB number of UE RRM measurement and loop convergence. It also shows that the it has no severe impact on RSRP difference between two adjacent samples.

Note: section 5.3.4 in TR38.840 is for adaptation/relaxing inter-freuency measurement – Xiaodong, vivo

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Agreements:

Capture the followings in TR38.840 section 7:

For adapting/relaxing RRM measurement in time domain

- [11.1% - 26.6%] and [7.4% - 17.8%] power saving gain is shown for increasing measurement period 4 times and 2 times respectively for For RRC CONNECTED state, [17.9%-19.7%] and [0.89%-5.36%] power saving gain is shown RRC IDLE/INACTIVE state by increasing measurement period for 1 SSB burst set for measurement and periodic activities and 2 or 3 SSB burst set for measurement and periodic activities respectively.
- For stationary or low mobility (e.g., 3km/h) case, increasing measurement period has less impact (e.g., handover failure rate changes from [0%] to [0.26%] for 3km/h by extending 4 times measurement period) to the mobility performance compared to high mobility cases (e.g., handover failure rate changes from [XX%] to [YY%] for 60km/h by extending 4 times measurement period).

For adapting/relaxing RRM measurement for intra-frequency measurement by reducing the number of measured cells,

- By assuming number of neighbouring cells to be measured is reduced, it is shown that about [4.7% - 7.1%] power saving gain can be observed if reducing the number of measured cells for IDLE state. 1 source shows that about [1.8% - 21.3%] power saving gain can be observed if reducing the number of measured cells for CONNECTED state.
- In additional to that, by also assuming that UE can limit the processing for measurement within a constrained time period and/or with reduced complexity, [26.43% - 37.5%] power saving gain is shown.
- The corresponding performance impact was not reported and summarized

For additional resource for RRM measurement

- For RRC IDLE/INACTIVE, by using additional resources for RRM measurement, the UE power saving gain is [19%~38%]. Analysis on network architecture impact, higher-layer/PHY-layer signaling overhead and network energy consumption is not provided. Two sources report [1.6%] of SSB overhead for 160ms additional reference signals periodicity assuming that SSB burst set periodicity is 20ms. If static UE specific signals (e.g., CSI-RS) for connected mode UEs can be reused as additional resource for RRM, reference signal overhead may not increase.
- For RRC CONNECTED, one source showed that, by having CSI-RS repetition for CSI-RS based RRM, the UE power saving gain is [11.8%~20.7%] by assuming that CSI-RS overhead of baseline is identical to CSI-RS overhead with enhancement. The analysis on handover failure rate is not provided under the assumed overhead.

For reducing the number of measured inter-frequency layers

- 2 sources show that reducing the number of measured inter-frequency layers can provide [21~38%] power saving gain for RRC CONNECTED states, and 1 source shows [xx~xx%] power saving gain for RRC IDLE states by assuming reducing inter-frequency layers from 6 to 3. The mobility performance impact is not provided.

It is noted that for RRM evaluation, PDCCH-only monitoring without data is assumed for RRC CONNECTED state.

R1-1903430	Power consumption reduction in RRM measurements	Huawei, HiSilicon (rev of R1-1901573)
R1-1901711	UE power saving in RRM Measurements	vivo
R1-1903354	NR RRM UE power saving	MediaTek Inc. (rev of R1-1901805)
R1-1902026	UE Power saving scheme for RRM measurements	CATT
R1-1902032	On UE Power Saving for RRM Measurement	ZTE Corporation
R1-1902054	Discussion on UE power consumption reduction in RRM measurements	LG Electronics
R1-1902187	Power consumption reduction in RRM measurements	Sony
R1-1902319	UE power consumption reduction in RRM measurement	Samsung
R1-1902341	Discussion on power saving in intra-band RRM measurements	CMCC
R1-1902509	On RRM aspects of NR UE power saving	Intel Corporation
R1-1902731	Consideration on NR RRM for UE power saving	Spreadtrum Communications
R1-1903351	UE power Consumption Reduction in RRM Measurements	OPPO (rev of R1-1902746)
R1-1902752	Additional resource for RRM measurement in power saving aspect	ASUSTEK COMPUTER (SHANGHAI)
R1-1903236	Discussion on UE power Consumption Reduction in RRM Measurements	NTT DOCOMO. (rev of R1-1902816)
R1-1902936	RRM aspects of NR UE power saving	Ericsson
R1-1903017	UE Power Consumption Reduction in RRM Measurements	Qualcomm Incorporated
R1-1903136	UE Power Consumption Reduction in RRM Measurements	Nokia, Nokia Shanghai Bell

7.2.9.4 Other

R1-1901712	Modeling and evaluation results for gaming	vivo
R1-1901713	Triggering adaptation of UE power consumption characteristics	vivo

R1-1901766 Considerations on study item conclusion vivo
R1-1901806 DRX cycle adaptation for NR UE power reduction MediaTek Inc.
R1-1902342 Consideration on resource of power saving signal for paging monitoring CMCC
R1-1902620 Orthogonal ON/OFF Keying for Wake-up Signal Design InterDigital, Inc.
R1-1902751 Triggering adaptation of UE power consumption ASUSTEK COMPUTER (SHANGHAI)
R1-1902772 Higher layer techniques for UE power saving Apple Inc.
R1-1902906 Measurement relaxation for UE low battery status Xiaomi
R1-1902937 Additional discussion on Network impact of NR UE power saving Ericsson
R1-1902938 Prioritization criteria for UE power saving improvement features Ericsson
R1-1902939 High-level UE Energy Consumption Modeling Ericsson
R1-1902940 WUS design based on OOK Ericsson
R1-1902941 Aspects of UE power saving in UL transmission Ericsson
R1-1902942 UE power saving techniques for Idle and Inactive states Ericsson
R1-1903135 On potential power saving triggering signals Nokia, Nokia Shanghai Bell
R1-1903137 Considerations for limiting the PDCCH blind decoding candidates Nokia, Nokia Shanghai Bell
R1-1903192 UE power saving for paging Huawei, HiSilicon
R1-1903193 UE reporting assistance information to gNB Huawei, HiSilicon
R1-1903194 Calibration results for power saving study Huawei, HiSilicon

7.2.10 Study on NR positioning support

FS_NR_pos; SID in RP-182155. Please refer to the SID for detailed scoping

R1-1903632 **Chairman's notes of AI 7.2.10 Study on NR positioning support** **Ad-hoc Chair (Ericsson)**
Decision: The document is endorsed, content incorporated below.

Friday
R1-1903534 **TR 38.855 v1.0.5 Study on NR positioning support** **Ericsson**
Decision: The document is endorsed.
Updated version for email approval till March 6th (Florent, Ericsson) with the following:

- removing Section 9.5, and moving the contents Section 9.3.2 – a new section
- removing editor's comments
- removing void sections (section 8) and correct reference

R1-1903775 TR 38.855 v1.0.4

R1-1903775 is endorsed with the following modifications:

- In section 7.1, fix typo for the word "Whether"
- Add reference at the end of Section 7.2.1
- Remove company names in Section 8.
- Fix legend in Figure 8.3.3.10-1
- Fix Umi and Uma where applicable
- Remove "End of text proposal change" in Section 9.3.1
- Change ":" to "." in Section 10.
- Add agreed TP for Section 7.2.3
- Incorporate any input from RAN3
- Enhancements identified in Section 9.4 can be considered for future specification work

R1-1903722 TP for TR 38.855, Section 2, 7.2 and 7.2.4 on RAT independent positioning Ericsson, ESA

Agreement:
The TP for Section 7.2.4 proposed in R1-1903722 excluding the first paragraph is endorsed as Section 7.2.3 in the TR, ensuring that the references are aligned with the TR.

R1-1903603 LS on RAN2 conclusion for NR positioning SI RAN2

R1-1902510 Remaining Open Aspects and Potential Conclusions for NR Positioning Study Item Intel Corporation
R1-1903107 TP on the conclusion for NR RAT dependent positioning Huawei, HiSilicon

R1-1903485 Offline Discussion Outcome on Intermediate Conclusions for NR Positioning Study Item and Remaining Open Aspects Intel Corporation

Agreement:
The text proposal in Section 3 of R1-1903485 is endorsed for the Conclusions section of the TR

R1-1903442 TR 38.855 v1.0.1 Study on NR positioning support Ericsson

Agreement:
R1-1903442 with the agreed text proposal for the Conclusions section from Section 3 of R1-1903485 is endorsed as v1.0.2 of the TR in R1-1903487.

TPs in Sections 7.2 and 8.4 capturing observations from the evaluation results
Check all the editorial changes

R1-1903688 TR 38.855 v1.0.3 Study on NR positioning support Ericsson

Agreement:
Include the following in Section 10 of the TR prior to the recommendation to start normative work for NR positioning:
DL-only UE-based positioning is feasible from a RAN1 perspective. System level aspects need further consideration in other working groups.

Agreement:
Capture the following in Section 10 of the TR:
GNSS SSR completion (PPP-RTK support) can be considered for further specification work.

Agreement:
Include the following in Section 10 of the TR:
A variety of enhancements for UL SRS were proposed by many sources and were reported to be beneficial by these sources.

Agreement:
Modify a statement in Section 10 of the TR as follows:
"It was identified that enhancements are necessary (e.g., based on extensions to current reference signals or with new reference signals) to meet horizontal accuracy requirements in some scenarios. In order to achieve target performance characteristics, …"

R1-1903701 TP for TR 38.855, Section 2 and 7.2 on RAT independent positioning Ericsson, ESA, Qualcomm, Nokia, Sony

Agreement:
The TPs in R1-1903701 are endorsed with the following text for Section 7.2.3:
Support for RAT independent positioning in NR was introduced in Rel. 15. Hybridization between RAT independent and NR RAT dependent positioning methods should be supported for NR.

R1-1903702 TP for TR 38.855, Section 8.x on RAT independent positioning evaluations Ericsson, ESA, Qualcomm, Nokia

Agreement:
The TP in R1-1903702 is agreed with the following modifications:

- Include the figures that have been deleted

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- Change 5G-GNSS to NR-GNSS
- All mentions of company names or the word company should be changed to "source" with a reference provided to the contribution where the results were included.
- Insert the statement, "No conclusions can be drawn from the results in this Section", in Section 8.x.1 after the statement, "No GNSS models or scenarios have been agreed in 3GPP for positioning evaluations."

R1-1903709 TP for TR 38.855, Section 8.x on RAT-independent positioning ESA, Ericsson, Nokia, Qualcomm
R1-1903618 Text Proposal for the list of proposed SRS enhancements Huawei, HiSilicon
R1-1903624 TP on conclusion for multipath measurement Huawei, HiSilicon

Conclusion:
DL-only UE-based positioning is feasible from a RAN1 perspective. System level aspects need further consideration in other working groups.

R1-1903691 Text Proposal on Additional NR Positioning Enhancements for the 3GPP TR 38.855 Intel Corporation

Agreement:
The text proposal in R1-1903691 is agreed for inclusion in the TR with the following modifications:

- Phase-based RSTD measurement (PDoA) was proposed in [15] to be applied for DL-TDOA or RTT positioning techniques [16].
- Add the following statement at the beginning of Section 9.6: "Multiple sources proposed a variety of UL SRS enhancements for NR positioning".

7.2.10.1 Potential Techniques for NR RAT Dependent Positioning

7.2.10.1.1 DL only based Positioning

Including positioning techniques, UE measurements/reports, reference signals and performance evaluations, etc.

R1-1901574 Remaining issues on DL based positioning Huawei, HiSilicon
R1-1901714 Views on NR downlink positioning techniques vivo
R1-1901753 Discussion on downlink-based positioning ZTE Corporation,Sanechips
R1-1903239 On downlink OTDOA and angle based techniques MediaTek Inc. (rev of R1-1901816)
R1-1901817 On downlink angle based technique MediaTek Inc.
Withdrawn (content merged into R1-1903239)
R1-1901847 DL based NR Positioning Nokia, Nokia Shanghai Bell
R1-1901980 Further discussion of NR RAT-dependent DL Positioning CATT
R1-1903346 Discussion on DL only based Positioning LG Electronics (rev of R1-1902099)
R1-1902188 Considerations on DL-based positioning for NR Sony
R1-1902243 DL only based Positioning Samsung
R1-1902511 Design Aspects for NR DL Positioning Intel Corporation
R1-1902699 DL only based Positioning of Co-band TBS BUPT, ZTE, CAICT
R1-1902721 Discussion on DL only based positioning Spreadtrum Communications
R1-1902835 Views on DL only positioning techniques Mitsubishi Electric Co.
R1-1903018 RAT-dependent DL-only NR positioning techniques Qualcomm Incorporated
R1-1903139 DL Positioning Solutions Ericsson

R1-1903394 Summary for NR-Positioning AI - 7.2.10.1.1 DL only Based Positioning Intel Corporation

Agreement:
The following is agreed for inclusion in TR 38.855:
NR DL PRS resource design with one antenna port should be supported. The use of more than two antenna ports per NR DL PRS resource need not supported.

Agreement:
New DL positioning reference signals should be defined for supporting NR positioning. When and how existing NR DL reference signals can be used for positioning needs further discussion.

7.2.10.1.2 UL only based Positioning

Including positioning techniques, gNB measurements/reports, reference signals and performance evaluations, etc.

R1-1901575 Remaining issues on UL based positioning Huawei, HiSilicon
R1-1901715 Views on NR uplink positioning techniques vivo
R1-1901818 On uplink angle based technique MediaTek Inc.
R1-1901848 UL based NR Positioning Nokia, Nokia Shanghai Bell
R1-1901981 Further discussion of NR RAT-dependent UL Positioning CATT
R1-1902100 Discussion on UL only based Positioning LG Electronics
R1-1902189 Considerations on UL-based positioning for NR Sony
R1-1902244 UL only based Positioning Samsung
R1-1902343 Discussion on UL angle-based solution for NR positioning CMCC
R1-1902512 Design Aspects for NR UL Positioning Intel Corporation
R1-1903019 RAT-dependent UL-only NR positioning techniques Qualcomm Incorporated
R1-1903053 Uplink NR TDOA Design Fraunhofer IIS, Fraunhofer HHI
R1-1903140 UL Positioning Solutions Ericsson

R1-1903395 Summary for NR-Positioning AI - 7.2.10.1.2 UL only based Positioning Intel Corporation

7.2.10.1.3 Combination of DL & UL based Positioning

Including positioning techniques, UE/gNB measurements/reports, reference signals and performance evaluations, etc.

R1-1901576 Remaining issues on DL & UL positioning Huawei, HiSilicon
R1-1901716 Views on NR DL & UL positioning techniques vivo
R1-1901849 DL and UL based NR Positioning Nokia, Nokia Shanghai Bell
R1-1901982 NR Positioning with the combination of DL/UL Measurements CATT
R1-1902101 Discussion on Combination of DL & UL based Positioning LG Electronics
R1-1902245 Combination of DL & UL based Positioning Samsung
R1-1902513 Design Aspects for NR DL and UL Positioning Intel Corporation
R1-1902836 Views on DL and UL positioning techniques Mitsubishi Electric Co.
R1-1903020 RAT-dependent DL and UL NR positioning techniques Qualcomm Incorporated
R1-1903141 On the use of RTT for positioning Ericsson

Agreement:
NR should support E-CID based positioning
- E-CID downlink measurements should be supported based on at least RRM measurements defined in NR Rel. 15
- Note:
  - Support of NR Rel-16 signals, measurements and procedures for E-CID are to be discussed when specified
  - NR Rel-15 signals may be used to define additional UE/gNB measurements to facilitate E-CID support

R1-1903396 Summary on NR Positioning AI – 7.2.10.1.1 DL&UL based Positioning Intel Corporation

Agreement:
The reference signals agreed for DL-only and UL-only positioning techniques can be reused for DL+UL RTT positioning with multiple TPs/gNBs

7.2.10.1.4 System-level Performance Evaluation for RAT-Dependent Positioning Techniques

Targeting chapter 8 of TR 38.855

R1-1901577 Performance evaluations for NR positioning Huawei, HiSilicon

R1-1901717 Evaluation for RAT-Dependent Positioning Techniques vivo
R1-1901781 System-level evaluations on Rat-dependent positioning ZTE Corporation,Sanechips
R1-1903331 System level performance with explicit link level simulation for downlink OTDOA and angle based techniques MediaTek Inc. Revision of R1-1903229, R1-1901819
R1-1901820 System level performance with explicit link level simulation for downlink angle based technique MediaTek Inc.
Withdrawn (content merged into R1-1903331)
R1-1901850 Updated system level simulation results for NR Positioning Nokia, Nokia Shanghai Bell
R1-1903222 Updated System-level Performance Evaluation for NR Positioning CATT Revision of R1-1901983
R1-1903347 Discussion on Performance Evaluation for RAT-Dependent Positioning Techniques LG Electronics Revision of R1-1902102
R1-1902246 System-level Performance Evaluation for RAT-Dependent Positioning Techniques Samsung
R1-1902397 System-level Performance Evaluation for SSB Angle Based Positioning Polaris Wireless
R1-1902514 NR Positioning Evaluation ResultsIntel Corporation
R1-1903220 System level simulations for OTDOA ESA Revision of R1-1902550
R1-1902698 System-level Performance Evaluation of Co-band TBS for TR 38.855 BUPT, ZTE, CAICT
R1-1903386 Evaluation results for NR positioning Mitsubishi Electric Co. Revision of R1-1902837
R1-1903342 Evaluation results for RAT-dependent positioning Techniques Qualcomm Incorporated Revision of R1-1903021
R1-1903332 SLS results for NR positioning potential solutions Fraunhofer IIS, Fraunhofer HHI Revision of R1-1903054
R1-1903142 System-level Performance Evaluation for RAT-Dependent Positioning Techniques Ericsson
R1-1903439 Summary for AI System-level Performance Evaluation for RAT-Dependent Positioning Techniques (AI 7.2.10.1.4) Ericsson

R1-1903433 Offline session notes for AI 7.2.10.1.4 System-level Performance Evaluation for RAT-Dependent Positioning Techniques (Monday session) Ericsson

Agreement:
The following text proposal for the section summarizing evaluations in TR 38.855 is agreed
----------begin of TP for 8.4.1.1 in 38.855:----------
For the Indoor open office scenario, channel models and simulation assumptions, the following can be observed for horizontal accuracy as described in section 5 of the TR for regulatory and commercial requirements:

- For scenario 1, the evaluations from 12 sources showed that DL-TDOA can meet the regulatory requirements.
- For scenario 1, the evaluations from 12 sources showed that DL-TDOA can meet the commercial requirements, when no synchronization error is included in the evaluation. When synchronization error is modeled, the commercial requirements as described in section 5 of the TR are not met.
- For scenario 1, 1 source evaluated DL AoD for FR2, and observed that it can meet the regulatory requirements.
- For scenario 1, 1 source evaluated DL AoD for FR2, and observed that it can meet the commercial requirements.
- For scenario 1, 1 source evaluated DL-TDOA+AoD for FR2, and observed that it can meet the regulatory requirements.
- For scenario 1, 1 source evaluated DL-TDOA+AoD for FR2, and observed that it can meet the commercial requirements, when no synchronization error is included in the evaluation. When synchronization error is modeled, the commercial requirements for horizontal accuracy are not met.

----------end of TP for 8.4.1.1 in 38.855:----------

R1-1903689 Offline session notes for 7.2.10.1.4 on evaluations of positioning solutions (Wednesday) Ericsson

Agreement:
The TPs in R1-1903689 are endorsed for inclusion in the TR with the following modifications:

- Replace “polaris” with a reference number in the TP for Section 8.4.1.2
- Replace “8 out of 12” with “7 out of 12” in the TP for Section 8.4.1.3

- Fix typo (ources) in the TP for Section 8.4.1.3
- Change all occurences of UTDOA to UL-TDOA.
- Replace all occurences "HW" with the appropriate reference number.
- In the second and fourth bullets in the TP for Section 8.4.3-3 (which mistakenly has been labelled as 8.4.3-1), insert "and outdoor UEs" after "For scenario 3,".

7.2.10.2 Potential Techniques for NR RAT Independent Positioning

Including combination of RAT-independent & RAT-dependent techniques

R1-1901578 Positioning with GNSS Huawei, HiSilicon
R1-1901718 Views on potential techniques for NR RAT-Independent positioning vivo
R1-1901984 Further discussion of NR Hybrid Positioning Techniques CATT
R1-1902103 Discussion on Potential Hybrid Techniques of RAT-Independent and RAT-Dependent Positioning LG Electronics
R1-1902190 Considerations on RAT Independent and Hybrid Positioning for NR Sony
R1-1902247 Potential Techniques for NR RAT Independent Positioning Samsung
R1-1902549 TP on hybrid positioning and GNSS enhancements for TR 38.855 ESA, Mitsubishi Electric Corporation, u-blox AG
R1-1903022 RAT Independent and Hybrid Positioning Solutions Qualcomm Incorporated
R1-1903143 NR RAT Independent and Hybrid Positioning Solutions Ericsson
R1-1903724 TP on positioning for RAT-independent techniques Huawei, HiSilicon

7.2.10.3 Other

R1-1901821 On channel modelling for NR positioning MediaTek Inc.
R1-1901985 NLOS Model for NR Positioning CATT
R1-1902248 Other issues on NR positioning Samsung
R1-1902344 Discussion on measurement reporting for network synchronization error compensation scheme CMCC
R1-1902407 Discussion on Periodical UE Geo-Location and Techniques for NR Positioning ITRI
R1-1902515 Comparative Analysis of NR Positioning Techniques Intel Corporation
R1-1902516 Reporting of Received Signal Waveform to Boost NR Positioning Performance Intel Corporation
R1-1903055 Carrier Phase enhanced potential solution for NR positioning schemes Fraunhofer IIS, Fraunhofer HHI
R1-1903144 Co-ordination among UE, gNB and Location Server for PRS Configuration and Feedbacks Ericsson

7.2.11 Study on Channel Modeling for Indoor Industrial Scenarios

FS_IIIOT_CM; SID in RP-182862. Please refer to the SID for detailed scoping

Note: no online time intended for this agenda item during this meeting

R1-1901579 Consideration on channel model for industrial factory environment Huawei, HiSilicon
R1-1902112 About IIOT scenario ZTE, Sanechips, BJTU, Tongji University
R1-1902623 Directional channel response in a dense factory clutter environment Nokia, Nokia Shanghai Bell
R1-1902624 Delay Spread Measurement Results and Observations from two Operational Factory Halls at 3.5 GHz for various Antenna Configurations Nokia, Nokia Shanghai Bell
R1-1902817 Discussion on delay spread for factory scenario NTT DOCOMO, INC.
R1-1903023 Indoor Industrial Channel Model Qualcomm Incorporated
R1-1903122 Further discussion on channel modelling for the Indoor industrial scenario Ericsson
R1-1903123 Email discussion on frequency bands of interest Ericsson
R1-1903124 Email discussion on measurements and observations Ericsson
R1-1903125 Email discussion on scenario description Ericsson

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7.2.12 NR Mobility Enhancements

NR_Mob_enh-Core; WID in RP-181433. Please refer to the WID for detailed scoping

7.2.12.1 Physical Layer Aspects for Mobility Enhancements during HO and SCG Change

R1-1901779 **Discussion on NR Mobility Enhancements in Physical Layer** **ZTE**

- Observation 1: Both DC-based handover and MBB with multiple Tx/Rx chains at UE can achieve 0ms interruption.
- Proposal 1: RACH-less handover should be supported in Rel-16 NR at least for the scenarios in which TA is known in the network.
- Proposal 2: RAN1 to study how to perform reliable DL/UL communication with source cell and target cell during the period of dual connection.

Decision: The document is noted.

R1-1902249 **Physical Layer Aspects for Mobility Enhancements** **Samsung**

- Observation 1: LTE Make-Before-Break (MBB) operation can be applied also in NR without any remarkable modification.
- Observation 2: LTE RACH-less handover operation can be applied also in NR without any remarkable modification. In addition, NR already supports uplink transmission based on configured grant which facilitate RACH-less operation in NR.
- Observation 3: Simultaneous transmission to / reception from two cells on the same frequency has certain challenges, especially for FR2 where beam-forming operation is needed.
- Observation 4: RAN1 implication of intra-frequency DC-based handover would be UE power control, UL timing adjustment, and so on. Joint analysis on DC-based handover, MBB, and RACH-less operation would be required. Observation 5: Conditional handover would require specification updates on handover procedure and corresponding signalling.
- Observation 6: LTE mobility enhancement functionality with early T310 termination based on T312 can be baseline for fast RLF recovery and/or mobility performance enhancement in NR.

Decision: The document is noted.

R1-1902463 **Physical layer aspects of enhanced mobility** **Intel Corporation**

- Proposal 1: Discuss what the RAN1 work plan should be and coordinate the work plan with RAN2.
- Proposal 2:
  - Initiate collection of input from companies on feasibility of simultaneous Tx/Rx to/from two NR cells.
  - Classify collection of the information into 2 categories, inter-frequency inter-band, inter-frequency intra-band, and intra-frequency (intra-band). Further subcategorize each cases depending the MRTD and MTTD expected for the UE to handle.

Decision: The document is noted.

R1-1902528 **Lower-layer mobility enhancements** **Ericsson**

- Observation 1 A quite small addition is required in the standard to enable the UE to report RSRP also on SSBs from non-serving cells.
- Observation 2 L1-RSRP measurements of SSBs in neighbour cells is readily available in the UE. No additional measurement functionality needs to be implemented.
- Observation 3 Reporting over L1 is significantly faster than reporting than L3 reporting and enables to the NW to perform UE-specific processing of the measurement, taking additional quantities into account.
- Observation 4 The NW can very easily activate and deactivate the L1 reporting when needed, leading to reduced UE power consumption.
- Observation 5 The beam management functionality specified in Rel-15 provides the mechanisms to change the QCL source for the PDCCH/PDSCH DMRS via MAC CE.
- Observation 6 The delay associated with a MAC CE update of the QCL source is small.
- Observation 7 In NR, it is possible to have the same physical layer configuration in serving and target cell.
- Observation 8 The link recovery procedure is significantly faster than the RRC re-establishment that follows after RLF.
- Proposal 1 Include an optional PCI in the definition of SSB resources for beam management reporting to enable reporting of L1-RSRP of non-serving cells over PUCCH/PUSCH.
- Proposal 2 Introduce an optional PCI in the QCL-info definition to facilitate update of the QCL source to an RS in a non-serving cell.
- Proposal 3 Include a PCI in the definition of BFR-SSB-Resource and/or BFR-CSIRS-Resource to allow the UE to perform the beam recovery in other cells.

Decision: The document is noted.

R1-1903024 **On Mobility Enhancements during HO** **Qualcomm Incorporated**

- Proposal 1: Study mechanism for UE to obtain timing advance of the target cell for supporting NR RACH-less HO.
- Proposal 2: Consider reusing the same UL grant configuration mechanism in LTE RACH-less HO as a starting point for NR RACH-less HO.
- Proposal 3: Study the power control for PUSCH carrying handover command response to the target cell in NR RACH-less HO.
- Proposal 4: Study multi-beam aspects in supporting RACH-less HO e.g., a list of candidate beams might be provided to UE for PUSCH transmission to target cell.

Decision: The document is noted.

R1-1903113 **Overview on NR mobility enhancements** **Huawei, HiSilicon**

- Observation 1: Only DC-based HO and enhanced MBB that keep the source link until a UE can receive control/data from the target cell, can achieve 0ms interruption time, and they have the same RAN1 impacts.
- Observation 2: RAN1 impacts on RACH-less HO are how to obtain timing advance, power control and UL grant for initial PUSCH transmission.
- Observation 3: Direct RAN1 impacts on conditional HO and fast HO failure recovery solutions are limited.

Decision: The document is noted.

R1-1903138 **On mobility enhancements during cell change** **Nokia, Nokia Shanghai Bell**

- Observation: The service interruption in NR can be defined as the duration between the point in time when the UE stops transmission/reception with the source gNB and the time when target gNB resumes the transmission/reception with the UE after UE has sent *RRCReconfigurationComplete*.
- Observation: Make-before-Break and RACH procedure related enhancements should be studied for mobility enhancements. For RACH enhancements, RACH-less HO and 2-step RACH could be considered.
- Observation: Simultaneous connectivity solutions covering 1TX and 2TX implementations should be studied for NR mobility enhancements.
- Observation: Beam domain aspects could be considered in conjunction of mobility robustness enhancements.

Decision: The document is noted.

Tuesday conclusion: Continue discussion offline – Daewon (Intel)

Wednesday session

R1-1903537 **Summary of discussions on physical layer aspects of enhanced mobility** **Intel**

Decision: The document is noted.

Conclusion:

The following physical layer aspects for mobility enhancements have been identified in RAN1#96 and are to be further studied (but not limited to):

- Potential physical layer aspects of RACH-less HO
  - TA for target cell (if applicable)
  - Power control for PUSCH for the target cell
  - UL grants configuration
  - Tx/Rx beam related aspects
  - PUSCH transmission aspects (e.g. repetition, etc.)
- Potential physical layer aspects of dual connectivity (DC) based HO
  - Feasibility/applicability (with respect to various Tx/Rx RF capability and carrier frequencies of source/target cell)
  - PDCCH monitoring for source and target cells.
  - Procedures related to DL/UL operation
  - Power control for PUSCH/PUCCH/SRS
  - Tx/Rx beam related aspects
  - Note: this may interact with multi-TRP discussion in Rel-16 eMIMO
- Potential physical layer aspects of Make-before-break (MBB) related to 0ms HO interruption latency (if supported)
  - If supported, whether or not PHY impacts are similar/the same to those under dual connectivity (DC) based HO
- Potential physical layer aspects of solutions/enhancements that are not explicitly mentioned in the WID
  - Measurement procedure to provide low latency reports (e.g. L1 based measurements)

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- Methods of conveying QCL information for target cell (e.g. MAC CE based indication of QCL information for target cell)
- Link recovery on non-serving cells

7.2.12.2 Other

R1-1903114 Discussion on scenarios for mobility enhancements Huawei, HiSilicon
R1-1903115 Details on mobility enhancements Huawei, HiSilicon

7.2.13 Multi-RAT Dual-Connectivity and Carrier Aggregation enhancements (LTE, NR)

LTE_NR_DC_CA_enh-Core; WID in RP-182076. Please refer to the WID for detailed scoping

R1-1903187 Workplan for the DC and CA enhancements WI Ericsson, Nokia
Decision: The document is noted.

7.2.13.1 Uplink Power Control for Supporting NR-NR Dual-Connectivity

Including both synchronous & asynchronous, covering only cases not covered in Rel-15

R1-1901551 UL power control for NR-NR dual connectivity Huawei, HiSilicon

- Observation: UE operating in dynamic power sharing is able to maintain phase continuity in power-limited cases even when uplink transmissions on two different CGs are partially overlapped.
- Proposal 1: Dynamic power sharing shall be supported for NN-DC with FR1+FR1 band combination(s). The UE modem for each CG has the same ability of obtaining scheduling information of the other CG.
- Proposal 2: Look-ahead in determining UL transmission power can be considered for NN-DC UE.
- Proposal 3: For NN-DC with FR1+FR1 band combination(s), it is preferable to introduce minimum guaranteed power to dynamic power sharing.
- Proposal 4: Prioritizations for transmission power reductions in Rel-15 are treated as starting points for NN-DC.
- Proposal 5: Consider to introduce additional prioritizations for transmission power reductions on top of current ones in Rel-15, e.g., prioritization among different PUCCH formats or PUSCH types.
- Proposal 6: Study the UE behavior on PH calculation in asynchronous NN-DC scenario.
- Proposal 7: Consider single UL operation for NN-DC among multiple CGs in order to combat the IMD issue.

Decision: The document is noted.

R1-1902834 Uplink PC for Supporting NR-NR DC Panasonic Corporation
Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Kianoush (Qualcomm)

Thursday session
R1-1903645 Summary for Uplink Power Control For Supporting NR-NR Dual Connectivity Qualcomm
Decision: The document is noted.

Proposal:

- For Rel. 16 NR-DC with FR1+FR1 band combinations, both the semi-static power sharing and dynamic power sharing ~~modes~~ are supported.

Friday session
R1-1903778 Summary for Uplink Power Control For Supporting NR-NR Dual Connectivity Qualcomm
Decision: The document is noted.

Proposals:

- For Rel. 16 NR-DC with FR1+FR1 band combinations both the semi-static power sharing and dynamic power sharing operations are supported.
  - FFS whether each power sharing operation is associated with the UE capability.

Email discussion till March 15th – Kianoush (Qualcomm)

R1-1901719 Uplink power control for NR-NR DC vivo
R1-1901776 Discussion on uplink power control for NR-NR DC ZTE
R1-1901986 UL Power control for NR -DC CATT
R1-1902207 Uplink Power Control for NR-NR DC AT&T
R1-1902250 Uplink Power Control for NR-NR DC Samsung
R1-1902426 Uplink PC for NR-NR Dual Connectivity Nokia, Nokia Shanghai Bell
R1-1902517 Uplink power control for NR-NR Dual Connectivity Intel Corporation
R1-1902708 UL power control for NR-NR DC OPPO
R1-1902773 Considerations on uplink power control for supporting NN-DC Apple Inc.
R1-1902818 Power-control for NR-NR dual connectivity NTT DOCOMO, INC.
R1-1902851 Uplink power control for NR-NR dual-connectivity Motorola Mobility, Lenovo
R1-1902943 Power Control for NR-NR DC Ericsson
R1-1903025 Uplink Power Control Solutions for NR-NR Dual Connectivity Qualcomm Incorporated

7.2.13.2 Cross-carrier Scheduling with Different Numerologies

CA only, targeting completion by RAN#84

R1-1901720 **Cross-carrier scheduling with different numerologies** **vivo**

- Observation 1: It is desirable that the introduction of support of mix numerologies does not impose significant implementation complexity to the UE, compared with the same numerology case.
- Observation 2: For each scheduled cell, the BD/CCE limit is identical between self-scheduling and cross-carrier scheduling with same numerology on the scheduling and scheduled cells.
- Observation 3: If the limit of BDs/CCEs were determined based on the numerology of the scheduling CC,
  - the total number of BD/CCE required in a subframe would be increased;
  - the backward incompatibility issue should be considered.
- Observation 4: Support of multi-slot scheduling may either have difficulty in DCI design, or introduce processing complexity of UE implementation.
- Proposal 1: In the case of cross-carrier scheduling with different numerologies on the scheduling and the scheduled cells,
  - the BD/CCE limits is determined by min {per-CC limit, per-numerology limit}, i.e. same as self-scheduling case or cross-carrier scheduling with same numerology case,
  - the total number of BD/CCE for each scheduling cell is then given by formula (1).
- Proposal 2: In the case of cross-carrier scheduling where the SCS of the PDSCH is larger than that of the PDCCH, a UE should be able to process more than one unicast DCI scheduling PDSCH per scheduled cell.
- Proposal 3: A UE is not expected to receive a Type-B PDSCH, if the delta between the first symbol of the PDSCH and the first symbol of the PDCCH scheduling the PDSCH is less than N0 symbols.
- Proposal 4: A UE is not expected to receive a Type-A PDSCH, if the delta between the first symbol of the scheduling PDCCH and the first symbol of the PDSCH or the Type-A DMRS, is less than N0 symbols.
- Proposal 5: For cross carrier scheduling, if the scheduling timing offset is smaller than the threshold, or if Tci-PresentInDCI is not enabled for DCI format 1_1, the default QCL assumption for PDSCH can base on the active TCI state with the lowest ID applicable to PDSCH in the active BWP of the scheduled cell.
- Proposal 6: Rel-16 supports aperiodic CSI reports based on aperiodic CSI-RS resources with different numerology from that of the triggering DCI.
- Proposal 7: For AP-CSI-RS triggered by PDCCH with different numerology, the threshold can be determined based on the SCS of the cell where the CSI-RS is configured. The UE does not expect the scheduling offset is smaller than the threshold.

Decision: The document is noted.

R1-1902944 **Cross-carrier scheduling with different numerologies** **Ericsson**

Proposal 1: If a UE is configured with CIF, and if numerology of the scheduling cell is different from that of the scheduled cell, the UE is not expected to receive a PDSCH if the corresponding PDCCH DCI indicates k0<X.

- X depends on the numerology of the scheduling cell and the scheduled cell

Proposal 2: For cross-carrier scheduling with different numerologies with BD/CCE capability Y for a frequency range, the limit of BDs/CCEs per slot of the scheduling CC(s) (with numerology *j)* belonging to the frequency range for scheduled CC(s) with numerology i is given by

- $\left(\frac{2^i}{2^j} * M_i \text{ or } N_i\right)$, if N_{cells}^{DL} is less than or equal to 4 or N_{cells}^{DL} is less than or equal to Y,
- $\left\lfloor \frac{2^i}{2^j} * (M_i \text{ or } N_i) * \frac{X_{ij}}{N_{cells}^{DL}} * Y \right\rfloor$, if N_{cells}^{DL} is greater than Y,

where

- N_{cells}^{DL} is the number of configured CCs that are schedulable from that frequency range
- j is the numerology of the scheduling CC(s),
- i is the numerology of the scheduled CC(s),
- M_i *or* N_i denotes the limit of BDs/CCEs for non-CA case for numerology i,
- X_{ij} is the number of CCs with numerology i that are schedulable from the scheduling CCs with numerology j

Proposal 3: For cross-carrier scheduling, an explicit TCI-state is configured for QCL assumption for PDSCH reception when the PDSCH scheduling timing offset is smaller than delta_offset threshold.
Proposal 4: For CA with mixed numerology, increased number of valid unicast DCIs per PDCCH monitoring occasion can be considered.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Karri (Nokia)

Thursday session

R1-1903695 Feature lead summary on Cross-carrier Scheduling with Different Numerologies Nokia, Nokia Shanghai Bell

Decision: The document is noted.

Agreements:

- At least for the case of lower SCS PDCCH scheduling a higher SCS PDSCH the earliest possible starting point for the PDSCH is defined by the end of the PDCCH + Δ
  - Δ>0. Detailed value(s) FFS
  - FFS other factor(s) impacting Δ

Agreements:

- The limit of BDs/CCEs (per slot in the scheduling CC) for the scheduled CC is determined based on the numerology of the scheduling CC.
  - Change the definition of $N_{cells}^{DL,\mu}$ to "the number of configured DL-CCs whose scheduling cell is with active DL BWP having SCS configuration μ" as in Section 10.1 of 38.213

R1-1903812 Feature lead summary on Cross-carrier Scheduling with Different Numerologies Nokia, Nokia Shanghai Bell

R1-1901580 Discussion on NR CA for cross-carrier scheduling with different numerologies Huawei, HiSilicon
R1-1901777 Discussion on cross-carrier scheduling with different numerologies ZTE
R1-1901808 On timing relationship for cross-carrier scheduling with different numerologies MediaTek Inc.
R1-1901987 Discussion on cross-carrier scheduling with different numerologies CATT
R1-1902251 Cross-carrier Scheduling with Different Numerologies Samsung
R1-1902345 Discussion on cross-carrier scheduling with different numerologies CMCC
R1-1902427 On cross-carrier scheduling with mixed numerologies Nokia, Nokia Shanghai Bell
R1-1902518 On support of cross-carrier scheduling with different numerologies Intel Corporation
R1-1902709 On Cross-carrier Scheduling with Different Numerologies OPPO
R1-1902741 Discussion on cross-carrier scheduling with different numerologies Spreadtrum Communications
R1-1902819 Cross-carrier Scheduling with Different Numerologies NTT DOCOMO, INC.
R1-1902840 BD/CCE limit for cross-carrier scheduling with different numerologies Panasonic Corporation
R1-1903026 Cross-Carrier Scheduling with Different Numerologies Qualcomm Incorporated
R1-1903048 Cross-carrier scheduling with different numerologies ASUSTEK COMPUTER (SHANGHAI)

7.2.13.3 Potential Enhancements to Single Tx Switched Uplink Solution for EN-DC

R1-1902428 Discussion on single uplink operation enhancement for EN-DC Nokia, Nokia Shanghai Bell

- Observation 1: Potential enhancement on single UL operation for EN-DC is only focused on intra-band TDD EN-DC.
- Observation 2: Configuring DL-reference configuration for TD-LTE can improve the DL performance for EN-DC UE.
- Proposal 1: If DL reference HARQ timing is introduced for TDD EN-DC, only UL/DL configurations 2, 4 and 5 can be used as a reference HARQ configuration of the PCell, and the PUCCH fallback operation is not supported.

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- Observation 3: Utilizing all UL subframes by LTE or NR is too restrictive for eNB and gNB implementation.
- Observation 4: For the case that a EN-DC UE is configured with FDD PCell in single uplink operation mode, DL CA was already supported.
- Proposal 2: If Case 1 HARQ timing is configured, the UL subframe usage in a UL CA carrier is determinbed by whether its CA band is problematic band in EN-DC band combination.
    - For intra-band UL CA or inter-band CA with problematic CA band, the uplink subframes in Scell are aligned with the uplink subframe allocation in PCell
    - For inter-band CA with non-problematic CA band, all UL subframe in the carrier of that band can be scheduled

Decision: The document is noted.

R1-1902820 **Potential Enhancements to Single Tx Switched Uplink Solution for EN-DC** **NTT DOCOMO, INC.**

- Proposal 1: Support LTE UL-CA for EN-DC with DL-reference UL-DL configuration on LTE serving cell.
    - The subframes available for UL transmission can be common across LTE serving cells.
- Proposal 2: Support DL-reference UL-DL configuration for EN-DC with TDD-PCell.
- Proposal 3: Consider enabling UL transmission other than offset-UL subframes when available.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Wei (Apple)

Thursday session

R1-1903604 **Summary of enhancements to single Tx switched uplink for EN-DC** **Apple Inc.**

Decision: The document is noted.

Proposed working assumption:
For single tx switched UL in EN-DC with TDD PCell, the LTE PCell can be configured with DL-reference UL/DL config

- For DL HARQ timing, the DL-reference UL/DL configuration is applied
    - Only LTE TDD Pattern 2, 4, 5 can be used as DL-reference
- For UL HARQ timing, the PCell's UL/DL configuration other than TDD pattern 0/6, i.e., associated with "subframeAssignment", is applied
    - FFS: whether/how to support TDD pattern 0/6 for LTE PCell
- UE is not expected to transmit on the MCG and SCG simultaneously
- For type 1 UE (i.e., UE with dynamic power sharing capability),
    - The UE should not assume that LTE PUSCH is only scheduled in the UL subframes associated configured by the DL-reference configuration
    - The UE should not assume that NR PUSCH is only scheduled in the remaining UL subframes other than those configured by the DL-reference configuration
    - If there is a collision, UE is expected to drop NR PUSCH
- FFS: whether/how to support HARQ-offset (similar as in SUO case 1 in EN-DC with LTE FDD PCell)

Friday session

R1-1903761 Updated summary of enhancements to single Tx switched uplink for EN-DC **Apple**

Decision: The document is noted.

Agreements:

For single tx switched UL in EN-DC with TDD PCell, the LTE PCell can be configured with DL-reference UL/DL config

- For DL HARQ timing, the DL-reference UL/DL configuration is applied
    - Only LTE TDD Pattern 2, 4, 5 can be used as DL-reference
- For UL HARQ timing is the same as without reference configuration for PCell's UL/DL configuration other than TDD pattern 0/6,
    - FFS: whether/how to support TDD pattern 0/6 for LTE PCell
- UE is not expected to transmit on the MCG and SCG simultaneously
- For type 2 UE (i.e., UE without dynamic power sharing capability):
    - UE is allowed to transmit LTE PUSCH only in the UL subframes designated as UL in the DL-reference configuration
- For type 1 UE (i.e., UE with dynamic power sharing capability):

- The UE should not assume that LTE PUSCH is only scheduled in the UL subframes associated configured by the DL-reference configuration
- The UE should not assume that NR PUSCH is only scheduled in the remaining UL subframes other than those configured by the DL-reference configuration
- If there is a collision,
  - In the UL subframes designated as UL in the DL-reference configuration, UE is expected to drop NR PUSCH
  - In other UL subframes, UE behaviour to be expected to specified with details FFS
    - E.g., drop LTE PUSCH, drop NR PUSCH, etc.
  - FFS for the case of NR SRS & NR PRACH
- Note: the impact of switching time (if non-zero) will be further studied.
- Note: the above does not assume any restriction between gNB and eNB (e.g., tight coordination)

- FFS: whether/how to support HARQ-offset (similar as in SUO case 1 in EN-DC with LTE FDD PCell)

R1-1901552	Enhancements for single UL operation for EN-DC	Huawei, HiSilicon
R1-1901778	Discussion on single Tx switched uplink solution for EN-DC	ZTE
R1-1902252	On Enhancements to Single Tx Switched UL for EN-DC	Samsung
R1-1902519	On enhanced single tx switched uplink solution for EN-DC	Intel Corporation
R1-1902774	Enhancements to single Tx switched uplink for EN-DC	Apple Inc.
R1-1902945	Enhancements to single-tx operation for EN-DC	Ericsson
R1-1903027	Enhancements for EN-DC Single-Tx TDM Operation	Qualcomm Incorporated

7.2.13.4 Other

Including any RAN1 impact on support of efficient and low latency serving cell configuration/activation/setup

R1-1903028 Fast SCG and Scell activiation Qualcomm Incorporated

- Proposal 1: A-TRS/CSI triggering from SCell activation command should be supported in Rel-16 to greatly reduce SCell activation time.
- Proposal 2: DCI-based signaling for SCell activation/deactivation should be supported in Rel-16, if other enhancements are also adopted to greatly reduce the overall activation timeline.
- Proposal 3: SCell dormancy state should be supported in Rel-16 NR for power saving. The BWP framework should be enhanced to support operation with "dormant BWP".
- Proposal 4: Semi-persistent search space configuration based on DCI-signaling can be considered to support fast transitioning in and out of SCell dormancy state.
- Proposal 5: Consider latency reduction mechanisms for RACH procedure on SCG, including both CBRA and CFRA.
- Proposal 6: Support repetition of CSI-RS for mobility.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Karri (Nokia)

Thursday session

R1-1903694 Summary of Efficient and low latency serving cell configuration/activation/setup Nokia, Nokia Shanghai Bell

Decision: The document is noted. Companies are encouraged to check.

R1-1901581	Low latency of Scell activation	Huawei, HiSilicon
R1-1901807	Efficient SCell Access Switching for NR	MediaTek Inc.
R1-1901888	Efficient and low latency serving cell configuration/activation/setup for NR	AT&T
R1-1902253	On SCell Activation/Deactivation and Dormant SCells	Samsung
R1-1902429	Efficient CA design	Nokia, Nokia Shanghai Bell
R1-1902946	Reduced latency Scell management for NR-NR CA	Ericsson

7.2.14 Other

R1-1901838 Consideration on the system simulation for NTN ZTE
R1-1901839 Discussion on the enhancement for CSI report in NTN ZTE
R1-1901840 Discussion on the enhancement for random access in NTN ZTE
R1-1901841 Discussion on the enhancement for TA in NTN ZTE
R1-1901988 Overview of NTN CATT
R1-1901989 Considerations on NTN PHY aspect CATT
R1-1903383 Pathloss model in IIOT scenario ZTE, Sanechips, BJTU, Tongji University (rev of R1-1902113)
R1-1902114 K-factor model in IIOT scenario ZTE, Sanechips, BJTU, Tongji University
R1-1902115 Absolute time of arrival model in IIOT scenario ZTE, Sanechips, BJTU, Tongji University
R1-1902117 LOS probability model in IIOT scenario ZTE, Sanechips, BJTU, Tongji University
R1-1902621 NTN link level channel models Nokia, Nokia Shanghai Bell, Fraunhofer HHI, Fraunhofer IIS
R1-1902622 Cluster angle scaling factors in NTN channel model Nokia, Nokia Shanghai Bell, Fraunhofer HHI, Fraunhofer IIS
R1-1902898 Evaluation framework for NTN Ericsson
R1-1902899 Frequency compensation in NTN Ericsson
R1-1902901 NTN Overview Ericsson
R1-1902902 On adapting HARQ procedures for NTN Ericsson
R1-1902903 On adapting random access procedures for NTN Ericsson
R1-1902904 On UL power control for NTN Ericsson
R1-1902905 On UL transmission timing for NTN Ericsson
R1-1903108 Survey of frequency band of interest for Industrial IOT Huawei, HiSilicon
R1-1903109 Investigation of characteristics of industrial factory environment Huawei, HiSilicon
R1-1903110 Existing literature and measurement review for industrial factory environment Huawei, HiSilicon
R1-1903111 Preliminary channel measurement on large-scale propagation loss for indoor factory environment Huawei, HiSilicon
R1-1903112 Preliminary channel measurement on fast fading parameters for indoor factory environment Huawei, HiSilicon
R1-1903116 Corrections for TR38.811 Chapter 6 Non-Terrestrial Networks channel models Huawei, HiSilicon, Nokia, Nokia Shanghai Bell, Thales, Fraunhofer HHI, Fraunhofer IIS, Keysight
R1-1903126 Introduction of the indoor industrial scenario Ericsson
R1-1903127 Path loss, LOS probability and penetration modeling for indoor industrial Ericsson
R1-1903128 Fast fading model for indoor industrial Ericsson
R1-1903129 Additional modelling components for Indoor industrial Ericsson
R1-1903195 Overview of NTN Huawei, HiSilicon
R1-1903196 Discussion on data transmission related procedures for NTN Huawei, HiSilicon
R1-1903197 Discussion on timing advance for NTN Huawei, HiSilicon
R1-1903199 Discussion on timing issues in random access for NTN Huawei, HiSilicon
R1-1903200 Discussion on PAPR in NTN Huawei, HiSilicon
R1-1903201 Evaluation of DL synchronization and central frequency tracking for NTN Huawei, HiSilicon
R1-1903202 Discussion on cell measurement for mobility management in NTN Huawei, HiSilicon
R1-1903203 Discussion on HARQ for NTN Huawei, HiSilicon
R1-1903217 PHY aspects of a moving RAN in non-terrestrial networks Ericsson
R1-1903218 On Sync and PBCH reading in NTN Ericsson
R1-1903703 Summary of Simulation assumption & calibration for NTN ZTE, Thales

7.3 Other

R1-1901721 Positioning in NTN Nokia, Nokia Shanghai Bell
R1-1901722 Overview for NR supporting NTN Nokia, Nokia Shanghai Bell
R1-1901723 Link budget analysis in NTN Nokia, Nokia Shanghai Bell
R1-1901724 Simulation assumptions and scenarios in NTN Nokia, Nokia Shanghai Bell
R1-1901725 Large-scale channel model calibration in NTN Nokia, Nokia Shanghai Bell
R1-1902893 Discussion on A-CSI with mixed numerology for CA in Rel-15 NR MediaTek Beijing Inc.
R1-1903051 Timing Advance Adjustments for Satellite Communications (NTN) Fraunhofer IIS

R1-1903148	Timing alignment in NTN	THALES
R1-1903154	Initial access in NTN	THALES
R1-1903158	Doppler spectrum in NTN	THALES
R1-1903216	Link and system level performance evaluation for NR-NTN	THALES

8 Closing of the meeting

Just before closing, as many Rel-16 SI got complete at this meeting and the standardization phase should very likely start after next plenary, Huawei raised a question about feature leads, where it is of outstanding importance to assign feature leads who are completely focused on their tasks.
RAN1 chair re-emphasized the key role played by the feature leads for making progress, that careful attention is being paid to the choice of feature leads, no doubt in their skills, their involvement and hard work. Furthermore, the assignment is always done to maintain a good balance sharing the roles within the group.

As highlighted in previous meeting(s), the completion of Rel-16 opened study items by this meeting was a rather challenging objective. "RAN1 did it…" said RAN1Chair. He noticed the progress made by the group during the week, the excellent spirit of delegates and emphasized that working as a group makes things happen. RAN1 applauded the achievements on LTE EnTV, NR URLLC, NR V2X, NR pos and NR power saving.

Thanks again to the feature leads.
Thanks to the Vice Chairmen, Kazuaki-san for chairing the UE features sessions.
Thanks to the host, EF3. Athought the meeting place becomes very familiar to RAN1, it is always very well appreciated to be in Athens.

Meeting was closed at 17:05.
See you all in Xi'an.

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Annex A: List of Tdocs at RAN1 #96

Please see excel file attached to this report

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Annex B: List of CRs agreed at RAN1 #96

TS/TR	CR	rev	Rel	Title	Cat	Vsn	@ Mtg	TD#	Source to WG	Work Item
36.211	475	-	Rel-14	Correction of higher layer signalling for special subframe configuration 10	F	14.9.0	R1#96	R1-1903258	CMCC	LTE_UL_CAP_enh-Core
36.211	476	-	Rel-15	Correction of higher layer signalling for special subframe configuration 10	A	15.4.0	R1#96	R1-1903259	CMCC	LTE_UL_CAP_enh-Core
36.211	477	-	Rel-15	DMRS sequence index for PUSCH sub-PRB allocation for LTE-MTC	F	15.4.0	R1#96	R1-1903282	Ericsson	LTE_eMTC4-Core
36.211	478	-	Rel-15	CR on DMRS mapping for SPDCCH	F	15.4.0	R1#96	R1-1903306	Samsung	LTE_sTTIandPT-Core
36.212	311		Rel-15	Correction on rate matching for 1024QAM	F	15.4.0	R1#96	R1-1902380	Qualcomm Incorporated	LTE_1024QAM_DL-Core
36.212	312	-	Rel-15	Introduction of SUO Case 1 for NE-DC as Rel-15 late drop	F	15.4.0	R1#96	R1-1903478	Huawei, HiSilicon	NR_newRAT-Core
36.212	313	-	Rel-15	Correction on NPRACH format 2 configuration presence	F	15.4.0	R1#96	R1-1903308	Huawei, HiSilicon	NB_IOTenh2-Core
36.212	314		Rel-14	Correction for DCI 0C and special subframe configuration 10	F	14.8.0	R1#96	R1-1903316	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core, LTE_UL_CAP_enh-Core
36.212	315		Rel-15	Correction for DCI 0C and special subframe configuration 10	A	15.4.0	R1#96	R1-1903317	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core, LTE_UL_CAP_enh-Core
36.213	1209	-	Rel-14	Correction of higher layer signalling for special subframe configuration 10	F	14.9.0	R1#96	R1-1903260	CMCC	LTE_UL_CAP_enh-Core
36.213	1210	-	Rel-15	Correction of higher layer signalling for special subframe configuration 10	A	15.4.0	R1#96	R1-1903261	CMCC	LTE_UL_CAP_enh-Core
36.213	1211		Rel-14	Priority rules for SRS carrier switching	F	14.9.0	R1#96	R1-1903262	Qualcomm Incorporated	LTE_SRS_switch-Core
36.213	1212		Rel-15	Priority rules for SRS carrier switching	A	15.4.0	R1#96	R1-1903263	Qualcomm Incorporated	LTE_SRS_switch-Core
36.213	1213		Rel-14	Support of 6-symbol SRS in UpPTS	F	14.9.0	R1#96	R1-1903265	Qualcomm Incorporated	LTE_SRS_switch-Core
36.213	1214		Rel-15	Support of 6-symbol SRS in UpPTS	A	15.4.0	R1#96	R1-1903266	Qualcomm Incorporated	LTE_SRS_switch-Core
36.213	1215		Rel-14	Corrections for VoLTE enhancements	F	14.9.0	R1#96	R1-1903267	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core
36.213	1216		Rel-15	Corrections for VoLTE enhancements	A	15.4.0	R1#96	R1-1903268	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core
36.213	1217		Rel-13	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	F	13.12.0	R1#96	R1-1903269	Qualcomm Incorporated	LTE_MTCe2_L1-Core
36.213	1218		Rel-14	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	A	14.9.0	R1#96	R1-1903270	Qualcomm Incorporated	LTE_MTCe2_L1-Core, LTE_VoLTE_ViLTE_enh-Core
36.213	1219		Rel-15	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	A	15.4.0	R1#96	R1-1903271	Qualcomm Incorporated	LTE_MTCe2_L1-Core, LTE_VoLTE_ViLTE_enh-Core
36.213	1220		Rel-14	Power control for PUSCH enhancements	F	14.9.0	R1#96	R1-1903272	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core
36.213	1221		Rel-15	Power control for PUSCH enhancements	A	15.4.0	R1#96	R1-1903273	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core
36.213	1222	-	Rel-15	Correction on the MCS index range for DCI format 6-1A	F	15.4.0	R1#96	R1-1903274	Huawei, HiSilicon	LTE_eMTC4-Core
36.213	1223	-	Rel-15	Edge PRB restriction for flexible starting PUSCH PRB for LTE-MTC	F	15.4.0	R1#96	R1-1903283	Ericsson, Qualcomm Incorporated	LTE_eMTC4-Core
36.213	1224	-	Rel-14	Correction on PSSCH resource pool determination in 36.213	F	14.9.0	R1#96	R1-1903287	Huawei, HiSilicon	LTE_V2X-Core
36.213	1225	-	Rel-15	Correction on PSSCH resource pool determination in 36.213	A	15.4.0	R1#96	R1-1903288	Huawei, HiSilicon	LTE_V2X-Core
36.213	1226		Rel-13	UL Delay for CE Mode B	F	13.12.0	R1#96	R1-1903289	Qualcomm Incorporated	LTE_MTCe2_L1-Core
36.213	1227		Rel-14	UL Delay for CE Mode B	A	14.9.0	R1#96	R1-1903290	Qualcomm Incorporated	LTE_MTCe2_L1-Core
36.213	1228		Rel-15	UL Delay for CE Mode B	A	15.4.0	R1#96	R1-1903291	Qualcomm Incorporated	LTE_MTCe2_L1-Core
36.213	1229	-	Rel-15	Introduction of SUO Case 1 for NE-DC as Rel-15 late drop	F	15.4.0	R1#96	R1-1903477	Huawei, HiSilicon	NR_newRAT-Core
36.213	1230	-	Rel-15	Corrections on CSI update capability for sTTI	F	15.4.0	R1#96	R1-1903302	LG Electronics	LTE_sTTIandPT-Core
36.213	1231	-	Rel-15	Correction on type 2 power headroom	F	15.4.0	R1#96	R1-1903305	Huawei, HiSilicon	LTE_sTTIandPT-Core
36.213	1232	-	Rel-15	Correction on the 1ms HARQ-ACK transmission for the collision between sPUSCH and PUCCH/PUSCH	F	15.4.0	R1#96	R1-1903307	Huawei, HiSilicon	LTE_sTTIandPT-Core
36.213	1233	-	Rel-15	Correction on NPRACH format 2 configuration presence	F	15.4.0	R1#96	R1-1903309	Huawei, HiSilicon	NB_IOTenh2-Core
36.213	1234		Rel-14	Power control for RACH-less HO	F	14.9.0	R1#96	R1-1903312	Qualcomm Incorporated	LTE_eMob-Core
36.213	1235		Rel-15	Power control for RACH-less HO	A	15.4.0	R1#96	R1-1903313	Qualcomm Incorporated	LTE_eMob-Core

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TS/TR	CR	rev	Rel	Title	Cat	Vsn	@ Mtg	TD#	Source to WG	Work Item
36.213	1236		Rel-14	Correction for DCI 0C and special subframe configuration 10	F	14.9.0	R1#96	R1-1903314	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core, LTE_UL_CAP_enh-Core
36.213	1237		Rel-15	Correction for DCI 0C and special subframe configuration 10	A	15.4.0	R1#96	R1-1903315	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core, LTE_UL_CAP_enh-Core
36.213	1238		Rel-14	HARQ ID for asynchronous HARQ with DCI format 0	F	14.9.0	R1#96	R1-1903318	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core
36.213	1239		Rel-15	HARQ ID for asynchronous HARQ with DCI format 0	A	15.4.0	R1#96	R1-1903319	Qualcomm Incorporated	LTE_VoLTE_ViLTE_enh-Core
36.213	1240		Rel-14	On MPDCCH USS/CSS differentiation	F	14.9.0	R1#96	R1-1903518	Samsung, Ericsson, Qualcomm	LTE_feMTC-Core
36.213	1241		Rel-15	On MPDCCH USS/CSS differentiation	A	15.4.0	R1#96	R1-1903519	Samsung, Ericsson, Qualcomm	LTE_feMTC-Core
36.213	1242		Rel-15	EPRE for RSS	F	15.4.0	R1#96	R1-1903520	Qualcomm Incorporated, Ericsson, Sierra Wireless	LTE_eMTC4-Core
36.213	1243	-	Rel-15	Correction on UL HARQ for EN-DC with SUO Case 1	F	15.4.0	R1#96	R1-1903763	Huawei, HiSilicon, Nokia, Nokia Shanghai Bell	NR_newRAT-Core
37.213	4	-	Rel-15	Corrections on channel access procedures in 37.213	F	15.1.0	R1#96	R1-1903281	Sharp, WILUS Inc., Huawei, HiSilicon	LTE_unlic-Core
38.211	5	-	Rel-15	CR for PUCCH Format 1	F	15.4.0	R1#96	R1-1903548	ZTE	NR_newRAT-Core
38.211	6	-	Rel-15	CR on PDSCH mapping to virtual resource blocks	F	15.4.0	R1#96	R1-1903549	ZTE	NR_newRAT-Core
38.211	7	2	Rel-15	Alignment of terminology across specifications	F	15.4.0	R1#96	R1-1903821	Ericsson	NR_newRAT-Core
38.211	8	-	Rel-15	Correction on physical resource mapping for PUSCH with configured grant	F	15.4.0	R1#96	R1-1903785	Huawei, HiSilicon	NR_newRAT-Core
38.212	6	-	Rel-15	Correction of wrong implementation on frequency domain resource assignment bitwidth	F	15.4.0	R1#96	R1-1903232	MCC	NR_newRAT-Core
38.212	8	-	Rel-15	Correction to UCI multiplexing	F	15.4.0	R1#96	R1-1903561	Ericsson	NR_newRAT-Core
38.212	9	-	Rel-15	Correction on DCI format 2_3 for SUL cell in TS 38.212	F	15.4.0	R1#96	R1-1903602	Huawei, HiSilicon	NR_newRAT-Core
38.212	10	-	Rel-15	Corrections to TS38.212	F	15.4.0	R1#96	R1-1903642	Huawei, HiSilicon	NR_newRAT-Core
38.212	11	-	Rel-15	On bitwidth calculation for DCI fields using RRC parameter indicating maximum number of MIMO layers per serving cell	F	15.4.0	R1#96	R1-1903733	Intel Corporation, Ericsson, Qualcomm	NR_newRAT-Core
38.212	12	-	Rel-15	CR on zero-padding of DCI 1_1 in cross-carrier scheduling case	F	15.4.0	R1#96	R1-1903762	vivo	NR_newRAT-Core
38.212	13	-	Rel-15	Clarification on UL_SUL indicator field and SRS request field	F	15.4.0	R1#96	R1-1903799	Huawei, HiSilicon	NR_newRAT-Core
38.213	9	-	Rel-15	Correction on search space sharing	F	15.4.0	R1#96	R1-1903492	Ericsson	NR_newRAT-Core
38.213	10	-	Rel-15	CR on timing adjustment indicator	F	15.4.0	R1#96	R1-1903504	vivo	NR_newRAT-Core
38.213	12		Rel-15	Removal of CSI request in RAR grant	F	15.4.0	R1#96	R1-1903553	Ericsson	NR_newRAT-Core
38.213	14		Rel-15	Correction to dynamic HARQ codebook in NR	F	15.4.0	R1#96	R1-1903598	Fujitsu	NR_newRAT-Core
38.213	16	-	Rel-15	CR on simultaneous active BWP switching across carriers	F	15.4.0	R1#96	R1-1903651	MediaTek	NR_newRAT-Core
38.213	17	-	Rel-15	CR on using CORESET#0 in dedicated DL BWP	F	15.4.0	R1#96	R1-1903652	ZTE	NR_newRAT-Core
38.213	19	-	Rel-15	Correction to last PUCCH resource set configuration	F	15.4.0	R1#96	R1-1903680	Ericsson	NR_newRAT-Core
38.213	20	-	Rel-15	Correction on physical downlink control channel	F	15.4.0	R1#96	R1-1903682	ASUSTeK	NR_newRAT-Core
38.213	21	-	Rel-15	Correction to align RAN1 and RAN4 specifications for EN-DC power control	F	15.4.0	R1#96	R1-1903710	Ericsson	NR_newRAT-Core
38.213	23	-	Rel-15	QCL properties of Msg4 in CONNECTED Mode	F	15.4.0	R1#96	R1-1903745	Nokia, Nokia Shanghai Bell	NR_newRAT-Core
38.213	25	-	Rel-15	Clarifying DL reception and UL transmision related restrictions	F	15.4.0	R1#96	R1-1903748	Nokia, Nokia Shanghai Bell	NR_newRAT-Core
38.213	26	-	Rel-15	CR on QCL assumption for receiving PDCCH for RAR	F	15.4.0	R1#96	R1-1903749	NTT DOCOMO, INC.	NR_newRAT-Core
38.213	28	-	Rel-15	CR on overlapping of CSI and PUSCH with slot aggregation	F	15.4.0	R1#96	R1-1903759	CATT	NR_newRAT-Core
38.213	29	-	Rel-15	Correction on PHR timing for configured grant	F	15.4.0	R1#96	R1-1903758	Huawei, HiSilicon	NR_newRAT-Core
38.213	31	-	Rel-15	Correction on DCI format 2_3 for SUL cell in TS 38.213	F	15.4.0	R1#96	R1-1903782	Huawei, HiSilicon	NR_newRAT-Core
38.213	32	-	Rel-15	Correction to support FR1 extension to 7.125 GHz	F	15.4.0	R1#96	R1-1903801	Huawei, HiSilicon, Qualcomm	NR_newRAT-Core
38.213	33		Rel-15	CR on UE procedure for reporting multiple UCI types	F	15.4.0	R1#96	R1-1903807	CATT	NR_newRAT-Core
38.213	34	-	Rel-15	Correction to transmission timing adjustments in TS 38.213	F	15.4.0	R1#96	R1-1903814	Sharp	NR_newRAT-Core
38.214	9	-	Rel-15	Correction on CSI-RS configuration in 38.214	F	15.4.0	R1#96	R1-1903528	Huawei, HiSilicon	NR_newRAT-Core
38.214	10	-	Rel-15	Correction on uplink resource allocation type 1	F	15.4.0	R1#96	R1-1903554	Ericsson	NR_newRAT-Core

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TS/TR	CR	rev	Rel	Title	Cat	Vsn	@ Mtg	TD#	Source to WG	Work Item
38.214	11	-	Rel-15	Correction on determination of the resource allocation table for PUSCH with SP CSI	F	15.4.0	R1#96	R1-1903557	Huawei, HiSilicon	NR_newRAT-Core
38.214	12	-	Rel-15	Correction on PUSCH resource allocation	F	15.4.0	R1#96	R1-1903558	Huawei, HiSilicon	NR_newRAT-Core
38.214	13	-	Rel-15	Change Request for alignment of frequency domain resource allocation with 38.213 for a PUSCH transmission scheduled by a RAR UL grant	F	15.4.0	R1#96	R1-1903590	Sharp	NR_newRAT-Core
38.214	14		Rel-15	CR on sequential PDSCH and PUSCH scheduling	F	15.4.0	R1#96	R1-1903653	CATT, Qualcomm, Huawei, HiSilicon	NR_newRAT-Core
38.214	15	-	Rel-15	CR on out of HARQ order with multiple PDSCHs within one slot	F	15.4.0	R1#96	R1-1903654	Huawei, HiSilicon, CATT, Qualcomm	NR_newRAT-Core
38.214	16	-	Rel-15	Correction to LBRM restriction	F	15.4.0	R1#96	R1-1903685	Ericsson	NR_newRAT-Core
38.214	17	-	Rel-15	38.214 CR on PDSCH beam indication	F	15.4.0	R1#96	R1-1903738	vivo	NR_newRAT-Core
38.214	18	-	Rel-15	Correction on TCI indication for multi-slot PDSCH	F	15.4.0	R1#96	R1-1903740	Intel	NR_newRAT-Core
38.214	19	-	Rel-15	Clarifications on CSI reporting on PUSCH	F	15.4.0	R1#96	R1-1903563	Nokia, Nokia Shanghai Bell	NR_newRAT-Core
38.214	20	-	Rel-15	QCL properties of Msg4 in CONNECTED Mode	F	15.4.0	R1#96	R1-1903746	Nokia, Nokia Shanghai Bell	NR_newRAT-Core
38.214	22	1	Rel-15	CR on dynamic grant overriding configured grant	F	15.4.0	R1#96	R1-1903783	Qualcomm, Intel	NR_newRAT-Core
38.214	23	-	Rel-15	Correction on PUSCH with configured grant	F	15.4.0	R1#96	R1-1903815	Huawei, HiSilicon	NR_newRAT-Core
38.214	24	-	Rel-15	Corrections to 38.214	F	V15.4.0	R1#96	R1-1903823	Nokia, Nokia Shanghai Bell	NR_newRAT-Core
38.213	11	-	Rel-15	CR on SSB-RO association	F	15.4.0	R1#96	R1-1903546	Samsung	NR_newRAT-Core
38.213	15	1	Rel-15	Correcttions to TS 38.213	F	15.4.0	R1#96	R1-1903795	Samsung	NR_newRAT-Core
38.213	18	-	Rel-15	PDCCH monitoring for overlapped CORESETs	F	15.4.0	R1#96	R1-1903678	Samsung	NR_newRAT-Core
38.213	22	-	Rel-15	(Late Drop) CR on PRACH Power Ramping Counter Suspension	F	15.4.0	R1#96	R1-1903726	Samsung	NR_newRAT-Core
38.213	24	-	Rel-15	CR on latency after gNB response for recovery	F	15.4.0	R1#96	R1-1903747	ZTE	NR_newRAT-Core
38.213	27	-	Rel-15	CR on identifying transmission occasion after resetting a PC closed loop	F	15.4.0	R1#96	R1-1903750	ZTE	NR_newRAT-Core
38.213	30	-	Rel-15	CR on QCL assumption for a CORESET other than 0	F	15.4.0	R1#96	R1-1903779	NTT DOCOMO, INC., Ericsson, Nokia, NSB	NR_newRAT-Core

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Annex C-1: List of Outgoing LSs from RAN1 #96

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
R1-1903292	LS on wideband PRG size	RAN1, Huawei	Rel-16	TEI16		RAN2			
R1-1903311	On support of special subframe configuration 10 with FDD+TDD CA	RAN1, Qualcomm	Rel-14	LTE_UL_CAP_enh-Core		RAN2			
R1-1903659	Reply LS on RSS based measurements signaling	RAN1	Rel-16	LTE_eMTC5-Core	R2-1818662	RAN2			
R1-1903677	LS on UE-UE CLI measurement/reporting and Network coordination mechanism for CLI	LG Electronics	Rel-16	NR_CLI_RIM-Core		RAN2, RAN3, RAN4			
R1-1903697	LS on support of Enhancements on multi-TRP/panel transmission	RAN1, Huawei	Rel-16	NR_eMIMO-Core		RAN2			
R1-1903754	LS on pdcch-BlindDetectionCA	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN2			
R1-1903757	LS to ETSI BRAN on EN 301 893	RAN1, Qualcomm Incorporated	Rel-16	NR_unlic-Core		ETSI BRAN	RAN4		
R1-1903790	LS on text proposal to TR 38.825 on TSN requirements evaluation	RAN1, Nokia	Rel-16	FS_NR_IIOT		RAN2			
R1-1903803	LS reply on MBSFN subframe pattern configuration for LTE CRS rate matching	RAN1, Ericsson	Rel-15	NR_newRAT-Core	R2-1902611	RAN2			
R1-1903809	LS on initial access SSB periodicity assumption for IAB MT	RAN1, Qualcomm	Rel-16	NR_IAB-Core		RAN2, RAN3			
R1-1903810	LS on OTA timing alignment for IAB	RAN1, Huawei	Rel-16	NR_IAB-Core		RAN4			
R1-1903816	Response LS on FR1 range	RAN1, Qualcomm	Rel-15	NR_newRAT-Core	RP-182876	RAN	RAN2, RAN3, RAN4, RAN5		
R1-1903819	LS on text proposal for TR 38.825 on UL/DL intra-UE prioritization/multiplexing	RAN1, Nokia	Rel-16	FS_NR_IIOT		RAN2			
R1-1903820	LS on RAN1 NR UE features update	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN, RAN2			
R1-1903676	LS on completion of CLI-RIM in RAN1	RAN1, CMCC	Rel-16	NR_CLI_RIM-Core		RAN3, SA5			
R1-1903836	LS on RRC parameters for NR CLI-handling	RAN1, LG Electronics	Rel-16	NR_CLI_RIM-Core		RAN2, RAN4			

Annex C-2: List of Incoming LSs from RAN1 #96

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
R1-1901484	LS on FR1 range	RAN, Qualcomm	Rel-15	NR_newRAT-Core		RAN4, RAN1	RAN2, RAN3, RAN5	RP-182876	
R1-1901485	LS on RAN1 NR UE features	RAN, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN1, RAN2, RAN4	RAN3	RP-182890	
R1-1901486	LS on RSS based measurements signalling	RAN2, Huawei	Rel-16	LTE_eMTC5-Core		RAN1		R2-1818662	
R1-1901487	LS on PHR procedure in dual-connectivity	RAN2, Qualcomm	Rel-15	NR_newRAT-Core		RAN1		R2-1819101	
R1-1901488	LS on BWP ID interpretation for DCI code point	RAN2, Intel	Rel-15	NR_newRAT-Core		RAN1		R2-1819102	
R1-1901489	LS for inclusion of Receive Only Mode MBMS service parameters in USD	RAN2, Qualcomm	Rel-15	TEI15		SA4	SA2, RAN1	R2-1818960	
R1-1901490	LS on SSB based BFD	RAN4, Intel Corporation	Rel-15	NR_newRAT-Core		RAN1	RAN2	R4-1816144	
R1-1901491	LS reply on UL PRB to DL PRB center offset for TDD NB-IoT	RAN4, Ericsson	Rel-15	NB_IOTenh2-Core	R1-1809681	RAN1	RAN2	R4-1816194	
R1-1901492	LS on the beam correspondence requirement and multi-band applicability framework for FR2 power class 3 Ues	RAN4, Apple	Rel-15	NR_newRAT-Core		RAN, RAN1, RAN5		R4-1816747	
R1-1901493	LS reply on NR-LTE Co-existence	RAN4, Intel Corporation	Rel-15	NR_newRAT-Core	R1-1809992	RAN1	RAN2	R4-1816749	
R1-1901494	Updated reply LS on intra-band combination for NR-CA and MR-DC	RAN4, Intel Corporation	Rel-15	NR_newRAT-Core	R2-1813442	RAN1, RAN2		R4-1816768	
R1-1901495	LS reply on NR MIMO layer configuration	RAN4, Intel Corporation	Rel-15	NR_newRAT-Core	R2-1816065	RAN2	RAN1	R4-1816463	
R1-1901496	LS to RAN2 on UE signalling for Xscale	RAN4, SPRINT Corporation	Rel-15	NR_newRAT-Core		RAN2	RAN1	R4-1816618	
R1-1901497	LS on new UE capability for intra-band EN-DC and intra-band NR UL CA	RAN4, CHTTL	Rel-15	NR_newRAT-Core		RAN2	RAN1	R4-1816623	
R1-1901498	Reply LS to TSG RAN regarding LTE LAA channel combinations for 5GHz	RAN4, Charter Communications	Rel-13	LTE_LAA	RP-182177	RAN	RAN1, RAN2	R4-1816774	
R1-1901499	Reply LS on 5G requirements for dedicated broadcast networks	SA2, Qualcomm	Rel-16	FS_LTE_terr_bcast	R1-1811739	RAN1	SA4, CT3	S2-1901383	
R1-1901500	LS on Draft new Recommendation E.RQST –	ITU-T Study Group 12				RAN1, SA5		SG12-LS68	

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TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
	"KPI targets for mobile networks"								
R1-1903329	Invitation to a Coexistence Workshop in Vienna, Austria July 2019	IEEE 802.11 WG				RAN1	RAN, IEEE-SA, IEEE 802.11	2019-02-20-3GPP RAN1-Invitation-to-Coexistence-Workshop-July 2019	
R1-1903333	LS on 2Rx Antennas for NR V2X Sidelink	5GAA WG4, General Motors	Rel-16	FS_NR_V2X		RAN	RAN1, RAN4	5GAA_S-190045	
R1-1903373	Reply LS on TSN requirements evaluation	SA1, Nokia	Rel-16	FS_NR_IIOT	R2-1816043	RAN2, SA2	RAN1, RAN3	S1-190233	
R1-1903496	LS on MBSFN subframe pattern configuration for LTE CRS rate matching	RAN2, Ericsson	Rel-15	NR_newRAT-Core		RAN1		R2-1902611	
R1-1903603	LS on RAN2 conclusion for NR positioning SI	RAN2, Intel	Rel-16	FS_NR_pos		RAN1, RAN3, SA2, SA3	RAN	R2-1902479	
R1-1903765	LS to RAN1 on power saving	RAN2, vivo	Rel-16	FS_NR_UE_pow_sav		RAN1		R2-1902563	
R1-1903787	LS on Conclusion of NR V2X and Agreed TP for TR 38.885	RAN3, LG Electronics	Rel-16	FS_NR_V2X		RAN1		R3-191104	
R1-1903802	LS on RAN2 conclusion for NR positioning SI	RAN3, Intel	Rel-16	FS_NR_pos		RAN2, RAN1, SA2, SA3, RAN		R3-191141	

Annex D: List of Approved updated WIDs

None

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Annex E: List of draft TSs/TRs agreed at RAN1 #96

Tdoc Number	Title	Source	Conclusion/Decision
R1-1902023	Update of TR38.840 Study on UE Power Saving	CATT	38.840 v0.1.1 (Rel-16; FS_NR_UE_pow_sav) is endorsed
R1-1903438	TR 38.824 Study on physical layer enhancements for NR ultra-reliable low latency communication (URLLC)	Huawei	38.824 v1.0.2 (Rel-16; FS_NR_L1enh_URLLC) is endorsed
R1-1903593	TR 38.885 v1.0.2 Study on Vehicle-to-Everything	Huawei Tech.(UK) Co., Ltd	Endorsed
R1-1903660	TR 36.776 v1.0.0 Study on LTE-based 5G terrestrial broadcast	Qualcomm Incorporated	Endorsed
R1-1903824	TR 38.855 v1.1.0 Study on NR positioning support	Ericsson	Endorsed
R1-1903829	TR 38.824 V1.2.0 Study on physical layer enhancements for NR ultra-reliable low latency communication (URLLC)	Huawei	Endorsed
R1-1903830	TR 38.885 v1.1.0 Study on Vehicle-to-Everything	Huawei Tech.(UK) Co., Ltd	Endorsed
R1-1903832	TR 38.840 v1.0.0 Study on UE Power Saving	CATT	Endorsed

Annex F: List of actions

- **Outgoing LS**

[96-NR-02] – Seunghee (Intel)
Email discussion on Reply LS to RAN4 and RAN2 on capability signaling of dual PA architecture and phase discontinuity aspects until March 6th
Done: As per decision posted on March 12th, reply LS is postponed to next meeting. Further discussion is required on aligning the relevant parameters.

[96-NR-06] – Xiaodong (CMCC)
CLI/RIM: Email discussion/approval on RRC & backhaul parameters & LSs by 03/06, to be commented and endorsed 03/13
Done: As per decision posted on March 14th, the set of OAM parameters is agreed in:
R1-1903833 OAM configuration parameters for NR RIM CMCC
Furthermore, final LS to RAN3, SA5 is approved in:
R1-1903676 LS on completion of CLI-RIM in RAN1 RAN1, CMCC
As the RRC parameters for CLI were missing from the previous email discussion, decision was taken on March 19th to prepare the set of RRC parameters for CLI for email approval, along with an LS to RAN2. Target till March 25th – Hyunsoo (LGE)
Done: As per decision posted on April 2nd, LS is approved in:
R1-1903835 RRC parameters for NR CLI-handling LG Electronics
…and includes the agreed list of parameters as in:
R1-1903836 LS on RRC parameters for NR CLI-handling RAN1, LG Electronics

- **CR approval**

[96-NR-14] – Stefan (Ericsson)
Email approval till March 6th to update 38.211 alignment CR R1-1903781 (38.211, CR0007R1) by including:
R1-1903619 Corrections on SRS to TS38.211 CATT, Nokia, Huawei/HiSilicon, Ericsson, ZTE
The draft CR is endorsed. For inclusion in the alignment CR for TS38.211
R1-1902226
Draft CR on NR CSI-RS Samsung
The draft CR is endorsed with one additional modification. Change *slotconfig* to *slotConfig*. For inclusion in the alignment CR for TS38.211.
Done: As per decision posted on March 7th, final CR is agreed in R1-1903821 (38.211, CR0007R2)

[96-NR-05]

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Editors to prepare Rel-16 CRs for CLI/RIM WI by March 27th, to be commented and endorsed by RAN1 by April 3rd
Done: As per decision posted on April 4th, the following draft CRs are endorsed – Note the draft CRs were submitted as inputs to RAN1#96bis and Tdoc numbers refer to that meeting. It is common understanding that the endorsed draft CRs may be further updated later towards the end of Rel-16 to align with the updated version of the spec.

R1-1905603	Introduction of cross layer interference measurements	Intel Corporation	draftCR Rel-16, 38.215, B	NR_CLI_RIM-Core
R1-1905602	Introduction of UE behaviour for SRS measurements for CLI	Nokia	draftCR Rel-16, 38.214, B	NR_CLI_RIM-Core
R1-1904647	Introduction of remote interference management	Ericsson	draftCR Rel-16, 38.211, B	NR_CLI_RIM-Core

- **Miscellaneous**

[96-NR-01] – Fred (NTT DOCOMO)
Email approval to confirm the companies' understanding on Table 10.1-1: Whether the number of PDCCH candidates for Type0/0A/2-CSS set follows Table 10.1-1 if the CSS set is not SS#0?, till March 7th
Done: According to email conclusion posted on March 11th, common understanding in RAN1 is as follows:

- **For a Type0/0A/2-CSS set, in R15, regardless of whether the CSS set is the SS#0 or not, the UE determines CCE aggregation levels and max number of candidates per CCE aggregation level as specified in Table 10.1-1 of TS38.213, which are applicable to all RNTIs monitored in the CSS set.**
  - **It means if a Type0/0A/2-CSS set is not the SS#0, gNB may configure parameter *nrofCandidates* in TYPE0/0A/2 SS set to any value allowed by ASN.1, and R15 UE ignores the configured values by parameter *nrofCandidates* and assumes values specified in Table 10.1-1 of TS38.213 instead for the SS set.**
- **No spec change is necessary for the above.**

[96-NR-03] – Li (ZTE)
Email discussion focusing on potential link-level simulation assumptions for 2-step RACH till March 15th
Done: According to email decision posted on March 21st, the latest proposal as in the Summary section of R1-1903834 is considered as agreed.

R1-1903834	Email discussion on potential link-level simulation assumption for 2-step RACH	ZTE	Rel-16	NR_2step_RACH-Core

[96-NR-04] – Matthew (Huawei)
V2X: Email approval for TR 38.885 update till 3/7 (including updated evalations, submitted no later than 3/6)
Done: According to email decision posted on March 12th, the following updated TR is endorsed.

R1-1903830	TR 38.885 v1.1.0 Study on Vehicle-to-EverythingHuawei Tech.(UK) Co., Ltd		Rel-16	38.885	1.1.0	FS_NR_V2X

The endorsed version should be used as input (v2.0.0) to plenary for approval of the TR.

[96-NR-07] – Chengyan (Huawei)
eURLLC: Email approval for TR 38.824 update till 3/7

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Done: According to email decision posted on March 11th, the following updated TR is endorsed.
R1-1903829 TR 38.824 V1.2.0 Study on physical layer enhancements for NR ultra-reliable low latency communication (URLLC) Huawei Rel-16 38.824 1.2.0 FS_NR_L1enh_URLLC
The endorsed version should be used as input (v2.0.0) to plenary for approval of the TR.
Note from email thread conclusion the following:

- **R1-1903825 Text proposal for TR 38.824 Section 6.1 Huawei**
  - **TP is endorsed**
- **R1-1903826 Text proposal for TR 38.824 Section 8.2.2 Huawei**
  - **TP is endorsed**
- **R1-1903827 Text proposal for TR 38.824 Section 5.3 Huawei**
  - **No consensus on that TP thus no need to update the TR**
- **R1-1903828 Text proposal for TR 38.824 Section 6.4.1.3 Huawei**
  - **No consensus on that TP thus no need to update the TR**

[96-NR-08] – Eko (Samsung)
Email discussion by 15th of March: Companies to provide more details on the alternatives listed above. Strive to converge on a single set of parameters for each alternative.
Done: According to email decision posted on March 18th, the two proposals as in R1-1903822 are agreed.
R1-1903822 Summary of email discussion [96-NR-08] on parameter setting for RI=3-4 extension Samsung Rel-16 NR_eMIMO-Core

[96-NR-09] – Min (Huawei)
Email discussion to converge on the descriptions of scheme 1 and scheme 2 by 15th of March
Done: According to email decision posted on March 18th, the following is agreed.
To facilitate further down-selection for one or more schemes in RAN1#96bis, schemes for multi-TRP based URLLC, scheduled by single DCI at least, are clarified as following:

- **Scheme 1 (SDM): n ($n<=N_s$) TCI states within the single slot, with overlapped time and frequency resource allocation**
  - **Scheme 1a:**
    - **Each transmission occasion is a layer or a set of layers of the same TB, with each layer or layer set is associated with one TCI and one set of DMRS port(s).**
    - **Single codeword with one RV is used across all spatial layers or layer sets. From the UE perspective, different coded bits are mapped to different layers or layer sets with the same mapping rule as in Rel-15.**
  - **Scheme 1b:**
    - **Each transmission occasion is a layer or a set of layers of the same TB, with each layer or layer set is associated with one TCI and one set of DMRS port(s).**

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        - **Single codeword with one RV is used for each spatial layer or layer set. The RVs corresponding to each spatial layer or layer set can be the same or different.**
        - **FFS: codeword-to-layer mapping when total number of layers <= 4**
    - **Scheme 1c:**
        - **One transmission occasion is one layer of the same TB with one DMRS port associated with multiple TCI state indices, or one layer of the same TB with multiple DMRS ports associated with multiple TCI state indices one by one.**
    - **Applying different MCS/modulation orders for different layers or layer sets can be discussed.**
- **Scheme 2 (FDM): n (n<=N_f) TCI states within the single slot, with non-overlapped frequency resource allocation**
    - **Each non-overlapped frequency resource allocation is associated with one TCI state.**
    - **Same single/multiple DMRS port(s) are associated with all non-overlapped frequency resource allocations.**
    - **Scheme 2a:**
        - **Single codeword with one RV is used across full resource allocation. From UE perspective, the common RB mapping (codeword to layer mapping as in Rel-15) is applied across full resource allocation.**
    - **Scheme 2b:**
        - **Single codeword with one RV is used for each non-overlapped frequency resource allocation. The RVs corresponding to each non-overlapped frequency resource allocation can be the same or different.**
    - **Applying different MCS/modulation orders for different non-overlapped frequency resource allocations can be discussed.**
    - **Details of frequency resource allocation mechanism for FDM 2a/2b with regarding to allocation granularity, time domain allocation can be discussed.**
- **Scheme 3 (TDM): n (n<=N_{t1}) TCI states within the single slot, with non-overlapped time resource allocation**
    - **Each transmission occasion of the TB has one TCI and one RV with the time granularity of mini-slot.**
    - **All transmission occasion (s) within the slot use a common MCS with same single or multiple DMRS port(s).**
    - **RV/TCI state can be same or different among transmission occasions.**
    - **FFS channel estimation interpolation across mini-slots with the same TCI index**
- **Scheme 4 (TDM): n (n<=N_{t2}) TCI states with K (n<=K) different slots.**
    - **Each transmission occasion of the TB has one TCI and one RV.**
    - **All transmission occasion (s) across K slots use a common MCS with same single or multiple DMRS port(s)**
    - **RV/TCI state can be same or different among transmission occasions.**
    - **FFS channel estimation interpolation across slots with the same TCI index**

Note that M-TRP/panel based URLLC schemes shall be compared in terms of improved reliability, efficiency, and specification impact.
Note: Support of number of layers per TRP may be discussed

[96-NR-10] – Fang Chen (CATT)
PowerSavings: Email approval for TR 38.840 update till March 7th
Done: Done: According to email decision posted on March 12th, the following updated TR is endorsed.
R1-1903832 TR 38.840 v1.0.0 Study on UE Power Saving CATT Rel-16 38.840 1.0.0 FS_NR_UE_pow_sav

The endorsed version should be used as input (v1.0.0) to plenary and presented for information.

[96-NR-11] – Xiaodong (vivo)
Email discussion/approval for the following till March 6th
The followings to be captured as observations in TR38.840 section 5.3.4
For IDLE state, one source shows that [36%~64%] power saving gain is shown for reducing RRM measurement for SSBs by considering adjacent directional beams of each SSB can be provided by gNB to reduce SSB number of UE RRM measurement and loop convergence. It also shows that the it has no severe impact on RSRP difference between two adjacent samples.
Note: section 5.3.4 in TR38.840 is for adaptation/relaxing inter-freuency measurement
Done: According to email conclusion posted on March 11th, there are are still concerns with the proposal and corresponding observation on RRM measurements of Table 17. It is agreed to update the table in the TR with the new results but w/o observation. See summary, which provides the updated table and clarifications how these values were derived and updated, in:
R1-1903831 Email discussion summary of [96-NR-11]: observation for reducing RRM measurement for SSBs by considering adjacent directional beams vivo

[96-NR-12] – Florent (Ericsson)
Positioning - Updated version of TR38.855 for email approval till March 6th with the following:

- removing Section 9.5, and moving the contents Section 9.3.2 – a new section
- removing editor's comments
- removing void sections (section 8) and correct reference

Done: As per decision posted on March 7th, TR38.855 is endorsed as v1.1.0 in
R1-1903824 TR 38.855 v1.1.0 Study on NR positioning support Ericsson Rel-16 38.855 1.1.0 FS_NR_pos
Version 2.0.0 for approval to next pleanary will be based on the endorsed R1-1903824.

[96-NR-13] – Kianoush (Qualcomm)
Proposals under email discussion till March 15th:
For Rel. 16 NR-DC with FR1+FR1 band combinations both the semi-static power sharing and dynamic power sharing operations are supported.
FFS whether each power sharing operation is associated with the UE capability.
Done: As per decision posted on April 1st, the following summary including potential proposals is for further online discussion at next meeting.
R1-1903837 Email discussion on summarizing the details of the proposed NR-NR DC power control schemes Qualcomm

Annex G: List of participants at RAN1 #96

Please see excel file attached to this report

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Annex H: TSG RAN WG1 meetings in 2019 – 2020

TITLE	TYPE	DATES	LOCATION	CTRY
3GPPRAN1#96bis	WG	8 - 12 Apr 2019	Xi'an	China
3GPPRAN1#97	WG	13 - 17 May 2019	Reno	US
3GPPRAN1-AH-1906-TBC	AH	24 - 28 Jun 2019	Cancelled	-
3GPPRAN1#98	WG	26 - 30 Aug 2019	Prague	CZ
3GPPRAN1#98bis	WG	14 - 18 Oct 2019	China	China
3GPPRAN1#99	WG	18 - 22 Nov 2019	Reno	US
3GPPRAN1#100	WG	24 - 28 Feb 2020	Athens	Greece
3GPPRAN1#100bis	WG	20 - 24 Apr 2020	TBD	China
3GPPRAN1#101	WG	25 - 29 May 2020	TBD	China
3GPPRAN1#102	WG	24 - 28 Aug 2020	Toulouse (TBC)	France
3GPPRAN1#102bis	WG	12 - 16 Oct 2020	TBD	South Korea
3GPPRAN1#103	WG	16 - 20 Nov 2020	TBD	US

MEETING TYPES		
AH = Ad Hoc	ST = Startup Meeting	RG = Rapporteurs Group
JM = Joint	WG = Working Group	SG = Steering Group
PM = Preparatory Meeting	CM = Chairmen's meeting	TG = Task Group
RM = Resolution Meeting	OR = Ordinary	XO = Extraordinary

End of document

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APPENDIX D

TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
R1-1901480	Draft Agenda of RAN1#96 meeting	RAN1 Chair	approved	2019-02-04 13:01:52	2019-02-04 13:30:05
R1-1901481	Highlights from RAN#82	RAN1 Chair	noted	2019-02-04 13:01:52	2019-02-05 13:11:22
R1-1901482	Report of RAN1#95 meeting	ETSI MCC	approved	2019-02-04 13:01:52	2019-02-21 21:07:53
R1-1901483	Report of RAN1#AH_1901 meeting	ETSI MCC	approved	2019-02-04 13:01:52	2019-02-22 10:15:40
R1-1901484	LS on FR1 range	RAN,	treated	2019-02-04 13:01:52	2019-02-05 13:05:11
R1-1901485	LS on RAN1 NR UE features	RAN, NTT	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901486	LS on RSS based measurements signalling	RAN2,	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901487	LS on PHR procedure in dual-connectivity	RAN2,	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901488	LS on BWP ID interpretation for DCI code	RAN2, Intel	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901489	LS for inclusion of Receive Only Mode MBMS service parameters in USD	RAN2, Qualcomm	noted	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901490	LS on SSB based BFD	RAN4, Intel Corporation	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901491	LS reply on UL PRB to DL PRB center offset	RAN4,	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901492	LS on the beam correspondence requirement and multi-band applicability framework for	RAN4, Apple	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901493	LS reply on NR-LTE Co-existence	RAN4, Intel Corporation	treated	2019-02-04 13:01:52	2019-02-05 13:05:12
R1-1901494	Updated reply LS on intra-band combination for NR-CA and MR-DC	RAN4, Intel Corporation	treated	2019-02-04 13:01:53	2019-02-05 13:05:12
R1-1901495	LS reply on NR MIMO layer configuration	RAN4, Intel Corporation	noted	2019-02-04 13:01:53	2019-02-05 13:05:12
R1-1901496	LS to RAN2 on UE signalling for Xscale	RAN4, SPRINT	noted	2019-02-04 13:01:53	2019-02-05 13:05:12
R1-1901497	LS on new UE capability for intra-band EN-DC and intra-band NR UL CA	RAN4, CHTTL	noted	2019-02-04 13:01:53	2019-02-05 13:05:12
R1-1901498	Reply LS to TSG RAN regarding LTE LAA channel combinations for 5GHz	RAN4, Charter	noted	2019-02-04 13:01:53	2019-02-05 13:05:12
R1-1901499	Reply LS on 5G requirements for dedicated broadcast networks	SA2, Qualcomm	treated	2019-02-04 13:01:53	2019-02-05 13:05:12
R1-1901500	LS on Draft new Recommendation E.RQST – “KPI targets for mobile networks”	ITU-T Study Group 12	treated	2019-02-04 13:18:02	2019-02-05 13:05:12
R1-1901501	Revision of additional enhancements for NB-	Huawei,	noted	2019-02-05 23:59:51	2019-02-16 03:30:02
R1-1901502	UE-group wake-up signal	Huawei,	noted	2019-02-05 23:59:52	2019-02-16 03:30:02
R1-1901503	Transmission in preconfigured UL resources	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:30:02
R1-1901504	Scheduling multiple DL/UL transport blocks for SC-PTM and unicast	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:30:02
R1-1901505	Performance enhancements for NB-IoT	Huawei,	not treated	2019-02-05 23:59:52	2019-02-16 03:30:02
R1-1901506	Msg3 quality reporting for non-anchor access	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:30:02
R1-1901507	NRS presence on non-anchor carriers for paging	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:30:02
R1-1901508	Coverage enhancement for Non-BL UE	Huawei, HiSilicon	noted	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901509	DL transmission on LTE control channel region	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901510	Scheduling of multiple transport blocks	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901511	UL transmission in preconfigured resource	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901512	Channel quality reporting in Msg3	Huawei, HiSilicon	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901513	On MPDCCH performance improvement	Huawei,	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901514	Support of sub-groups for MWUS	Huawei,	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901515	On eMTC co-existence with NR	Huawei,	not treated	2019-02-05 23:59:52	2019-02-16 03:29:12
R1-1901516	Correction on the MCS index range for DCI	Huawei,	revised	2019-02-05 23:59:52	2019-02-16 03:28:19
R1-1901517	Correction on flexible UL starting PRB allocation of 3MHz system bandwidth in TDD	Huawei, HiSilicon	postponed	2019-02-05 23:59:52	2019-02-16 03:28:19

R1-1901518	Correction on the number of bits of flexible UL starting PRB allocation in TDD	Huawei, HiSilicon	postponed	2019-02-05 23:59:52	2019-02-16 03:28:19
R1-1901519	Correction on NPRACH format 2	Huawei,	revised	2019-02-05 23:59:52	2019-02-16 03:28:19
R1-1901520	Correction on NPRACH format 2	Huawei,	revised	2019-02-05 23:59:52	2019-02-16 03:28:19
R1-1901521	Correction on timing relationships for 2-HARQ with NPRACH format 2	Huawei, HiSilicon	revised	2019-02-05 23:59:52	2019-02-16 03:28:19
R1-1901522	Initial access signal and channels in NR	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901523	DL channels and signals in NR unlicensed	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901524	UL channels and signals in NR unlicensed	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901525	Coexistence and channel access for NR unlicensed band operations	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901526	Initial access in NR unlicensed	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901527	HARQ enhancement in NR unlicensed	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901528	Transmission with configured grant in NR	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901529	NRU wideband BWP operation	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901530	Generic design of spectral-domain modulation sequences for 5G NR-U PRACH	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 21:08:01
R1-1901531	SSB-based discovery and measurement for IAB	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 00:57:46
R1-1901532	RACH design for IAB	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 00:57:46
R1-1901533	Resource multiplexing between backhaul and access in IAB	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 00:57:46
R1-1901534	DL transmission timing alignment for IAB	Huawei, HiSilicon	noted	2019-02-06 00:05:48	2019-02-16 00:57:46
R1-1901535	On backhaul link radio link failure handling for	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 00:57:46
R1-1901536	Sidelink physical layer structure for NR V2X	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901537	Sidelink physical layer procedures for NR	Huawei,	noted	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901538	Discussion on reference signal for sidelink control and data channel design	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901539	Sidelink synchronization mechanisms for NR	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901540	Sidelink resource allocation mode 2	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 02:25:43
R1-1901541	System level evaluations on sidelink for NR	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901542	Link level evaluations on sidelink for NR V2X	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901543	NR Uu and LTE Uu support and enhancement for advanced V2X use cases	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901544	Discussion on Uu-based sidelink resource allocation/configuration	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901545	QoS management for NR V2X	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901546	Discussion on co-existence for NR V2X and	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 21:59:33
R1-1901547	Discussion on RIM-RS configuration	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 02:54:18
R1-1901548	Discussion on OAM functions and RIM	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 02:54:18
R1-1901549	Discussion on UE-UE measurement and reporting for CLI management	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 02:54:18
R1-1901550	Discussion on network coordination mechanisms for CLI management	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 02:54:18
R1-1901551	UL power control for NR-NR dual connectivity	Huawei, HiSilicon	noted	2019-02-06 00:05:48	2019-02-16 02:22:03
R1-1901552	Enhancements for single UL operation for EN-DC	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 02:22:03
R1-1901553	Baseline performance achievable with Rel-15 URLLC for transport industry	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901554	Baseline performance achievable with Rel-15 URLLC for power distribution	Huawei, HiSilicon	revised	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901555	Baseline performance achievable with Rel-15 URLLC for factory automation	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901556	Baseline performance achievable with Rel-15 URLLC for R15 enabled cases	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901557	PDCCH enhancements for URLLC	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901558	UCI enhancements for URLLC	Huawei,	revised	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901559	PUSCH enhancements for URLLC	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901560	Enhancements to scheduling/HARQ/CSI processing timeline for URLLC	Huawei, HiSilicon	revised	2019-02-06 00:05:48	2019-02-16 05:41:43
R1-1901561	UL inter-UE transmission prioritization and	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 04:05:46

R1-1901562	Enhanced UL configured grant transmissions	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 03:35:07
R1-1901563	Draft response to LS on Combinations of Uu QoS characteristics values for V2X services	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 04:05:46
R1-1901564	Evaluation results on Combinations of Uu QoS characteristics values for V2X services	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 04:05:46
R1-1901565	Consideration on IMT-2020 evaluation towards final submission in June 2019	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 03:33:27
R1-1901566	Discussion on CSI enhancement	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 01:55:46
R1-1901567	Enhancements on multi-TRP/panel transmission	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 01:55:46
R1-1901568	Enhancements on multi-beam operation	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 04:05:25
R1-1901569	Enhancements on UL MIMO with multiple PAs to allow full power transmission	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 01:55:46
R1-1901570	Discussion on DMRS sequence design for	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 01:55:46
R1-1901571	Evaluation results of UE power saving	Huawei,	revised	2019-02-06 00:05:48	2019-02-16 02:56:17
R1-1901572	Power saving schemes	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 02:56:17
R1-1901573	Power consumption reduction in RRM measurements	Huawei, HiSilicon	revised	2019-02-06 00:05:48	2019-02-16 02:56:17
R1-1901574	Remaining issues on DL based positioning	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 17:49:11
R1-1901575	Remaining issues on UL based positioning	Huawei,	not treated	2019-02-06 00:05:48	2019-02-15 17:49:11
R1-1901576	Remaining issues on DL & UL positioning	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 17:49:11
R1-1901577	Performance evaluations for NR positioning	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 17:49:11
R1-1901578	Positioning with GNSS	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 17:49:11
R1-1901579	Consideration on channel model for industrial factory environment	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-15 22:29:04
R1-1901580	Discussion on NR CA for cross-carrier scheduling with different numerologies	Huawei, HiSilicon	not treated	2019-02-06 00:05:48	2019-02-16 02:22:03
R1-1901581	Low latency of Scell activation	Huawei,	not treated	2019-02-06 00:05:48	2019-02-16 02:22:03
R1-1901582	Simulation results on enhancement	Huawei,	noted	2019-02-06 00:07:54	2019-02-15 22:07:24
R1-1901583	On enhancement techniques for LTE ENTV	Huawei,	not treated	2019-02-06 00:07:54	2019-02-15 22:07:24
R1-1901584	On remaining requirements not requiring simulations	Huawei, HiSilicon	noted	2019-02-06 00:07:54	2019-02-15 22:07:24
R1-1901585	Introduction of additional SRS symbols in	Huawei,	not treated	2019-02-06 00:07:54	2019-02-16 03:33:34
R1-1901586	On virtual cell ID for SRS sequence	Huawei,	not treated	2019-02-06 00:07:54	2019-02-16 03:33:34
R1-1901587	Discussion on power control for additional	Huawei,	not treated	2019-02-06 00:07:54	2019-02-16 03:33:34
R1-1901588	Discussion on remaining issues on introduction of wideband PRG size	Huawei, HiSilicon	noted	2019-02-06 00:07:54	2019-02-16 03:33:34
R1-1901589	Additional Results for Underlay Scheduling Request for NR Rel. 16	Idaho National Laboratory	not treated	2019-02-06 00:12:30	2019-02-15 20:19:10
R1-1901590	Introduction of configured PRG size for TM9 and TM10 in 36.213	Huawei, HiSilicon	postponed	2019-02-06 00:14:29	2019-02-16 03:33:34
R1-1901591	Correction on PSSCH resource pool	Huawei,	revised	2019-02-06 00:14:29	2019-02-16 03:33:34
R1-1901592	Correction on type 2 power headroom	Huawei,	revised	2019-02-06 00:14:29	2019-02-16 03:33:34
R1-1901593	PDCCH Enhancements for NR URLLC	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901594	UCI Enhancements for NR URLLC	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901595	PUSCH Enhancements for NR URLLC	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901596	Scheduling/HARQ/CSI Processing Timeline Enhancements for NR URLLC	Ericsson	revised	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901597	Inter-UE Prioritization and Multiplexing of UL	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901598	Enhancement of Configured Grant for NR	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901599	Evaluation of URLLC Power Distribution	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901600	Evaluation of URLLC Transport Industry	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901601	Physical Layer Enhancements for Intra-UE Prioritization and Multiplexing	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901602	On Two Proposed 5QI Values	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901603	Initial Transmission Opportunity in UL	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901604	Channel Model for Factory Automation	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901605	URLLC Use Cases and Deployments for	Ericsson	not treated	2019-02-06 00:17:16	2019-02-16 08:44:49
R1-1901606	Considerations on initinal access signals and channels for NR-U	ZTE, Sanechips	not treated	2019-02-06 01:39:38	2019-02-16 08:44:18

R1-1901607	Considerations on DL reference signals and channels design for NR-U	ZTE, Sanechips	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901608	Considerations on UL reference signals and channels design for NR-U	ZTE, Sanechips	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901609	Discussion on Channel access procedure for	ZTE,	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901610	Discussion on enhancement of the initial access procedure for NR-U	ZTE, Sanechips	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901611	Discussion on scheduling and HARQ for NR-	ZTE,	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901612	Discussion on configured grant for NR-U	ZTE,	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901613	Discussion on Wide-band operation for NR-U	ZTE,	not treated	2019-02-06 01:39:39	2019-02-16 08:44:18
R1-1901614	Correction on port indexing in 38.214	Huawei,	noted	2019-02-07 12:34:13	2019-02-16 01:27:20
R1-1901615	Correction on AP-CSI-RS triggering offset in 38.214	Huawei, HiSilicon	endorsed	2019-02-07 12:48:24	2019-02-16 01:27:20
R1-1901616	Text proposal on capturing examples of detailed use case and requirements for Rel-	Huawei, HiSilicon	noted	2019-02-07 12:48:24	2019-02-16 04:05:46
R1-1901617	Correction on CSI-RS configuration in 38.214	Huawei,	revised	2019-02-07 12:48:24	2019-02-16 01:27:20
R1-1901618	Correction on determination of the resource allocation table for PUSCH with SP CSI	Huawei, HiSilicon	revised	2019-02-07 12:48:24	2019-02-16 02:53:31
R1-1901619	Correction on PUSCH with configured grant	Huawei, HiSilicon	revised	2019-02-07 12:48:24	2019-02-16 02:53:31
R1-1901620	Correction on 10ms RTT for EN-DC with	Huawei,	revised	2019-02-07 12:48:24	2019-02-16 03:31:19
R1-1901621	Clarification on Rel-15 NR UE features	Huawei,	noted	2019-02-07 12:48:24	2019-02-16 03:58:32
R1-1901622	Correction on PHR timing for configured	Huawei,	revised	2019-02-07 12:48:24	2019-02-16 03:55:53
R1-1901623	Correction on SRS Carrier Switching Time in 38.214	Huawei, HiSilicon	endorsed	2019-02-07 12:48:24	2019-02-16 01:27:20
R1-1901624	Correction on PDSCH/PUSCH scheduling	Huawei, HiSilicon	noted	2019-02-07 12:48:24	2019-02-16 02:53:31
R1-1901625	Work plan for 2-step RACH	ZTE	noted	2019-02-07 13:44:37	2019-02-16 03:57:09
R1-1901626	Considerations on the channel structure of	ZTE	noted	2019-02-07 13:44:37	2019-02-16 03:57:09
R1-1901627	Considerations on 2-step RACH procedures	ZTE	not treated	2019-02-07 13:44:37	2019-02-16 03:57:09
R1-1901628	LTE-M Pre-configured UL Resources Design Considerations	Sierra Wireless,	not treated	2019-02-07 18:34:08	2019-02-15 00:41:54
R1-1901629	NB-IOT Pre-configured UL Resources Design Considerations	Sierra Wireless,	not treated	2019-02-07 18:36:31	2019-02-15 00:41:54
R1-1901630	LTE-M Multiple Transport Block Grant Design Considerations	Sierra Wireless,	not treated	2019-02-07 18:38:16	2019-02-15 00:41:54
R1-1901631	NB-IOT Multiple Transport Block Grant Design Considerations	Sierra Wireless,	not treated	2019-02-07 18:41:20	2019-02-15 00:41:54
R1-1901632	IMT-2020 Reliability Evaluation Results (URLLC)	Nokia, Nokia	not treated	2019-02-08 13:06:07	2019-02-15 20:26:13
R1-1901633	CSI Enhancement for MU-MIMO Support	ZTE	revised	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901634	Enhancements on Multi-TRP/Panel Transmission	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901635	Enhancements on Multi-beam Operation	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901636	Full TX Power UL transmission	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901637	Low PAPR RS	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901638	Details and evaluation results on multi-	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901639	Additional considerations on beam	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901640	Additional details of latency and overhead reduction for beam management	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901641	Details and evaluation on UL simultaneous transmission for multi-panel operation	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901642	Details and evaluation on L1-SINR measurement and reporting	ZTE	revised	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901643	Discussion on UL power control for multi-	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901644	Discussion on additional SRS symbols	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901645	Discussion on virtual Cell ID for SRS	ZTE	not treated	2019-02-08 16:22:34	2019-02-16 07:36:51
R1-1901646	Draft reply to LS on SSB based BFD	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901647	UE-group wake-up signal for eMTC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901648	UE-group wake-up signal for NB-IoT	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901649	Further discussion on SRS enhancements	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901650	On virtual cell ID configuration for SRS	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901651	Draft TS 38.213 CR on timing adjustment indicator	vivo	revised	2019-02-09 15:53:01	2019-02-15 15:45:02
R1-1901652	Draft TS 38.213 CR on association between SSB and RACH occasion	vivo	not pursued	2019-02-09 15:53:01	2019-02-15 15:45:02

R1-1901653	Draft 38.214 CR on cross carrier aperiodic CSI-RS beam indication	vivo	not pursued	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901654	Draft 38.214 CR on PUSCH spatial relation	vivo	endorsed	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901655	Draft 38.214 CR on default QCL for aperiodic	vivo	not pursued	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901656	Draft 38.214 CR on PDSCH beam indication	vivo	revised	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901657	Draft 38.213 CR on PDCCH beam after BFR	vivo	not pursued	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901658	Draft 38.214 CR on simultaneous reception of DL and UL physical channels and RSs	vivo	not pursued	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901659	Draft TS 38.214 CR on aperiodic SRS transmission	vivo	endorsed	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901660	Draft TS 38.214 CR on association between SRS port and PTRS port	vivo	revised	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901661	Draft TS 38.212 CR on association between SRI and SRS resource	vivo	noted	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901662	Draft TS 38.214 CR on NZP CSI-RS based interference measurement	vivo	withdrawn	2019-02-09 15:53:01	
R1-1901663	Draft TS 38.214 CR on NZP CSI-RS	vivo	noted	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901664	Draft TS 38.214 CR on CPU occupancy for P/SP NZP-CSI-RS configured with repetition	vivo	noted	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901665	Draft TS 38.213 CR on multiplexing HARQ-ACK/SR/CSI in PUCCH	vivo	not pursued	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901666	Draft TS 38.212 CR on zero-padding of DCI 1_1 in cross-carrier scheduling case	vivo	revised	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901667	Draft TS 38.213 CR on BD and CCE limits when active DL BWP switching occurs	vivo	not pursued	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901668	Draft TS 38.213 CR on NE-DC power control	vivo	not pursued	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901669	Discussion on channel structure for 2-step	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901670	Discussion on 2-step RACH procedure	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901671	Views on 2-step RACH design	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901672	Discussion on initial access signals and	vivo	revised	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901673	Discussion on physical DL channel design in unlicensed spectrum	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901674	Discussion on physical UL channel design in unlicensed spectrum	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901675	Discussion on the channel access procedures	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901676	Discussion on initial access procedure for	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901677	Discussion on HARQ operation for NR-U	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901678	Discussion on the enhancements to	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901679	Discussion on wideband operation in NR-U	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901680	Discussion on extension of SSBs for inter-IAB-node discovery and measurements	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901681	Discussion on resource multiplexing among backhaul and access links	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901682	Physical layer structure for NR sidelink	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901683	Physical layer procedure for NR sidelink	vivo	not treated	2019-02-09 15:53:01	2019-02-16 05:19:38
R1-1901684	NR sidelink synchronization mechanism	vivo	revised	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901685	Discussion on sidelink resource allocation	vivo	revised	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901686	System level evaluations on sidelink for NR	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901687	Discussion on NR Uu enhancements for NR-V2X	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901688	Enhancements of Uu link to control sidelink	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901689	On coexistence of NR and LTE sidelink for	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901690	UE-to-UE CLI measurements	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901691	Network coordination for CLI management	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901692	PDCCH enhancements for URLLC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901693	UCI enhancements for URLLC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901694	PUSCH enhancements for URLLC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901695	Enhancement for Scheduling/HARQ/CSI Processing timeline	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901696	UL inter UE Tx prioritization for URLLC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901697	Enhanced UL grant-free transmissions for	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13

R1-1901698	UL intra UE Tx prioritization for URLLC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901699	DL intra UE Tx prioritization for URLLC	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901700	Power control enhancements for UL intra-UE	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901701	Further discussion on type II CSI compression and feedback parameters	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901702	Further discussion on multi TRP transmission	vivo	not treated	2019-02-09 15:53:01	2019-02-15 15:45:03
R1-1901703	Further discussion on multi beam operation	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:21:29
R1-1901704	Further discussion on full TX power for codebook based UL transmission	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901705	Further discussion on remaining issues on	vivo	not treated	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901706	Performance evaluation on type II CSI	vivo	revised	2019-02-09 15:53:01	2019-02-16 04:02:13
R1-1901707	Performance evaluation on multi PDCCH based multi TRP transmission	vivo	not treated	2019-02-09 15:53:01	2019-02-16 05:59:19
R1-1901708	Discussion multi-TRP based URLLC	vivo	not treated	2019-02-09 15:53:02	2019-02-15 15:45:03
R1-1901709	Detailed Evaluation Results for UE power	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:13
R1-1901710	UE adaptation to traffic and power consumption characteristics	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:13
R1-1901711	UE power saving in RRM Measurements	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901712	Modeling and evaluation results for gaming	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901713	Triggering adaptation of UE power consumption characteristics	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901714	Views on NR downlink positioning techniques	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901715	Views on NR uplink positioning techniques	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901716	Views on NR DL & UL positioning techniques	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901717	Evaluation for RAT-Dependent Positioning Techniques	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901718	Views on potential techniques for NR RAT-Independent positioning	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901719	Uplink power control for NR-NR DC	vivo	not treated	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901720	Cross-carrier scheduling with different numerologies	vivo	noted	2019-02-09 15:53:02	2019-02-16 04:02:14
R1-1901721	Positioning in NTN	Nokia, Nokia	not treated	2019-02-09 18:16:55	2019-02-16 06:01:05
R1-1901722	Overview for NR supporting NTN	Nokia, Nokia	not treated	2019-02-09 18:18:22	2019-02-16 06:01:05
R1-1901723	Link budget analysis in NTN	Nokia, Nokia	not treated	2019-02-09 18:20:41	2019-02-16 06:01:05
R1-1901724	Evaluation scenarios and simulation assumptions for NTN	Nokia, Nokia	not treated	2019-02-09 18:21:32	2019-02-16 06:01:05
R1-1901725	Large-scale channel model calibration in NTN	Nokia, Nokia	not treated	2019-02-09 18:23:04	2019-02-16 06:01:05
R1-1901726	Discussion on case determination of EPDCCH USS when enabling CSI-RS	MediaTek Inc.	noted	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901727	CR 36.211-Correction on nEPDCCH for EPDCCH USS case determination	MediaTek Inc.	not pursued	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901728	CR 36.213 - Correction on nEPDCCH for EPDCCH USS case determination	MediaTek Inc.	not pursued	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901729	Discussion on Ambiguity for sPDCCH Order for Random Access	MediaTek Inc.	withdrawn	2019-02-10 15:28:30	
R1-1901730	Additional SRS symbols in LTE MIMO	MediaTek	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901731	Coexistence of NB-IoT with NR	MediaTek	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901732	UE-Group WUS in NB-IoT	MediaTek	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901733	Early Transmission in Preconfigured UL resources in NB-IoT	MediaTek Inc.	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901734	Quality report in Msg3 on non-anchor carrier in NB-IoT	MediaTek Inc.	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901735	NRS presence on non-anchor carrier in NB-IoT	MediaTek Inc.	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901736	Scheduling of multiple DL/UL transport blocks in NB-IoT	MediaTek Inc.	not treated	2019-02-10 15:28:30	2019-02-14 10:01:31
R1-1901737	UE-group wake-up signal in LTE-MTC	Ericsson	not treated	2019-02-10 19:02:41	2019-02-16 00:02:51

R1-1901738	Support for transmission in preconfigured UL resources in LTE-MTC	Ericsson	not treated	2019-02-10 19:02:41	2019-02-15 23:07:29
R1-1901739	Scheduling of multiple DL/UL transport blocks in LTE-MTC	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901740	Coexistence of LTE-MTC with NR	Ericsson	not treated	2019-02-10 19:02:42	2019-02-16 00:02:51
R1-1901741	Support of quality report in Msg3 and connected mode in LTE-MTC	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901742	MPDCCH performance improvement in LTE-	Ericsson	not treated	2019-02-10 19:02:42	2019-02-16 00:02:51
R1-1901743	CE mode A and B improvements for LTE-MTC non-BL UEs	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901744	Use of LTE control channel region for DL transmission in LTE-MTC	Ericsson	not treated	2019-02-10 19:02:42	2019-02-16 00:02:51
R1-1901745	Use of RSS for measurement improvements	Ericsson	noted	2019-02-10 19:02:42	2019-02-16 00:02:51
R1-1901746	UE-group wake-up signal in NB-IoT	Ericsson	not treated	2019-02-10 19:02:42	2019-02-16 00:02:51
R1-1901747	Support for transmission in preconfigured UL resources in NB-IoT	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901748	Scheduling of multiple DL/UL transport blocks in NB-IoT	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901749	Coexistence of NB-IoT with NR	Ericsson	not treated	2019-02-10 19:02:42	2019-02-16 00:02:51
R1-1901750	Support of quality report in Msg3 for non-anchor access in NB-IoT	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901751	Presence of NRS on a non-anchor carrier for paging in NB-IoT	Ericsson	not treated	2019-02-10 19:02:42	2019-02-15 23:07:29
R1-1901752	Performance requirements for ProSe D2D communications within the scope of NR V2X sidelink	FirstNet, AT&T, SyncTechno, Bittium, VIRVE, The Police of Netherlands, Norwegian Communica	noted	2019-02-10 23:16:14	2019-02-13 16:03:19
R1-1901753	Discussion on downlink-based positioning	ZTE Corporation,	noted	2019-02-11 01:42:22	2019-02-16 03:34:46
R1-1901754	Draft CR on default QCL for AP-CSI-RS	ZTE	revised	2019-02-11 02:28:18	2019-02-16 07:36:51
R1-1901755	Draft CR on QCL indication for PDSCH with	ZTE	revised	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901756	Draft CR on CORESET#0 after gNB	ZTE	noted	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901757	Draft CR on default QCL for PDSCH	ZTE	noted	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901758	Draft CR on priority rules for simultaneous	ZTE	not pursued	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901759	Draft CR on AP CSI-RS as QCL source	ZTE	not pursued	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901760	Draft CR for correction of ZP CSI-RS trigger	ZTE	revised	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901761	Draft CR on correction of DMRS description	ZTE	withdrawn	2019-02-11 02:28:21	
R1-1901762	Discussion on potential collision between SRS and configured grant based PUSCH	ZTE	noted	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901763	Draft CR on potential collision between SRS and configured grant based PUSCH	ZTE	not pursued	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901764	Draft CR on description of ZP CSI-RS resource configuration	ZTE	endorsed	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901765	Draft CR on identifying transmission occasion after resetting a PC closed loop	ZTE	revised	2019-02-11 02:28:21	2019-02-16 07:36:51
R1-1901766	Considerations on study item conclusion	vivo	not treated	2019-02-11 05:30:56	2019-02-16 04:02:14
R1-1901767	On PDCCH enhancements for URLLC	ZTE	not treated	2019-02-11 08:00:34	2019-02-16 02:45:59
R1-1901768	UL control enhancements for URLLC	ZTE	not treated	2019-02-11 08:00:34	2019-02-16 02:45:59
R1-1901769	Grant-based PUSCH enhancements for	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901770	On scheduling/HARQ processing timeline for URLLC	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901771	Discussion on resource allocation for URLLC	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901772	UL inter-UE multiplexing between eMBB and	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901773	Enhancements for UL grant-free	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901774	Discussion on intra-UE multiplexing	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901775	Performance evaluation for factory	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59

R1-1901776	Discussion on uplink power control for NR-NR DC	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901777	Discussion on cross-carrier scheduling with different numerologies	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901778	Discussion on single Tx switched uplink solution for EN-DC	ZTE	not treated	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901779	Discussion on NR Mobility Enhancements in Physical Layer	ZTE	noted	2019-02-11 08:00:35	2019-02-16 02:45:59
R1-1901780	Simulation results for legacy LTE-based broadcast and effect of longer CP	Shanghai Jiao Tong	not treated	2019-02-11 13:07:42	2019-02-17 10:45:26
R1-1901781	System-level evaluations on Rat-dependent positioning	ZTE Corporation,	not treated	2019-02-12 01:29:49	2019-02-16 03:34:46
R1-1901782	Discussion on TRS availability out of DRX	vivo	noted	2019-02-12 05:12:45	2019-02-15 15:45:03
R1-1901783	Remaining Issues in R-15 UE Features	MediaTek	noted	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901784	Open issues for paging in the connected mode	MediaTek Inc.	withdrawn	2019-02-12 06:48:36	
R1-1901785	UE behavior clarification for BWP operation	MediaTek Inc.	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901786	Maintenance for rate matching	MediaTek Inc.	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901787	Maintenance for MIMO	MediaTek	withdrawn	2019-02-12 06:48:36	
R1-1901788	CSI Enhancement for MU-MIMO Support	MediaTek	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901789	Enhancements on Multi-TRP/Panel Transmission	MediaTek Inc.	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901790	Enhancements on Multi-beam Operation	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901791	Full TX Power UL transmission	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901792	Low PAPR RS	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901793	On channel structure for two-step RACH	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901794	On procedure for two-step RACH	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901795	On Initial Access Signals and Channels for	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901796	DL Signals and Channels for NR-U operation	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901797	UL Signals and Channels for NR-U operation	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901798	On channel access procedure	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901799	Enhancements to initial access procedure	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901800	Enhancements to HARQ for NR-U operation	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901801	Discussion on NR-U configured grant	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901802	Wideband operation for NR-U	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901803	Evaluation results for NR power saving	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901804	NR UE power saving designs	MediaTek Inc.	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901805	NR RRM UE power saving	MediaTek Inc.	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901806	DRX cycle adaptation for NR UE power	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901807	Efficient SCell Access Switching for NR	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901808	On timing relationship for cross-carrier scheduling with different numerologies	MediaTek Inc.	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901809	On sidelink physical layer structure	MediaTek	not treated	2019-02-12 06:48:36	2019-02-18 11:13:41
R1-1901810	Discussion on Physical layer procedure	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901811	Discussion on sidelink based synchronization	MediaTek	not treated	2019-02-12 06:48:36	2019-02-18 11:13:41
R1-1901812	On sidelink resource allocation mechanism	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901813	Enhancements to NR Uu for advanced V2X use cases	MediaTek Inc.	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901814	Uu based SL configuration and resource allocation	MediaTek Inc.	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901815	Coexistence mechanisms between NR-V2X	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901816	On downlink OTDOA technique	MediaTek	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901817	On downlink angle based technique	MediaTek	withdrawn	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901818	On uplink angle based technique	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901819	System level performance with explicit link level simulation for downlink OTDOA	MediaTek Inc.	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901820	System level performance with explicit link level simulation for downlink angle based	MediaTek Inc.	withdrawn	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901821	On channel modelling for NR positioning	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901822	Evaluations and enhancements of NR	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901823	Enhancements to UCI for URLLC	MediaTek	revised	2019-02-12 06:48:36	2019-02-16 07:10:15

R1-1901824	Enhancements of NR PUSCH for URLLC	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901825	Study and valuation of scheduling, HARQ and CSI processing timeline	MediaTek Inc.	revised	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901826	Uplink inter-UE prioritization and multiplexing	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901827	Evaluation and enhancements of configured-	MediaTek	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901828	Intra-UE multiplexing and prioritization between mixed traffic priorities	MediaTek Inc.	not treated	2019-02-12 06:48:36	2019-02-16 07:00:39
R1-1901829	Discussion on QoS management for NR V2X	vivo	not treated	2019-02-12 10:36:03	2019-02-16 04:02:14
R1-1901830	Views on physical layer design for NR V2X sidelink	Mitsubishi Electric	not treated	2019-02-12 10:43:55	2019-02-15 17:05:35
R1-1901831	Waveform evaluations for V2X sidelink	Mitsubishi Electric	not treated	2019-02-12 10:45:51	2019-02-15 17:05:35
R1-1901832	Draft CR for PUCCH Format 1	ZTE	revised	2019-02-12 12:29:52	2019-02-16 02:45:59
R1-1901833	Draft CR for CSI multiplexing with SR	ZTE	revised	2019-02-12 12:29:52	2019-02-16 02:45:59
R1-1901834	Draft CR on using CORESET#0 in dedicated DL BWP	ZTE	revised	2019-02-12 12:29:52	2019-02-16 02:45:59
R1-1901835	Draft CR on PDSCH mapping to virtual resource blocks	ZTE	revised	2019-02-12 12:29:52	2019-02-16 02:45:59
R1-1901836	Draft CR on UE procedure for transmitting PUSCH without UL-SCH	ZTE	not pursued	2019-02-12 12:29:52	2019-02-16 02:46:00
R1-1901837	Draft CR on DMRS for configured grant PUSCH	ZTE	not pursued	2019-02-12 12:29:52	2019-02-16 02:46:00
R1-1901838	Consideration on the system simulation for	ZTE	not treated	2019-02-12 12:46:35	2019-02-15 12:51:34
R1-1901839	Discussion on the enhancement for CSI	ZTE	not treated	2019-02-12 12:46:35	2019-02-15 12:51:34
R1-1901840	Discussion on the enhancement for random	ZTE	not treated	2019-02-12 12:46:35	2019-02-15 12:51:34
R1-1901841	Discussion on the enhancement for TA in	ZTE	not treated	2019-02-12 12:46:35	2019-02-15 12:51:34
R1-1901842	Design and Analysis of NR V2X Physical Layer Structure	Fraunhofer HHI,	not treated	2019-02-12 13:32:47	2019-02-15 11:58:59
R1-1901843	Physical Layer Procedures for Unicast and Groupcast	Fraunhofer HHI,	not treated	2019-02-12 13:35:06	2019-02-15 11:58:59
R1-1901844	Evaluation of NR V2X Mode 2 Resource Allocation	Fraunhofer HHI,	not treated	2019-02-12 13:37:27	2019-02-15 11:58:59
R1-1901845	NR V2X Uu-based Resource Allocation	Fraunhofer HHI,	not treated	2019-02-12 13:39:55	2019-02-15 11:58:59
R1-1901846	Performance of Non-Uniform Constellations for LTE-Based 5G Terrestrial Broadcast	Shanghai Jiao Tong	not treated	2019-02-12 15:42:28	2019-02-21 07:26:04
R1-1901847	DL based NR Positioning	Nokia, Nokia	not treated	2019-02-12 17:40:06	2019-02-15 19:05:00
R1-1901848	UL based NR Positioning	Nokia, Nokia	not treated	2019-02-12 17:40:08	2019-02-15 19:05:00
R1-1901849	DL and UL based NR Positioning	Nokia, Nokia	not treated	2019-02-12 17:40:08	2019-02-15 19:05:00
R1-1901850	Updated system level simulation results for NR Positioning	Nokia, Nokia	not treated	2019-02-12 17:40:08	2019-02-15 19:05:00
R1-1901851	Correction on search space sharing	Ericsson	revised	2019-02-12 21:55:12	2019-02-16 00:11:08
R1-1901852	Correction on BWP ID interpretation for DCI code point	Ericsson	not pursued	2019-02-12 21:58:36	2019-02-16 00:11:08
R1-1901853	Correction on interpreting QCL TypeD across multiple CORESETs with different QCL	Ericsson	not pursued	2019-02-12 22:01:28	2019-02-16 00:11:08
R1-1901854	Correction on PDCCH monitoring with pdcch-BlindDetectionCA	Ericsson	noted	2019-02-12 22:03:40	2019-02-16 00:11:08
R1-1901855	Discussion on Enhanced Coverage	ZTE	noted	2019-02-12 22:38:35	2019-02-15 23:16:30
R1-1901856	Discussion for Enhanced Coverage	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:16:30
R1-1901857	Discussion on Wake-up signal for MTC	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901858	Support for transmission in preconfigured UL resources for MTC	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901859	Consideration on scheduling enhancement for MTC	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901860	Coexistence of LTE-MTC with NR	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901861	Support of quality report in Msg3 and Connected Mode for MTC	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901862	Discussion on MPDCCH performance	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48

R1-1901863	On CE mode A and B improvements for non-BL UE	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901864	Use of LTE control channel region for DL transmission	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901865	Discussion on Wake-up signal for NB-IoT	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901866	Support for transmission in preconfigured UL resources for NB-IoT	ZTE	not treated	2019-02-12 22:38:35	2019-02-17 19:12:39
R1-1901867	Consideration on scheduling enhancement for NB-IoT	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901868	Coexistence of NB-IoT with NR	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901869	Support of Quality report in Msg3 for non-anchor access	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901870	Presense of NRS on non-anchor PRB	ZTE	not treated	2019-02-12 22:38:35	2019-02-15 23:09:48
R1-1901871	Views on Random Access Enhancements	Charter Communica	not treated	2019-02-13 01:02:54	2019-02-16 03:45:21
R1-1901872	HARQ Enhancements and UL Scheduling	Charter Communica	not treated	2019-02-13 01:02:57	2019-02-16 03:45:21
R1-1901873	LBT for Control Transmissions without multiplexed data	Charter Communica	not treated	2019-02-13 01:02:57	2019-02-16 03:45:21
R1-1901874	On Initial Signal Design	Charter Communica	not treated	2019-02-13 01:02:57	2019-02-16 03:45:21
R1-1901875	Draft CR on the index n of SS/PBCH block mapping to 1/N PRACH occasions	ZTE Corporation	noted	2019-02-13 02:25:47	2019-02-15 08:46:54
R1-1901876	Correction on one port PUSCH power scaling	Ericsson	not pursued	2019-02-13 02:44:07	2019-02-16 05:16:28
R1-1901877	Discussion on QoS management	ZTE,	not treated	2019-02-13 03:59:43	2019-02-15 22:26:21
R1-1901878	Coexistence between NR V2X and LTE V2X	ZTE,	not treated	2019-02-13 03:59:43	2019-02-15 22:26:21
R1-1901879	Discussion on Uu based resource allocation/configuration for NR V2X	ZTE, Sanechips	not treated	2019-02-13 03:59:43	2019-02-15 22:26:21
R1-1901880	Analysis of Mode 2 resource schemes on	ZTE,	not treated	2019-02-13 03:59:43	2019-02-15 22:26:21
R1-1901881	Design of initial access signals and channels for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901882	Design of DL signals and channels for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901883	Design of UL signals and channels for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901884	Design of channel access procedures for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 03:39:43
R1-1901885	Design of initial access procedures for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901886	Design of HARQ procedures for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901887	Wideband operation for NR-based access to unlicensed spectrum	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901888	Efficient and low latency serving cell configuration/activation/setup for NR	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901889	Enhancements to support IAB node initial access	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901890	Enhancements to support inter-IAB node discovery and measurements	AT&T	noted	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901891	Enhancements to support IAB node RACH	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901892	Mechanisms for supporting access and backhaul link multiplexing	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901893	Mechanisms for supporting IAB node timing alignment	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901894	Mechanisms for resource coordination and radio-aware scheduling for IAB	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901895	Physical layer structure for NR sidelink	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901896	Physical layer procedures for NR sidelink	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901897	Synchronization mechanism for NR sidelink	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901898	Resource allocation mechanism and	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901899	Additional field trial results from 39GHz vehicle to vehicle communication	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46

R1-1901900	Enhancements of NR Uu to control sidelink	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901901	On congestion level indication in resource	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901902	UE-UE CLI measurements and reporting	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901903	Network coordination for CLI mitigation	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901904	Enhancements on multi-beam operation	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901905	On Type2 CSI Enhancements for MIMO	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901906	Multi-TRP/Panel Enhancements for Release 16 MIMO	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901907	Remaining Issues of PAPR in NR	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901908	On Full Transmit Power for UL Transmission	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901909	On Potential enhancements to PDDCH for	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901910	UCI Enhancements for NR	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901911	On Frequency Hopping for PUSCH	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901912	HARQ Enhancements to URLLC	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901913	On UL Inter UE Tx Prioritization/multipelxing	AT&T	not treated	2019-02-13 04:38:12	2019-02-16 02:18:46
R1-1901914	On UCI Enhancements for URLLC	Nokia, Nokia	not treated	2019-02-13 05:14:01	2019-02-15 23:32:40
R1-1901915	On PUSCH enhancements for NR URLLC	Nokia, Nokia	not treated	2019-02-13 05:14:01	2019-02-15 23:32:40
R1-1901916	Enhancements to scheduling/HARQ/CSI processing timeline for NR URLLC	Nokia, Nokia Shanghai	revised	2019-02-13 05:14:01	2019-02-15 23:32:40
R1-1901917	On intra-UE DL/UL prioritization for NR URLLC	Nokia, Nokia	not treated	2019-02-13 05:14:01	2019-02-15 23:32:40
R1-1901918	Text proposal for TSN requirements evaluation	Nokia, Nokia	revised	2019-02-13 05:14:01	2019-02-15 23:32:40
R1-1901919	Initial access signals/channels for NR-U	OPPO	not treated	2019-02-13 07:01:59	2019-02-16 01:40:32
R1-1901920	DL signals and channels for NR-U	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901921	UL signals and channels for NR-U	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901922	Channel access procedures for NR-U	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901923	Enhancements to initial access procedure for	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901924	HARQ enhancements for NR-U	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901925	On configured grant for NR-U	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901926	Wideband operation for NR-U	OPPO	not treated	2019-02-13 07:02:00	2019-02-16 01:40:32
R1-1901927	Discussion on SS rasters for NR-U	OPPO	not treated	2019-02-13 07:02:01	2019-02-16 01:40:32
R1-1901928	Draft CR on obtaining P0_Nominal for virtual PHR on SCell without RACH	ZTE	not pursued	2019-02-13 07:06:27	2019-02-16 07:36:51
R1-1901929	Text proposal for the conclusion of TR 38.885	LG	not treated	2019-02-13 07:10:36	2019-02-16 06:02:35
R1-1901930	Discussion on physical layer structure for NR	LG	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901931	Discussion on physical layer procedure for	LG	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901932	Discussion on synchronization mechanism	LG	revised	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901933	Discussion on resource allocation	LG	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901934	Discussion on NR Uu for advanced V2X use cases	LG Electronics	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901935	Discussion on Uu-based sidelink resource allocation/configuration	LG Electronics	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901936	Discussion on QoS management for NR V2X	LG	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901937	Discussion on coexistence mechanism for	LG	not treated	2019-02-13 07:10:37	2019-02-16 06:02:35
R1-1901938	Consideration on PRACH in NR-U	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06
R1-1901939	Initial slot with flexible starting positions for NR-U	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06
R1-1901940	Enhancements to initial access procedure and scheduling request procedure for NR-U	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06
R1-1901941	Scheduling/HARQ enhancements for NR-U	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06
R1-1901942	On wideband operation for NR-U	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06
R1-1901943	Discussion on physical layer structure for NR sidelink	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06

R1-1901944	Discussion on HARQ-ACK feedback for NR-V2X	Fujitsu	not treated	2019-02-13 08:36:42	2019-02-15 08:32:06
R1-1901945	Geographic Information based Dynamic TFRP Resource Selection Procedure in NR-	Fujitsu	not treated	2019-02-13 08:36:43	2019-02-15 08:32:06
R1-1901946	Discussion on basic resource allocation methods for NR V2X sidelink communication	Fujitsu	not treated	2019-02-13 08:36:43	2019-02-15 08:32:06
R1-1901947	Further considerations on NR V2X resource selection procedure of mode 2(a) in mixture	Fujitsu	not treated	2019-02-13 08:36:43	2019-02-15 08:32:06
R1-1901948	Further considerations on Mode 1 resource allocation for NR-V2X	Fujitsu	not treated	2019-02-13 08:36:43	2019-02-15 08:32:06
R1-1901949	Dynamic Sidelink Bi-mode Transmission in NR-V2X	Fujitsu	noted	2019-02-13 08:36:43	2019-02-15 08:32:06
R1-1901950	On the PDCCH enhancements for NR URLLC	Nokia, Nokia	not treated	2019-02-13 08:45:55	2019-02-15 16:04:14
R1-1901951	Remaining details of UL inter-UE eMBB and URLLC multiplexing	Nokia, Nokia	not treated	2019-02-13 08:45:55	2019-02-15 16:04:14
R1-1901952	On Configured Grant enhancements for NR URLLC	Nokia, Nokia	revised	2019-02-13 08:45:55	2019-02-15 16:04:14
R1-1901953	UE-group wake-up signal for MTC	Nokia, Nokia	not treated	2019-02-13 08:58:06	2019-02-15 17:46:13
R1-1901954	Transmission in preconfigured UL resources	Nokia, Nokia	not treated	2019-02-13 08:59:43	2019-02-15 14:41:56
R1-1901955	Scheduling of multiple DL/UL transport blocks	Nokia, Nokia	not treated	2019-02-13 09:00:44	2019-02-15 14:41:56
R1-1901956	Coexistence of eMTC with NR	Nokia, Nokia	not treated	2019-02-13 09:02:07	2019-02-15 14:41:56
R1-1901957	Support of Quality report in Msg3	Nokia, Nokia	not treated	2019-02-13 09:03:12	2019-02-15 14:41:56
R1-1901958	MPDCCH performance improvement	Nokia, Nokia	not treated	2019-02-13 09:04:12	2019-02-15 14:41:56
R1-1901959	CE mode A and B improvements for non-BL UEs	Nokia, Nokia	not treated	2019-02-13 09:05:17	2019-02-15 17:46:13
R1-1901960	Consideration on the usage of LTE control channel region	Nokia, Nokia	not treated	2019-02-13 09:06:19	2019-02-15 14:41:56
R1-1901961	Correction to SRS offset indication	Ericsson	noted	2019-02-13 09:06:45	2019-02-15 07:12:34
R1-1901962	Correction to PDSCH mapping to VRB	Ericsson	endorsed	2019-02-13 09:08:45	2019-02-14 15:29:23
R1-1901963	UE group wake-up signal for NB-IoT	Nokia, Nokia	not treated	2019-02-13 09:12:10	2019-02-15 17:46:13
R1-1901964	Preconfigured Grant for Uplink transmission	Nokia, Nokia	not treated	2019-02-13 09:13:08	2019-02-15 14:41:56
R1-1901965	Scheduling of multiple DL/UL transport blocks	Nokia, Nokia	not treated	2019-02-13 09:14:08	2019-02-15 14:41:56
R1-1901966	Coexistence of NB-IoT with NR	Nokia, Nokia	not treated	2019-02-13 09:15:12	2019-02-15 14:41:56
R1-1901967	Support of Quality report in Msg3 on non-anchor carrier	Nokia, Nokia	not treated	2019-02-13 09:16:02	2019-02-15 14:41:56
R1-1901968	Presence of NRS on a non-anchor carrier for paging	Nokia, Nokia	not treated	2019-02-13 09:17:12	2019-02-15 14:41:56
R1-1901969	Discussion on remaining issues of CLI measurement and reporting	ZTE Corporation	not treated	2019-02-13 09:28:24	2019-02-16 03:33:42
R1-1901970	Discussion on remaining issues of network coordination mechanisms	ZTE Corporation	not treated	2019-02-13 09:29:43	2019-02-16 03:33:42
R1-1901971	Draft CR on the clarification of NR PRACH resource mapping	CATT	not pursued	2019-02-13 09:32:07	2019-02-16 05:55:19
R1-1901972	Corrections on CSI acquisition to TS38.214	CATT	not pursued	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901973	Corrections on CSI reporting to TS38.212	CATT	endorsed	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901974	Corrections on SRS to TS38.211	CATT	revised	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901975	Corrections on non-codebook based UL transmission to TS38.214	CATT	not pursued	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901976	Draft CR on sequential PDSCH and PUSCH scheduling	CATT	revised	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901977	Draft CR on PUSCH scheduled by a RAR UL grant	CATT	not pursued	2019-02-13 09:32:08	2019-02-16 05:55:19

R1-1901978	Corrections to UCI feedback	CATT	noted	2019-02-13 09:32:08	2019-02-16 05:56:33
R1-1901979	Draft CR on UE procedure for reporting multiple UCI types	CATT	revised	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901980	Further discussion of NR RAT-dependent DL	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901981	Further discussion of NR RAT-dependent UL	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901982	NR Positioning with the combination of DL/UL Measurements	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901983	Updated System-level Performance Evaluation for NR Positioning	CATT	revised	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901984	Further discussion of NR Hybrid Positioning Techniques	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901985	NLOS Model for NR Positioning	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901986	UL Power control for NR -DC	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901987	Discussion on cross-carrier scheduling with different numerologies	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901988	Overview of NTN	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901989	Considerations on NTN PHY aspect	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901990	Discussion of NR-U Initial access	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901991	Discussion of NR-U initial access procedure	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901992	Discussion on physical layer structure in NR	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901993	Discussion on physical layer procedures in	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901994	Further design and evaluation of S-SSB for	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901995	Discussion on resource allocation	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901996	Further considerations on Uu enhancement in NR V2X	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901997	Discussion On Uu-based sidelink resource allocation/configuration in NR V2X	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901998	QoS management in NR V2X	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1901999	Discussion on coexistence of NR V2X and	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902000	Details on UE CLI measurement and reporting	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902001	Remaining details on RIM RS design	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902002	PDCCH enhancements for URLLC	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902003	UL control enhancements for URLLC	CATT	not treated	2019-02-13 09:32:08	2019-02-16 06:03:31
R1-1902004	On PUSCH enhancements for URLLC	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902005	Scheduling and processing timeline enhancements for URLLC	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902006	Remaining details on inter-UE UL	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902007	On enhancements to configured UL grant	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902008	Discussion on intra-UE multiplexing	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902009	Performance evaluation of the factory	CATT	revised	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902010	On configured DL assignments for URLLC	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902011	Discussions on calculation of shadow fading margin for link budget in LOS cases	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902012	Self-evaluation on LTE Spectrum Efficiency in Indoor Hptspot-eMBB	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902013	Self-evaluation on LTE Spectrum Efficiency in Dense Urban-eMBB	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902014	Self-evaluation on LTE Area Traffic Capacity in Indoor Hptspot-eMBB	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902015	Self-evaluation on LTE User Experienced Data Rate in Dense Urban-eMBB	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902016	Self-evaluation on Mobility for LTE	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902017	Further Self-Evaluation on Link Budget for NR	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902018	Discussions on Type II CSI enhancement	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902019	Consideration on multi-TRP/panel transmission	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902020	On multi-beam operation enhancements	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902021	Full Tx power UL transmission	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902022	Evaluation results of multi-TRP/panel	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902023	Update of TR38.840 Study on UE Power	CATT	endorsed	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902024	Evaluation Results of UE Power Saving	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19

R1-1902025	UE Power saving schemes and power saving signal/channel	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902026	UE Power saving scheme for RRM measurements	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902027	Discussion on Channel Structure for 2-Step	CATT	not treated	2019-02-13 09:32:08	2019-02-16 05:55:19
R1-1902028	Discussion on RIM RS resource and	ZTE	not treated	2019-02-13 09:35:59	2019-02-16 03:33:42
R1-1902029	Discussion on remaining issues of OAM functions to support RIM	ZTE Corporation	not treated	2019-02-13 09:37:15	2019-02-16 03:33:42
R1-1902030	Evaluation results of UE power consumption	ZTE	not treated	2019-02-13 09:38:58	2019-02-16 03:33:42
R1-1902031	Dicussion on potential techniques for UE power saving	ZTE Corporation	not treated	2019-02-13 09:39:10	2019-02-16 03:33:42
R1-1902032	On UE Power Saving for RRM Measurement	ZTE Corporation	not treated	2019-02-13 09:40:50	2019-02-16 03:33:42
R1-1902033	Wideband operation in NR unlicensed	PANASONI	not treated	2019-02-13 09:52:30	2019-02-15 12:32:02
R1-1902034	Link Budget on eMBB for IMT-2020 self-	ZTE	revised	2019-02-13 09:57:00	2019-02-15 08:23:36
R1-1902035	Reliability for IMT-2020 self-evaluation	ZTE	not treated	2019-02-13 09:57:06	2019-02-15 08:13:59
R1-1902036	Corrections on CSI update capability for sTTI	LG	revised	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902037	Physical layer design of initial access signals and channels for NR-U	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902038	Physical layer design of DL signals and	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902039	Physical layer design of UL signals and	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902040	Channel access procedure for NR-U	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902041	Initial access and mobility for NR-U	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902042	HARQ procedure for NR-U	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902043	Discussion on configured grant for NR-U	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902044	Wide-band operation for NR-U	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902045	PDCCH enhancements for NR URLLC	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902046	UCI enhancements for NR URLLC	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902047	PUSCH enhancements for NR URLLC	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902048	Scheduling/HARQ processing timeline enhancements for NR URLLC	LG Electronics	revised	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902049	Discussion on UL inter UE Tx prioritization	LG	revised	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902050	Discussion on enhancement for grant-free	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902051	Intra-UE prioritization for NR URLLC	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902052	Numerical results for UE power saving	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902053	Discussion on potential techniques for UE power saving	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902054	Discussion on UE power consumption reduction in RRM measurements	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902055	Discussion on UE-grouping wake up signal in	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902056	Discussion on preconfigured UL resources in MTC	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902057	Discussion on multiple transport blocks scheduling in MTC	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902058	Discussion on coexistence of LTE-MTC with	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902059	Downlink channel quality report during random access procedure	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902060	Discussion on MPDCCH performance	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902061	CE mode improvements for non-BL UEs	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902062	On the use of LTE control channel region for LTE-MTC DL transmission	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902063	Discussion on UE-grouping wake up signal in	LG	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902064	Discussion on preconfigured UL resources in NB-IoT	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902065	Discussion on multiple transport blocks scheduling in NB-IoT	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902066	Downlink channel quality report during random access procedure on a non-anchor	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902067	Discussion on NRS on a non-anchor carrier	LG Electronics	not treated	2019-02-13 10:26:01	2019-02-16 06:59:28
R1-1902068	Update of evaluation results	CATT	not treated	2019-02-13 10:42:23	2019-02-16 05:55:19
R1-1902069	Correction to last PUCCH resource set configuration	Ericsson	revised	2019-02-13 10:59:09	2019-02-16 07:30:26

R1-1902070	Correction to Type-2 HARQ codebook	Ericsson	endorsed	2019-02-13 10:59:09	2019-02-16 07:30:26
R1-1902071	Correction to UCI multiplexing	Ericsson	revised	2019-02-13 10:59:09	2019-02-16 07:30:26
R1-1902072	UCI enhancements for URLLC	Fujitsu	not treated	2019-02-13 11:01:56	2019-02-15 13:20:17
R1-1902073	Discussion on UL preemption indication	Fujitsu	not treated	2019-02-13 11:01:57	2019-02-15 13:20:17
R1-1902074	Enhancement on multi-beam operation	Fujitsu	not treated	2019-02-13 11:01:57	2019-02-15 11:16:34
R1-1902075	Enhancements on SRS resource allocation	LG	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902076	Discussion on VCID for SRS sequence	LG	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902077	Discussion on SSB/RMSI periodicity for NR initial access	LG Electronics	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902078	Discussion on SSBs for inter-IAB-node discovery and measurements	LG Electronics	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902079	Discussion on RACH occasions and periodicities for backhaul RACH resources	LG Electronics	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902080	Discussions on resource multiplexing among backhaul and access links	LG Electronics	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902081	Discussions on timing alignment for IAB nodes	LG Electronics	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902082	Discussion on scenario with same cell ID	LG	not treated	2019-02-13 11:14:47	2019-02-16 06:33:32
R1-1902083	Discussion on remaining issue of UE-to-UE CLI measurement and reporting at a UE	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902084	Discussion on remaining issue of network coordination and information exchange for CLI	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902085	Discussion on remaining issue of RIM RS resource and configuration	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902086	Discussion on remaining issue of OAM functions to support RIM operation	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902087	Evaluation results of Dense Urban-eMBB for IMT-2020 self-evaluation	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902088	Evaluation results of Rural-eMBB for IMT-	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902089	Evaluation results of Indoor Hotspot-eMBB for IMT-2020 self-evaluation	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:33
R1-1902090	Discussion on overhead reduction for Type II	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902091	Enhancements on multi-TRP/panel transmission	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902092	Discussion on multi-beam based operations and enhancements	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902093	Discussion on full Tx power uplink	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902094	Discussion on low PAPR RS	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902095	Evaluation and analysis on simultaneous	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902096	Evaluation on quantization methods for Type II overhead reduction	LG Electronics	revised	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902097	Discussion on supporting rank 3 and 4 for	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902098	Discussion on DMRS port indication for	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902099	Discussion on DL only based Positioning	LG	revised	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902100	Discussion on UL only based Positioning	LG	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902101	Discussion on Combination of DL & UL based Positioning	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902102	Discussion on Performance Evaluation for RAT-Dependent Positioning Techniques	LG Electronics	revised	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902103	Discussion on Potential Hybrid Techniques of RAT-Independent and RAT-Dependent	LG Electronics	not treated	2019-02-13 11:14:48	2019-02-16 06:33:32
R1-1902104	QoS Management for NR V2X	Fraunhofer IIS,	not treated	2019-02-13 12:17:35	2019-02-15 13:05:03
R1-1902105	Correction of SSB subcarrier spacing parameter name	Ericsson	noted	2019-02-13 13:12:06	2019-02-15 22:22:36
R1-1902106	Correction of SIB1 parameter name	Ericsson	noted	2019-02-13 13:16:06	2019-02-15 22:22:36
R1-1902107	Reference for EUTRA-MBSFN-	Ericsson	noted	2019-02-13 13:18:29	2019-02-15 22:19:50
R1-1902108	NR-U enhancements for uplink signals and channels	Nokia, Nokia	not treated	2019-02-13 13:25:34	2019-02-15 19:51:23
R1-1902109	Channel access and co-existence for NR-U operation	Nokia, Nokia	not treated	2019-02-13 13:26:39	2019-02-15 19:51:23

R1-1902110	On support of UL transmission with configured grants in NR-U	Nokia, Nokia	not treated	2019-02-13 13:27:34	2019-02-15 19:51:23
R1-1902111	On preambles for NR-U	Nokia, Nokia	not treated	2019-02-13 13:29:16	2019-02-15 19:51:23
R1-1902112	About IIOT scenario	ZTE, Sanechips, BJTU,	not treated	2019-02-13 13:29:34	2019-02-15 17:29:39
R1-1902113	Pathloss model in IIOT scenario	ZTE, Sanechips, BJTU,	revised	2019-02-13 13:34:03	2019-02-15 17:29:39
R1-1902114	K-factor model in IIOT scenario	ZTE, Sanechips, BJTU,	not treated	2019-02-13 13:37:10	2019-02-15 17:29:39
R1-1902115	Absolute time of arrival model in IIOT scenario	ZTE, Sanechips, BJTU,	not treated	2019-02-13 13:41:04	2019-02-15 17:29:39
R1-1902116	NR-U enhancements for HARQ scheduling and feedback	Nokia, Nokia	not treated	2019-02-13 13:46:16	2019-02-15 19:51:23
R1-1902117	LOS probability model in IIOT scenario	ZTE, Sanechips, BJTU,	not treated	2019-02-13 14:00:47	2019-02-15 17:29:39
R1-1902118	Correction and clarification to CSI	Ericsson	revised	2019-02-13 14:26:44	2019-02-15 17:48:20
R1-1902119	Corrections to CSI reference resource	Ericsson	endorsed	2019-02-13 14:29:55	2019-02-15 17:48:20
R1-1902120	Correction to aperiodic CSI-RS triggering with different numerology between PDCCH	Ericsson	revised	2019-02-13 14:33:09	2019-02-15 17:48:20
R1-1902121	Motivation for correction to aperiodic CSI-RS triggering with different numerology between	Ericsson	noted	2019-02-13 14:35:41	2019-02-15 17:48:20
R1-1902122	Enhancements on UE multi-beam operation	Fraunhofer IIS,	not treated	2019-02-13 14:53:37	2019-02-16 06:48:40
R1-1902123	Enhancements on Type-II CSI reporting	Fraunhofer IIS,	not treated	2019-02-13 14:54:22	2019-02-15 22:30:01
R1-1902124	Enhancements on Type-II CSI: Doppler Approach	Fraunhofer IIS,	not treated	2019-02-13 14:55:18	2019-02-15 22:30:01
R1-1902125	On Enhancements to Initial Access Procedures for NR-U	Nokia, Nokia	not treated	2019-02-13 15:30:29	2019-02-15 22:56:01
R1-1902126	PDCCH enhancements for URLLC	Sequans Communica	not treated	2019-02-13 16:16:30	2019-02-15 10:38:56
R1-1902127	Enhancements for grant free transmissions	Sequans Communica	not treated	2019-02-13 16:19:01	2019-02-15 10:38:56
R1-1902128	UL control enhancements for NR URLLC	Sequans Communica	not treated	2019-02-13 16:20:54	2019-02-15 10:38:56
R1-1902129	Considerations on UL inter-UE multiplexing for URLLC	Sequans Communica	not treated	2019-02-13 16:22:55	2019-02-15 10:38:56
R1-1902130	Evaluation Results for LTE-Based 5G Terrestrial Broadcast	EBU, BBC, IRT	revised	2019-02-13 17:07:33	2019-02-15 19:02:12
R1-1902131	Support for Reservation in Mode 2	Kyocera	not treated	2019-02-13 17:20:50	2019-02-14 22:20:44
R1-1902132	A Reliable Groupcast HARQ feedback	Kyocera	not treated	2019-02-13 17:22:36	2019-02-14 22:20:44
R1-1902133	Channel Structure for Two-Step RACH	Sierra	not treated	2019-02-13 19:22:27	2019-02-15 20:49:26
R1-1902134	Procedure for Two-Step RACH	Sierra	not treated	2019-02-13 19:24:31	2019-02-15 20:49:26
R1-1902135	On 2-step RACH Channel Structure	Nokia, Nokia	not treated	2019-02-13 21:13:13	2019-02-15 22:34:41
R1-1902136	On 2-step RACH Procedure	Nokia, Nokia	noted	2019-02-13 21:13:18	2019-02-15 22:34:41
R1-1902137	Discussion on NR sidelink physical layer	ZTE,	not treated	2019-02-13 21:33:04	2019-02-15 17:48:46
R1-1902138	Discussion on PHY procedures for NR V2X	ZTE,	not treated	2019-02-13 21:36:42	2019-02-15 17:48:46
R1-1902139	Discussion on synchronization mechanism in	ZTE,	not treated	2019-02-13 21:39:39	2019-02-15 17:48:46
R1-1902140	About Uu enhancements for advanced V2X use cases	ZTE, Sanechips	not treated	2019-02-13 21:42:05	2019-02-15 17:48:46
R1-1902141	Discussion on IAB-assumed SSB periodicity in stage-1 initial access	ZTE, Sanechips	not treated	2019-02-13 21:45:05	2019-02-15 17:48:46

R1-1902142	Discussion on backhaul RACH resources configuration	ZTE, Sanechips	not treated	2019-02-13 21:46:56	2019-02-15 17:48:46
R1-1902143	Resource multiplexing among backhaul and access links	ZTE, Sanechips	not treated	2019-02-13 21:49:00	2019-02-15 17:48:46
R1-1902144	Discussion on OTA timing alignment mechanism	ZTE, Sanechips	noted	2019-02-13 21:50:48	2019-02-15 17:48:46
R1-1902145	UE-group wake-up signal for Rel-16 MTC	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902146	UL transmission in preconfigured resources for eMTC	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902147	Design of scheduling of multiple DL/UL transport blocks for MTC	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902148	UE-group wake-up signal for Rel-16 NB-IoT	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902149	UL transmission in preconfigured resources for NBIoT	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902150	Design of scheduling of multiple DL/UL transport blocks for NBIoT	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902151	UL signals and channels for NR-U	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902152	HARQ enhancement for NR-U	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902153	Wide-band operation for NR-U	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902154	Discussion on discovery and measurement for IAB network	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902155	Discussion on resource partitioning for IAB network	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902156	Physical layer structures in NR V2X	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902157	Physical layer procedures in NR V2X	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902158	Resource allocation mechanism in NR V2X	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902159	Discussion on Uu-based sidelink resource allocation	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902160	Discussion on co-existence for NR-V2X and LTE-V2X	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902161	Discussion of multi-panel/TRP transmission	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902162	Discussion of multi-beam operation	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902163	Discussion of UL transmission with multi-TRP	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902164	Discussion of additional SRS symbols	Lenovo, Motorola	not treated	2019-02-13 22:17:40	2019-02-15 15:18:32
R1-1902165	On Channel Structure for Two-Step RACH	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902166	Discussion on Procedure for 2-step RACH	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902167	Initial access signals and channels for NR-U	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902168	DL Signals and Channels for NR unlicensed	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902169	Channel access for NR unlicensed operations	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902170	Enhancements to initial access procedure for	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902171	Consideration on HARQ enhancement for NR-	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902172	Enhancements to Configured Grants in NR-U	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902173	Wideband operation for NR Unlicensed	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902174	Discussion on HARQ feedback for NR V2X	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902175	Discussion on NR V2X resource allocation	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902176	Remaining considerations on compact DCI	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902177	Considerations on UCI enhancements for	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902178	Considerations on PUSCH enhancements for	Sony	not treated	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902179	Considerations on enhancement to HARQ processing for URLLC	Sony	revised	2019-02-14 00:06:27	2019-02-16 03:49:24
R1-1902180	Considerations on UL Inter-UE Tx	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902181	Consideration on enhanced UL grant-free	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24

R1-1902182	Considerations on UL Intra-UE Tx	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902183	Considerations on Multi-TRP/Panel Transmission	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902184	Enhancements on multi-beam operation	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902185	Evaluation results for power saving	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902186	Power saving techniques for NR	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902187	Power consumption reduction in RRM measurements	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902188	Considerations on DL-based positioning for	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902189	Considerations on UL-based positioning for	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902190	Considerations on RAT Independent and Hybrid Positioning for NR	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902191	UE group wake up signal for MTC	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902192	Considerations in using PUR	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902193	On transmission of multiple DL transport blocks	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902194	Quality Report in Msg3	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:23
R1-1902195	On MPDCCH performance improvement	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902196	UE group wake up signal for NB-IoT	Sony	not treated	2019-02-14 00:06:28	2019-02-16 03:49:24
R1-1902197	Discussion of SSB for inter-IAB-node discovery and measurements	ZTE, Sanechips	not treated	2019-02-14 00:47:00	2019-02-15 17:48:46
R1-1902198	Correction for higher layer parameter alignment	NEC Corporation	noted	2019-02-14 01:30:48	2019-02-14 08:56:56
R1-1902199	Discussion on quantization schemes	MediaTek	revised	2019-02-14 01:55:13	2019-02-16 07:00:39
R1-1902200	Discussion on FD component selection and coefficient subset selection	MediaTek Inc.	revised	2019-02-14 01:55:13	2019-02-16 07:00:39
R1-1902201	Discussion on physical layer structure for NR	Panasonic	not treated	2019-02-14 02:12:53	2019-02-15 02:53:24
R1-1902202	Discussion on PSFCH channel design in NR	Panasonic	not treated	2019-02-14 02:12:54	2019-02-15 02:53:24
R1-1902203	Discussion on resource allocation	Panasonic	not treated	2019-02-14 02:12:54	2019-02-15 02:53:24
R1-1902204	Discussion on sidelink resource allocation in mode 1 for NR V2X	Panasonic	not treated	2019-02-14 02:12:54	2019-02-15 02:53:24
R1-1902205	Discussion on QoS management for NR V2X	Panasonic	not treated	2019-02-14 02:12:54	2019-02-15 02:53:24
R1-1902206	Discussion on coexistence between LTE sidelink and NR sidelink for NR V2X	Panasonic	not treated	2019-02-14 02:12:54	2019-02-15 02:53:24
R1-1902207	Uplink Power Control for NR-NR DC	AT&T	not treated	2019-02-14 02:23:59	2019-02-16 02:18:46
R1-1902208	Draft CR on DMRS mapping for SPDCCH	Samsung	revised	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902209	UE-group wake-up signal for eMTC	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902210	Discussion on transmission in preconfigured UL reosurces for MTC	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902211	Scheduling of multiple transport blocks for MTC	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902212	Discussion on quality report in Msg3 and connected mode	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902213	Discussion on MPDCCH performance	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902214	CE Mode A and Mode B improvements for non-BL UEs	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902215	Discussion on use of control channel region	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902216	UE-group wake-up signal for NB-IoT	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902217	Discussion on transmission in preconfigured UL reosurces for NB-IoT	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902218	Scheduling of multiple transport blocks for NB-IoT	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902219	Discussion on Msg3 report for non-anchor access	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902220	NRS presence on non-anchor carrier	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902221	Discussion on additional SRS symbols	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 07:47:46
R1-1902222	Discussions on virtual cell ID for SRS	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 07:49:10
R1-1902223	Draft CR on the notation for MSB of k_SSB for FR1	Samsung, CMCC	noted	2019-02-14 03:47:17	2019-02-15 20:43:31

R1-1902224	Draft CR on SSB-RO association	Samsung	revised	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902225	Draft CR on PRACH Power Ramping Counter Suspension	Samsung	revised	2019-02-14 03:47:17	2019-02-15 21:55:31
R1-1902226	Draft CR on NR CSI-RS	Samsung	endorsed	2019-02-14 03:47:17	2019-02-15 07:47:46
R1-1902227	Draft CR on UE assumption on MU MIMO	Samsung	endorsed	2019-02-14 03:47:17	2019-02-15 07:47:46
R1-1902228	Discussion on scheduling restriction and calculation of TBS_LBRM and max data rate	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902229	Draft CR on scheduling restriction by max data rate	Samsung	noted	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902230	Draft CR on LBRM	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902231	Draft CR on calculation of max data rate	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902232	Draft CR on A-CSI Multiplexing in a PUSCH Transmission with Repetitions	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 21:55:31
R1-1902233	Draft CR on PDCCH monitoring for Scell	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 07:35:44
R1-1902234	Draft CR on QCL confliction	Samsung	revised	2019-02-14 03:47:17	2019-02-15 07:35:44
R1-1902235	Draft CR on cross-carrier scheduling	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 07:35:44
R1-1902236	PUCCH Repetitions in NR Rel-15	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:55:31
R1-1902237	Draft CR on PUCCH Repetitions	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 21:55:31
R1-1902238	PDCCH Monitoring for NN-DC	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:55:31
R1-1902239	Draft CR on PDCCH Monitoring for NN-DC	Samsung, Nokia,	postponed	2019-02-14 03:47:17	2019-02-15 21:55:31
R1-1902240	Draft CR on PDCCH order for cross-carrier scheduling	Samsung	not pursued	2019-02-14 03:47:17	2019-02-15 07:35:44
R1-1902241	Channel Structure for Two-Step RACH	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902242	Procedure for Two-step RACH	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902243	DL only based Positioning	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 18:59:19
R1-1902244	UL only based Positioning	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 18:59:19
R1-1902245	Combination of DL & UL based Positioning	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 18:59:19
R1-1902246	System-level Performance Evaluation for RAT-Dependent Positioning Techniques	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 18:59:19
R1-1902247	Potential Techniques for NR RAT Independent Positioning	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 18:59:19
R1-1902248	Other issues on NR positioning	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 18:59:19
R1-1902249	Physical Layer Aspects for Mobility Enhancements	Samsung	noted	2019-02-14 03:47:17	2019-02-15 07:39:45
R1-1902250	Uplink Power Control for NR-NR DC	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:55:01
R1-1902251	Cross-carrier Scheduling with Different Numerologies	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:55:01
R1-1902252	On Enhancements to Single Tx Switched UL for EN-DC	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 07:37:27
R1-1902253	On SCell Activation/Deactivation and	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:55:01
R1-1902254	Initial access signals and channels for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902255	DL signals and channels for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902256	UL signals and channels for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902257	Channel access procedures for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:10:03
R1-1902258	Enhancements to initial access procedure for	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 21:10:03
R1-1902259	HARQ enhancement for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 11:01:00
R1-1902260	Configured grant enhancement for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 07:31:25

R1-1902261	Wide-band operation for NR-U	Samsung	not treated	2019-02-14 03:47:17	2019-02-15 20:43:31
R1-1902262	Draft LS on SCS of SSB and SS raster for NR-	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902263	Discussion on Wi-Fi preamble	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902264	Evaluation results for directional LBT	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 21:10:03
R1-1902265	Discussion on HARQ-ACK codebook design	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 11:01:00
R1-1902266	Discussion on time/freq-domain enhancements for RACH resources	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 11:01:00
R1-1902267	Discussion on multple msg.1 transmisson	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 11:01:00
R1-1902268	SSB/RMSI Periodicity for Initial Access in IAB	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 15:13:57
R1-1902269	Support of SSBs for IAB Node Discovery and Measurement	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 15:13:57
R1-1902270	Support of RACH Occasions and Periodicity for IAB RACH	Samsung	noted	2019-02-14 03:47:18	2019-02-15 11:01:00
R1-1902271	Resource Multiplexing between Backhaul and Access Links	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 07:37:27
R1-1902272	Support of Case 1 OTA Timing Alignment	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 07:37:27
R1-1902273	On physical layer structures for NR V2X	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902274	On physical layer procedures for NR V2X	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:44:56
R1-1902275	On synchronization mechanisms for NR V2X	Samsung	revised	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902276	On resource allocation mechanisms for NR	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 21:44:01
R1-1902277	On AGC settling issues with evaluation	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902278	Considerations on sidelink HARQ procedure	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:44:56
R1-1902279	Considerarions on Sidelink CSI	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:44:56
R1-1902280	On low-latency sidelink resouce allocation	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:44:56
R1-1902281	Considerations on sidelink RLM	Samsung	not treated	2019-02-14 03:47:18	2019-02-18 11:13:41
R1-1902282	On DMRS design for NR V2X	Samsung	not treated	2019-02-14 03:47:18	2019-02-18 11:13:41
R1-1902283	System level evaluations for NR V2X sidelink resource allocation	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 21:44:01
R1-1902284	System level evaluations considering resource reservation signal and LBT	Samsung	withdrawn	2019-02-14 03:47:18	
R1-1902285	Considerations on channel structures in sensing slots for NR V2X sidelink	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 21:44:01
R1-1902286	Considerations on Sidelink power control	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:44:56
R1-1902287	On sidelink feedback channel format	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 05:35:03
R1-1902288	On Uu for advanced V2X use cases	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902289	On Uu-based sidelink resource allocation and configuration	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:44:56
R1-1902290	On QoS management for NR V2X	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902291	On Coexistence between LTE and NR PC5	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 20:43:31
R1-1902292	Cross-link interference measurements and reporting at a UE	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 15:16:21
R1-1902293	Network coordination mechanism(s) for CLI	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 15:16:21
R1-1902294	RIM RS resource and configurations	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 07:39:45
R1-1902295	OAM functions to support RIM operation	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 07:39:45
R1-1902296	DL Control Enhancements for URLLC	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 21:55:01
R1-1902297	UL Control Enhancements for URLLC	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 21:55:01
R1-1902298	Potential enhancements for PUSCH for	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 11:01:00
R1-1902299	Potential enhancements for scheduling/HARQ/CSI Processing timeline	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 07:01:23
R1-1902300	Uplink inter UE multiplexing/prioritization for enhanced URLLC	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 07:01:23
R1-1902301	Potential enhancement for UL grant-free	Samsung	not treated	2019-02-14 03:47:18	2019-02-15 11:01:00
R1-1902302	Discussion on intra-UE multiplexing	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 07:01:23
R1-1902303	CSI enhancement for MU-MIMO	Samsung	revised	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902304	Summary of CSI enhancement for MU-	Samsung	noted	2019-02-14 03:47:19	2019-02-25 21:43:17
R1-1902305	Enhancements on multi-TRP/panel transmission	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 07:47:46
R1-1902306	Enhancements on multi-beam operation	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:22:34
R1-1902307	View on full power UL transmission	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902308	View on Low PAPR RS	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 07:47:46

R1-1902309	SLS evaluation on Multi-TRP/panel	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 07:49:10
R1-1902310	SLS evaluation on MU-MIMO CSI: FD compression parameters	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902311	SLS evaluation on MU-MIMO CSI: subset selection for FD compression	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902312	SLS evaluation on MU-MIMO CSI: LC	Samsung	revised	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902313	SLS evaluation on MU-MIMO CSI: RI=2	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902314	Preliminary SLS evaluation on Type II rank 3-	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902315	Evaluation on SINR metrics for beam	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902316	On UCI design and CBSR for DFT-based	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:46:35
R1-1902317	Evaluation results on UE power saving	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 07:35:44
R1-1902318	On UE power saving techniques	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 21:59:27
R1-1902319	UE power consumption reduction in RRM measurement	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 07:35:44
R1-1902320	Discussion on evaluation methodology for Dense Urban eMBB scenario	Samsung	not treated	2019-02-14 03:47:19	2019-02-15 08:23:41
R1-1902321	Draft CR on CSI-RS measurement for L3 mobility	ZTE	withdrawn	2019-02-14 04:11:18	2019-02-16 02:46:00
R1-1902322	NR-U PRACH design	Panasonic	not treated	2019-02-14 04:35:58	2019-02-15 08:40:45
R1-1902323	NR-U UL signals and channels	Panasonic	not treated	2019-02-14 04:36:36	2019-02-15 08:40:45
R1-1902324	NR-U PRACH resource enhancement	Panasonic	not treated	2019-02-14 04:38:56	2019-02-15 08:40:45
R1-1902325	HARQ enhancement for NR-U	Panasonic	not treated	2019-02-14 04:49:37	2019-02-15 08:44:40
R1-1902326	Discussion on channel structure for two-step	CMCC	not treated	2019-02-14 06:16:57	2019-02-16 03:08:18
R1-1902327	Discussion on procedure for two-step RACH	CMCC	not treated	2019-02-14 06:16:57	2019-02-16 03:09:44
R1-1902328	Discussion on extensions of SSBs for inter-IAB-node discovery and measurements	CMCC	not treated	2019-02-14 06:16:57	2019-02-16 03:09:44
R1-1902329	Discussions on PRACH enhancements to support NR Backhaul links	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902330	Discussion on HARQ feedback for NR V2X	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902331	Discussion on Uu-based sidelink resource allocation/configuration	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902332	Discussion on UE-UE cross link interference measurements	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902333	Discussion on backhaul information exchange for CLI management	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902334	Further discussion on configuration of RIM	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902335	Further discussion on OAM functions to	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902336	Discussion on UL inter UE Tx	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902337	Discussion on intra-UE multiplexing	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902338	Discussion on multi-TRP/panel transmission	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902339	Enhancements on multi-beam operation	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902340	Discussion on UE power saving schemes with adaption to UE traffic	CMCC	revised	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902341	Discussion on power saving in intra-band RRM measurements	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902342	Consideration on resource of power saving signal for paging monitoring	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902343	Discussion on UL angle-based solution for	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902344	Discussion on measurement reporting for network synchronization error compensation	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902345	Discussion on cross-carrier scheduling with different numerologies	CMCC	not treated	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902346	CR of TS36.211 for correction of higher layer signalling for special subframe configuration	CMCC	revised	2019-02-14 06:16:58	2019-02-16 03:09:44
R1-1902347	CR of TS36.213 for correction of higher layer signalling for special subframe configuration	CMCC	revised	2019-02-14 06:16:58	2019-02-16 03:09:45
R1-1902348	On EPDCCH case determination for non-uniform CSI-RS	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902349	Evaluation results and potential enhancements	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-20 08:26:22
R1-1902350	Priority rules for SRS carrier switching	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-16 04:05:53

R1-1902351	On support of special subframe configuration 10 with FDD+TDD CA	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902352	Support of 6-symbol SRS in UpPTS	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902353	Corrections for VoLTE enhancements	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902354	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902355	UL delay for CE mode B	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902356	Antenna switching for 6 SRS symbol in UpPTS	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902357	Power control for RACH-less HO	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902358	Power control for PUSCH enhancements	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902359	Support of scheduling enhancements for SRS carrier switching	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902360	Correction for DCI 0C and special subframe configuration 10	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902361	Correction for DCI 0C and special subframe configuration 10	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902362	HARQ ID for asynchronous HARQ from DCI format 0	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902363	EPRE for RSS	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902364	EPRE for WUS	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902365	Correction on rate matching for 1024QAM	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902366	UE-group wake-up signal	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902367	Support for transmission in preconfigured UL resources	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902368	Scheduling of multiple DL/UL transport blocks	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902369	Coexistence of LTE-MTC with NR	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902370	Support of Quality report in msg3 and connected mode	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902371	Usage of CRS for MPDCCH	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902372	CE Mode A and B improvements for non-BL Ues	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902373	Use of control region for eMTC Ues	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902374	UE-group wake-up signal	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902375	Support for transmission in preconfigured UL resources	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902376	Scheduling of multiple DL/UL transport blocks	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902377	Coexistence of NB-IoT with NR	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902378	Support of quality report in msg3 for non-anchor	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902379	Presence of NRS on a non-anchor carrier for paging	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902380	Additional SRS symbols	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902381	Virtual cell ID for SRS	Qualcomm Incorporated	not treated	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902382	Evaluation results and potential enhancements	Qualcomm Incorporated	revised	2019-02-14 06:24:00	2019-02-16 07:45:24

R1-1902383	Non-simulation requirements	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902384	Details of wideband PRG	Qualcomm Incorporated	noted	2019-02-14 06:24:00	2019-02-16 04:05:53
R1-1902385	Physical layer structure for NR-V2X	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902386	Physical layer procedure for NR-V2X	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902387	Discussion of synchronization mechanism for	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902388	Discussion of Uu-based sidelink resource allocation and configuration	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902389	Discussion on UE autonomous RA in NR-	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902390	Further enhancements on NR Uu for NR-V2X	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902391	Further considerations on QoS management	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902392	Further considerations on NR and LTE V2X	OPPO	not treated	2019-02-14 07:05:26	2019-02-16 00:07:18
R1-1902393	Discussion on channel structure for 2-step	Panasonic	not treated	2019-02-14 07:09:16	2019-02-15 08:53:47
R1-1902394	Discussion on 2-step RACH procedure	Panasonic	not treated	2019-02-14 07:10:09	2019-02-15 08:53:47
R1-1902395	Discussion on UCI and PUCCH	Panasonic	not treated	2019-02-14 07:11:01	2019-02-15 08:53:47
R1-1902396	Discussion on URLLC enhancements for grant-free transmission	Panasonic Corporation	not treated	2019-02-14 07:11:56	2019-02-15 08:53:47
R1-1902397	System-level Performance Evaluation for SSB Angle Based Positioning	Polaris Wireless	not treated	2019-02-14 07:12:26	2019-02-16 08:28:08
R1-1902398	Discussion on intra-UE Tx	Panasonic	not treated	2019-02-14 07:12:42	2019-02-15 08:53:47
R1-1902399	PDCCH enhancements for NR URLLC	Panasonic	not treated	2019-02-14 07:18:31	2019-02-15 08:53:47
R1-1902400	CSI enhancement for MU-MIMO	Asia Pacific Telecom co.	not treated	2019-02-14 07:25:16	2019-02-15 09:23:26
R1-1902401	Sidelink Physical Procedures for NR V2X	ITRI	not treated	2019-02-14 07:37:21	2019-02-15 09:02:00
R1-1902402	Discussion for NR V2X Sidelink Synchronization Issues and Mechanisms	ITRI	not treated	2019-02-14 07:39:47	2019-02-15 09:02:00
R1-1902403	Discussion on Sidelink resource management techniques for NR V2X	ITRI	not treated	2019-02-14 07:41:32	2019-02-15 09:02:00
R1-1902404	Considerations on Design issues for NR V2X unicast, groupcast, broadcast	ITRI	not treated	2019-02-14 07:42:25	2019-02-15 09:02:00
R1-1902405	Considering on NR Uu for Resource Configuration on controlling NR sidelink	ITRI	not treated	2019-02-14 07:43:51	2019-02-15 09:02:00
R1-1902406	Considerations on issue for resource sharing among different QoS levels	ITRI	not treated	2019-02-14 07:44:38	2019-02-15 09:02:00
R1-1902407	Discussion on Periodical UE Geo-Location and Techniques for NR Positioning	ITRI	not treated	2019-02-14 07:45:38	2019-02-15 09:02:00
R1-1902408	Enhancements on UL Multi-beam Operation	Asia Pacific Telecom co.	not treated	2019-02-14 08:03:45	2019-02-15 09:26:14
R1-1902409	SSB periodicity at initial access 7.2.3.1	Ericsson	not treated	2019-02-14 08:29:58	2019-02-15 23:07:15
R1-1902410	SSB-based IAB node discovery and measurement	Ericsson	not treated	2019-02-14 08:31:03	2019-02-15 23:07:15
R1-1902411	IAB Enhancements for RACH resources	Ericsson	noted	2019-02-14 08:32:06	2019-02-15 23:07:15
R1-1902412	IAB resource configuration and assignment	Ericsson	revised	2019-02-14 08:32:56	2019-02-15 23:07:15
R1-1902413	IAB OTA Timing Alignment	Ericsson	not treated	2019-02-14 08:33:39	2019-02-15 23:07:15
R1-1902414	PDCCH enhancements for NR URLLC	Asia Pacific Telecom co.	not treated	2019-02-14 08:33:54	2019-02-15 09:25:15
R1-1902415	Resource for IAB up-stream (MT)	Ericsson	not treated	2019-02-14 08:34:34	2019-02-15 23:07:15
R1-1902416	PDCCH enhancement for URLLC	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902417	UCI enhancement for URLLC	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902418	PUSCH enhancement for URLLC	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902419	Enhancements on scheduling and HARQ processing timeline	OPPO	revised	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902420	Consideration on UL inter UE Tx prioritization and multiplexing	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902421	UL grant free transmission enhancement	OPPO	revised	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902422	Discussions on intra-UE multiplexing	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902423	Resource allocation enhancements for NR	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57
R1-1902424	On eMBB and URLLC data differentiation	OPPO	not treated	2019-02-14 08:52:24	2019-02-15 11:01:57

R1-1902425	Discussion on UE power saving schemes	Hisense	not treated	2019-02-14 08:53:32	2019-02-16 05:50:02
R1-1902426	Uplink PC for NR-NR Dual Connectivity	Nokia, Nokia	not treated	2019-02-14 08:58:12	2019-02-15 20:26:13
R1-1902427	On cross-carrier scheduling with mixed numerologies	Nokia, Nokia	not treated	2019-02-14 08:58:12	2019-02-15 20:26:13
R1-1902428	Discussion on single uplink operation enhancement for EN-DC	Nokia, Nokia	noted	2019-02-14 08:58:12	2019-02-15 20:26:13
R1-1902429	Efficient CA design	Nokia, Nokia	not treated	2019-02-14 08:58:12	2019-02-15 20:26:13
R1-1902430	SSB periodicity for IAB initial access	Nokia, Nokia	not treated	2019-02-14 09:09:35	2019-02-15 17:23:51
R1-1902431	SSB TX/RX for IAB stage 2 discovery	Nokia, Nokia	not treated	2019-02-14 09:09:35	2019-02-15 17:23:51
R1-1902432	Enhancements on RACH for IAB	Nokia, Nokia Shanghai	not treated	2019-02-14 09:09:35	2019-02-15 17:23:51
R1-1902433	Mechanisms for resource multiplexing among backhaul and access links	Nokia, Nokia	noted	2019-02-14 09:09:35	2019-02-15 17:23:51
R1-1902434	IAB Case #1 timing	Nokia, Nokia	not treated	2019-02-14 09:09:35	2019-02-15 17:23:51
R1-1902435	Initial Access Signals and Channels for NR-U	Nokia, Nokia	not treated	2019-02-14 09:20:33	2019-02-15 20:50:39
R1-1902436	On DL signals and channels	Nokia, Nokia	revised	2019-02-14 09:20:33	2019-02-15 20:50:39
R1-1902437	On wideband operation in NR-U	Nokia, Nokia	not treated	2019-02-14 09:20:33	2019-02-15 20:50:39
R1-1902438	Consideration on NR-U DRS design	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902439	Discussion on NR V2X Sidelink Design	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902440	Discussion on NR V2X sidelink	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902441	PDCCH enhancements for URLLC	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902442	Views on intra-UE DL prioritization for	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902443	Potential enhancements to PUSCH	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902444	UL inter UE Tx prioritization/multiplexing	ETRI	not treated	2019-02-14 09:45:20	2019-02-16 03:21:01
R1-1902445	Discussion on sidelink physical layer procedure on NR V2X	ASUSTEK COMPUTER	not treated	2019-02-14 10:10:31	2019-02-15 10:07:13
R1-1902446	Consideration on Mode 2 NR-V2X sidelink communication	ASUSTEK COMPUTER	not treated	2019-02-14 10:12:52	2019-02-15 10:07:13
R1-1902447	On PUSCH enhancements for NR URLLC	Panasonic	not treated	2019-02-14 10:39:39	2019-02-15 11:05:26
R1-1902448	Draft Reply to LS on SSB based BFD	Intel	noted	2019-02-14 10:40:01	2019-02-16 08:04:50
R1-1902449	[DRAFT] Reply LS on NR-LTE Co-existence	Intel	noted	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902450	UE-group wake-up signal for eMTC	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902451	UL transmission in preconfigured resources for eMTC	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902452	Scheduling of multiple DL/UL TBs for eMTC	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902453	Quality report in Msg3 and connected mode for eMTC	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902454	MPDCCH performance improvement	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902455	CE mode A and B improvements for non-BL UEs	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902456	Use of LTE control channel region for eMTC DL transmission	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902457	UE-group wake-up signal for NB-IoT	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902458	UL transmission in preconfigured resources for NB-IoT	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902459	Scheduling of multiple DL/UL TBs for NB-IoT	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902460	Quality report in Msg3 for NB-IoT non-anchor access	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902461	Additional SRS symbols	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902462	Virtual cell ID support for SRS	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20

R1-1902463	Physical layer aspects of enhanced mobility	Intel Corporation	noted	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902464	Multiple TA for synchronous intra-band EN-	Intel	noted	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902465	Rel-15 NR UE features	Intel	withdrawn	2019-02-14 10:40:01	
R1-1902466	Channel structure for two-step RACH	Intel	noted	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902467	Procedure for two-step RACH	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902468	Initial access signals/channels for NR-	Intel	revised	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902469	DL signals and channels for NR-unlicensed	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902470	UL signals and channels for NR-unlicensed	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902471	Channel access mechanism for NR-	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902472	Enhancements to initial access and mobility for NR-unlicensed	Intel Corporation	revised	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902473	Enhancements to HARQ for NR-unlicensed	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902474	Enhancements to configured grants for NR-	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902475	Wideband operation for NR-unlicensed	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902476	SSB/RMSI periodicity for NR initial access	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902477	SSBs for inter-IAB-node discovery and measurements	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902478	RACH enhancements for NR IAB	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902479	Mechanisms for resource multiplexing among backhaul and access links	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902480	Mechanism to support the "case-1" OTA timing alignment	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902481	Sidelink physical structure for NR V2X	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902482	Physical layer procedures for NR V2X	Intel	revised	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902483	Synchronization for NR V2X sidelink	Intel	revised	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902484	Resource allocation schemes for NR V2X sidelink communication	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902485	Analysis of NR Uu interface to support advanced V2X use cases	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902486	Uu-based sidelink resource allocation for V2X use cases	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902487	QoS and congestion control for NR V2X sidelink communication	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:20
R1-1902488	In-device coexistence for NR V2X sidelink	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:19
R1-1902489	CLI measurement and reporting at a UE	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:19
R1-1902490	Network coordination mechanisms for CLI	Intel Corporation	not treated	2019-02-14 10:40:01	2019-02-16 07:52:19
R1-1902491	Remaining details of RIM-RS configuration	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:19
R1-1902492	Remaining details of OAM functions for RIM	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:19
R1-1902493	On PDCCH enhancements for eURLLC	Intel	not treated	2019-02-14 10:40:01	2019-02-16 07:52:19
R1-1902494	On enhancements to UCI for eURLLC	Intel	not treated	2019-02-14 10:40:01	2019-02-16 09:15:48
R1-1902495	On enhancements to PUSCH for eURLLC	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902496	On enhancements to Scheduling/HARQ/CSI processing	Intel Corporation	revised	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902497	On inter-UE UL multiplexing for eURLLC	Intel	not treated	2019-02-14 10:40:02	2019-02-16 09:01:42
R1-1902498	On enhancements to configured grant	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902499	On enhancements to intra-UE multiplexing for	Intel	not treated	2019-02-14 10:40:02	2019-02-16 09:15:48
R1-1902500	Considerations for IMT-2020 Self-Evaluations	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902501	Type II CSI feedback compression	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902502	On multi-TRP/multi-panel transmission	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902503	On beam management enhancement	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902504	On full power uplink transmission	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:19
R1-1902505	Low PAPR reference signals	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902506	On Type II CSI higher rank extension	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902507	System level evaluation of UE power saving	Intel	not treated	2019-02-14 10:40:02	2019-02-16 08:06:28
R1-1902508	On potential techniques for UE power saving	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 09:01:42

R1-1902509	On RRM aspects of NR UE power saving	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902510	Remaining Open Aspects and Potential Conclusions for NR Positioning Study Item	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902511	Design Aspects for NR DL Positioning	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902512	Design Aspects for NR UL Positioning	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902513	Design Aspects for NR DL and UL Positioning	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902514	NR Positioning Evaluation Results	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902515	Comparative Analysis of NR Positioning	Intel	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902516	Reporting of Received Signal Waveform to Boost NR Positioning Performance	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902517	Uplink power control for NR-NR Dual Connectivity	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902518	On support of cross-carrier scheduling with different numerologies	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902519	On enhanced single tx switched uplink solution for EN-DC	Intel Corporation	not treated	2019-02-14 10:40:02	2019-02-16 07:52:20
R1-1902520	On NR URLLC scheduling and UL cancellation processing timeline	Panasonic	not treated	2019-02-14 10:40:31	2019-02-15 11:05:26
R1-1902521	On NR URLLC UL inter UE Tx	Panasonic	not treated	2019-02-14 10:41:31	2019-02-15 11:05:26
R1-1902522	On multi-TRP enhancements for NR MIMO in Rel. 16	Panasonic	not treated	2019-02-14 10:42:57	2019-02-15 11:05:26
R1-1902523	On enhancements for multi-beam operations for NR MIMO in Rel. 16	Panasonic	not treated	2019-02-14 10:43:46	2019-02-15 11:05:26
R1-1902524	On low PAPR RS for NR MIMO in Rel. 16	Panasonic	not treated	2019-02-14 10:45:00	2019-02-15 11:05:26
R1-1902525	On UE-to-UE cross-link interference measurement and reporting	CEWiT	revised	2019-02-14 11:28:22	2019-02-15 17:11:12
R1-1902526	On Network coordination mechanisms for CLI measurement	CEWiT	not treated	2019-02-14 11:31:06	2019-02-15 17:11:33
R1-1902527	Removal of CSI request in RAR grant	Ericsson	revised	2019-02-14 11:36:17	2019-02-15 15:22:44
R1-1902528	Lower-layer mobility enhancements	Ericsson	noted	2019-02-14 11:36:17	2019-02-15 15:12:54
R1-1902529	Enhancements to multi-beam operation	Ericsson	revised	2019-02-14 11:36:17	2019-02-15 15:04:46
R1-1902530	DL signals and channels for NR-U	PANASONI	not treated	2019-02-14 12:02:22	2019-02-15 12:32:35
R1-1902531	UCI enhancements for NR URLLC	NEC	not treated	2019-02-14 12:29:15	2019-02-15 20:37:50
R1-1902532	UL inter-UE Tx prioritisation and multiplexing	NEC	not treated	2019-02-14 12:29:15	2019-02-15 18:44:24
R1-1902533	Discussion on 2step RACH Structure	LG	not treated	2019-02-14 13:02:22	2019-02-16 06:33:32
R1-1902534	Discussion on 2step RACH Procedure	LG	not treated	2019-02-14 13:02:22	2019-02-16 06:33:32
R1-1902535	Discussion on preamble selection for 2-step	LG	not treated	2019-02-14 13:02:22	2019-02-16 06:33:32
R1-1902536	Remaining details on low PAPR RS	Ericsson	not treated	2019-02-14 13:13:14	2019-02-14 15:29:23
R1-1902537	Further observations on time-domain DMRS	Ericsson	not treated	2019-02-14 13:25:04	2019-02-14 15:29:23
R1-1902538	Correction on uplink resource allocation type 1	Nanjing Ericsson	withdrawn	2019-02-14 13:28:31	
R1-1902539	Correction on uplink resource allocation type 1	Nanjing Ericsson	revised	2019-02-14 13:57:14	2019-02-14 14:37:23
R1-1902540	On multi-TRP and multi-panel	Ericsson	not treated	2019-02-14 14:01:24	2019-02-15 16:17:33
R1-1902541	Discussion on physical layer structure for NR	Sony	not treated	2019-02-14 14:06:46	2019-02-16 03:49:24
R1-1902542	System level simulation results on NR sidelink communication	Sony	not treated	2019-02-14 14:06:46	2019-02-16 03:49:24
R1-1902543	Discussion on multiplexing issues for configured grants in NR-U	TCL Communica	not treated	2019-02-14 14:08:17	2019-02-15 16:23:53
R1-1902544	Wideband carrier usage for NR-U	TCL Communica	not treated	2019-02-14 14:08:17	2019-02-15 16:23:53
R1-1902545	On Sidelink DMRS Design for NR V2X	TCL Communica	not treated	2019-02-14 14:08:17	2019-02-15 16:23:53
R1-1902546	DMRS Overhead Reduction for Intra Slot Repetitions	TCL Communica	not treated	2019-02-14 14:08:17	2019-02-15 16:23:53
R1-1902547	Receiver-assisted LBT for NR-U	TCL Communica	not treated	2019-02-14 14:31:21	2019-02-15 16:23:53

R1-1902548	Discussion on UE power saving and traffic adaptation	Panasonic	not treated	2019-02-14 15:21:27	2019-02-15 10:52:56
R1-1902549	TP on hybrid positioning and GNSS enhancements for TR 38.855	ESA, Mitsubishi Electric	not treated	2019-02-14 15:50:17	2019-02-15 20:02:31
R1-1902550	System level simulations for OTDOA	ESA	revised	2019-02-14 15:52:41	2019-02-15 21:50:42
R1-1902551	Discussion on enhancements for multi-TRP/panel transmission	Fraunhofer HHI,	not treated	2019-02-14 16:32:25	2019-02-15 20:25:26
R1-1902552	Consideration for preconfigured uplink resources (PUR)	Sequans Communica	not treated	2019-02-14 17:40:54	2019-02-14 22:08:41
R1-1902553	Consideration for preconfigured uplink resources (PUR)	Sequans Communica	not treated	2019-02-14 17:44:22	2019-02-14 22:08:41
R1-1902554	On Coexistence Between LTE and NR Side-	DISH	not treated	2019-02-14 19:58:06	2019-02-15 21:05:18
R1-1902555	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	revised	2019-02-14 20:00:42	2019-02-15 22:34:41
R1-1902556	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	revised	2019-02-14 20:00:42	2019-02-15 22:34:41
R1-1902557	Number of HARQ-ACK coded modulation symbols used to determine CSI-part2 coded	Nokia, Nokia	not pursued	2019-02-14 20:00:42	2019-02-15 22:34:41
R1-1902558	Determination of m_0 before dedicated PUCCH resource configuration	Nokia, Nokia	endorsed	2019-02-14 20:00:42	2019-02-15 22:34:41
R1-1902559	Clarifications on CSI reporting on PUSCH	Nokia, Nokia	revised	2019-02-14 20:00:42	2019-02-15 22:34:41
R1-1902560	Correction on DM-RS procedure	Nokia, Nokia	withdrawn	2019-02-14 20:13:05	
R1-1902561	Failure Detection Resources for BFR	Nokia, Nokia	not pursued	2019-02-14 20:16:12	2019-02-16 00:58:39
R1-1902562	CSI Overhead reduction for Type II codebook up to rank 2	Nokia, Nokia	not treated	2019-02-14 20:17:46	2019-02-16 05:45:55
R1-1902563	Enhancements on Multi-TRP/Panel Transmission	Nokia, Nokia	not treated	2019-02-14 20:17:46	2019-02-16 00:58:39
R1-1902564	Enhancements on Multi-beam Operation	Nokia, Nokia	not treated	2019-02-14 20:17:46	2019-02-16 00:58:39
R1-1902565	On the Full TX Power UL transmission	Nokia, Nokia	not treated	2019-02-14 20:17:46	2019-02-16 00:58:39
R1-1902566	Discussion on Low PAPR RS	Nokia, Nokia	not treated	2019-02-14 20:17:46	2019-02-16 00:58:39
R1-1902567	SLS results for Rel-15 Type II codebook extension for higher ranks	Nokia, Nokia	withdrawn	2019-02-14 20:17:46	
R1-1902568	On phase rotations and FD compression	Nokia, Nokia	not treated	2019-02-14 20:17:46	2019-02-16 05:45:55
R1-1902569	Correction to align RAN1 and RAN4 specifications for EN-DC power control	Ericsson	revised	2019-02-14 20:45:29	2019-02-16 07:35:58
R1-1902570	Correction to PUCCH power control	Ericsson	endorsed	2019-02-14 20:45:29	2019-02-16 07:35:58
R1-1902571	Correction to LBRM restriction	Ericsson	revised	2019-02-14 20:45:29	2019-02-16 07:28:48
R1-1902572	Correction to out of order PUSCH transmissions without UL-SCH	Ericsson	not pursued	2019-02-14 20:45:29	2019-02-16 07:28:31
R1-1902573	Discussions on NR V2X Sidelink Physical Layer Structures	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902574	On Sidelink physical layer procedures	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902575	Discussion on NR V2X Sidelink Synchronization	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902576	On Sidelink Resource Allocation	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902577	Discussions on DMRS for NR sidelink	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902578	On Uu for advanced V2X use cases	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902579	On Uu-based sidelink resource allocation/configuration	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902580	On QoS Management	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44

R1-1902581	Discussion on coexistence between NR sidelink and LTE sidelink	Nokia, Nokia	not treated	2019-02-14 20:54:53	2019-02-16 07:34:44
R1-1902582	On Signal Structure for Two-Step RACH	InterDigital, Inc.	not treated	2019-02-14 23:39:40	2019-02-16 02:24:38
R1-1902583	Perspectives on operation of Two-Step RACH	InterDigital, Inc.	not treated	2019-02-14 23:40:42	2019-02-16 02:24:38
R1-1902584	Initial access signals and channels for NR-U	InterDigital, Inc.	not treated	2019-02-14 23:41:42	2019-02-16 02:24:38
R1-1902585	DL signals and channels for gNB initiated COT	InterDigital, Inc.	not treated	2019-02-14 23:42:44	2019-02-16 02:24:38
R1-1902586	Discussion on uplink signals and channels for NR-U	InterDigital, Inc.	not treated	2019-02-14 23:43:33	2019-02-16 02:24:38
R1-1902587	Contention window adjustment and coexistence in NR-U	InterDigital, Inc.	not treated	2019-02-14 23:52:54	2019-02-16 02:24:38
R1-1902588	Initial access and mobility procedures in NR-U	InterDigital, Inc.	not treated	2019-02-14 23:53:48	2019-02-16 02:24:08
R1-1902589	Enhanced HARQ procedures for NR-U	InterDigital, Inc.	not treated	2019-02-14 23:54:30	2019-02-16 02:24:08
R1-1902590	Discussion on configured grant enhancement for NR-U	InterDigital, Inc.	not treated	2019-02-14 23:55:18	2019-02-16 02:24:08
R1-1902591	NR-U wideband operation	InterDigital, Inc.	not treated	2019-02-14 23:56:01	2019-02-16 02:24:08
R1-1902592	Correction to dynamic HARQ codebook in NR	Fujitsu	revised	2019-02-14 23:56:03	2019-02-15 17:32:02
R1-1902593	Correction to SRS/PUSCH/PUCCH transmission in NR CA	Fujitsu	noted	2019-02-14 23:56:03	2019-02-15 17:32:02
R1-1902594	Correction to UE sounding procedure in NR	Fujitsu	revised	2019-02-14 23:56:03	2019-02-15 17:32:02
R1-1902595	Discussion on Physical Layer Structure for NR V2X Sidelink	InterDigital, Inc.	not treated	2019-02-14 23:56:58	2019-02-16 02:24:08
R1-1902596	Discussion on Physical Layer Procedures for NR V2X Sidelink	InterDigital, Inc.	not treated	2019-02-14 23:58:27	2019-02-16 02:24:08
R1-1902597	On Synchronization Mechanism and Procedures for NR V2X	InterDigital, Inc.	not treated	2019-02-14 23:59:32	2019-02-16 02:24:08
R1-1902598	Sidelink Resource Allocation Mechanism for NR V2X	InterDigital, Inc.	not treated	2019-02-15 00:01:26	2019-02-16 02:24:08
R1-1902599	On Waveform for NR V2X Sidelink	InterDigital, Inc.	not treated	2019-02-15 00:03:09	2019-02-16 02:24:08
R1-1902600	Performance Evaluation of NR V2X S-SSB Structures	InterDigital, Inc.	not treated	2019-02-15 00:05:02	2019-02-16 02:24:08
R1-1902601	Performance Evaluation of DMRS for NR V2X	InterDigital, Inc.	not treated	2019-02-15 00:06:47	2019-02-16 02:23:29
R1-1902602	On NR Uu enhancements for advanced V2X use cases	InterDigital, Inc.	not treated	2019-02-15 00:07:55	2019-02-16 02:23:29
R1-1902603	Discussion on Uu-based Sidelink Resource Allocation and Configuration	InterDigital, Inc.	not treated	2019-02-15 00:08:45	2019-02-16 02:23:29
R1-1902604	Discussion on QoS Management	InterDigital, Inc.	not treated	2019-02-15 00:09:25	2019-02-16 02:23:29
R1-1902605	Discussion on Coexistence Between LTE and NR Sidelinks	InterDigital, Inc.	not treated	2019-02-15 00:10:15	2019-02-16 02:23:29
R1-1902606	On Potential PDCCH enhancements for URLLC	InterDigital, Inc.	not treated	2019-02-15 00:11:05	2019-02-16 02:23:29
R1-1902607	On the support of multiple HARQ-ACK codebooks within a slot	InterDigital, Inc.	not treated	2019-02-15 00:11:53	2019-02-16 02:23:29
R1-1902608	On Potential PUSCH enhancements for URLLC	InterDigital, Inc.	not treated	2019-02-15 00:12:40	2019-02-16 02:23:29
R1-1902609	Preliminary performance evaluations for AR/VR	InterDigital, Inc.	not treated	2019-02-15 00:13:24	2019-02-16 02:23:29
R1-1902610	Potential enhancements for UL inter-UE multiplexing	InterDigital, Inc.	not treated	2019-02-15 00:14:34	2019-02-16 02:23:29
R1-1902611	Potential enhancements for UL configured grant	InterDigital, Inc.	not treated	2019-02-15 00:15:14	2019-02-16 02:22:54
R1-1902612	Intra-UE Prioritization/Multiplexing for Scenarios 2-5	InterDigital, Inc.	not treated	2019-02-15 00:16:07	2019-02-16 02:22:54
R1-1902613	L1/PHY Impacts for Intra-UE prioritization/multiplexing scenarios 6-7	InterDigital, Inc.	not treated	2019-02-15 00:16:55	2019-02-16 02:22:54

R1-1902614	Performance Evaluation of Multi-TRP Schemes	InterDigital, Inc.	not treated	2019-02-15 00:17:47	2019-02-16 02:22:54
R1-1902615	Enhancement for multi-beam uplink operation	InterDigital, Inc.	not treated	2019-02-15 00:18:30	2019-02-16 02:22:54
R1-1902616	Discussion on Solutions and UE Capabilities for Full TX Power UL	InterDigital, Inc.	not treated	2019-02-15 00:19:28	2019-02-16 02:22:54
R1-1902617	On Low PAPR RS	InterDigital, Inc.	not treated	2019-02-15 00:20:27	2019-02-16 02:22:54
R1-1902618	Evaluation of UE Power Saving Techniques	InterDigital, Inc.	not treated	2019-02-15 00:21:23	2019-02-16 02:22:54
R1-1902619	On UE Power Saving Techniques	InterDigital, Inc.	not treated	2019-02-15 00:21:58	2019-02-16 02:22:54
R1-1902620	Orthogonal ON/OFF Keying for Wake-up Signal Design	InterDigital, Inc.	not treated	2019-02-15 00:22:40	2019-02-16 02:22:54
R1-1902621	NTN link level channel models	Nokia, Nokia Shanghai	not treated	2019-02-15 00:28:48	2019-02-15 04:28:51
R1-1902622	Cluster angle scaling factors in NTN channel model	Nokia, Nokia Shanghai	not treated	2019-02-15 00:28:48	2019-02-15 04:28:51
R1-1902623	Directional channel response in a dense factory clutter environment	Nokia, Nokia	not treated	2019-02-15 00:28:48	2019-02-15 04:28:51
R1-1902624	Delay Spread Measurement Results and Observations from two Operational Factory Halls at 3.5 GHz for various Antenna	Nokia, Nokia Shanghai	not treated	2019-02-15 00:28:48	2019-02-15 20:55:00
R1-1902625	UL inter-UE multiplexing between eMBB and URLLC	China Telecommu	not treated	2019-02-15 00:40:17	2019-02-15 01:21:15
R1-1902626	Updated results on spectral efficiency and user experienced data rate of Dense Urban-	China Telecommu	not treated	2019-02-15 00:40:17	2019-02-15 01:21:15
R1-1902627	Updated results on spectral efficiency and area traffic capacity of Indoor Hotspot-eMBB	China Telecommu	not treated	2019-02-15 00:40:17	2019-02-15 01:21:15
R1-1902628	Updated results of rural-eMBB for NR and LTE in TDD	China Telecommu	not treated	2019-02-15 00:40:17	2019-02-15 01:21:15
R1-1902629	Initial results on FDD eMBB spectrum efficiency for IMT-2020 self-evaluation	China Telecommu	not treated	2019-02-15 00:40:17	2019-02-15 01:21:15
R1-1902630	Enhancements on multi-beam operation for multi-panel transmission	China Telecommu	not treated	2019-02-15 00:40:17	2019-02-15 01:21:15
R1-1902631	Correction on beam failure detection	Intel	not pursued	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902632	Correction on QCL assumption of PDSCH during beam failure recovery	Intel Corporation	not pursued	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902633	Correction on CORESET0 QCL assumption after beam failure recovery	Intel Corporation	noted	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902634	Correction on QCL assumption of aperiodic CSI-RS for beam management	Intel Corporation	not pursued	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902635	Correction on TCI indication for multi-slot	Intel	revised	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902636	On bitwidth calculation for DCI fields using RRC parameter indicating maximum number	Intel Corporation	revised	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902637	On QCL prioritization for PDSCH overlap	Intel	not pursued	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902638	Draft CR on PUCCH resource determination for carrying HARQ-ACK	Intel Corporation	not pursued	2019-02-15 00:44:59	2019-02-16 07:52:20
R1-1902639	Discussion on sidelink resource allocation	Asia Pacific Telecom co.	not treated	2019-02-15 00:45:47	2019-02-15 09:24:37
R1-1902640	Corrections on channel access procedures in 37.213	Sharp, WILUS Inc.,	revised	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902641	Consideration on UE-group wake-up signal for Rel-16 MTC	Sharp	not treated	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902642	Consideration on UE-group wake-up signal for Rel-16 NB-IoT	Sharp	not treated	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902643	Correction to mapping of SSB to valid PRACH occasion in TS 38.213	Sharp	noted	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902644	Correction to SSB Case C in TS 38.213	Sharp	withdrawn	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902645	Correction to transmission timing adjustments in TS 38.213	Sharp	revised	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902646	Change Request for spreading factor of PUCCH format 4 in TS 38.211	Sharp	not treated	2019-02-15 01:15:35	2019-02-15 22:35:15

R1-1902647	Discussion on rate-matching for LTE CRS	Sharp	not pursued	2019-02-15 01:15:35	2019-02-15 22:35:15
R1-1902648	Correction to bit width of FDRA in DCI format 1_0 in TS 38.212	Sharp	not pursued	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902649	Correction to DCI size alignment in TS 38.212	Sharp	noted	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902650	Correction to resource allocation type 1 in TS 38.214	Sharp	not pursued	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902651	Change Request for alignment of frequency domain resource allocation with 38.213 for a PUSCH transmission scheduled by a RAR	Sharp	revised	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902652	Correction on UL power control	Sharp	not pursued	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902653	On UE specific channel bandwidth	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902654	Initial access signals/channels for NR-U	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902655	Downlink structure and procedure for NR-U operation	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902656	UL signals and channels for NR-U	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902657	Channel access procedure for NR-U	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902658	Initial access procedure for NR-U	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902659	HARQ enhancement for NR unlicensed operation	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902660	Wideband operation and UL/DL indication for NR-U	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902661	Considerations on use of Wi-Fi preamble in NR-U system	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902662	Discussion on physical layer procedures in NR V2X	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902663	URLLC HARQ-ACK feedback enhancements	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902664	Views on potential enhancements to PUSCH for eURLLC	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902665	Views on potential enhancements to Scheduling/HARQ/CSI Processing timeline	Sharp	revised	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902666	Clarifications on uplink system level evaluation for IMT-2020 self-evaluation	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902667	Evaluation results of mobility in Indoor Hotspot - eMBB in FR1 for IMT-2020 self-	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902668	Evaluation results of mobility in Dense Urban – eMBB in FR1 for IMT-2020 self-evaluation	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902669	Evaluation results of mobility in Dense Urban – eMBB in FR2 for IMT-2020 self-evaluation	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902670	Evaluation results of mobility in Rural – eMBB for IMT-2020 self-evaluation	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902671	Discussion on multi-TRP/panel techniques for URLLC	Sharp	not treated	2019-02-15 01:15:36	2019-02-15 22:35:15
R1-1902672	Details of UE CLI measurements	Nokia, Nokia	not treated	2019-02-15 01:16:23	2019-02-15 08:19:26
R1-1902673	Network-based coordination of UL/DL configurations	Nokia, Nokia	not treated	2019-02-15 01:16:34	2019-02-15 08:19:26
R1-1902674	Discussion on RIM-RS configurations	Nokia, Nokia	not treated	2019-02-15 01:16:34	2019-02-15 08:19:26
R1-1902675	Discussion on OAM functions for NR RIM	Nokia, Nokia	not treated	2019-02-15 01:16:34	2019-02-15 08:19:26
R1-1902676	Correction on UL HARQ operation for SUO case 1	Nokia, Nokia	revised	2019-02-15 01:16:34	2019-02-15 08:19:26
R1-1902677	EPDCCH rate matching for CSI-RS with	Samsung	not pursued	2019-02-15 01:39:33	2019-02-15 07:47:46
R1-1902678	Discussion on EPDCCH rate matching for CSI-RS with density less than one	Samsung	not treated	2019-02-15 01:39:33	2019-02-15 07:47:46
R1-1902679	Remaining issues on NR Sidelink PHY	HEPTA	not treated	2019-02-15 01:51:53	2019-02-16 00:55:57

R1-1902680	Remaining issues on NR Sidelink PHY layer procedures for V2X	HEPTA 7291	not treated	2019-02-15 01:54:24	2019-02-16 00:55:57
R1-1902681	Remaining issues on NR Sidelink	HEPTA	not treated	2019-02-15 01:56:17	2019-02-16 00:55:57
R1-1902682	Discussion on initial access in NR-U	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902683	Discussion on UL Signals and Channels in	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902684	Discussion on configured grant enhancement	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902685	Discussion on IAB	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902686	Discussion on CSI Reporting	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902687	Discussion on multi-beam operation	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902688	Discussion on multi-TRP operation	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902689	Discussion on multi-TRP transmission	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902690	Discussion on low PAPR RS	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902691	Correction on block-wise spreading for PUCCH format 4	NEC	endorsed	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902692	Physical layer structure for NR V2X	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902693	Physical layer procedures for NR V2X	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902694	Synchronization mechanism for NR V2X	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902695	Resource allocation mechanism for NR V2X	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902696	Discussion on the coexistence between NR	NEC	not treated	2019-02-15 01:56:32	2019-02-15 14:11:23
R1-1902697	Remaining issues on NR Sidelink resource	HEPTA	not treated	2019-02-15 01:58:52	2019-02-16 00:55:57
R1-1902698	System-level Performance Evaluation of Co-band TBS for TR 38.855	BUPT, ZTE, CAICT	not treated	2019-02-15 02:02:18	2019-02-16 06:21:52
R1-1902699	DL only based Positioning of Co-band TBS	BUPT, ZTE,	not treated	2019-02-15 02:06:21	2019-02-16 07:49:41
R1-1902700	Enhancements on overhead reduction for type	OPPO	not treated	2019-02-15 02:18:54	2019-02-16 02:46:01
R1-1902701	Enhancements on multi-TRP and multi-panel transmission	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902702	Discussion on RS enhancement for PAPR	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902703	Enhancements on rank extension for type II	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902704	Discussion on Multi-beam Operation	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902705	Discussion on the Full TX power UL	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902706	Discussion on CLI measurement and reporting	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902707	Discussion on network coordination mechanism(s) for CLI	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902708	UL power control for NR-NR DC	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902709	On Cross-carrier Scheduling with Different Numerologies	OPPO	not treated	2019-02-15 02:18:54	2019-02-15 10:24:18
R1-1902710	Discussion on physical layer structure for NR V2X	Xiaomi Communica	not treated	2019-02-15 02:19:45	2019-02-15 09:45:28
R1-1902711	On HARQ operation for V2x communications	Xiaomi Communica	not treated	2019-02-15 02:19:45	2019-02-15 09:45:28
R1-1902712	On Synchronization for NR V2X	Xiaomi Communica	not treated	2019-02-15 02:19:45	2019-02-15 09:45:28
R1-1902713	On resource allocation of V2x communications	Xiaomi Communica	not treated	2019-02-15 02:19:45	2019-02-15 09:45:28
R1-1902714	Discussion on multi-beam operation	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902715	Considerations on sidelink QoS management	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902716	Discussion on PDCCH enhancements for URLLC	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902717	Discussion on PUSCH enhancements for URLLC	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902718	Discussion on UL grant-free transmission enhancements for URLLC	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902719	Discussion on HARQ enhancements for NR-U	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902720	Discussion on Type II CSI overhead reduction	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902721	Discussion on DL only based positioning	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902722	Discussion on resource allocation for Mode-2	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19

R1-1902723	Discussion on NR V2X physical layer structure	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902724	Discussion on NR V2X physical layer procedure	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902725	Consideration on NR Uu-based sidelink resource allocation	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902726	Discussion on synchronization mechanism for NR V2X	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902727	Discussion on full TX power for UL transmission	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902728	Discussion on UL Signals and Channels in NR-U	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902729	Discussion on UCI enhancement on URLLC	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902730	Discussion on power imbalance for DMRS	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902731	Consideration on NR RRM for UE power saving	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902732	Discussion on DL signals and channels for NR-U	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902733	Remaining issues on Rel-15 NR UE feature	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902734	Remaining issues on evaluation methodology for UE power saving	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902735	Discussion on potential techniques for UE power saving	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902736	Discussion on DRS in NR-U	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902737	Discussion on initial access and mobility in NR-U	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902738	Clarification on simultaneous PRACH and PUSCH/PUCCH/SRS transmission	Spreadtrum Communica	not pursued	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902739	Discussion on multi-TRP transmission	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902740	Discussion on scheduling_HARQ_CSI processing timeline	Spreadtrum Communications	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902741	Discussion on cross-carrier scheduling with different numerologies	Spreadtrum Communica	not treated	2019-02-15 02:27:57	2019-02-16 04:55:19
R1-1902742	Enhancement on HARQ-ACK feedback for URLLC	III	not treated	2019-02-15 02:39:44	2019-02-15 09:54:25
R1-1902743	SSB/RMSI periodicity for NR initial access	OPPO	not treated	2019-02-15 02:46:22	2019-02-16 03:38:54
R1-1902744	Extension of RACH configuration for backhaul link	OPPO	not treated	2019-02-15 02:46:22	2019-02-16 03:38:54
R1-1902745	UE Adaptation to the Traffic and UE Power Consumption Characteristics	OPPO	not treated	2019-02-15 02:46:22	2019-02-16 03:38:54
R1-1902746	UE power Consumption Reduction in RRM Measurements	OPPO	revised	2019-02-15 02:46:22	2019-02-16 03:38:54
R1-1902747	On Channel Structure for 2-step RACH	OPPO	not treated	2019-02-15 02:46:22	2019-02-16 03:38:54
R1-1902748	On Procedure for 2-step RACH	OPPO	not treated	2019-02-15 02:46:22	2019-02-16 03:38:54
R1-1902749	Correction to Type-1 HARQ-ACK codebook for only one reception	OPPO	not pursued	2019-02-15 03:13:05	2019-02-15 11:01:57
R1-1902750	Discussion on power control mechanism for UL inter UE Tx multiplexing	ASUSTEK COMPUTER	not treated	2019-02-15 03:22:02	2019-02-15 13:41:35
R1-1902751	Triggering adaptation of UE power consumption	ASUSTEK COMPUTER	not treated	2019-02-15 03:25:12	2019-02-15 13:41:51
R1-1902752	Additional resource for RRM measurement in power saving aspect	ASUSTEK COMPUTER	not treated	2019-02-15 03:27:15	2019-02-15 13:42:07

R1-1902753	PDSCH resource allocation restriction for power saving	ASUSTEK COMPUTER	not treated	2019-02-15 03:28:57	2019-02-15 13:42:23
R1-1902754	Evaluation of URLLC Factory Automation	Ericsson	revised	2019-02-15 04:02:35	2019-02-16 08:44:49
R1-1902755	Evaluation of URLLC Factory Automation	Ericsson	revised	2019-02-15 04:02:35	2019-02-16 08:44:49
R1-1902756	Evaluation of Rel-15 Enabled URLLC Use	Ericsson	revised	2019-02-15 04:02:35	2019-02-16 08:44:49
R1-1902757	Evaluation of URLLC Urban Macro Scenario	Ericsson	not treated	2019-02-15 04:02:35	2019-02-16 08:44:49
R1-1902758	Rel-16 Work Item Scope for eURLLC	Ericsson	not treated	2019-02-15 04:02:35	2019-02-23 16:22:15
R1-1902759	On DL signals for NR-U	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902760	Considerations on NR V2X physical layer	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902761	Considerations on NR V2X Synchronization	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902762	Considerations on NR V2X Resource	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902763	Considerations on NR V2X scheduling	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902764	NR URLLC enhancement for cell edge UE	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902765	Considerations on URLLC UL Inter UE Tx prioritization/multiplexing	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902766	Considerations on CSI enhancement for MU-	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902767	Considerations on PDCCH design for NCJT design	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902768	Considerations on beam measurement and reporting enhancement	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902769	Considerations on separate DL and UL beam	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902770	Evaluation of UE power saving techniques	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 05:50:32
R1-1902771	UE power saving techniques	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 05:50:32
R1-1902772	Higher layer techniques for UE power saving	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 05:50:32
R1-1902773	Considerations on uplink power control for supporting NN-DC	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902774	Enhancements to single Tx switched uplink for EN-DC	Apple Inc.	not treated	2019-02-15 04:12:33	2019-02-16 04:36:39
R1-1902775	Discussion on UE-group wake up signal in	NTT	not treated	2019-02-15 05:07:22	2019-02-15 23:52:17
R1-1902776	Discussion on preconfigured UL resources in MTC	NTT DOCOMO,	not treated	2019-02-15 05:07:22	2019-02-15 23:52:17
R1-1902777	Discussion on the use of LTE control channel region for DL transmission	NTT DOCOMO,	not treated	2019-02-15 05:07:22	2019-02-16 02:41:36
R1-1902778	Discussion on UE-group wake up signal in	NTT	not treated	2019-02-15 05:07:22	2019-02-15 23:52:17
R1-1902779	Discussion on preconfigured UL resources in NB-IoT	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-15 23:52:17
R1-1902780	CR on QCL assumption for receiving PDCCH for RAR	NTT DOCOMO,	revised	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902781	Remaining issues on half-duplex UE behavior	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902782	Draft CR on QCL assumption for a CORESET other than 0	NTT DOCOMO,	revised	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902783	Remaining issues on Rel-15 NR UE features	NTT	noted	2019-02-15 05:07:23	2019-02-15 09:22:25
R1-1902784	Discussion on Channel Structure for Two-	NTT	not treated	2019-02-15 05:07:23	2019-02-15 13:03:43
R1-1902785	Discussion on Procedure for Two-step	NTT	noted	2019-02-15 05:07:23	2019-02-15 13:03:43
R1-1902786	Initial access signals and channels for NR-U	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902787	DL signals and channels for NR-U	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902788	UL signals and channels for NR-U	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902789	Channel access procedures for NR-U	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902790	Enhancements to initial access procedure for	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902791	HARQ enhancement for NR-U	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902792	Wide-band operation for NR-U	NTT	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902793	SSB/RMSI periodicity for IAB initial access	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902794	Extensions of SSBs for inter-IAB-node discovery and measurements	NTT DOCOMO,	noted	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902795	Extension of RACH occasions and periodicities for backhaul RACH resources	NTT DOCOMO, INC.	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902796	Mechanisms for resource multiplexing among backhaul and access links	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902797	Mechanism to support the “case-1” OTA timing alignment	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-15 11:00:16
R1-1902798	Sidelink physical layer structure for NR V2X	NTT	not treated	2019-02-15 05:07:23	2019-02-16 01:57:02

R1-1902799	Sidelink physical layer procedure for NR V2X	NTT	not treated	2019-02-15 05:07:23	2019-02-16 01:57:02
R1-1902800	Sidelink synchronization mechanism for NR	NTT	not treated	2019-02-15 05:07:23	2019-02-16 01:57:02
R1-1902801	Sidelink resource allocation mechanism for	NTT	not treated	2019-02-15 05:07:23	2019-02-16 01:57:02
R1-1902802	Uu-based NR sidelink resource allocation/configuration for NR V2X	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-16 01:57:02
R1-1902803	Updated views on LTE and NR sidelink	NTT	not treated	2019-02-15 05:07:23	2019-02-16 01:57:02
R1-1902804	Potential enhancements to PDCCH	NTT	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902805	UCI enhancements for URLLC	NTT	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902806	PUSCH enhancements for URLLC	NTT	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902807	Enhancements to Scheduling/HARQ/CSI Processing timeline for URLLC	NTT DOCOMO, INC.	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902808	UL inter-UE transmission	NTT	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902809	Enhanced UL transmission with configured	NTT	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902810	UL intra-UE transmission	NTT	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902811	Type II CSI overhead reduction	NTT	not treated	2019-02-15 05:07:23	2019-02-16 04:25:43
R1-1902812	Enhancements on multi-TRP/panel transmission	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902813	Discussion on multi-beam enhancement	NTT	not treated	2019-02-15 05:07:23	2019-02-15 10:56:35
R1-1902814	Full Tx Power UL transmission	NTT	not treated	2019-02-15 05:07:23	2019-02-15 10:56:35
R1-1902815	Discussion on Potential Techniques for UE Power Saving	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-15 13:03:43
R1-1902816	Discussion on UE power Consumption Reduction in RRM Measurements	NTT DOCOMO,	revised	2019-02-15 05:07:23	2019-02-15 13:03:43
R1-1902817	Discussion on delay spread for factory scenario	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902818	Power-control for NR-NR dual connectivity	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902819	Cross-carrier Scheduling with Different Numerologies	NTT DOCOMO,	not treated	2019-02-15 05:07:23	2019-02-16 02:12:23
R1-1902820	Potential Enhancements to Single Tx Switched Uplink Solution for EN-DC	NTT DOCOMO,	noted	2019-02-15 05:07:24	2019-02-16 02:12:23
R1-1902821	Use Cases and Scenarios for 2-Step RACH	Ericsson	not treated	2019-02-15 05:30:58	2019-02-16 05:11:12
R1-1902822	Channel Structure for Two-step RACH	Ericsson	not treated	2019-02-15 05:30:58	2019-02-16 05:45:31
R1-1902823	Procedure for Two-step RACH	Ericsson	not treated	2019-02-15 05:30:58	2019-02-16 05:11:12
R1-1902824	Evaluation methodology and metrics for Two-	Ericsson	not treated	2019-02-15 05:30:58	2019-02-16 05:11:12
R1-1902825	Discussion on Rel-15 SRS Power Scaling	Ericsson	noted	2019-02-15 05:30:58	2019-02-16 05:22:30
R1-1902826	On full power UL transmission	Ericsson	not treated	2019-02-15 05:30:58	2019-02-16 05:22:30
R1-1902827	Discussion on PDCCH monitoring after a COT initiated by gNB in NR-U	ITRI	not treated	2019-02-15 05:30:58	2019-02-15 08:58:08
R1-1902828	HARQ enhancements for NR-U	ITRI	not treated	2019-02-15 05:30:59	2019-02-15 08:58:09
R1-1902829	Scheduling/HARQ processing timeline enhancement for URLLC	ITRI	not treated	2019-02-15 05:30:59	2019-02-15 08:58:09
R1-1902830	Correction on SRS Power Scaling	Ericsson	not pursued	2019-02-15 05:41:10	2019-02-16 05:22:30
R1-1902831	Discussion on SL resource allocation	KDDI	revised	2019-02-15 05:51:09	2019-02-15 06:28:23
R1-1902832	Views on additional SRS designs for LTE	Mitsubishi	not treated	2019-02-15 05:56:30	2019-02-15 11:26:22
R1-1902833	Views on multi-beam operation	Mitsubishi	not treated	2019-02-15 05:58:07	2019-02-15 11:26:22
R1-1902834	Uplink PC for Supporting NR-NR DC	Panasonic Corporation	noted	2019-02-15 05:59:29	2019-02-15 10:55:53
R1-1902835	Views on DL only positioning techniques	Mitsubishi	not treated	2019-02-15 06:01:00	2019-02-15 11:26:22
R1-1902836	Views on DL and UL positioning techniques	Mitsubishi Electric Co.	not treated	2019-02-15 06:03:46	2019-02-15 11:26:22
R1-1902837	Evaluation results for NR positioning	Mitsubishi Electric Co.	revised	2019-02-15 06:10:15	2019-02-15 11:26:22
R1-1902838	Views on pre-emption for UL inter UE Tx	Mitsubishi	not treated	2019-02-15 06:12:21	2019-02-15 11:26:22
R1-1902839	Views on pre-emption for UL intra UE Tx	Mitsubishi	not treated	2019-02-15 06:14:50	2019-02-15 11:26:22
R1-1902840	BD/CCE limit for cross-carrier scheduling with different numerologies	Panasonic Corporation	not treated	2019-02-15 06:39:34	2019-02-15 11:08:59
R1-1902841	Draft CR on the number of closed-loop PC processes	Motorola Mobility,	not pursued	2019-02-15 06:41:39	2019-02-16 08:57:45
R1-1902842	Draft CR on TPC command accumulation for slot aggregation	Motorola Mobility,	not pursued	2019-02-15 06:41:39	2019-02-16 08:21:32
R1-1902843	2-step RACH procedure	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 08:57:45

R1-1902844	UCI enhancement for URLLC	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 08:57:45
R1-1902845	PUSCH enhancement for URLLC	Motorola Mobility,	withdrawn	2019-02-15 06:41:39	
R1-1902846	UL inter UE Tx prioritization/multiplexing for URLLC operation	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 07:28:53
R1-1902847	On MU-MIMO CSI Enhancements	Motorola Mobility,	revised	2019-02-15 06:41:39	2019-02-16 07:12:33
R1-1902848	Interrupted transmission indication for Multi-TRP Transmission	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 07:12:33
R1-1902849	Power control for multi-panel uplink transmission	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 10:09:58
R1-1902850	UE power saving schemes	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 09:08:20
R1-1902851	Uplink power control for NR-NR dual-connectivity	Motorola Mobility,	not treated	2019-02-15 06:41:39	2019-02-16 09:40:52
R1-1902852	On NR-U initial access signals/channels	Xiaomi	not treated	2019-02-15 06:41:54	2019-02-15 10:07:02
R1-1902853	NR-U initial access procedure enhancements	Xiaomi	not treated	2019-02-15 06:47:27	2019-02-15 10:07:02
R1-1902854	Configured grant enhancements for NR-U	Panasonic	not treated	2019-02-15 06:48:01	2019-02-15 11:09:13
R1-1902855	Discussion on introduction of additional SRS symbols	Nokia, Nokia	not treated	2019-02-15 07:11:15	2019-02-16 05:59:02
R1-1902856	Remaining issues on virtual cell ID for SRS	Nokia, Nokia	not treated	2019-02-15 07:12:22	2019-02-16 05:59:02
R1-1902857	Additional evaluation results for NC-JT with 4Tx ports per TRP under indoor scenario	Ericsson	not treated	2019-02-15 07:16:23	2019-02-15 16:17:33
R1-1902858	NC-JT performance with layer restriction	Ericsson	not treated	2019-02-15 07:16:30	2019-02-15 16:17:33
R1-1902859	Multi-TRP diversity strategies at 4 GHz	Ericsson	not treated	2019-02-15 07:16:30	2019-02-15 16:17:33
R1-1902860	On the number of TRPs for high reliability at 4	Ericsson	not treated	2019-02-15 07:16:30	2019-02-15 16:17:33
R1-1902861	On MAC-CE signaling impact of Rel-16 TCI indication framework	Ericsson	not treated	2019-02-15 07:16:30	2019-02-15 16:17:33
R1-1902862	Discussion on DL signals and channels in NR	Google Inc.	not treated	2019-02-15 07:17:51	2019-02-16 08:05:45
R1-1902863	Discussion on channel access procedure	Google Inc.	not treated	2019-02-15 07:19:22	2019-02-16 08:05:45
R1-1902864	TR 38.885 v1.0.1 Study on Vehicle-to-Everything	Huawei Tech.(UK)	revised	2019-02-15 07:36:21	2019-02-15 22:09:56
R1-1902865	Enhancements on Multi-TRP/Panel Transmission	Beijing Xiaomi	not treated	2019-02-15 07:41:30	2019-02-15 09:31:06
R1-1902866	Enhancements on beam management	Beijing Xiaomi	not treated	2019-02-15 07:43:17	2019-02-15 09:31:06
R1-1902867	Draft CR on reference slot for PUCCH transmission with HARQ-ACK	WILUS Inc.	not pursued	2019-02-15 07:55:38	2019-02-16 04:18:05
R1-1902868	Discussion on initial access signals and	WILUS Inc.	not treated	2019-02-15 07:55:38	2019-02-16 04:18:05
R1-1902869	Discussion on UL channels for NR-U	WILUS Inc.	not treated	2019-02-15 07:55:38	2019-02-16 04:18:05
R1-1902870	Discussion on channel access procedures for	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902871	Discussion on enhancement to initial access procedure for NR-U	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902872	Discussion on wideband operation for NR-U	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902873	On UCI enhancement for NR URLLC	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902874	On PUSCH enhancement for NR URLLC	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902875	On UL inter-UE multiplexing for NR URLLC	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902876	UL intra-UE transmission prioritization and multiplexing for NR URLLC	WILUS Inc.	not treated	2019-02-15 07:55:39	2019-02-16 04:18:05
R1-1902877	On TYPE-1 HARQ-ACK CB	Nokia, Nokia	not pursued	2019-02-15 08:00:02	2019-02-15 20:50:39
R1-1902878	On half-duplex operation in CA	Nokia, Nokia	postponed	2019-02-15 08:00:02	2019-02-15 20:50:39
R1-1902879	Discussion on UL Inter UE Tx multiplexing	III	not treated	2019-02-15 08:12:10	2019-02-15 09:37:05
R1-1902880	Initial access signals and channels	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902881	DL signals and channels for NR-U	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902882	UL signals and channels for NR-U	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902883	Channel access mechanisms for NR-U	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902884	Enhancements to initial access procedure	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902885	Potential HARQ enhancements for NR-U	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902886	Configured UL grant for NR-U	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902887	Wideband operation for NR-U	Ericsson	revised	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902888	Evaluation results for enhanced PRACH	Ericsson	revised	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902889	Enhanced PUCCH design details	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13

R1-1902890	On the LS from ETSI BRAN	Ericsson	not treated	2019-02-15 08:16:51	2019-02-16 06:20:13
R1-1902891	Physical layer structure for NR V2X	ITL	not treated	2019-02-15 08:19:04	2019-02-16 05:11:43
R1-1902892	Physical layer procedure for NR V2X	ITL	not treated	2019-02-15 08:21:21	2019-02-16 05:11:43
R1-1902893	Discussion on A-CSI with mixed numerology for CA in Rel-15 NR	MediaTek Beijing Inc.	not treated	2019-02-15 08:29:30	2019-02-16 07:00:39
R1-1902894	Correction for handling of CG PUSCH when colliding with dynamic PUSCH of different	Intel Corporation	revised	2019-02-15 08:30:58	2019-02-16 09:01:42
R1-1902895	System level evaluations of eURLLC use	Intel	revised	2019-02-15 08:30:58	2019-02-16 07:52:20
R1-1902896	Considerations on sidelink synchronization for NR V2X	Sequans Communica	not treated	2019-02-15 08:31:18	2019-02-16 01:00:32
R1-1902897	Self-evaluation results for Rural and Dense Urban - eMBB for IMT-2020	CEWiT	not treated	2019-02-15 08:38:36	2019-02-15 13:14:22
R1-1902898	Evaluation framework for NTN	Ericsson	not treated	2019-02-15 08:39:13	2019-02-15 23:26:57
R1-1902899	Frequency compensation in NTN	Ericsson	not treated	2019-02-15 08:40:49	2019-02-15 23:26:57
R1-1902900	Discussion on SL resource allocation	KDDI	not treated	2019-02-15 08:40:54	2019-02-15 08:46:23
R1-1902901	NTN Overview	Ericsson	not treated	2019-02-15 08:42:05	2019-02-15 23:26:57
R1-1902902	On adapting HARQ procedures for NTN	Ericsson	not treated	2019-02-15 08:43:31	2019-02-15 23:26:57
R1-1902903	On adapting random access procedures for	Ericsson	not treated	2019-02-15 08:47:33	2019-02-15 23:26:57
R1-1902904	On UL power control for NTN	Ericsson	not treated	2019-02-15 08:49:38	2019-02-15 23:27:16
R1-1902905	On UL transmission timing for NTN	Ericsson	not treated	2019-02-15 08:54:03	2019-02-15 23:27:16
R1-1902906	Measurement relaxation for UE low battery	Xiaomi	not treated	2019-02-15 08:55:12	2019-02-15 10:07:02
R1-1902907	DL signals and channels for NR-U	Xiaomi	not treated	2019-02-15 09:04:08	2019-02-15 10:07:02
R1-1902908	HARQ enhancement for NR-U	Xiaomi	not treated	2019-02-15 09:05:54	2019-02-15 10:07:02
R1-1902909	Wideband operation for NR-U	Xiaomi	not treated	2019-02-15 09:07:32	2019-02-15 10:07:02
R1-1902910	Considerations on sidelink synchronization mechanism for NR V2X	ITL	not treated	2019-02-15 09:09:40	2019-02-16 07:34:32
R1-1902911	Discussion on PSFCH in NR V2X	ASUSTEK COMPUTER	not treated	2019-02-15 09:14:19	2019-02-15 10:06:26
R1-1902912	Discussion on preemption indication enhancement	ASUSTEK COMPUTER	not treated	2019-02-15 09:15:52	2019-02-15 10:06:26
R1-1902913	Discussion on resource allocation enhancement on URLLC	ASUSTEK COMPUTER	not treated	2019-02-15 09:17:02	2019-02-15 10:06:26
R1-1902914	On Rel-16 LTE SRS enhancements	Ericsson	not treated	2019-02-15 09:22:30	2019-02-15 22:58:08
R1-1902915	On virtual cell ID for SRS	Ericsson	not treated	2019-02-15 09:29:25	2019-02-15 22:58:08
R1-1902916	Discussion on Sidelink groupcast HARQ	Nokia, Nokia	not treated	2019-02-15 09:38:05	2019-02-16 07:34:44
R1-1902917	Considerations on Resource Pool Design for PUSCH in MsgA of 2-step RACH	CAICT	not treated	2019-02-15 09:54:06	2019-02-15 10:05:24
R1-1902918	A scheme of fallback from 2-step RACH to 4-	CAICT	not treated	2019-02-15 09:54:06	2019-02-15 10:05:24
R1-1902919	Discussions on DL signals and channels	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:05:24
R1-1902920	Discussions on UL signals and channels	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:05:24
R1-1902921	Discussion on extensions of SSBs for inter-IAB-node discovery and measurements	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:05:24
R1-1902922	Discussion on RACH occassions and periodicities for backhaul RACH resources	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:05:24
R1-1902923	Considerations on Scrambling Issue for NR V2X Unicast Sidelink	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:05:24
R1-1902924	Potential enhancements to UCI for URLLC	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:57:47
R1-1902925	Potential enhancements to PUSCH for	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:57:47
R1-1902926	Discussion on URLLC reliability/robustness enhancement with multi-TRP/panel	CAICT	not treated	2019-02-15 09:54:07	2019-02-15 10:05:24
R1-1902927	Draft LS to RAN2 on introduction of UE capability for aperiodic CSI-RS triggering	Ericsson	revised	2019-02-15 09:58:51	2019-02-15 17:48:20
R1-1902928	On Enhancement to Initial Access Procedure	Potevio	not treated	2019-02-15 10:00:30	2019-02-15 10:12:54
R1-1902929	Views on the synchronization signal for NR	KT Corp.	not treated	2019-02-15 10:02:03	2019-02-15 13:30:28
R1-1902930	On timing between SRS and CSI-RS in non-codebook based UL	CEWiT	not treated	2019-02-15 10:05:01	2019-02-16 02:00:51

R1-1902931	Discussion on Configured Grant	III	not treated	2019-02-15 10:15:51	2019-02-16 05:33:58
R1-1902932	TR 38.824 Study on physical layer enhancements for NR ultra-reliable low	Huawei	revised	2019-02-15 10:16:49	2019-02-16 04:04:19
R1-1902933	Discussion on transmission in preconfigured UL resources	III	not treated	2019-02-15 10:17:57	2019-02-16 05:33:58
R1-1902934	Evaluations and modeling of UE power	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902935	Techniques for NR UE power saving	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902936	RRM aspects of NR UE power saving	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902937	Additional discussion on Network impact of NR UE power saving	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902938	Prioritization criteria for UE power saving improvement features	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902939	High-level UE Energy Consumption Modeling	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902940	WUS design based on OOK	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902941	Aspects of UE power saving in UL	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902942	UE power saving techniques for Idle and	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:26:25
R1-1902943	Power Control for NR-NR DC	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:35:58
R1-1902944	Cross-carrier scheduling with different numerologies	Ericsson	noted	2019-02-15 10:19:02	2019-02-16 07:35:58
R1-1902945	Enhancements to single-tx operation for EN-DC	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:35:58
R1-1902946	Reduced latency Scell management for NR-	Ericsson	not treated	2019-02-15 10:19:02	2019-02-16 07:35:58
R1-1902947	Draft reply to RAN4 LS on NR-LTE Co-	Ericsson	noted	2019-02-15 10:19:02	2019-02-16 07:35:58
R1-1902948	Text proposal for the requirements involving simulations in TR 36.776	Huawei, HiSilicon	not treated	2019-02-15 10:27:57	2019-02-15 22:07:24
R1-1902949	Text proposal for the conclusion of TR 36.776	Huawei,	not treated	2019-02-15 10:27:57	2019-02-15 22:07:24
R1-1902950	Correction on the 1ms HARQ-ACK transmission for the collision between	Huawei, HiSilicon	revised	2019-02-15 10:27:57	2019-02-16 03:33:34
R1-1902951	Discussion on enhanced UL grant-free	KDDI	not treated	2019-02-15 10:37:45	2019-02-15 15:16:35
R1-1902952	Discussion on TBS determination in	Samsung	withdrawn	2019-02-15 10:38:25	
R1-1902953	Discussion on TBS determination in	Samsung	noted	2019-02-15 10:38:29	2019-02-15 11:01:00
R1-1902954	Discussion on multi-beam operation	KDDI	not treated	2019-02-15 10:39:07	2019-02-15 10:41:21
R1-1902955	DL Frame Structure and COT Aspects for NR-U	Motorola Mobility,	not treated	2019-02-15 10:40:21	2019-02-15 23:15:04
R1-1902956	Improvements to SRS-based UL beam	Ericsson	not treated	2019-02-15 10:41:54	2019-02-15 15:04:46
R1-1902957	Latency analysis of SCell BFR solutions	Ericsson	not treated	2019-02-15 10:41:54	2019-02-15 15:04:46
R1-1902958	On event-driven reporting for beam	Ericsson	not treated	2019-02-15 10:41:54	2019-02-15 15:04:46
R1-1902959	Performance of beam selection based on L1-	Ericsson	not treated	2019-02-15 10:41:54	2019-02-15 15:04:46
R1-1902960	Further simulation results for UL multi-panel	Ericsson	revised	2019-02-15 10:41:54	2019-02-15 15:04:46
R1-1902961	Discussion on channel structure for two-step	KDDI	not treated	2019-02-15 10:44:10	2019-02-15 15:16:35
R1-1902962	Extensions for Channel Access Procedures	Motorola Mobility,	not treated	2019-02-15 10:45:15	2019-02-15 23:15:04
R1-1902963	Initial access procedure for NR-U	Motorola Mobility,	not treated	2019-02-15 10:47:14	2019-02-15 23:15:04
R1-1902964	Discussion on procedure for two-step RACH	KDDI	not treated	2019-02-15 10:47:43	2019-02-15 15:16:35
R1-1902965	Discussion of RAN2 LS on PHR Procedure in Dual-Connectivity	Qualcomm Incorporated	noted	2019-02-15 10:51:22	2019-02-16 07:36:58
R1-1902966	Draft Response LS on PHR Procedure in Dual-Connectivity	Qualcomm Incorporated	noted	2019-02-15 10:51:22	2019-02-16 07:36:58
R1-1902967	Draft CR on correction to frequency-domain starting position indication for SRS resource	Qualcomm Incorporated	revised	2019-02-15 10:51:22	2019-02-16 03:55:46
R1-1902968	Draft CR on clarification of action time for A-CSI-RS as QCL source of PDSCH	Qualcomm Incorporated	not pursued	2019-02-15 10:51:22	2019-02-16 06:58:51
R1-1902969	Draft CR on clarification of action time for A-CSI-RS as QCL source of spatial relation	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 06:58:51
R1-1902970	Draft CR on clarification of action time for A-SRS as QCL source of spatial relation	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 06:58:51
R1-1902971	Draft CR on clarification of PUSCH spatial relation after reception of BFR response	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 06:58:51
R1-1902972	Maintenance for CSI Acquisition	Qualcomm Incorporated	noted	2019-02-15 10:51:23	2019-02-16 04:03:22
R1-1902973	Draft CR on FDRA in DCI Format Description	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 03:28:31

R1-1902974	Draft CR on CORESET Size Smaller than AL	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 03:28:31
R1-1902975	Draft CR on default PDSCH TDRA Table for Type0/0A/2-PDCCH CSS	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 03:28:31
R1-1902976	Draft CR on correction for capability #2 RRC parameter naming	Qualcomm Incorporated	endorsed	2019-02-15 10:51:23	2019-02-16 06:45:50
R1-1902977	Channel Structure for Two-Step RACH	Qualcomm Incorporated	noted	2019-02-15 10:51:23	2019-02-16 07:02:00
R1-1902978	Procedures for Two-step RACH	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 07:02:00
R1-1902979	Other Considerations for Two-Step RACH	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:38:29
R1-1902980	Email discusion summary on response LS to ETSI BRAN and IEEE	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 02:54:03
R1-1902981	Draft LS to ETSI BRAN on short control signaling	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 02:54:03
R1-1902982	Initial access signals and channels for NR-U	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902983	DL signals and channels for NR-U	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902984	UL signals and channels for NR-U	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902985	Channel access procedures for NR unlicensed	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902986	Initial access and mobility procedures for NR-U	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902987	Enhancements to Scheduling and HARQ Operation for NR-U	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902988	Enhancements to configured grants for NR-U	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902989	Wideband operation for NR-U operation	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:54:04
R1-1902990	Proposal for SSB extensions for IAB	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:56:58
R1-1902991	Proposal for RACH extension for IAB	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:56:58
R1-1902992	IAB resource management framework	Qualcomm Incorporated	noted	2019-02-15 10:51:23	2019-02-16 06:56:58
R1-1902993	IAB node synchronization framework	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:56:58
R1-1902994	Considerations on Physical Layer aspects of NR V2X	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1902995	Physical layer procedures for HARQ operation for groupcast and unicast	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1902996	Synchronization design for NR V2X	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1902997	Sidelink resource allocation mechanism for NR V2X	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1902998	Uu for advanced V2X use cases	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1902999	Enhancements of LTE Uu and NR Uu to control NR sidelink	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1903000	Design aspects and requirements for QoS	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1903001	Co-existence aspects for NR-V2X and LTE-V2X	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:14:00
R1-1903002	Signal transmission and measurement for UE-to-UE CLI	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:28:31
R1-1903003	Network coordination and gNB information exchange for CLI	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:28:31
R1-1903004	PDCCH Enhancements for eURLLC	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:43:48
R1-1903005	UCI Enhancements for eURLLC	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:43:48

R1-1903006	PUSCH enhancements for eURLLC	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:43:48
R1-1903007	Processing timeline enhancements for eURLLC	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 07:43:48
R1-1903008	UL Inter-UE Tx Multiplexing and Prioritization	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:43:48
R1-1903009	Enhanced Grant-Free Transmissions for eURLLC	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:43:48
R1-1903010	PHY-layer differentiation for Intra-UE multiplexing	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:43:48
R1-1903011	Full Tx power for UL transmissions	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:44:35
R1-1903012	Lower PAPR reference signals	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 03:44:35
R1-1903013	Comparison between Single-CW and Multi-CW for Multi-TRP	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:59:36
R1-1903014	Comparison between SFN and other multi-TRP schemes for PDSCH reliability	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 02:59:37
R1-1903015	Evaluation Methodology and Results for UE Power Saving	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 07:04:52
R1-1903016	Potential Techniques for UE Power Saving	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 07:04:52
R1-1903017	UE Power Consumption Reduction in RRM Measurements	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 07:04:52
R1-1903018	RAT-dependent DL-only NR positioning techniques	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:54:11
R1-1903019	RAT-dependent UL-only NR positioning techniques	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:54:11
R1-1903020	RAT-dependent DL and UL NR positioning techniques	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:54:11
R1-1903021	Evaluation results for RAT-dependent positioning Techniques	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-16 03:54:11
R1-1903022	RAT Independent and Hybrid Positioning Solutions	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 03:54:11
R1-1903023	Indoor Industrial Channel Model	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:31:24
R1-1903024	On Mobility Enhancements during HO	Qualcomm Incorporated	noted	2019-02-15 10:51:23	2019-02-16 03:47:26
R1-1903025	Uplink Power Control Solutions for NR-NR Dual Connectivity	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:09:02
R1-1903026	Cross-Carrier Scheduling with Different Numerologies	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:09:02
R1-1903027	Enhancements for EN-DC Single-Tx TDM Operation	Qualcomm Incorporated	not treated	2019-02-15 10:51:23	2019-02-16 06:09:02
R1-1903028	Solutions for fast SCG and Scell activiation	Qualcomm Incorporated	noted	2019-02-15 10:51:23	2019-02-16 06:09:02
R1-1903029	Draft CR on clarification of action time for A-CSI-RS as QCL source of spatial relation	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 06:57:49
R1-1903030	Draft CR on clarification of action time for A-SRS as QCL source of spatial relation	Qualcomm Incorporated	not pursued	2019-02-15 10:51:23	2019-02-16 06:57:49
R1-1903031	Draft CR on guard period for dynamic grant overriding configured grant	Qualcomm Incorporated	revised	2019-02-15 10:51:23	2019-02-23 16:22:15
R1-1903032	Remaining issues for CLI measurement and reporting	Ericsson	not treated	2019-02-15 11:13:55	2019-02-15 17:48:20
R1-1903033	Remaining issues for network coordination mechanism	Ericsson	not treated	2019-02-15 11:13:55	2019-02-15 17:48:20
R1-1903034	On RIM-RS resource and configurations	Ericsson	not treated	2019-02-15 11:13:55	2019-02-15 17:48:20
R1-1903035	On OAM functions to support RIM operation	Ericsson	not treated	2019-02-15 11:13:55	2019-02-15 17:48:20
R1-1903036	Evaluation results for CLI mitigation schemes	Ericsson	not treated	2019-02-15 11:13:55	2019-02-15 17:48:20
R1-1903037	Multi-slot CQI for CLI measurement	Ericsson	not treated	2019-02-15 11:13:55	2019-02-15 17:48:20
R1-1903038	On CSI enhancements for MU-MIMO	Ericsson	revised	2019-02-15 11:13:55	2019-02-16 08:23:55
R1-1903039	Scheduling/HARQ Processing Timeline Enhancements for NR URLLC	Fraunhofer HHI, Fraunhofer	not treated	2019-02-15 11:32:36	2019-02-15 14:57:50

R1-1903040	NR Features and Capabilities	Qualcomm Incorporated	withdrawn	2019-02-15 11:40:53	
R1-1903041	UE capabilities for NR-NR dual connectivity	Qualcomm Incorporated	noted	2019-02-15 11:40:53	2019-02-16 03:39:50
R1-1903042	CSI enhancement for MU-MIMO support	Qualcomm Incorporated	not treated	2019-02-15 11:40:53	2019-02-16 03:34:19
R1-1903043	Multi-TRP Enhancements	Qualcomm Incorporated	not treated	2019-02-15 11:40:53	2019-02-16 02:59:37
R1-1903044	Enhancements on Multi-beam Operation	Qualcomm Incorporated	not treated	2019-02-15 11:40:53	2019-02-16 04:01:07
R1-1903045	Correction on physical downlink control channel	ASUSTEK COMPUTER	revised	2019-02-15 11:56:37	2019-02-15 13:54:23
R1-1903046	Enhancements on multiple TRP or panel transmission	ASUSTEK COMPUTER	not treated	2019-02-15 11:58:30	2019-02-15 13:54:34
R1-1903047	Enhancements on multi-beam operation	ASUSTEK COMPUTER	not treated	2019-02-15 11:59:25	2019-02-15 13:54:46
R1-1903048	Cross-carrier scheduling with different numerologies	ASUSTEK COMPUTER	not treated	2019-02-15 12:00:17	2019-02-15 13:54:58
R1-1903049	DL signals and channels for NR-U	ASUSTEK COMPUTER	not treated	2019-02-15 12:01:46	2019-02-15 13:55:10
R1-1903050	Enhancement to initial access for NR-U	KT Corp.	not treated	2019-02-15 12:26:07	2019-02-15 12:28:08
R1-1903051	Timing Advance Adjustments for Satellite Communications (NTN)	Fraunhofer IIS	not treated	2019-02-15 12:28:34	2019-02-15 12:31:50
R1-1903052	Considerations on UL inter UE Tx	KT Corp.	not treated	2019-02-15 12:31:31	2019-02-19 08:22:15
R1-1903053	Uplink NR TDOA Design	Fraunhofer IIS,	not treated	2019-02-15 12:36:06	2019-02-15 20:37:38
R1-1903054	SLS results for NR positioning potential solutions	Fraunhofer IIS,	revised	2019-02-15 12:36:57	2019-02-15 20:37:39
R1-1903055	Carrier Phase enhanced potential solution for NR positioning schemes	Fraunhofer IIS,	not treated	2019-02-15 12:37:54	2019-02-15 20:37:39
R1-1903056	Channel structure for 2-step RACH	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 02:03:23
R1-1903057	Discussion on 2-step RACH procedure	Huawei,	noted	2019-02-15 12:38:34	2019-02-16 02:03:23
R1-1903058	Other issues for 2-step RACH	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 02:03:23
R1-1903059	Deployment scenarios and design target for 2-	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 02:03:23
R1-1903060	Spectrum utilization in unlicensed bands	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:08:03
R1-1903061	Performance evaluation of initial signals	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:08:04
R1-1903062	Inband leakage and blocking in wideband	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:08:04
R1-1903063	Further evaluation of coexistence in 6GHz	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:08:05
R1-1903064	Discussion on the LS reply to ETSI BRAN	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:08:05
R1-1903065	Remaining issues on SSB periodicity for IAB	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 00:57:46
R1-1903066	LTE Uu support for advanced V2X use cases.	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903067	Discussion on NR Uu to control LTE sidelink	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903068	Sidelink discovery for NR V2X	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903069	Frame and slot structure for sidelink	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903070	Sidelink CSI	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903071	Design and contents of PSCCH and PSFCH	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903072	BWP operation for V2X sidelink	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903073	Discussion on LTE Uu to control NR sidelink	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903074	Power control and power sharing for V2X	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903075	Beamforming for V2X sidelink for FR1 and	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903076	Sidelink measurements	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 21:59:33
R1-1903077	Compact DCI for URLLC	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 03:35:07
R1-1903078	Enhanced CSI measurement and reporting for	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 03:35:07
R1-1903079	Discussion on explicit HARQ-ACK feedback for configured grant transmission	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:35:07
R1-1903080	Detailed design on multiple active configurations for configured grant	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:35:07
R1-1903081	Intra-UE transmission prioritization and	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 04:05:46
R1-1903082	DL intra-UE transmission prioritization and	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 04:05:46
R1-1903083	Discussion on differentiation of eMBB and	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 04:05:46

R1-1903084	Scheduling reliable retransmission	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 04:05:46
R1-1903085	Considerations and evaluation results for IMT-2020 for eMBB spectral efficiency in NR	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:33:27
R1-1903086	Consideration on self evaluation of IMT-2020 for area traffic capacity in NR	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:33:27
R1-1903087	Consideration on LTE evaluation features and parameters for IMT-2020 self evaluation on	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:33:27
R1-1903088	Considerations and evaluation results for IMT-2020 for eMBB spectral efficiency in LTE	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:33:27
R1-1903089	Consideration on self evaluation of IMT-2020 for area traffic capacity in LTE	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 03:33:27
R1-1903090	UL/DL BM for latency/overhead reduction	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903091	Panel-based UL beam selection	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903092	Beam measurement and reporting using L1-	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903093	Beam failure recovery for SCell	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903094	Evaluation results of multi-beam operation	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903095	Evaluation results of DFT-based	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903096	Discussion of high resolution codebook	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903097	Phase Randomization and Correction for CSI quantization in frequency domain	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903098	Evaluation results for multi-TRP/panel	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903099	Single PDCCH based multi-TRP/panel	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903100	CSI measurement enhancement for multi-TRP/panel transmission	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903101	Reliability/robustness enhancement with	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 02:25:43
R1-1903102	Evaluation results of sequence design for Pi/2-BPSK DFT-S-OFDM	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903103	Evaluation results of full power transmission for UL MIMO with multiple PAs	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903104	Discussion on RAN2 impacts for NR-MIMO enhancements in Rel-16	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903105	Discussion on CW to layer mapping in single-DCI based multi-TRP transmission	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903106	Evaluation methodology for multi-beam	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 01:55:46
R1-1903107	TP on the conclusion for NR RAT dependent	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 17:49:11
R1-1903108	Survey of frequency band of interest for	Huawei,	not treated	2019-02-15 12:38:34	2019-02-15 22:29:04
R1-1903109	Investigation of characteristics of industrial factory environment	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-15 22:29:04
R1-1903110	Existing literature and measurement review for industrial factory environment	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-15 22:29:04
R1-1903111	Preliminary channel measurement on large-scale propagation loss for indoor factory	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-15 22:29:04
R1-1903112	Preliminary channel measurement on fast fading parameters for indoor factory	Huawei, HiSilicon	not treated	2019-02-15 12:38:34	2019-02-15 22:29:04
R1-1903113	Overview on NR mobility enhancements	Huawei, HiSilicon	noted	2019-02-15 12:38:34	2019-02-16 03:35:54
R1-1903114	Discussion on scenarios for mobility	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 03:35:54
R1-1903115	Details on mobility enhancements	Huawei,	not treated	2019-02-15 12:38:34	2019-02-16 03:35:54
R1-1903116	Corrections for TR38.811 Chapter 6 Non-Terrestrial Networks channel models	Huawei, HiSilicon, Nokia, Nokia Shanghai Bell, Thales,	not treated	2019-02-15 12:38:34	2019-02-15 20:40:36
R1-1903117	Correction on PUSCH resource allocation	Huawei, HiSilicon	revised	2019-02-15 12:38:35	2019-02-16 02:53:31
R1-1903118	Corrections on the description of SRS request in 38.214	Huawei, HiSilicon	endorsed	2019-02-15 12:38:35	2019-02-16 01:27:20
R1-1903119	IMT-2020 self-evaluation: mMTC coverage, data rate, latency & battery life	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:09:24
R1-1903120	IMT-2020 self-evaluation: mMTC non-full buffer connection density for LTE-MTC and	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:09:24
R1-1903121	IMT-2020 self-evaluation: CP latency	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:16:55
R1-1903122	Further discussion on channel modelling for the Indoor industrial scenario	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:01:28

R1-1903123	Email discussion on frequency bands of interest	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:01:28
R1-1903124	Email discussion on measurements and observations	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:01:28
R1-1903125	Email discussion on scenario description	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:01:28
R1-1903126	Introduction of the indoor industrial scenario	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:01:28
R1-1903127	Path loss, LOS probability and penetration modeling for indoor industrial	Ericsson	not treated	2019-02-15 13:14:02	2019-02-15 22:01:27
R1-1903128	Fast fading model for indoor industrial	Ericsson	not treated	2019-02-15 13:14:03	2019-02-15 22:01:28
R1-1903129	Additional modelling components for Indoor	Ericsson	not treated	2019-02-15 13:14:03	2019-02-15 22:01:28
R1-1903130	V2X antenna model and pathloss correction	Fraunhofer HHI,	revised	2019-02-15 13:18:51	2019-02-15 15:00:21
R1-1903131	Removal of UL transmision restrictions for paired spectrum	Nokia, Nokia	revised	2019-02-15 13:20:33	2019-02-15 18:28:14
R1-1903132	Unnecesary UL-DL slot configuration restrictions in respect of pdcch-ConfigSIB1	Nokia, Nokia	not pursued	2019-02-15 13:20:33	2019-02-15 18:28:14
R1-1903133	Comparison of DRX with WUS and GTS schemes	Nokia, Nokia	not treated	2019-02-15 13:20:33	2019-02-15 18:29:08
R1-1903134	On UE adaptation to the traffic	Nokia, Nokia	not treated	2019-02-15 13:20:33	2019-02-15 18:29:08
R1-1903135	On potential power saving triggering signals	Nokia, Nokia	not treated	2019-02-15 13:20:33	2019-02-15 18:29:08
R1-1903136	UE Power Consumption Reduction in RRM Measurements	Nokia, Nokia	not treated	2019-02-15 13:20:33	2019-02-15 18:29:08
R1-1903137	Considerations for limiting the PDCCH blind decoding candidates	Nokia, Nokia	not treated	2019-02-15 13:20:33	2019-02-15 18:29:08
R1-1903138	On mobility enhancements during cell change	Nokia, Nokia Shanghai	noted	2019-02-15 13:20:33	2019-02-15 18:28:37
R1-1903139	DL Positioning Solutions	Ericsson	not treated	2019-02-15 13:40:13	2019-02-15 23:06:09
R1-1903140	UL Positioning Solutions	Ericsson	not treated	2019-02-15 13:40:13	2019-02-15 23:06:09
R1-1903141	On the use of RTT for positioning	Ericsson	not treated	2019-02-15 13:40:13	2019-02-15 23:06:09
R1-1903142	System-level Performance Evaluation for RAT-Dependent Positioning Techniques	Ericsson	not treated	2019-02-15 13:40:13	2019-02-15 23:06:09
R1-1903143	NR RAT Independent and Hybrid Positioning Solutions	Ericsson	not treated	2019-02-15 13:40:13	2019-02-15 23:06:09
R1-1903144	Co-ordination among UE, gNB and Location Server for PRS Configuration and Feedbacks	Ericsson	not treated	2019-02-15 13:40:13	2019-02-15 23:06:09
R1-1903145	Discussion on short fixed duration LBT for transmissions outside a COT	Broadcom	revised	2019-02-15 13:43:47	2019-02-16 08:53:55
R1-1903146	Discussion on the use of 802.11 preamble for	Broadcom	revised	2019-02-15 13:51:52	2019-02-16 08:53:55
R1-1903147	Considerations on two-step RACH for NTN	THALES	not treated	2019-02-15 14:36:54	2019-02-15 15:47:44
R1-1903148	Timing alignment in NTN	THALES	not treated	2019-02-15 14:41:10	2019-02-15 15:56:13
R1-1903149	On Additional RACH Opportunities for NR-U	Convida	not treated	2019-02-15 14:41:16	2019-02-16 05:09:56
R1-1903150	PHR timing for configured grant	Nokia, Nokia	not pursued	2019-02-15 14:42:17	2019-02-15 20:26:13
R1-1903151	On features mandatory without capability	Nokia, Nokia	noted	2019-02-15 14:42:18	2019-02-15 20:55:53
R1-1903152	Flexible starting point for PUSCH due to LBT	Convida	not treated	2019-02-15 14:42:31	2019-02-16 05:09:56
R1-1903153	Discussion on Sidelink Procedures	Convida	not treated	2019-02-15 14:43:34	2019-02-16 06:49:24
R1-1903154	Initial access in NTN	THALES	not treated	2019-02-15 14:44:15	2019-02-15 16:15:46
R1-1903155	Design Considerations for NR V2X	Convida	not treated	2019-02-15 14:44:21	2019-02-16 05:09:56
R1-1903156	On Sidelink Resource Allocation	Convida	not treated	2019-02-15 14:45:21	2019-02-16 07:17:33
R1-1903157	On Intra-UE prioritization	Convida	not treated	2019-02-15 14:46:45	2019-02-16 05:09:56
R1-1903158	Doppler spectrum in NTN	THALES	not treated	2019-02-15 14:47:28	2019-02-15 15:42:09
R1-1903159	On Beam Failure Recovery for SCell	Convida	not treated	2019-02-15 14:47:59	2019-02-16 05:09:56
R1-1903160	Clarification regarding non-full-duplex UE communication	Nanjing Ericsson	revised	2019-02-15 15:01:30	2019-02-15 22:57:07
R1-1903161	DMRS sequence index for PUSCH sub-PRB allocation for LTE-MTC	Ericsson	revised	2019-02-15 15:17:52	2019-02-15 22:31:35
R1-1903162	Edge PRB restriction for flexible starting PUSCH PRB for LTE-MTC	Ericsson, Qualcomm	revised	2019-02-15 15:17:52	2019-02-15 22:28:09
R1-1903163	Remaining details on physical structure for NR SL	Ericsson	not treated	2019-02-15 15:18:43	2019-02-15 17:42:39

R1-1903164	Remaining details on PHY procedures for Rel. 16 NR V2X	Ericsson	noted	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903165	On Synchronization for NR Sidelink	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903166	Resource allocation procedures for Mode 2	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903167	System level evaluations of NR V2X sidelink	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903168	Clustering and Cluster Head Election Schemes for In-Coverage and Out-of-	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903169	NR Uu enhancements for advanced V2X use cases	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903170	Remaining details on Uu based resource allocation for SL	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903171	Remaining RAN1 issues for NR SL QoS	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903172	Remaining details on in-device coexistence issues for SL V2X	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903173	On SCI and SFCI formats	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903174	Configuration details for NR V2X scenarios	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903175	Details on CSIT acquisition for SL unicast	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903176	On L1 measurements for sidelink	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:38
R1-1903177	On NR sidelink resources	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 18:08:34
R1-1903178	On the NR sidelink discovery	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903179	On HARQ support for mode-1	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903180	Link level evaluations of NR PSCCH	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903181	Link level evaluations of NR PSSCH	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903182	Text Proposal for TR Conclusion	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903183	Discussion on NR V2X Work Item scope	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903184	On Interface Selection	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903185	On link adaptation for sidelink groupcast	Ericsson	not treated	2019-02-15 15:18:46	2019-02-15 17:42:39
R1-1903186	Discussion on 2-step RACH for NR	Fraunhofer HHI,	not treated	2019-02-15 15:42:09	2019-02-15 20:25:26
R1-1903187	Workplan for the DC and CA enhancements WI	Ericsson, Nokia	noted	2019-02-15 15:53:00	2019-02-16 07:35:58
R1-1903188	TP for TR 38.885 on Uu multicast/broadcast	Huawei, HiSilicon,	revised	2019-02-15 16:01:31	2019-02-15 21:59:33
R1-1903189	TP for TR 38.885 Conclusions	Huawei,	not treated	2019-02-15 16:01:31	2019-02-15 21:59:33
R1-1903190	Evaluation result about A-CSI on PUCCH for	Huawei,	revised	2019-02-15 16:01:32	2019-02-16 03:35:07
R1-1903191	Considerations and evaluation results for IMT-2020 for mMTC connection density	Huawei, HiSilicon	not treated	2019-02-15 16:01:32	2019-02-16 03:33:27
R1-1903192	UE power saving for paging	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 02:56:17
R1-1903193	UE reporting assistance information to gNB	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 02:56:17
R1-1903194	Calibration results for power saving study	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 02:56:17
R1-1903195	Overview of NTN	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903196	Discussion on data transmission related	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903197	Discussion on timing advance for NTN	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903198	Discussion on NTN in Rel-16	Huawei,	withdrawn	2019-02-15 16:01:32	
R1-1903199	Discussion on timing issues in random	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903200	Discussion on PAPR in NTN	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903201	Evaluation of DL synchronization and central frequency tracking for NTN	Huawei, HiSilicon	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29

R1-1903202	Discussion on cell measurement for mobility management in NTN	Huawei, HiSilicon	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903203	Discussion on HARQ for NTN	Huawei,	not treated	2019-02-15 16:01:32	2019-02-16 01:00:29
R1-1903204	Discussion on UE power saving in Rel-16	Huawei,	withdrawn	2019-02-15 16:01:32	
R1-1903205	Correction on PDCCH selection among different QCL-TypeD property	Huawei, HiSilicon	revised	2019-02-15 16:01:32	2019-02-16 02:53:31
R1-1903206	Clarification on HARQ-ACK codebook and PUCCH resource determination	Huawei, HiSilicon	not pursued	2019-02-15 16:01:32	2019-02-16 02:53:31
R1-1903207	Correction on DCI format 2_3 for SUL cell in TS 38.213	Huawei, HiSilicon	revised	2019-02-15 16:01:32	2019-02-16 03:33:27
R1-1903208	Remaining issue on DCI format ambiguity	Huawei, HiSilicon	not pursued	2019-02-15 16:01:32	2019-02-16 02:53:31
R1-1903209	Clarification on UL/SUL indicator field and SRS request field in DCIs	Huawei, HiSilicon	noted	2019-02-15 16:01:32	2019-02-16 05:49:56
R1-1903210	Introduction of SUO Case 1 for NE-DC in TS	Huawei,	revised	2019-02-15 16:01:32	2019-02-16 03:31:19
R1-1903211	Introduction of SUO Case 1 for NE-DC in TS	Huawei,	revised	2019-02-15 16:01:32	2019-02-16 03:31:19
R1-1903212	Correction on DCI format 2_3 for SUL cell in	Huawei,	revised	2019-02-15 16:01:32	2019-02-16 03:31:19
R1-1903213	TP for TR 38.885 Section 11: Evaluations	Huawei	not treated	2019-02-15 16:01:32	2019-02-15 21:59:33
R1-1903214	Correction on association of SSB and PRACH occasion	Huawei, HiSilicon	noted	2019-02-15 16:01:32	2019-02-16 03:07:07
R1-1903215	Introduction of CLI RSSI and SRS-RSRP measurement in TS 38.215	Huawei, HiSilicon	noted	2019-02-15 16:03:23	2019-02-16 02:54:18
R1-1903216	Link and system level performance evaluation	THALES	not treated	2019-02-15 16:07:05	2019-02-15 18:12:41
R1-1903217	PHY aspects of a moving RAN in non-	Ericsson	not treated	2019-02-15 17:36:17	2019-02-15 23:27:16
R1-1903218	On Sync and PBCH reading in NTN	Ericsson	not treated	2019-02-15 17:38:32	2019-02-15 23:27:16
R1-1903219	On UE-to-UE cross-link interference measurement and reporting	CEWiT	not treated	2019-02-18 10:01:27	2019-02-18 19:46:39
R1-1903220	System level simulations for OTDOA	ESA	not treated	2019-02-18 10:02:33	2019-02-18 10:37:49
R1-1903221	Feature lead summary #2 of Enhancements to initial access procedure	Charter Communica	noted	2019-02-18 11:01:51	2019-02-27 19:37:55
R1-1903222	Updated System-level Performance Evaluation for NR Positioning	CATT	not treated	2019-02-18 11:04:07	2019-02-20 08:26:22
R1-1903223	CSI Enhancement for MU-MIMO Support	MediaTek	not treated	2019-02-18 11:05:18	2019-02-27 05:47:55
R1-1903224	Discussion on quantization schemes	MediaTek	revised	2019-02-18 11:06:00	2019-02-27 05:47:56
R1-1903225	Discussion on FD component selection and coefficient subset selection	MediaTek Inc.	not treated	2019-02-18 11:06:40	2019-02-27 05:47:56
R1-1903226	IAB resource configuration and assignment	Ericsson	not treated	2019-02-18 11:17:28	2019-02-18 19:46:39
R1-1903227	Enhancements to scheduling/HARQ/CSI processing timeline for URLLC	Huawei, HiSilicon	not treated	2019-02-18 19:39:52	2019-02-19 10:08:20
R1-1903228	Draft CR on obtaining P0_Nominal for virtual PHR on SCell without RACH	ZTE	withdrawn	2019-02-19 08:23:42	2019-02-20 08:26:22
R1-1903229	System level performance with explicit link level simulation for downlink OTDOA and	MediaTek Inc.	revised	2019-02-19 08:25:43	2019-02-20 08:26:22
R1-1903230	Further simulation results for UL multi-panel	Ericsson	not treated	2019-02-19 21:15:46	2019-02-20 08:26:22
R1-1903231	Enhancements to multi-beam operation	Ericsson	not treated	2019-02-19 21:16:17	2019-02-20 08:26:22
R1-1903232	Correction of wrong implementation on frequency domain resource assignment	ETSI MCC	agreed	2019-02-20 08:21:10	2019-02-20 08:26:22
R1-1903233	Baseline performance achievable with Rel-15 URLLC for power distribution	Huawei, HiSilicon	not treated	2019-02-20 08:27:57	2019-02-22 07:27:14
R1-1903234	UCI enhancements for URLLC	Huawei,	not treated	2019-02-20 08:28:23	2019-02-21 07:56:07
R1-1903235	Evaluation result about A-CSI on PUCCH for	Huawei,	not treated	2019-02-20 08:29:04	2019-02-21 07:56:07
R1-1903236	Discussion on UE power Consumption Reduction in RRM Measurements	NTT DOCOMO,	not treated	2019-02-20 08:29:51	2019-02-21 07:56:07
R1-1903237	Discussion on TRS availability out of DRX	vivo	withdrawn	2019-02-20 08:30:50	
R1-1903238	Discussion on initial access signals and	vivo	not treated	2019-02-20 08:31:31	2019-02-21 07:56:07
R1-1903239	On downlink OTDOA and angle based techniques	MediaTek Inc.	not treated	2019-02-20 08:33:15	2019-02-21 07:56:07
R1-1903240	Maintenance for rate matching	MediaTek Inc.	noted	2019-02-20 14:05:13	2019-02-22 10:21:17
R1-1903241	On DL signals and channels	Nokia, Nokia	not treated	2019-02-20 14:07:56	2019-02-22 12:46:15

R1-1903242	Scheduling/HARQ processing timeline enhancements for NR URLLC	LG Electronics	not treated	2019-02-20 14:09:07	2019-02-22 07:27:14
R1-1903243	Discussion on UL inter UE Tx prioritization	LG	not treated	2019-02-20 14:09:48	2019-02-21 07:56:07
R1-1903244	Feature lead summary of Enhancements on Multi-beam Operations	LG Electronics	noted	2019-02-20 14:26:36	2019-02-27 19:37:55
R1-1903245	Feature lead summary for Scheduling of multiple DL/UL transport blocks for LTE-	Ericsson	noted	2019-02-20 14:26:37	2019-02-25 21:43:21
R1-1903246	Feature lead summary for Coexistence of	Ericsson	noted	2019-02-20 14:26:37	2019-02-25 21:43:21
R1-1903247	Feature lead summary for Group Wake-up	Ericsson	noted	2019-02-20 14:26:37	2019-02-25 21:43:21
R1-1903248	LTE-M Preconfigured UL Resources Summary RAN1 #96	Sierra Wireless	noted	2019-02-20 14:26:38	2019-02-25 21:43:21
R1-1903249	Edge PRB restriction for flexible starting PUSCH PRB for LTE-MTC	Ericsson, Qualcomm	revised	2019-02-20 14:26:38	2019-02-25 21:43:21
R1-1903250	DMRS sequence index for PUSCH sub-PRB allocation for LTE-MTC	Ericsson	revised	2019-02-20 14:26:38	2019-02-25 21:43:21
R1-1903251	Presence of NRS on a non-anchor for paging (feature lead summary)	Qualcomm Incorporated	noted	2019-02-20 14:26:39	2019-02-27 19:37:56
R1-1903252	Summary of 6.2.1.1 UE group MWUS	Qualcomm Incorporated	noted	2019-02-20 14:26:39	2019-02-25 21:43:21
R1-1903253	Feature lead summary of MPDCCH performance improvement	Huawei, HiSilicon	withdrawn	2019-02-20 14:26:39	
R1-1903254	Feature lead summary of Support for transmission in preconfigured UL resources	Huawei, HiSilicon	noted	2019-02-20 14:26:40	2019-02-25 21:43:21
R1-1903255	Feature lead summary of Coexistence of NB-	Huawei,	noted	2019-02-20 14:26:40	2019-02-27 05:47:56
R1-1903256	Feature lead summary of Support of Quality report in Msg3 for non-anchor access	Huawei, HiSilicon	noted	2019-02-20 14:26:40	2019-02-27 19:37:56
R1-1903257	Summary on Multiple TB scheduling enhancement for NB-IoT	ZTE	noted	2019-02-20 14:26:41	2019-02-27 05:47:56
R1-1903258	CR of TS36.211 for correction of higher layer signalling for special subframe configuration	CMCC	agreed	2019-02-20 14:26:41	2019-02-25 21:43:21
R1-1903259	CR of TS36.211 for correction of higher layer signalling for special subframe configuration	CMCC	agreed	2019-02-20 14:26:41	2019-02-25 21:43:21
R1-1903260	CR of TS36.213 for correction of higher layer signalling for special subframe configuration	CMCC	agreed	2019-02-20 14:26:42	2019-02-25 21:43:21
R1-1903261	CR of TS36.213 for correction of higher layer signalling for special subframe configuration	CMCC	agreed	2019-02-20 14:26:42	2019-02-25 21:43:21
R1-1903262	Priority rules for SRS carrier switching	Qualcomm Incorporated	agreed	2019-02-20 14:26:42	2019-02-27 19:37:56
R1-1903263	Priority rules for SRS carrier switching	Qualcomm Incorporated	agreed	2019-02-20 14:26:43	2019-02-27 19:37:56
R1-1903264	On support of special subframe configuration 10 with FDD+TDD CA	Qualcomm Incorporated	revised	2019-02-20 14:26:43	2019-02-27 19:37:56
R1-1903265	Support of 6-symbol SRS in UpPTS	Qualcomm Incorporated	agreed	2019-02-20 14:26:43	2019-02-27 19:37:56
R1-1903266	Support of 6-symbol SRS in UpPTS	Qualcomm Incorporated	agreed	2019-02-20 14:26:44	2019-02-27 19:37:56
R1-1903267	Corrections for VoLTE enhancements	Qualcomm Incorporated	agreed	2019-02-20 14:26:44	2019-02-27 19:37:56
R1-1903268	Corrections for VoLTE enhancements	Qualcomm Incorporated	agreed	2019-02-20 14:26:45	2019-03-01 11:15:17
R1-1903269	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	Qualcomm Incorporated	agreed	2019-02-20 14:26:45	2019-03-01 11:15:17
R1-1903270	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	Qualcomm Incorporated	agreed	2019-02-20 14:26:45	2019-03-01 11:15:17
R1-1903271	Correction for TDD UL/DL configuration 0 and PUSCH with repetitions	Qualcomm Incorporated	agreed	2019-02-20 14:26:46	2019-03-01 11:15:17
R1-1903272	Power control for PUSCH enhancements	Qualcomm Incorporated	agreed	2019-02-20 14:26:46	2019-03-01 11:15:17
R1-1903273	Power control for PUSCH enhancements	Qualcomm Incorporated	agreed	2019-02-20 14:26:46	2019-03-01 11:15:17
R1-1903274	Correction on the MCS index range for DCI	Huawei,	agreed	2019-02-20 14:26:47	2019-02-27 19:37:56
R1-1903275	UL delay for CE mode B	Qualcomm Incorporated	revised	2019-02-20 14:26:47	2019-02-27 05:47:56

R1-1903276	Summary of Use of LTE Control Channel Region for DL Transmission	Nokia, Nokia	noted	2019-02-20 14:26:47	2019-02-27 19:37:57
R1-1903277	Feature summary of quality report in Msg3 and connected mode	Samsung	withdrawn	2019-02-20 14:26:48	2019-02-27 05:47:56
R1-1903278	Summary of CE mode A and B improvements for non-BL Ues	LG Electronics	noted	2019-02-20 14:26:48	2019-02-27 05:47:57
R1-1903279	Feature lead summary of MPDCCH performance improvement	Huawei, HiSilicon	noted	2019-02-20 14:26:48	2019-02-27 05:47:57
R1-1903280	Correction on rate matching for 1024QAM	Qualcomm Incorporated	agreed	2019-02-20 14:26:49	2019-03-01 11:15:17
R1-1903281	Corrections on channel access procedures in 37.213	Sharp, WILUS Inc.,	agreed	2019-02-20 14:26:49	2019-02-27 05:47:57
R1-1903282	DMRS sequence index for PUSCH sub-PRB allocation for LTE-MTC	Ericsson	agreed	2019-02-20 14:26:50	2019-02-27 05:47:57
R1-1903283	Edge PRB restriction for flexible starting PUSCH PRB for LTE-MTC	Ericsson, Qualcomm	agreed	2019-02-20 14:26:50	2019-02-27 05:47:57
R1-1903284	Evaluation Results for LTE-Based 5G	EBU, BBC,	noted	2019-02-20 14:26:50	2019-02-27 05:47:57
R1-1903285	Draft LS on wideband PRG size	Huawei	revised	2019-02-20 14:26:51	2019-02-27 05:47:57
R1-1903286	Remaining issues of 6.2.1.1 UE group MWUS	Qualcomm Incorporated	noted	2019-02-20 14:26:51	2019-02-27 05:47:57
R1-1903287	Correction on PSSCH resource pool	Huawei,	agreed	2019-02-20 14:26:51	2019-02-27 05:47:57
R1-1903288	Correction on PSSCH resource pool	Huawei,	agreed	2019-02-20 14:26:52	2019-02-27 05:47:57
R1-1903289	UL delay for CE mode B	Qualcomm Incorporated	agreed	2019-02-20 14:26:52	2019-03-01 11:15:17
R1-1903290	UL delay for CE mode B	Qualcomm Incorporated	agreed	2019-02-20 14:26:53	2019-03-01 11:15:17
R1-1903291	UL delay for CE mode B	Qualcomm Incorporated	agreed	2019-02-20 14:26:53	2019-03-01 11:15:17
R1-1903292	LS on wideband PRG size	RAN1,	approved	2019-02-20 14:26:53	2019-02-27 05:47:58
R1-1903293	LTE-M Preconfigured UL Resources offline conclusion and remain issues	Sierra Wireless	noted	2019-02-20 14:26:54	2019-02-27 19:37:57
R1-1903294	Summary of evaluations for Requirements 7 and 8	Qualcomm Incorporated	revised	2019-02-20 14:26:54	2019-02-27 05:47:58
R1-1903295	Feature summary on LTE DL MIMO	Huawei,	noted	2019-02-20 14:26:54	2019-02-27 05:47:58
R1-1903296	Power control for RACH-less HO	Qualcomm Incorporated	revised	2019-02-20 14:26:55	2019-02-27 19:37:57
R1-1903297	Feature summary of 6.2.1.5 quality report in Msg3 and Connected Mode	Samsung	noted	2019-02-20 14:26:55	2019-02-27 05:47:58
R1-1903298	EPRE for RSS	Qualcomm Incorporated, Ericsson,	revised	2019-02-20 14:26:55	2019-02-27 19:37:57
R1-1903299	EPRE for WUS	Qualcomm Incorporated, Ericsson,	postponed	2019-02-20 14:26:56	2019-02-27 19:37:57
R1-1903300	Correction on timing relationships for 2-HARQ with NPRACH format 2	Huawei, HiSilicon	revised	2019-02-20 14:26:56	2019-02-27 19:37:57
R1-1903301	Discussion on timing relationships for 2-HARQ with NPRACH format 2	Huawei, HiSilicon	not treated	2019-02-20 14:26:56	2019-02-27 19:37:57
R1-1903302	Corrections on CSI update capability for sTTI	LG	agreed	2019-02-20 14:26:56	2019-02-27 19:37:57
R1-1903303	Correction on NPRACH format 2	Huawei,	revised	2019-02-20 14:26:57	2019-02-27 19:37:57
R1-1903304	Correction on NPRACH format 2	Huawei,	revised	2019-02-20 14:26:57	2019-02-27 19:37:58
R1-1903305	Correction on type 2 power headroom	Huawei,	agreed	2019-02-20 14:26:58	2019-03-01 11:15:18
R1-1903306	Draft CR on DMRS mapping for SPDCCH	Samsung	agreed	2019-02-20 14:26:58	2019-02-27 19:37:58
R1-1903307	Correction on the 1ms HARQ-ACK transmission for the collision between	Huawei, HiSilicon	agreed	2019-02-20 14:26:58	2019-03-01 11:15:18
R1-1903308	Correction on NPRACH format 2	Huawei,	agreed	2019-02-20 14:26:59	2019-02-27 19:37:58
R1-1903309	Correction on NPRACH format 2	Huawei,	agreed	2019-02-20 14:26:59	2019-02-27 19:37:58
R1-1903310	Summary of evaluations for Requirements 7 and 8	Qualcomm Incorporated	revised	2019-02-20 14:26:59	2019-02-27 19:37:58
R1-1903311	On support of special subframe configuration 10 with FDD+TDD CA	RAN1, Qualcomm	approved	2019-02-20 14:27:00	2019-02-27 19:37:58
R1-1903312	Power control for RACH-less HO	Qualcomm Incorporated	agreed	2019-02-20 14:27:00	2019-03-01 11:15:18
R1-1903313	Power control for RACH-less HO	Qualcomm Incorporated	agreed	2019-02-20 14:27:00	2019-03-01 11:15:18

R1-1903314	Correction for DCI 0C and special subframe configuration 10	Qualcomm Incorporated	agreed	2019-02-20 14:27:01	2019-03-01 11:15:18
R1-1903315	Correction for DCI 0C and special subframe configuration 10	Qualcomm Incorporated	agreed	2019-02-20 14:27:01	2019-03-01 11:15:18
R1-1903316	Correction for DCI 0C and special subframe configuration 10	Qualcomm Incorporated	agreed	2019-02-20 14:27:02	2019-03-01 11:15:18
R1-1903317	Correction for DCI 0C and special subframe configuration 10	Qualcomm Incorporated	agreed	2019-02-20 14:27:03	2019-03-01 11:15:18
R1-1903318	HARQ ID for asynchronous HARQ from DCI format 0	Qualcomm Incorporated	agreed	2019-02-20 14:27:03	2019-03-01 11:15:18
R1-1903319	HARQ ID for asynchronous HARQ from DCI format 0	Qualcomm Incorporated	agreed	2019-02-20 14:27:04	2019-03-01 11:15:18
R1-1903320	Considerations on enhancement to HARQ processing for URLLC	Sony	revised	2019-02-20 21:36:51	2019-02-21 13:18:21
R1-1903321	Procedures for Two-step RACH	Qualcomm Incorporated	not treated	2019-02-21 07:56:47	2019-02-22 07:27:14
R1-1903322	Enhancements to initial access and mobility for NR-unlicensed	Intel Corporation	not treated	2019-02-21 07:57:41	2019-02-22 07:27:14
R1-1903323	Summary of simultaneous Rx/Tx	Intel	revised	2019-02-21 07:59:30	2019-02-25 21:43:21
R1-1903324	Wideband operation for NR-U	Ericsson	not treated	2019-02-21 07:59:59	2019-02-23 16:22:15
R1-1903325	Summary of Rel15 SRS maintenance	Sony	noted	2019-02-21 08:01:06	2019-02-25 21:43:21
R1-1903326	Summary of RAN1#96 CRs on R15 PUCCH resource allocation	OPPO	noted	2019-02-21 08:02:22	2019-02-25 21:43:21
R1-1903327	Summary of RAN1#96 Tdocs on UCI enhancements for URLLC	OPPO	revised	2019-02-21 08:07:42	2019-02-25 21:43:21
R1-1903328	Views on potential enhancements to Scheduling/HARQ/CSI Processing timeline	Sharp	not treated	2019-02-21 08:08:30	2019-02-21 13:18:21
R1-1903329	Invitation to a Coexistence Workshop in Vienna, Austria July 2019	IEEE 802.11 WG	treated	2019-02-21 11:45:10	2019-02-21 13:18:21
R1-1903330	Feature Lead Summary for 7.2.4.4 QoS	Nokia	noted	2019-02-21 11:50:17	2019-02-27 05:47:58
R1-1903331	System level performance with explicit link level simulation for downlink OTDOA and	MediaTek Inc.	not treated	2019-02-21 11:51:25	2019-02-22 10:15:40
R1-1903332	SLS results for NR positioning potential solutions	Fraunhofer IIS,	not treated	2019-02-21 13:29:04	2019-02-22 22:21:53
R1-1903333	LS on 2Rx Antennas for NR V2X Sidelink	5GAA WG4, General	treated	2019-02-21 15:34:23	2019-02-21 15:38:28
R1-1903334	Summary of Draft CRs on CA for Rel-15 NR	Samsung	noted	2019-02-21 15:49:15	2019-02-25 21:43:21
R1-1903335	Correction to PUCCH resource set determining for UCI multiplexing	OPPO	not pursued	2019-02-21 15:55:43	2019-02-22 07:27:14
R1-1903336	NR sidelink synchronization mechanism	vivo	not treated	2019-02-21 16:00:21	2019-02-22 10:21:17
R1-1903337	Discussion on sidelink resource allocation	vivo	not treated	2019-02-21 16:00:36	2019-02-22 10:21:17
R1-1903338	Feature lead summary for UL Signals and	Ericsson	noted	2019-02-21 19:44:15	2019-02-27 05:47:58
R1-1903339	Summary for PDCCH structure and search space	NTT DOCOMO	noted	2019-02-22 07:28:50	2019-02-25 21:43:21
R1-1903340	Summary of contributions for UL transmission procedure	NTT DOCOMO	noted	2019-02-22 07:30:10	2019-02-25 21:43:21
R1-1903341	Summary of 7.2.6.3 Enhanced configured grant PUSCH transmissions	NTT DOCOMO	noted	2019-02-22 07:32:24	2019-02-27 05:47:58
R1-1903342	Evaluation results for RAT-dependent positioning Techniques	Qualcomm Incorporated	not treated	2019-02-22 07:32:52	2019-02-22 22:21:53
R1-1903343	CSI Enhancement for MU-MIMO Support	ZTE	not treated	2019-02-22 07:33:18	2019-02-22 10:21:17
R1-1903344	Discussion on UE power saving schemes with adaption to UE traffic	CMCC	not treated	2019-02-22 07:33:45	2019-02-22 10:15:40
R1-1903345	Sidelink resource allocation mechanism for NR V2X	Qualcomm Incorporated	not treated	2019-02-22 07:34:14	2019-03-03 00:00:00
R1-1903346	Discussion on DL only based Positioning	LG	not treated	2019-02-22 07:34:33	2019-02-22 12:46:15
R1-1903347	Discussion on Performance Evaluation for RAT-Dependent Positioning Techniques	LG Electronics	not treated	2019-02-22 07:34:54	2019-02-22 22:21:53

R1-1903348	Periodicity of CSI-RS for radio link monitoring	Ericsson	not treated	2019-02-22 07:45:12	2019-02-22 22:21:53
R1-1903349	Summary of 7.2.6.1.1 Potential enhancements	Huawei	noted	2019-02-22 10:23:09	2019-02-25 21:43:21
R1-1903350	Summary of remaining details on evaluation assumptions and evaluation results	Huawei	not treated	2019-02-22 10:24:20	2019-02-27 05:47:58
R1-1903351	UE power Consumption Reduction in RRM Measurements	OPPO	not treated	2019-02-22 10:24:54	2019-02-22 12:46:15
R1-1903352	On enhancements to Scheduling/HARQ/CSI processing	Intel Corporation	not treated	2019-02-22 12:39:36	2019-02-25 08:03:02
R1-1903353	NR UE power saving designs	MediaTek Inc.	not treated	2019-02-22 12:41:22	2019-02-23 16:22:15
R1-1903354	NR RRM UE power saving	MediaTek Inc.	not treated	2019-02-22 12:41:41	2019-02-23 16:22:15
R1-1903355	Interoperability of Release 15 specifications	TTA, KT, LG Uplus, SKT, LG	noted	2019-02-22 12:44:02	2019-02-22 22:21:53
R1-1903356	Feature lead summary for 7.1.1 SSB and RACH	Ericsson	noted	2019-02-22 12:45:47	2019-02-25 21:43:21
R1-1903357	Evaluation on quantization methods for Type II overhead reduction	LG Electronics	not treated	2019-02-22 21:58:11	2019-02-25 21:43:22
R1-1903358	SLS evaluation on MU-MIMO CSI: LC	Samsung	revised	2019-02-22 21:58:57	2019-02-23 16:22:15
R1-1903359	CSI enhancement for MU-MIMO	Samsung	not treated	2019-02-22 22:10:35	2019-02-23 16:22:15
R1-1903360	Evaluation results for enhanced PRACH	Ericsson	not treated	2019-02-22 22:11:38	2019-02-23 16:22:15
R1-1903361	Summary of AI7.1.1 on NR RMSI	CATT	noted	2019-02-22 22:13:37	2019-02-25 21:43:22
R1-1903362	Summary of 7.1.3 - Maintenance of DCI contents and formats	Ericsson	noted	2019-02-22 22:20:02	2019-02-25 21:43:22
R1-1903363	Summary of 7.1.3 - Maintenance of Resource allocation	Ericsson	noted	2019-02-22 22:20:02	2019-02-25 21:43:22
R1-1903364	Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH	Ericsson	revised	2019-02-22 22:20:02	2019-02-25 21:43:22
R1-1903365	Summary of 7.1.3 - Maintenance of LBRM and Data Rate	Ericsson	noted	2019-02-22 22:20:02	2019-02-25 21:43:22
R1-1903366	Feature lead summary for agenda item 7.2.4.1.1 Physical layer structure	LG Electronics	noted	2019-02-26 06:06:11	2019-02-27 05:47:58
R1-1903367	Feature lead summary for agenda item 7.2.4.1.2 Physical layer procedures	LG Electronics	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903368	Summary of contributions on potential enhancements for PUSCH for NR URLLC	Nokia, Nokia	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903369	Summary of contributions on UL/DL intra-UE prioritization/multiplexing	Nokia, Nokia	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903370	Discussion on short fixed duration LBT for transmissions outside a COT	Broadcom	not treated	2019-02-26 06:06:12	2019-02-27 05:47:59
R1-1903371	Discussion on the use of 802.11 preamble for	Broadcom	noted	2019-02-26 06:06:13	2019-02-27 05:47:59
R1-1903372	Initial access signals/channels for NR-	Intel	not treated	2019-02-25 08:03:02	2019-02-25 08:03:02
R1-1903373	Reply LS on TSN requirements evaluation	SA1, Nokia	noted	2019-02-25 08:03:02	2019-02-25 08:03:02
R1-1903374	Evaluation Methodology and Results for UE Power Saving	Qualcomm Incorporated	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903375	Feature lead summary for AI 7.2.4.3: Uu-based sidelink resource	Huawei	revised	2019-02-25 08:03:02	2019-02-25 08:03:02
R1-1903376	On CSI enhancements for MU-MIMO	Ericsson	not treated	2019-02-26 06:06:14	2019-02-27 05:47:59
R1-1903377	Maintenance for CSI acquisition	Ericsson	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903378	Draft LS to RAN2 on introduction of UE capability for aperiodic CSI-RS triggering	Ericsson, Qualcomm,	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903379	Correction to aperiodic CSI-RS triggering with different numerology between PDCCH	Ericsson, AT&T, T-	revised	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903380	Feature lead summary on Evaluation of Uu for advanced V2X use cases	Ericsson	revised	2019-02-26 06:06:16	2019-02-27 05:47:59
R1-1903381	On MU-MIMO CSI Enhancements	Motorola Mobility,	revised	2019-02-25 08:03:02	2019-02-25 08:03:02
R1-1903382	Summary of draft CRs for beam	Ericsson	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903383	Pathloss model in IIOT scenario	ZTE, Sanechips, BJTU,	not treated	2019-02-26 06:06:17	2019-02-27 05:47:59
R1-1903384	Summary of Coexistence Aspects in NR-V2X	Qualcomm	revised	2019-02-25 21:43:22	2019-02-25 21:43:22

R1-1903385	Rel-15 CR summary on long format PUCCH	Huawei	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903386	Evaluation results for NR positioning	Mitsubishi Electric Co.	not treated	2019-02-26 06:06:18	2019-02-27 05:47:59
R1-1903387	Maintenance of PT-RS	Ericsson	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903388	Feature lead summary of low PAPR RS	Ericsson	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903389	Summary for Rel-15 CRs on DL/UL data scheduling and HARQ procedure	Qualcomm	revised	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903390	Draft CR for correction of ZP CSI-RS trigger in 38.212	ZTE	endorsed	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903391	Summary of Bandwidth Part Related Draft CRs	MediaTek	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903392	Summary on wide-band operation for NR-U	LG	noted	2019-02-26 06:06:21	2019-02-27 05:47:59
R1-1903393	Synchronization for NR V2X sidelink	Intel	not treated	2019-02-26 06:06:21	2019-02-26 06:56:03
R1-1903394	Summary for NR-Positioning AI - 7.2.10.1.1 DL only Based Positioning	Intel	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903395	•Summary for NR-Positioning AI - 7.2.10.1.2 UL only Based Positioning	Intel	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903396	•Summary for NR-Positioning AI - 7.2.10.1.3 DL and UL Based Positioning	Intel	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903397	Feature Lead Summary for NR-V2X AI - 7.2.4.1.4 Resource Allocation Mechanism	Intel	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903398	Details and evaluation on L1-SINR measurement and reporting	ZTE	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903399	Summary for AI 7.1.5 Maintenance for UL	ZTE	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903400	Performance evaluation of the factory	CATT	not treated	2019-02-26 06:06:24	2019-02-27 05:47:59
R1-1903401	Summary of UL inter UE Tx	vivo	noted	2019-02-26 06:06:24	2019-02-27 05:47:59
R1-1903402	Discussion of ETSI TC BRAN LS on NR-U	Qualcomm Incorporated	noted	2019-02-26 06:06:24	2019-02-27 05:48:00
R1-1903403	[DRAFT] LS to ETSI BRAN on EN 301 893	Qualcomm Incorporated	revised	2019-02-26 06:06:25	2019-02-27 05:48:00
R1-1903404	Feature lead summary for 7.2.2.1.1	Qualcomm	noted	2019-02-26 06:06:25	2019-02-27 05:48:00
R1-1903405	Summary of CRs on UCI multiplexing on PUSCH	Qualcomm	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903406	Feature lead summary for NR RIM	CMCC	withdrawn	2019-02-26 06:06:26	
R1-1903407	Proposal summary for NR RIM	CMCC	noted	2019-02-26 06:06:26	2019-02-27 19:37:58
R1-1903408	Summary for Rel-15 CRs on DL/UL data scheduling and HARQ procedure	Qualcomm	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903409	Feature lead summary for Configured grant	vivo	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903410	Feature lead summary on Full TX Power UL	vivo	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903411	Summary of UE power saving schemes	CATT	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903412	Summary of V2X Sidelink Synchronization	CATT	revised	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903413	Maintenance of DM-RS	Qualcomm	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903414	Maintenance for TRS	MediaTek	not treated	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903415	Summary of CRs on UL non-codebook based transmission	Nokia, Nokia	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903416	Summary of Rel-15 CRs for NR Mobility	Intel	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903417	Maintenance for Beam Failure Recovery 1	Asia Pacific	revised	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903418	Maintenance for CSI-RS #1	Huawei,	noted	2019-02-26 06:06:31	2019-02-27 05:48:00
R1-1903419	Performance of Non-Uniform Constellations for LTE-Based 5G Terrestrial Broadcast	Shanghai Jiao Tong	not treated	2019-02-26 06:06:32	2019-02-27 05:48:00
R1-1903420	Correction on physical downlink control channel	ASUSTEK COMPUTER	revised	2019-02-26 06:06:32	2019-02-27 05:48:00
R1-1903421	Enhancements to scheduling/HARQ/CSI processing timeline for NR URLLC	Nokia, Nokia Shanghai	revised	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903422	Feature lead summary of maintenance for RS	Huawei,	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903423	Feature lead summary of HARQ	Huawei	noted	2019-02-26 06:06:34	2019-02-27 05:48:00
R1-1903424	Summary of UE power consumption reduction in RRM measurements	vivo	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903425	Summary of Maintenance for CSI	ZTE	noted	2019-02-25 21:43:22	2019-02-25 21:43:22

R1-1903426	Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline	Qualcomm	revised	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903427	Correction to UE sounding procedure in NR	Fujitsu, Ericsson	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903428	Text proposal on 2 Rx Antennas for NR V2X	General Motors,	revised	2019-02-26 06:06:36	2019-02-27 05:48:00
R1-1903429	Evaluation results of UE power saving	Huawei,	not treated	2019-02-26 06:06:36	2019-02-27 05:48:01
R1-1903430	Power consumption reduction in RRM measurements	Huawei, HiSilicon	not treated	2019-02-26 06:06:37	2019-02-27 05:57:54
R1-1903431	Summary of offline discussion on UCI enhancements for URLLC	OPPO	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903432	Summary for UE Power Saving Evaluation	Qualcomm	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903433	Offline session notes for AI 7.2.10.1.4 System-level Performance Evaluation for RAT-Dependent Positioning Techniques (Monday	Ericsson	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903434	SLS evaluation on MU-MIMO CSI: LC	Samsung	not treated	2019-02-26 06:06:39	2019-02-27 19:37:58
R1-1903435	Offline Summary of Channel Structure for	ZTE	noted	2019-02-26 06:06:39	2019-02-28 15:39:38
R1-1903436	Offline Summary of Procedures for Two-step	ZTE	noted	2019-02-26 06:06:39	2019-02-28 15:39:38
R1-1903437	Text proposal for TSN requirements evaluation	Nokia, Nokia	revised	2019-02-26 06:06:40	2019-02-27 19:37:59
R1-1903438	TR 38.824 Study on physical layer enhancements for NR ultra-reliable low	Huawei	endorsed	2019-02-26 06:06:40	2019-02-27 05:48:01
R1-1903439	Summary for AI System-level Performance Evaluation for RAT-Dependent Positioning	Ericsson	not treated	2019-02-26 06:06:44	2019-02-27 19:37:59
R1-1903440	Summary for AI Potential Techniques for NR RAT Independent Positioning (AI 7.2.10.2)	Ericsson	withdrawn	2019-02-26 06:06:45	
R1-1903441	TP for section 8.4 template in TR38.855	Ericsson	withdrawn	2019-02-26 06:06:45	
R1-1903442	TR 38.855 v1.0.1 Study on NR positioning	Ericsson	revised	2019-02-26 06:06:46	2019-02-27 05:48:01
R1-1903443	Summary of offline discussion on UCI enhancements for URLLC	OPPO	noted	2019-02-25 21:43:22	2019-02-25 21:43:22
R1-1903444	Draft TS 38.213 CR on timing adjustment indicator	vivo	agreed	2019-02-26 06:06:50	2019-02-27 05:48:01
R1-1903445	Outcome of offline discussion on Full TX Power UL transmission	vivo	noted	2019-02-26 06:06:50	2019-02-27 05:48:01
R1-1903446	Scheduling/HARQ/CSI Processing Timeline Enhancements for NR URLLC	Ericsson	revised	2019-02-26 06:06:51	2019-02-27 05:48:01
R1-1903447	Evaluation of URLLC Factory Automation	Ericsson	not treated	2019-02-26 06:06:51	2019-02-27 05:48:01
R1-1903448	Evaluation of URLLC Factory Automation	Ericsson	not treated	2019-02-26 06:06:51	2019-02-27 05:48:01
R1-1903449	Evaluation of Rel-15 Enabled URLLC Use	Ericsson	not treated	2019-02-26 06:06:52	2019-02-27 05:48:01
R1-1903450	Physical layer procedures for NR V2X	Intel	not treated	2019-02-26 06:06:52	2019-02-27 05:48:01
R1-1903451	System level evaluations of eURLLC use	Intel	not treated	2019-02-26 06:06:53	2019-02-27 05:48:02
R1-1903452	Feature Lead Summary of CLI topics	LG Electronics	not treated	2019-02-26 06:06:53	2019-02-27 05:48:02
R1-1903453	Offline Discussion Summary#1 of CLI topics	LG Electronics	noted	2019-02-26 06:06:53	2019-02-27 05:48:02
R1-1903454	Offline Discussion Summary#2 of CLI topics	LG Electronics	noted	2019-02-26 06:06:54	2019-02-27 19:37:59
R1-1903455	Offline Discussion Summary#3 of CLI topics	LG Electronics	noted	2019-02-26 06:06:54	2019-02-28 15:39:38
R1-1903456	Processing timeline enhancements for eURLLC	Qualcomm Incorporated	withdrawn	2019-02-26 06:06:55	
R1-1903457	Enhancements on scheduling and HARQ processing timeline	OPPO	not treated	2019-02-26 06:06:55	2019-02-27 05:48:02
R1-1903458	Summary 2 for AI 7.1.5 Maintenance for UL	ZTE	noted	2019-02-26 06:06:56	2019-02-27 05:48:02
R1-1903459	Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline	Qualcomm	noted	2019-02-26 06:06:56	2019-02-27 05:48:02
R1-1903460	Summary for Uplink Power Control For Supporting NR-NR Dual Connectivity	Qualcomm	withdrawn	2019-02-26 06:06:56	

R1-1903461	Summary on SCell BFR and L1-SINR	Intel	revised	2019-02-26 13:10:56	2019-02-26 13:10:56
R1-1903462	Offline discussion on maintenance of DCI contents and formats	Ericsson	noted	2019-02-27 19:26:10	2019-02-27 19:37:59
R1-1903463	Offline discussion on maintenance of Resource allocation	Ericsson	withdrawn	2019-02-27 19:26:11	
R1-1903464	Summary on maintenance related to rate-matching in NR	Nokia, Nokia	noted	2019-02-26 13:10:56	2019-02-26 13:10:56
R1-1903465	Correction on search space sharing	Ericsson	revised	2019-02-26 13:10:56	2019-02-26 13:10:56
R1-1903466	Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH	Ericsson	revised	2019-02-27 19:26:12	2019-02-27 19:37:59
R1-1903467	Draft CR on scheduling restriction by max data rate	Samsung	withdrawn	2019-02-27 19:26:12	
R1-1903468	Lower PAPR reference signals	Qualcomm Incorporated	not treated	2019-02-26 13:10:56	2019-02-26 13:10:56
R1-1903469	Maintenance for Beam Failure Recovery 1	Asia Pacific	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903470	Link Budget on eMBB for IMT-2020 self-	ZTE	not treated	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903471	Offline summary for R15 CRs on PUCCH resource allocation	OPPO	noted	2019-02-27 19:26:14	2019-02-27 19:37:59
R1-1903472	Summary offline discussion on UCI	OPPO	noted	2019-02-27 19:26:14	2019-02-27 19:37:59
R1-1903473	Clarification on simultaneous PRACH and PUSCH/PUCCH/SRS transmission	Spreadtrum Communica	withdrawn	2019-02-26 13:10:56	2019-02-26 13:10:56
R1-1903474	Summary of Bandwidth Part Related Draft CRs	MediaTek	noted	2019-02-27 19:26:15	2019-02-27 19:37:59
R1-1903475	Correction and clarification to CSI	Ericsson	revised	2019-02-26 13:10:56	2019-02-26 13:10:56
R1-1903476	Outcome of offline discussion on Configured grant enhancement	vivo	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903477	Introduction of SUO Case 1 for NE-DC as	Huawei,	agreed	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903478	Introduction of SUO Case 1 for NE-DC as	Huawei,	agreed	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903479	Correction on UL HARQ for EN-DC with SUO Case 1	Huawei, HiSilicon, Nokia,	revised	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903480	Summary of Tuesday offline discussion on potential enhancements for PUSCH for NR	Nokia, Nokia	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903481	Summary#2 of UE power consumption reduction in RRM measurements	vivo	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903482	Scheduling/HARQ/CSI Processing Timeline Enhancements for NR URLLC	Ericsson	not treated	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903483	Summary of UE power saving schemes	CATT	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903484	Summary of V2X Sidelink Synchronization	CATT	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903485	Offline Discussion Outcome on Intermediate Conclusions for NR Positioning Study Item	Intel	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903486	Summary for UE Power Saving Evaluation	Qualcomm	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903487	TR 38.855 v1.0.2 Study on NR positioning	Ericsson	revised	2019-02-27 19:26:26	2019-02-28 15:39:38
R1-1903488	Considerations on enhancement to HARQ processing for URLLC	Sony	not treated	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903489	TP to update mmWave results in TR 38.885	AT&T	revised	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903490	Feature lead summary#2 on Evaluation of Uu for advanced V2X use cases	Ericsson	noted	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903491	Draft CR on latency after gNB response for	ZTE	revised	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903492	Correction on search space sharing	Ericsson	agreed	2019-02-27 19:26:31	2019-02-27 19:37:59
R1-1903493	On synchronization mechanisms for NR V2X	Samsung	not treated	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903494	Summary of UE power saving schemes	CATT	noted	2019-02-27 19:26:35	2019-02-27 19:38:00
R1-1903495	Draft CR on SSB-RO association	Samsung	revised	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903496	LS on MBSFN subframe pattern configuration for LTE CRS rate matching	RAN2, Ericsson	treated	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903497	Outcome of offline discussion for low PAPR	Ericsson	revised	2019-02-26 18:42:54	2019-02-26 18:42:54
R1-1903498	Summary of offline discussion for 7.1.1 SSB and RACH	Ericsson	noted	2019-02-27 19:26:36	2019-02-27 19:38:00

R1-1903499	Feature Lead's Summary on Channel Access Procedures	Nokia, Nokia	noted	2019-02-27 19:26:37	2019-02-27 19:38:00
R1-1903500	Summary of Tuesday Offline Session on MU-	Samsung	noted	2019-02-27 19:26:37	2019-02-27 19:38:00
R1-1903501	Summary of Offline Email Discussion on MU-	Samsung	noted	2019-02-27 19:26:37	2019-02-28 15:39:38
R1-1903502	On Configured Grant enhancements for NR URLLC	Nokia, Nokia	not treated	2019-02-27 19:26:38	2019-02-27 19:38:00
R1-1903503	Discussion on quantization schemes	MediaTek	withdrawn	2019-02-27 19:26:38	
R1-1903504	CR on timing adjustment indicator	vivo	agreed	2019-02-27 19:26:39	2019-02-27 19:38:00
R1-1903505	On MU-MIMO CSI Enhancements	Motorola Mobility,	not treated	2019-02-27 19:26:41	2019-02-27 19:38:00
R1-1903506	CR on QCL assumption for receiving PDCCH for RAR	NTT DOCOMO,	revised	2019-02-27 19:26:41	2019-02-27 19:38:00
R1-1903507	Summary#2 of simultaneous Rx/Tx	Intel	noted	2019-02-27 19:26:42	2019-02-27 19:27:55
R1-1903508	Further topics for 6.2.2.1 Group WUS for NB-	Ericsson	noted	2019-02-27 19:26:42	2019-02-27 19:38:01
R1-1903509	Evaluation results and potential enhancements	Qualcomm Incorporated	withdrawn	2019-02-27 19:26:43	
R1-1903510	Summary of evaluations for Requirements 7 and 8	Qualcomm Incorporated	noted	2019-02-27 19:26:43	2019-02-28 11:06:24
R1-1903511	Correction on timing relationships for 2-HARQ with NPRACH format 2	Huawei, HiSilicon,	not pursued	2019-02-27 19:26:43	2019-02-28 09:38:52
R1-1903512	Link level analysis of CAS	Qualcomm Incorporated	not treated	2019-02-27 19:26:44	2019-02-27 19:38:01
R1-1903513	Updated feature lead summary of support for transmission in preconfigured UL resources	Huawei, HiSilicon	noted	2019-02-27 19:26:44	2019-02-27 19:38:01
R1-1903514	Remaining issues and proposals on SRS	Huawei,	noted	2019-02-27 19:26:45	2019-02-27 19:38:01
R1-1903515	Presence of NRS on a non-anchor for paging (feature lead summary)	Qualcomm Incorporated	noted	2019-02-27 19:26:45	2019-02-28 16:51:45
R1-1903516	Draft CR on MPDCCH USS/CSS differentiation	Samsung, Ericsson,	revised	2019-02-27 19:26:45	2019-02-28 09:38:52
R1-1903517	Remaining issues on MTC DL quality report	Samsung	noted	2019-02-27 19:26:46	2019-02-28 14:53:27
R1-1903518	On MPDCCH USS/CSS differentiation	Samsung, Ericsson,	agreed	2019-02-27 19:26:46	2019-03-01 12:46:52
R1-1903519	On MPDCCH USS/CSS differentiation	Samsung, Ericsson,	agreed	2019-02-27 19:26:47	2019-03-01 12:46:52
R1-1903520	EPRE for RSS	Qualcomm Incorporated , Ericsson,	agreed	2019-02-27 19:26:47	2019-02-28 16:51:45
R1-1903521	Draft Reply LS on RSS based measurements	Ericsson	revised	2019-02-27 19:26:47	2019-02-28 14:30:49
R1-1903522	TR 36.776 v1.01 Study on LTE-based 5G terrestrial broadcast	Qualcomm Incorporated	revised	2019-02-27 19:26:48	2019-03-01 08:36:10
R1-1903523	LTE-M Preconfigured UL Resources remain issues #2	Sierra Wireless	noted	2019-02-27 19:26:48	2019-02-28 15:11:59
R1-1903524	Chairman's notes of AI 6.1.1 Maintenance of E-UTRA Release 8 – 14	Ad-hoc Chair	endorsed	2019-02-27 19:26:49	2019-02-28 19:14:51
R1-1903525	Chairman's notes of AI 6.1.2 Maintenance of E-UTRA Release 15	Ad-hoc Chair	endorsed	2019-02-27 19:26:49	2019-02-28 19:14:51
R1-1903526	Chairman's notes of AI 6.2.1 Additional MTC Enhancements	Ad-hoc Chair	revised	2019-02-27 19:26:49	2019-02-28 17:24:04
R1-1903527	Chairman's notes of AI 6.2.2 Additional Enhancements for NB-IoT	Ad-hoc Chair	revised	2019-02-27 19:26:50	2019-02-28 17:24:04
R1-1903528	Correction on CSI-RS configuration in 38.214	Huawei,	agreed	2019-02-27 19:26:50	2019-02-27 19:38:01
R1-1903529	Offline discussion related to CR R1-1902645	Panasonic	noted	2019-02-27 19:26:53	2019-02-27 19:38:01
R1-1903530	Enhancements to UCI for URLLC	MediaTek	not treated	2019-02-27 19:26:53	2019-02-27 19:38:01
R1-1903531	Text proposal on capturing examples of detailed use case and requirements for Rel-	Huawei	endorsed	2019-02-27 19:26:54	2019-02-27 19:38:01
R1-1903532	Summary of 7.2.6.1.1 Potential enhancements	Huawei	noted	2019-02-27 19:26:54	2019-02-27 19:38:01
R1-1903533	Summary of remaining details on evaluation assumptions and evaluation results	Huawei	withdrawn	2019-02-27 19:26:55	
R1-1903534	TR 38.855 v1.0.5 Study on NR positioning support	Ericsson	revised	2019-02-28 05:56:12	2019-02-28 05:57:58
R1-1903535	Summary of Wednesday offline discussion on UL/DL intra-UE prioritization/multiplexing	Nokia, Nokia	noted	2019-02-27 11:08:08	2019-02-27 11:08:08

R1-1903536	On bitwidth calculation for DCI fields using RRC parameter indicating maximum number	Intel Corporation,	revised	2019-02-28 05:56:16	2019-02-28 05:57:58
R1-1903537	Summary of discussions on physical layer aspects of enhanced mobility	Intel	noted	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903538	Correction to transmission timing adjustments in TS 38.213	Sharp	revised	2019-02-28 05:56:16	2019-02-28 15:39:38
R1-1903539	Correction to DCI size alignment in TS 38.212	Sharp	withdrawn	2019-02-28 05:56:17	
R1-1903540	Correction to resource allocation type 1 in TS 38.214	Sharp	withdrawn	2019-02-28 05:56:17	2019-03-08 17:09:10
R1-1903541	Summary of Enhancements on Multi-TRP/Panel Transmission of Offline	Huawei, HiSilicon	noted	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903542	Draft CR on SSB-RO association	Samsung	revised	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903543	CR for CSI multiplexing with SR	ZTE	not pursued	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903544	Summary on SCell BFR and L1-SINR	Intel	noted	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903545	Clarifications on CSI reporting on PUSCH	Nokia, Nokia	revised	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903546	CR on SSB-RO association	Samsung	agreed	2019-02-28 05:56:22	2019-02-28 15:39:38
R1-1903547	Removal of CSI request in RAR grant	Ericsson	revised	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903548	CR for PUCCH Format 1	ZTE	agreed	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903549	CR on PDSCH mapping to virtual resource blocks	ZTE	agreed	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903550	CR on QCL assumption for receiving PDCCH for RAR	NTT DOCOMO,	revised	2019-02-28 05:56:28	2019-02-28 15:39:38
R1-1903551	Change Request for alignment of frequency domain resource allocation with 38.213 for a PUSCH transmission scheduled by a RAR	Sharp	revised	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903552	Draft CR on out of HARQ order	Huawei, HiSilicon,	revised	2019-02-28 05:56:29	2019-02-28 05:57:58
R1-1903553	Removal of CSI request in RAR grant	Ericsson	agreed	2019-02-27 11:08:08	2019-02-27 11:08:08
R1-1903554	Correction on uplink resource allocation type 1	Nanjing Ericsson	agreed	2019-02-27 11:08:09	2019-02-27 11:08:09
R1-1903555	[Draft] LS	NTT DOCOMO	withdrawn	2019-02-28 05:56:33	
R1-1903556	[Draft CR] Multiple TA for synchronous intra-band continuous EN-DC	Intel	withdrawn	2019-02-28 05:56:34	
R1-1903557	Correction on determination of the resource allocation table for PUSCH with SP CSI	Huawei, HiSilicon	agreed	2019-02-28 05:56:34	2019-02-28 21:54:32
R1-1903558	Correction on PUSCH resource allocation	Huawei, HiSilicon	agreed	2019-02-28 05:56:36	2019-02-28 21:54:32
R1-1903559	Summary#3 of UE power consumption reduction in RRM measurements	vivo	revised	2019-02-28 05:56:39	2019-02-28 15:39:38
R1-1903560	Draft CR on NR CSI-RS	Samsung	withdrawn	2019-02-28 05:56:39	2019-02-28 05:57:59
R1-1903561	Correction to UCI multiplexing	Ericsson	agreed	2019-02-28 05:56:39	2019-02-28 15:39:38
R1-1903562	V2X antenna model and pathloss correction	Fraunhofer HHI, Fraunhofer	not treated	2019-02-28 05:56:42	2019-02-28 15:39:38
R1-1903563	Clarifications on CSI reporting on PUSCH	Nokia, Nokia	agreed	2019-02-28 05:56:42	2019-02-28 21:54:32
R1-1903564	Draft CR on QCL confliction	Samsung	revised	2019-02-27 11:08:09	2019-02-27 11:08:09
R1-1903565	Draft CR on PDSCH DM-RS REs and REs not available for PDSCH	MediaTek	endorsed	2019-02-27 11:08:09	2019-02-27 11:08:09
R1-1903566	Correction on physical downlink control channel	ASUSTEK COMPUTER	revised	2019-02-28 05:56:43	2019-03-08 17:09:10
R1-1903567	Draft CR on sequential PDSCH and PUSCH scheduling	CATT	revised	2019-02-28 05:56:45	2019-02-28 05:57:59

R1-1903568	Feature lead summary#2 for AI 7.2.4.3: Uu-based sidelink resource	Huawei	revised	2019-02-27 11:08:09	2019-02-27 11:08:09
R1-1903569	Performance evaluation on type II CSI	vivo	not treated	2019-02-27 11:08:09	2019-02-27 11:08:09
R1-1903570	Enhancements to scheduling/HARQ/CSI processing timeline for NR URLLC	Nokia, Nokia Shanghai	not treated	2019-02-28 05:56:47	2019-02-28 05:57:59
R1-1903571	Summary of UL inter UE Tx	vivo	noted	2019-02-28 05:56:47	2019-02-28 05:57:59
R1-1903572	Feature lead summary#2 for AI 7.2.4.3: Uu-based sidelink resource	Huawei	noted	2019-02-28 05:56:47	2019-02-28 05:57:59
R1-1903573	Summary for 7.2.3.1 SSB periodicity for IAB NR initial acces	Qualcomm	noted	2019-02-28 05:56:48	2019-02-28 15:39:38
R1-1903574	Summary for 7.2.3.2 Extensions of SSBs for IAB	Qualcomm	noted	2019-02-28 05:56:48	2019-02-28 15:39:38
R1-1903575	Summary for 7.2.3.3 Extensions of RACH for IAB	Qualcomm	noted	2019-02-28 05:56:49	2019-02-28 15:39:38
R1-1903576	[DRAFT] LS to ETSI BRAN on EN 301 893	Qualcomm Incorporated	revised	2019-02-28 05:56:49	2019-02-28 21:54:32
R1-1903577	Draft LS to IEEE WG on short control signaling	Qualcomm Incorporated	revised	2019-02-28 05:56:49	2019-02-28 21:54:32
R1-1903578	Feature lead summary for NR-U DL Signals and Channels	Motorola Mobility,	noted	2019-02-28 05:56:50	2019-02-28 05:57:59
R1-1903579	TP for TR 38.885 on Uu multicast/broadcast	Huawei, HiSilicon,	not treated	2019-02-28 05:56:50	2019-02-28 05:57:59
R1-1903580	Outcome of offline discussion #2 for low	Ericsson	noted	2019-02-28 05:56:51	2019-02-28 05:57:59
R1-1903581	Draft CR on slot aggregation	Huawei, HiSilicon	not pursued	2019-02-28 05:56:51	2019-02-28 05:58:00
R1-1903582	Summary of 7.2.3.4 Mechanisms for resource multiplexing among backhaul and	AT&T	noted	2019-02-28 05:56:51	2019-02-28 15:39:38
R1-1903583	Summary of 7.2.3.5 Mechanism to support the “case-1” OTA timing alignment	AT&T	noted	2019-02-28 05:56:52	2019-02-28 15:39:38
R1-1903584	Draft CR on CPU occupancy for P/SP report for L1-RSRP	vivo	endorsed	2019-02-28 05:56:52	2019-02-28 05:58:00
R1-1903585	Summary for Enhanced configured grant PUSCH transmissions	NTT DOCOMO	noted	2019-02-28 05:56:52	2019-02-28 05:58:00
R1-1903586	Summary of discussion on Combinations of Uu QoS characteristics values for V2X	Huawei	revised	2019-02-28 05:56:53	2019-02-28 05:58:00
R1-1903587	Draft CR on dynamic grant overriding configured grant	Qualcomm, Intel	revised	2019-02-28 05:56:53	2019-02-28 05:58:00
R1-1903588	Draft CR on simultaneous active BWP switching across carriers	MediaTek	revised	2019-02-28 05:56:54	2019-02-28 15:39:38
R1-1903589	Final proposal summary for NR-RIM	CMCC	noted	2019-02-28 05:56:54	2019-02-28 05:58:00
R1-1903590	Change Request for alignment of frequency domain resource allocation with 38.213 for a PUSCH transmission scheduled by a RAR	Sharp	agreed	2019-02-28 05:56:54	2019-02-28 15:39:38
R1-1903591	TP to update mmWave results in TR 38.885	AT&T	endorsed	2019-02-28 05:56:58	2019-02-28 21:54:33
R1-1903592	Correction on UL HARQ for EN-DC with SUO Case 1	Huawei, HiSilicon, Nokia,	revised	2019-02-28 05:56:58	2019-02-28 15:39:38
R1-1903593	TR 38.885 v1.0.2 Study on Vehicle-to-Everything	Huawei Tech.(UK)	endorsed	2019-02-28 05:56:59	2019-02-28 05:58:01
R1-1903594	Updated Summary of Coexistence Aspects in	Qualcomm	noted	2019-02-28 05:57:01	2019-02-28 05:58:01
R1-1903595	Summary#2 on wide-band operation for NR-	LG	noted	2019-02-28 05:57:02	2019-02-28 21:54:33
R1-1903596	Feature lead summary#2 for agenda item 7.2.4.1.1 Physical layer structure	LG Electronics	noted	2019-02-28 05:57:02	2019-02-28 15:39:38
R1-1903597	Feature lead summary#2 for agenda item 7.2.4.1.2 Physical layer procedures	LG Electronics	noted	2019-02-28 05:57:03	2019-02-28 15:39:38
R1-1903598	Correction to dynamic HARQ codebook in NR	Fujitsu	agreed	2019-02-28 05:57:03	2019-02-28 05:58:01
R1-1903599	Draft CR on UE procedure for reporting multiple UCI types	CATT	revised	2019-02-28 05:57:05	2019-02-28 15:39:38
R1-1903600	Draft CR on overlapping of SR and PUSCH without UL-SCH	CATT	revised	2019-02-28 05:57:05	2019-02-28 15:39:38
R1-1903601	Draft CR on overlapping of CSI and PUSCH with slot aggregation	CATT	revised	2019-02-28 05:57:06	2019-02-28 15:39:38
R1-1903602	Correction on DCI format 2_3 for SUL cell in	Huawei,	agreed	2019-02-28 05:57:06	2019-02-28 15:39:38

R1-1903603	LS on RAN2 conclusion for NR positioning SI	RAN2, Intel	treated	2019-02-28 05:57:08	2019-02-28 05:58:01
R1-1903604	Summary of enhancements to single Tx switched uplink for EN-DC	Apple Inc.	noted	2019-02-28 05:57:09	2019-02-28 15:39:38
R1-1903605	Summary offline discussion on UCI	OPPO	noted	2019-02-28 05:57:09	2019-02-28 15:39:38
R1-1903606	Correction on TCI indication for multi-slot	Intel	revised	2019-02-28 05:57:10	2019-02-28 05:58:01
R1-1903607	Offline Summary for Draft CRs on Rel-15 NR CA	Samsung	noted	2019-02-28 05:57:10	2019-02-28 15:39:38
R1-1903608	Draft CR on default QCL for AP-CSI-RS	ZTE	endorsed	2019-02-28 05:57:10	2019-02-28 21:54:33
R1-1903609	Draft CR on identifying transmission occasion after resetting a PC closed loop	ZTE	revised	2019-02-28 05:57:11	2019-02-28 05:58:01
R1-1903610	Offline Discussion for Multi-TRP/Panel Transmission and General plan for RAN1	Huawei, HiSilicon	noted	2019-02-28 05:57:11	2019-02-28 15:39:38
R1-1903611	Outcome from offline discussion on maintenance of resource allocation	Ericsson	noted	2019-02-28 05:57:12	2019-02-28 05:58:01
R1-1903612	Draft CR on using CORESET#0 in dedicated DL BWP	ZTE	revised	2019-02-28 05:57:12	2019-02-28 07:03:12
R1-1903613	Summary#2 of Bandwidth Part Related Draft CRs	MediaTek	noted	2019-02-28 05:57:12	2019-02-28 15:39:38
R1-1903614	Final proposal summary for NR-RIM	CMCC	noted	2019-02-28 05:57:13	2019-02-28 15:39:39
R1-1903615	Correction to aperiodic CSI-RS triggering with different numerology between PDCCH	Ericsson, AT&T, T-	not pursued	2019-02-28 05:57:13	2019-02-28 15:39:39
R1-1903616	Correction on PUSCH with configured grant	Huawei, HiSilicon	revised	2019-02-28 05:57:14	2019-02-28 15:39:39
R1-1903617	Correction on physical resource mapping for PUSCH with configured grant	Huawei, HiSilicon	revised	2019-02-28 05:57:14	2019-02-28 15:39:39
R1-1903618	Text Proposal for the list of proposed SRS	Huawei,	not treated	2019-02-28 05:57:14	2019-02-28 15:39:39
R1-1903619	Corrections on SRS to TS38.211	CATT, Nokia, Huawei/HiSi	endorsed	2019-02-28 05:57:15	2019-02-28 15:39:39
R1-1903620	Clarification regarding non-full-duplex UE communication	Nanjing Ericsson	revised	2019-02-28 05:57:15	2019-02-28 15:39:39
R1-1903621	Study and valuation of scheduling, HARQ and CSI processing timeline	MediaTek Inc.	revised	2019-02-28 05:57:16	2019-02-28 15:39:39
R1-1903622	Summary of UE power saving schemes	CATT	noted	2019-02-28 05:57:16	2019-02-28 15:39:39
R1-1903623	Feature Lead Summary for NR-V2X AI - 7.2.4.1.4 Resource Allocation Mechanism	Intel	noted	2019-02-28 05:57:16	2019-02-28 07:03:12
R1-1903624	TP on conclusion for multipath measurement	Huawei,	not treated	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903625	Chairman's notes of AI 7.1.2 Maintenance for MIMO	Ad-hoc Chair	endorsed	2019-03-01 11:25:46	2019-03-01 11:25:46
R1-1903626	Chairman's notes of AI 7.1.4 Maintenance for NR-LTE co-existence	Ad-hoc Chair	endorsed	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903627	Chairman's notes of AI 7.1.5 Maintenance for UL power control	Ad-hoc Chair	endorsed	2019-03-01 11:25:46	2019-03-01 11:25:46
R1-1903628	Chairman's notes of AI 7.1.7 UE features list	Ad-hoc Chair (NTT	endorsed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903629	Chairman's notes of AI 7.2.2 Study on NR-based Access to Unlicensed Spectrum	Ad-hoc Chair	endorsed	2019-03-01 11:25:46	2019-03-01 11:25:46
R1-1903630	Chairman's notes of AI 7.2.5 Cross Link Interference (CLI) handling and Remote Interference Management (RIM) for NR	Ad-hoc Chair (Samsung)	endorsed	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903631	Chairman's notes of AI 7.2.8 Enhancements on MIMO for NR	Ad-hoc Chair	endorsed	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903632	Chairman's notes of AI 7.2.10 Study on NR positioning support	Ad-hoc Chair	endorsed	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903633	Draft CR on latency after gNB response for	ZTE	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903634	Draft CR on identifying transmission occasion after resetting a PC closed loop	ZTE	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903635	Draft CR on AP-CSI-RS with a large latency of beam switching	ZTE	not pursued	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903636	Summary#2 of discussion on Combinations of Uu QoS characteristics values for V2X	Huawei	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903637	Draft LS on support of Enhancements on multi-TRP/panel transmission	Huawei	revised	2019-02-28 15:39:39	2019-02-28 15:39:39

R1-1903638	Summary of offline discussion for Rel-15 CRs on DL/UL data scheduling and HARQ	Qualcomm	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903639	[DRAFT] LS on UE-UE CLI measurement/reporting and Network	LG Electronics	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903640	Corrections for PUSCH with configured grant	NTT DOCOMO	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903641	Alignment of terminology across	Ericsson	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903642	Corrections to TS38.212	Huawei	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903643	Corrections to TS38.213	Samsung	revised	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903644	Corrections to 38.214	Nokia, Nokia	revised	2019-03-04 07:37:34	2019-03-08 17:09:12
R1-1903645	Summary for Uplink Power Control For Supporting NR-NR Dual Connectivity	Qualcomm	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903646	Feature lead summary #3 of Enhancements to initial access procedure	Charter Communica	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903647	Draft CR on sequential PDSCH and PUSCH scheduling	CATT	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903648	Draft LS on pdcch-BlindDetectionCA	NTT DOCOMO	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903649	Feature Lead Summary #2 for 7.2.4.4 QoS	Nokia	noted	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903650	Summary on SCell BFR and L1-SINR	Intel	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903651	CR on simultaneous active BWP switching across carriers	MediaTek	agreed	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903652	CR on using CORESET#0 in dedicated DL BWP	ZTE	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903653	CR on sequential PDSCH and PUSCH scheduling	CATT	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903654	CR on out of HARQ order	Huawei, HiSilicon,	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903655	Correction to LBRM restriction	Ericsson	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903656	Chairman's notes of AI 6.2.3 DL MIMO efficiency enhancements for LTE	Ad-hoc Chair	endorsed	2019-02-28 14:30:49	2019-02-28 14:30:49
R1-1903657	Chairman's notes of AI 6.2.4 Study on LTE-based 5G Terrestrial Broadcast	Ad-hoc Chair	endorsed	2019-02-28 19:14:51	2019-02-28 19:14:51
R1-1903658	Chairman's notes of AI 6.2.5 Others	Ad-hoc Chair	endorsed	2019-02-28 19:14:51	2019-02-28 19:14:51
R1-1903659	Reply LS on RSS based measurements	RAN1	approved	2019-02-28 15:11:59	2019-02-28 15:11:59
R1-1903660	TR 36.776 v1.0.0 Study on LTE-based 5G terrestrial broadcast	Qualcomm Incorporated	endorsed	2019-03-01 12:08:59	2019-03-01 12:08:59
R1-1903661	RAN1 agreements for Rel-16 Additional MTC Enhancements for LTE	Ericsson	not treated	2019-03-03 16:22:31	2019-03-11 16:48:48
R1-1903662	Chairman's notes of AI 6.2.1 Additional MTC Enhancements	Ad-hoc Chair	revised	2019-03-01 11:15:19	2019-03-01 11:15:19
R1-1903663	Chairman's notes of AI 6.2.2 Additional Enhancements for NB-IoT	Ad-hoc Chair	endorsed	2019-03-01 11:15:19	2019-03-01 11:15:19
R1-1903664	Chairman's notes of AI 6.2.1 Additional MTC Enhancements	Ad-hoc Chair	endorsed	2019-03-01 12:08:59	2019-03-01 12:08:59
R1-1903665	RAN1 agreements for Rel-16 Additional Enhancements for NB-IoT	Huawei	not treated	2019-03-03 16:22:31	2019-03-11 16:48:48
R1-1903676	LS on completion of CLI-RIM in RAN1	RAN1,	approved	2019-03-03 17:36:06	2019-03-14 08:37:08
R1-1903677	LS on UE-UE CLI measurement/reporting and Network coordination mechanism for CLI	LG Electronics	approved	2019-03-03 17:36:06	2019-03-08 17:09:10
R1-1903678	CR on QCL confliction	Samsung	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903679	Draft CR on out of HARQ order with multiple PDSCH within one slot	Huawei, HiSilicon,	withdrawn	2019-03-03 17:36:09	
R1-1903680	Correction to last PUCCH resource set configuration	Ericsson	agreed	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903681	Configuration of RIM-RS monitoring	Intel	not treated	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903682	Correction on physical downlink control channel	ASUSTEK COMPUTER	agreed	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903683	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	revised	2019-02-28 15:39:39	2019-02-28 15:39:39

R1-1903684	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903685	Correction to LBRM restriction	Ericsson	agreed	2019-03-03 17:36:14	2019-05-03 00:00:00
R1-1903686	Feature lead summary of Enhancements on Multi-beam Operations	LG Electronics	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903687	Feature lead summary #2 for NR-U DL Signals and Channels	Motorola Mobility,	not treated	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903688	TR 38.855 v1.0.3 Study on NR positioning	Ericsson	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903689	Offline session notes for 7.2.10.1.4 on evaluations of positioning solutions	nn	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903690	Correction on PDCCH selection among different QCL-TypeD property	Huawei, HiSilicon	endorsed	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903691	Text Proposal on Additional NR Positioning Enhancements for the 3GPP TR 38.855	Intel	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903692	[Draft] LS on initial access SSB periodicity assumption for IAB MT	Qualcomm	revised	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903693	[Draft] LS on OTA timing alignment for IAB	Huawei	revised	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903694	Summary of Efficient and low latency serving cell configuration/activation/setup	Nokia, Nokia	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903695	Feature lead summary on Cross-carrier Scheduling with Different Numerologies	Nokia, Nokia	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903696	Draft CR on dynamic grant overriding configured grant	Qualcomm, Intel	revised	2019-03-03 17:36:20	
R1-1903697	LS on support of Enhancements on multi-TRP/panel transmission	RAN1, Huawei	approved	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903698	UL grant free transmission enhancement	OPPO	not treated	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903699	Summary of UL inter UE Tx	vivo	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903700	Summary of Thursday offline discussion on potential enhancements for PUSCH for NR	Nokia, Nokia	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903701	TP for TR 38.855, Section 2 and 7.2 on RAT-independent positioning	Ericsson, ESA, Qualcomm,	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903702	TP for TR 38.855, Section 8.x on RAT-independent positioning	ESA, Ericsson,	revised	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903703	Summary of Simulation assumption &	ZTE, Thales	not treated	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903704	Text proposal on 2 Rx Antennas for NR V2X	General Motors,	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903705	Feature Lead's Summary #2 on Channel Access Procedures	Nokia, Nokia	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903706	Study and valuation of scheduling, HARQ and CSI processing timeline	MediaTek Inc.	not treated	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903707	Offline discussions for enhanced configured grant PUSCH transmissions	NTT DOCOMO	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903708	Clarification on UL/SUL indicator field and SRS request field in DCIs	Huawei, HiSilicon	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903709	TP for TR 38.855, Section 8.x on RAT-independent positioning	ESA, Ericsson,	not treated	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903710	Correction to align RAN1 and RAN4 specifications for EN-DC power control	Ericsson	agreed	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903711	Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline	Qualcomm	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903712	Text proposal for TSN requirements evaluation	Nokia, Nokia	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903713	RAN1 NR UE features	NTT	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903714	Draft LS on RAN1 NR UE features update	NTT	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903715	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903716	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903717	Draft TS 38.213 CR on CORESET #0 Beam	vivo	withdrawn	2019-03-03 17:36:23	
R1-1903718	Draft TS 38.213 CR on multiplexing HARQ-ACK/SR/CSI in PUCCH	vivo	withdrawn	2019-02-28 15:39:39	2019-02-28 15:39:39

R1-1903719	Correction and clarification to CSI computation time	Ericsson	endorsed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903720	Removal of UL transmision restrictions for paired spectrum	Nokia, Nokia	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903721	[Draft] LS on text proposal to TR 38.825 on TSN requirements evaluation	Nokia	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903722	TP for TR 38.855, Section 2, 7.2 and 7.2.4 on RAT independent positioning	Ericsson, ESA,	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903723	Summary of remaining details on evaluation assumptions and evaluation results	Huawei	noted	2019-02-28 15:39:39	2019-02-28 15:39:39
R1-1903724	TP on positioning for RAT-independent techniques	Huawei, HiSilicon	not treated	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903725	Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH	Ericsson	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903726	(Late drop) CR on PRACH Power Ramping Counter Suspension	Samsung	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903727	Draft TS 38.214 CR on association between SRS port and PTRS port	vivo	endorsed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903728	UE Power Consumption Reduction in RRM Measurements	Qualcomm Incorporated	withdrawn	2019-03-03 17:36:26	
R1-1903729	Draft CR on QCL indication for PDSCH with	ZTE	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903730	Draft CR on correction to frequency-domain starting position indication for SRS resource	Qualcomm Incorporated	postponed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903731	Outcome of offline discussion on maintenance for DCI contents	Ericsson	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903732	Draft LS to IEEE WG on short control signaling	Qualcomm Incorporated	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903733	On bitwidth calculation for DCI fields using RRC parameter indicating maximum number	Intel Corporation,	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903734	Summary of offline discussion for 7.1.1 SSB and RACH	Ericsson	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903735	CR on default QCL for AP-CSI-RS	ZTE	withdrawn	2019-03-03 17:36:29	
R1-1903736	Summary of V2X Sidelink Synchronization	CATT	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903737	Summary of UE power saving schemes	CATT	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903738	CR on PDSCH beam indication	vivo	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903739	Discussion on capability signaling of dualpA-Architecture and pa-	Intel	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903740	Correction on TCI indication for multi-slot	Intel	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903741	Draft LS on RAN1 NR UE features update	RAN1, NTT DOCOMO	revised	2019-03-03 17:36:37	2019-03-08 17:09:10
R1-1903742	Correction on PHR timing for configured	Huawei,	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903743	Summary on PHR timing for configured	Huawei,	noted	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903744	Draft CR on QCL indication for PDSCH with	ZTE	not pursued	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903745	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903746	QCL properties of Msg4 in CONNECTED Mode	Nokia, Nokia	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903747	CR on latency after gNB response for	ZTE	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903748	Removal of UL transmision restrictions for paired spectrum	Nokia, Nokia	agreed	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903749	CR on QCL assumption for receiving PDCCH for RAR	NTT DOCOMO,	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903750	CR on identifying transmission occasion after resetting a PC closed loop	ZTE	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903751	Draft LS on pdcch-BlindDetectionCA	NTT DOCOMO	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903752	Correction to transmission timing adjustments in TS 38.213	Sharp	revised	2019-02-28 21:54:33	2019-02-28 21:54:33
R1-1903753	Summary for PDCCH structure and search space	NTT DOCOMO	noted	2019-02-28 21:54:34	2019-02-28 21:54:34
R1-1903754	LS on pdcch-BlindDetectionCA	RAN1, NTT DOCOMO	approved	2019-02-28 21:54:34	2019-02-28 21:54:34
R1-1903755	Draft CR on overlapping of SR and PUSCH without UL-SCH	CATT	endorsed	2019-02-28 21:54:34	2019-02-28 21:54:34

R1-1903756	Draft CR on overlapping of CSI and PUSCH with slot aggregation	CATT	revised	2019-02-28 21:54:34	2019-02-28 21:54:34
R1-1903757	LS to ETSI BRAN on EN 301 893	RAN1, Qualcomm	approved	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903758	Correction on PHR timing for configured	Huawei,	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903759	Draft CR on overlapping of CSI and PUSCH with slot aggregation	CATT	agreed	2019-02-28 21:54:34	2019-02-28 21:54:34
R1-1903760	Discussion on synchronization mechanism	LG	not treated	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903761	Updated summary of enhancements to single Tx switched uplink for EN-DC	Apple	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903762	CR on zero-padding of DCI 1_1 in cross-carrier scheduling case	vivo	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903763	Correction on UL HARQ for EN-DC with SUO Case 1	Huawei, HiSilicon, Nokia,	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903764	Summary#4 of UE power consumption reduction in RRM measurements	vivo	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903765	LS to RAN1 on power saving	RAN2, vivo	treated	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903766	Summary of Thursday offline discussion on UL/DL intra-UE prioritization/multiplexing	Nokia, Nokia	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903767	Text proposal on UL/DL intra-UE prioritization/multiplexing for TR 38.825	Nokia, Nokia	endorsed	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903768	Clarification regarding non-full-duplex UE communication	Nanjing Ericsson	postponed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903769	Feature lead summary#3 for agenda item 7.2.4.1.1 Physical layer structure	LG Electronics	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903770	Feature lead summary#2 for agenda item 7.2.4.1.2 Physical layer procedures	LG Electronics	withdrawn	2019-03-03 17:37:05	
R1-1903771	Correction on DCI format 2_3 for SUL cell in TS 38.213	Huawei, HiSilicon	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903772	Correction to transmission timing adjustments in TS 38.213	Sharp	revised	2019-03-03 17:37:05	2019-03-08 17:09:11
R1-1903773	TP for TR 38.885 on LTE Uu evaluation and	Huawei,	endorsed	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903774	CR on dynamic grant overriding configured grant	Qualcomm, Intel	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903775	TR 38.855 v1.0.4 Study on NR positioning	Ericsson	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903776	Email discussion on collecting the results for eURLLC processing timeline	Qualcomm	not treated	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903777	Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline	Qualcomm	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903778	Summary for Uplink Power Control For Supporting NR-NR Dual Connectivity	Qualcomm	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903779	CR on QCL assumption for a CORESET other than 0	NTT DOCOMO,	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903780	Summary of offline discussion for Rel-15 CRs on DL/UL data scheduling and HARQ	Qualcomm	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903781	Alignment of terminology across	Ericsson	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903782	Correction on DCI format 2_3 for SUL cell in TS 38.213	Huawei, HiSilicon	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903783	CR on dynamic grant overriding configured grant	Qualcomm, Intel	agreed	2019-03-03 17:37:19	2019-03-05 00:00:00
R1-1903784	Summary of 7.1.3 - Maintenance of UCI multiplexing on PUCCH	Ericsson	noted	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903785	Correction on physical resource mapping for PUSCH with configured grant	Huawei, HiSilicon	agreed	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903786	Draft CR on UE procedure for reporting multiple UCI types	CATT	revised	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903787	LS on Conclusion of NR V2X and Agreed TP	RAN3, LG	treated	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903788	Summary for UE Power Saving Evaluation	Qualcomm	revised	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903789	[Draft] LS on text proposal for TR 38.825 on UL/DL intra-UE prioritization/multiplexing	Nokia	revised	2019-03-01 15:04:25	2019-03-01 15:04:25
R1-1903790	LS on text proposal to TR 38.825 on TSN requirements evaluation	RAN1, Nokia	approved	2019-03-01 11:25:47	2019-03-01 11:25:47
R1-1903791	Combined TP for TR 38.885 Conclusions	Huawei	agreed	2019-03-01 13:19:09	2019-03-01 13:19:09

R1-1903792	RAN1 NR UE features	NTT	revised	2019-03-03 17:37:24	2019-03-08 17:09:11
R1-1903793	Corrections to 38.214	Nokia, Nokia	revised	2019-03-05 14:05:38	2019-03-08 17:09:12
R1-1903794	Summary offline discussion on UCI	OPPO	noted	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903795	Corrections to TS38.213	Samsung	agreed	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903796	Corrections to 38.214	Nokia, Nokia	revised	2019-03-05 14:05:39	2019-03-08 17:09:12
R1-1903797	Summary of Friday offline discussion on potential enhancements for PUSCH for NR	Nokia, Nokia	noted	2019-03-01 13:37:40	2019-03-01 13:37:40
R1-1903798	TR 38.824 v1.1.0 for Study on physical layer enhancements for NR ultra-reliable low	Huawei	revised	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903799	Clarification on UL/SUL indicator field and SRS request field in DCIs	Huawei, HiSilicon	agreed	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903800	[Draft] LS reply on MBSFN subframe pattern configuration for LTE CRS rate matching	Ericsson	revised	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903801	Correction to support FR1 extension to 7.125	Huawei,	agreed	2019-03-03 17:37:34	2019-05-03 00:00:00
R1-1903802	LS on RAN2 conclusion for NR positioning SI	RAN3, Intel	treated	2019-03-01 13:19:09	2019-03-01 13:19:09
R1-1903803	LS reply on MBSFN subframe pattern configuration for LTE CRS rate matching	RAN1, Ericsson	approved	2019-03-01 13:37:40	2019-03-01 13:37:40
R1-1903804	Summary for Potential Enhancements to Scheduling/HARQ/CSI Processing Timeline	Qualcomm	noted	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903805	Summary#5 of UE power consumption reduction in RRM measurements	vivo	noted	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903806	Summary for UE Power Saving Evaluation	Qualcomm	noted	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903807	CR on UE procedure for reporting multiple UCI types	CATT	agreed	2019-03-03 17:37:37	2019-05-03 00:00:00
R1-1903808	[Draft] Response LS on FR1 range	Qualcomm	revised	2019-03-03 17:37:39	2019-03-08 17:09:11
R1-1903809	LS on initial access SSB periodicity assumption for IAB MT	RAN1, Qualcomm	approved	2019-03-03 17:37:39	2019-03-08 17:09:11
R1-1903810	LS on OTA timing alignment for IAB	RAN1, Huawei	approved	2019-03-03 17:37:39	2019-03-08 17:09:11
R1-1903811	Summary of V2X Sidelink Synchronization	CATT	noted	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903812	Feature lead summary on Cross-carrier Scheduling with Different Numerologies	Nokia, Nokia	not treated	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903813	Correction on PUSCH with configured grant	Huawei, HiSilicon	revised	2019-03-03 17:37:39	2019-03-08 17:09:11
R1-1903814	Correction to transmission timing adjustments in TS 38.213	Sharp	agreed	2019-03-03 17:37:39	2019-03-07 07:24:55
R1-1903815	Correction on PUSCH with configured grant	Huawei, HiSilicon	agreed	2019-03-03 00:00:00	2019-03-03 00:00:00
R1-1903816	Response LS on FR1 range	RAN1, Qualcomm	approved	2019-03-03 17:37:39	2019-03-08 17:09:11
R1-1903817	RAN1 NR UE features	NTT	agreed	2019-03-03 17:37:39	2019-03-04 07:35:43
R1-1903818	Summary of Friday offline discussion on UL/DL intra-UE prioritization/multiplexing	Nokia, Nokia	not treated	2019-03-03 17:37:39	2019-03-05 17:44:51
R1-1903819	LS on text proposal for TR 38.825 on UL/DL intra-UE prioritization/multiplexing	RAN1, Nokia	approved	2019-03-03 17:37:39	2019-03-08 17:09:11
R1-1903820	LS on RAN1 NR UE features update	RAN1, NTT DOCOMO	approved	2019-03-03 17:37:39	2019-03-08 17:09:12
R1-1903821	Alignment of terminology across	Ericsson	agreed	2019-03-05 14:07:56	2019-03-05 17:44:51
R1-1903822	Summary of email discussion [96-NR-08] on parameter setting for RI=3-4 extension	Samsung	agreed	2019-03-05 14:07:57	2019-03-22 13:51:42
R1-1903823	Corrections to 38.214	Nokia, Nokia	agreed	2019-03-06 12:58:06	2019-03-06 13:27:04
R1-1903824	TR 38.855 v1.1.0 Study on NR positioning	Ericsson	endorsed	2019-03-07 20:09:21	2019-03-11 16:43:41
R1-1903825	Text proposal for TR 38.824 Section 6.1	Huawei	endorsed	2019-03-11 20:25:31	2019-03-14 09:00:45
R1-1903826	Text proposal for TR 38.824 Section 8.2.2	Huawei	endorsed	2019-03-11 20:25:31	2019-03-14 09:00:45
R1-1903827	Text proposal for TR 38.824 Section 5.3	Huawei	not pursued	2019-03-11 20:25:31	2019-03-14 09:00:45
R1-1903828	Text proposal for TR 38.824 Section 6.4.1.3	Huawei	not pursued	2019-03-11 20:25:31	2019-03-14 09:00:45

R1-1903829	TR 38.824 V1.2.0 Study on physical layer enhancements for NR ultra-reliable low	Huawei	**endorsed**	2019-03-11 20:25:31	2019-03-14 09:00:47
R1-1903830	TR 38.885 v1.1.0 Study on Vehicle-to-Everything	Huawei Tech.(UK)	**endorsed**	2019-03-13 16:05:51	2019-03-14 09:00:48
R1-1903831	Email discussion summary of [96-NR-11]: observation for reducing RRM measurement for SSBs by considering adjacent directional	vivo	**available**	2019-03-13 16:05:54	2019-03-14 09:00:45
R1-1903832	TR 38.840 v1.0.0 Study on UE Power Saving	CATT	**endorsed**	2019-03-13 16:05:54	2019-03-14 09:00:45
R1-1903833	OAM configuration parameters for NR RIM	CMCC	**agreed**	2019-03-13 16:05:57	2019-03-14 08:37:08
R1-1903834	Email discussion on potential link-level simulation assumption for 2-step RACH	ZTE	**agreed**	2019-03-22 14:14:24	2019-03-22 14:15:48
R1-1903835	RRC parameters for NR CLI-handling	LG Electronics	**agreed**	2019-04-02 11:05:00	2019-04-02 11:05:24
R1-1903836	LS on RRC parameters for NR CLI-handling	RAN1, LG Electronics	**approved**	2019-04-02 11:05:00	2019-04-02 11:05:24
R1-1903837	Email discussion on summarizing the details of the proposed NR-NR DC power control	Qualcomm	reserved	2019-03-04 00:00:00	

APPENDIX E

3GPP TSG RAN WG1 Meeting #97 **R1-1905921**
Reno, USA, 13th – 17th May 2019

Source: **MCC Support**

Title: **Final Report of 3GPP TSG RAN WG1 #96b v1.0.0 (Xi'an, China, 8th – 12th April 2019)**

Document for: **Approval**



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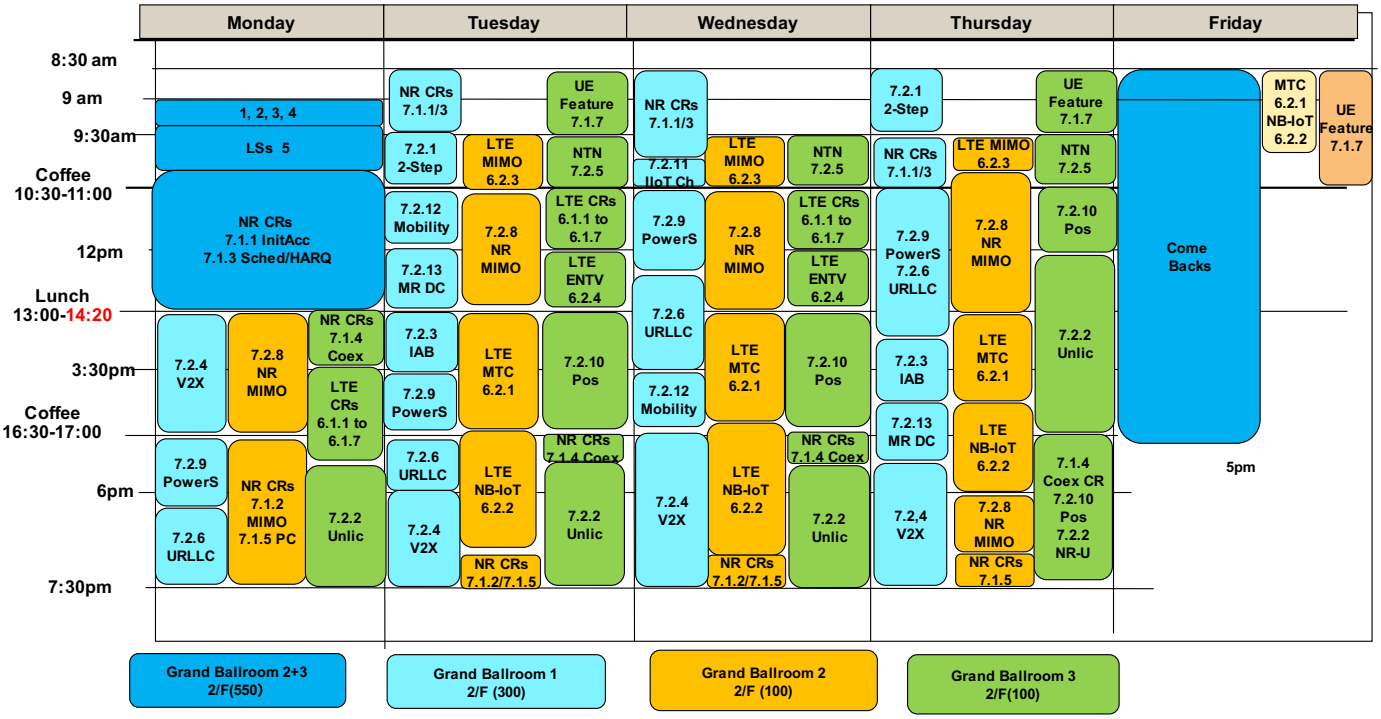
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Main facts summary

The 3GPP TSG WG RAN1#96b meeting, hosted by CF3, was held at the Shangri-La Hotel, Xi'an, China.
The meeting started at 9:00 on Monday 8th April and finished at 16:25 on Friday 12th April 2019.
The number of attending delegates, having confirmed their participation through the electronic check-in application, was **470.**
Note that the number of registered was 610.

Celebration of the 2018 3GPP Excellence Awards granted to Kazuaki Takeda from NTT DOCOMO, before usual business just at the start of the meeting.

The schedule of the week was as follows:



The list of action points that require RAN1 post meeting follow-up is listed in Annex F (end of document).

The number of contributions for this meeting was **2001**.

Note: The amount of documents includes those discussed during the email discussion session post meeting.

	Contribution is agreed/approved
	Contribution is not pursued (no consensus)
	Further discussion is required – come-back needed
	Working assumption
	Specific action needed from MCC
	Contribution is for email discussion/approval

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1 Opening of the meeting

Mr Wanshi Chen (RAN1 Chairman) welcomed the participants of the RAN WG1 #96b meeting and opened the meeting at 09:00.

Mr Shen Jia from OPPO on behalf of the hosts the Chinese Friends of 3GPP, Apple Computer Trading Co., Ltd, BEIJING SAMSUNG TELECOM R&D CENTER, China Academy of Information and Communications Technology, China Academy of Telecommunication Technology, China Information Technology Design & Consulting Institute Co., Ltd, China Mobile Communications Corporation, China Telecommunications Corporation, China Unicom, Guangdong OPPO Mobile Telecommunications Corp., Ltd, Huawei Technologies Co.,Ltd, Intel China Ltd, Nanjing Ericsson Panda Com Ltd, Qualcomm Wireless Communication Technologies (China) Ltd, vivo Mobile Communication Co., Ltd and ZTE Corporation – welcomed the delegates, and detailed the domestic arrangements for the full week.

3GPP Award
Further to 2012 leadership decision to recognise the very best individual for their contributions to current work within 3GPP, the Awards Panel decided to award once again RAN1 delegate. Mr Chair congratulated the seventh winner of the 3GPP Excellence Award, Mr Kazuaki Takeda from NTT DOCOMO.
This award is in recognition to Kazuaki's contribution to 3GPP, covering a variety aspects of physical layer standardization from LTE to NR and more recently, as rapporteur for the NR Release 15 study and work item. He has also helped chair the Release 15 UE feature discussions, as well as some of the recent Release 15 LTE - eMTC/NBI-IoT online sessions.

1.1 Call for IPR

The attention of the delegates to the meeting of this Technical Specification Group was drawn to the fact ***that 3GPP Individual Members have the obligation*** *under the IPR Policies of their respective Organizational Partners to* ***inform their respective*** *Organizational Partners* ***of Essential IPRs they become aware of****.*
The delegates take note that they are hereby invited:

- *to investigate whether their organization or any other organization owns IPRs which were, or were likely to become Essential in respect of the work of 3GPP.*
- *to notify their respective Organizational Partners of all potential IPRs, e.g., for ETSI, by means of the IPR Information Statement and the Licensing declaration forms (e.g. see the ETSI IPR forms https://www.etsi.org/intellectual-property-rights/ipr).*

More information is available via the "Legal" page on the web site: https://www.3gpp.org/about-3gpp/legal-matters .

1.2 Competition law statement

The Chairman also drew Member's attention to the fact that 3GPP activities are subject to antitrust and competition laws and that compliance with said laws is therefore required of any participant of this WG meeting including the Chairman and Vice Chairmen. In case of question, please contact your legal counsel.
The present meeting will be conducted with strict impartiality and in the interests of 3GPP.
Furthermore, the Chairman reminded Members that timely submission of work items/contributions in advance of WG meetings is important to allow for full and fair consideration of such matters.

1.3 Network usage conditions

The PCG has laid down the following network usage conditions:

Users shall not use the network to engage in illegal activities. This includes activities such as copyright violation, hacking, espionage or any other activity that may be prohibited by local laws.

Users shall not engage in non-work related activities that consume excessive bandwidth or cause significant degradation of the performance of the network.
Since the **network is a shared resource**, users should exercise some basic etiquette when using the 3GPP network at a meeting. It is understood that high bandwidth applications such as downloading large files or video streaming might be required for business purposes, but delegates should be strongly discouraged in performing these activities for personal use. Downloading a movie or doing something in an interactive environment for personal use essentially wastes bandwidth that others need to make the meeting effective. The meeting chairman should remind end users that the network is a shared resource; the more one user grabs, the less there is for another. Email and its attachments already

take up significant bandwidth (certain email programs are not very bandwidth efficient). In case of need the chair can ask the delegates to restrict IT usage to things that are essential for the meeting itself.

1. DON'T place your WiFi device in ad-hoc mode
2. DON'T set up a personal hotspot in the meeting room
3. DO try 802.11a if your WiFi device supports it
4. DON'T manually allocate an IP address
5. DON'T be a bandwidth hog by streaming video, playing online games, or downloading huge files
6. DON'T use packet probing software which clogs the local network (e.g., packet sniffers or port scanners)

1.4 Check-in for Registered Delegates

The attention of the delegates to this meeting was drawn to the fact that it is not permitted to check in other delegates on their behalf. In the event of technical difficulties preventing check-in, delegates should present themselves in person to the Secretary.

1.5 Aspects related to RAN1 Meeting Management

Delegates are encouraged to check R1-1721392 for some thoughts on RAN1 meeting management.

2 Approval of Agenda

R1-1905390 **Draft Agenda of RAN1#96bis meeting** **RAN1 Chair** **(Revision of R1-1903840)**
Wanshi Chen (RAN1 Chair) proposed the agenda for the meeting, as well the schedule of the week.
Discussion: No comments to the agenda.
Decision: The agenda is approved.

3 Highlights from RAN plenary

R1-1903841 **Highlights from RAN#83** **RAN1 Chair**
Discussion: No comments.
Decision: The document is noted.

4 Approval of Minutes from previous meetings

R1-1903842 **Report of RAN1#96 meeting** **ETSI MCC**
The document was presented by Patrick Merias from MCC (ETSI Mobile Competence Center) and provides the report from RAN1#96 meeting in Athens.
Discussion: No comments.
MCC recalled that any CR should be written against the correct version of the spec – a shadow CR is not a copy/paste of the CR from previous release.
Decision: The agenda is approved.
Friday: Report is revised in
R1-1905837 **Report of RAN1#96 meeting** **ETSI MCC**
… due to the following agreement, made in RAN1#96 (under AI 7.2.4.1.2) and not included in the meeting minutes approved in R1-1903842 on Monday.

Agreement:

- Sidelink HARQ ACK/NACK report from UE to gNB is not supported in Rel-16.

Decision: R1-1905837 is approved.

5 Incoming Liaison Statements

//NR related

Rel-15 InitAccess

R1-1903856 **LS on clarification about CSI-RS measurement** **RAN2, ZTE**
RAN2 asks RAN1/RAN4 to:

- Check whether the current CSI-RS measurement configuration framework defined in RAN2 is acceptable and whether some additional restrictions are needed?
- If RAN2 should capture some restriction referring to "frequency layer", answer above questions to clarify the definition of the "frequency layer" in the description of the maximum number of CSI-RS resources per above.

Discussion: Huawei commented that a number of replies have been prepared, with different views between each other. It is also noted that the LS is to RAN1/RAN4 and depending on the discussion, RAN1 reply may not be needed.
Decision: The document is noted. Offline discussion whether reply LS is necessary or not.
Friday: see reply under 7.1.1

R1-1904262	[Draft] Reply LS on clarification about CSI-RS measurement	Intel Corporation
R1-1904678	Draft reply to LS on clarification about CSI-RS measurement	ZTE
R1-1905133	Discussion on RAN2 LS on clarification about CSI-RS measurement	ZTE
R1-1905212	Draft LS response on clarification about CSI-RS measurement	Ericsson
R1-1905222	[Draft] Reply LS on on clarification about CSI-RS measurement	Nokia, Nokia Shanghai Bell
R1-1905261	Draft Reply LS on CSI-RS for mobility	Huawei, HiSilicon

Rel-15 Coex/DC

R1-1903848 LS on Specification support for SFTD with NR Pcell RAN4, Ericsson

RAN4 informs that the decision regarding SFTD between NR PCell and NR neighbour cell, has been reverted i.e. no requirements will be introduced in Rel-15 for this use case. The justification is that the physical layer synchronization assumed in Rel-15 NR-DC, requires such tight synchronization between MCG and SCG that a static timing relation between the cell groups is needed.

Decision: The document is noted.

R1-1903864 LS on SFTD measurement for NR-DC in Rel-15 RAN2, ZTE

RAN2 asks RAN1/RAN4 to confirm RAN2's understanding on synchronous NR-DC in Rel-15, namely that sync NR-DC implies at least slot synchronisation and it does not imply SFN synchronisation

Decision: The document is noted. Reply LS is necessary

R1-1904263	Introduction of SS-RSARP	Intel Corporation
R1-1905135	Draft reply to RAN4 LS on NR-LTE Co-existence	Ericsson

Rel-15 UE Feature

R1-1903849 LS on FR2 Beam Correspondence RAN4, Samsung

Decision: The document is noted.

R1-1904182 LS on UL sharing applicability in different scenarios RAN2, Nokia

RAN2 asks RAN1 to provide answers to the following questions:

- Is the shared E-UTRA-NR FDD carrier supported in RAN1, i.e. the case where both FDD DL carrier and FDD UL carrier are shared from UE perspective by E-UTRA and NR?
- Does the UL sharing from UE perspective (as indicated by the UL sharing capability) need to be supported together with any DL sharing capabilities that are required the shared E-UTRA-NR FDD carrier case?
- If the answer to previous question is "Yes", RAN2 might discuss how the corresponding capability is handled to avoid any NBC changes and any information related to that decision would be useful to RAN2.
- Which of the rate matching mechanisms defined in RAN1 specifications were designed to be used to accomplish the DL sharing between E-UTRA FDD and NR FDD carriers?

Decision: The document is noted. Reply LS is necessary

R1-1905227	DRAFT response LS on UL sharing applicability in different scenarios	Nokia, Nokia Shanghai Bell
R1-1905256	Draft LS response to RAN2 LS on UL sharing applicability in different scenarios	Huawei, HiSilicon

R1-1904888 [DRAFT] Reply LS on Capability signalling of single/dual PA architecture, phase discontinuity, and UL timing alignment aspects Intel Corporation

Discussion: title to be updated as "Reply LS on Capability signalling of phase discontinuity"
Qualcomm: offline is needed as adopting RAN4 proposal would be a non-backward compatible signaling change
Decision: The document is noted. See 7.1.4.

R1-1905228	On RAN4 UE feature list for NR: Introduction of Maximum UL duty cycle UE capability	Nokia, Nokia Shanghai Bell

NR-U

R1-1903845 Reply LS on wideband carrier operation for NR-U RAN4, Ericsson

RAN4 concluded the following:

- It is a common understanding that, we will not use RF filtering for adaption for both the UE and gNB side.
- RAN4 to study the feasibility of changing the baseband filtering between subsequent gNB transmissions
  - Feasibility will depend on RF leakage and blocking requirements
- RAN4 to study the feasible durations of changing baseband filtering at UE receiver
  - Feasibility will depend on RF leakage and blocking requirements
- RAN4 to study the need for guardbands between LBT sub-bands for wideband carrier operation between the adjacent LBT sub-bands where CCA passes on all adjacent LBT sub-bands once LBT outcome is known to the UE

Decision: The document is noted.

V2X

R1-1903847 **Reply LS on NR UE transient period in sidelink channels RAN4, LG Electronics**

Decision: The document is noted.

R1-1903854 **LS on SL RLM / RLF in NR V2X for unicast RAN2, Apple**

RAN2 asks RAN1 the following questions:

Q1: What reference signal(s) can be used for the UE pair to perform monitoring of the radio link?

Q2: What metric(s) can be used for SL RLM / RLF declaration? Potential metric discussed in RAN2 comprises of SL in-sync / out-of-sync indication (others are not excluded).

Decision: The document is noted. Reply LS is necessary

R1-1903855 **LS to RAN1 on all RAN2 agreed TPs and RAN2 conclusions for NR V2X SI RAN2, Huawei**

Decision: Noted. All TPs have been considered and included in TR38.885.

R1-1905448 Draft Reply LS on SL RLM / RLF in NR V2X for unicast LG Electronics

Late submission

eMIMO

R1-1903843 **LS on FR2 RF Exposure mitigation methods RAN4, Qualcomm Incorporated**

RAN4 has discussed FR2 RF Exposure issues. Two methods were introduced during Rel-15 in the specification to enable the UE to comply with regulatory exposure limits, one is P-MPR, the other is maxUplinkDutyCycle capability. For some UE implementation, the needed back off to comply with RF exposure regulation could be large.

Discussion: Huawei not sure to understand what RAN4 is expecting from RAN1

Qualcomm/ Intel: more detailled discussion is needed – and likely action as well (what are the impacts to RAN1 specs)

Decision: The document is noted.

R1-1903844 **Reply LS on new UE capability for Full TX power UL transmission RAN4, vivo**

Decision: The document is noted.

R1-1903846 **LS on NR ATF Measurements RAN4, Intel Corporation**

Recommends introducing the proposed NR RSARP measurement definition

Decision: The document is noted. Already in 38.215 Rel-15 according to spec editor.

R1-1905229 **On FR2 RF Exposure mitigation methods Nokia, Nokia Shanghai Bell**

- Observation 1: Excessively reducing the UE output power will lead to radio link failures. Similarly, excessively reducing the duty cycle may prevent sending ACK/NACK and other UL control signaling, thus also cause radio link failures.
- Observation 2: If MPE related UE assistance is provided to gNB, the gNB will have the flexibility and means to better mitigate the link degradation or radio link failure caused by MPE issues like a user approaching the antenna location of UE.
- Observation 3: With new MPE related UE assisntance and indications, the gNB can cope with a poor link by redirecting the link.
- Observation 4: Adding MPE like user detection knowledge in the beam alignement techniques adds flexibility for the network to prevent radio link failures.
- Proposal 1: RAN1 to investigate and introduce new MPE related UE assistance to informa the gNB of MPE situations and related restrictions.
- Proposal 2: Discuss and agree under which agenda item the MPE mitigation techniques should be discussed
  - New eMIMO sub-agenda item
  - Some other Rel-16 WI (which one?)
  - TEI16

Decision: The document is noted.

Mobility Enhancements

R1-1903863 LS on NR mobility enhancements RAN2, Intel Corporation

Question: RAN2 would like RAN1 and RAN4 to provide their feedback on whether the replies to the LTE LSs mentioned above are also applicable to NR for inter and intra frequency (both FR1 and FR2), synchronous, and asynchronous scenarios.

Decision: The document is noted. Reply LS is necessary (see AI 7.2.12.1)

R1-1904261 [Draft] Reply LS on NR mobility enhancements Intel Corporation

R1-1904710 Draft Reply LS on feasibility of simultaneous connectivity for NR Huawei, HiSilicon

// The following LSs are noted but not to be treated online, unless explicitly requested

R1-1903850 LS on frequency offset between anchor and non-anchor carrier for TDD NB-IoT standalone operation RAN4, Huawei

R1-1903851 Reply LS on the interruption time during mobility in LTE RAN4, Huawei

R1-1903852 LS on FR1 range RAN4, Ericsson

R1-1903853 Reply LS to 3GPP TSG RAN and 3GPP TSG RAN WG2 regarding LTE LAA channel combinations for 5GHz RAN4, Charter Communications

R1-1903857 LS on assistance information for TSN traffic flows RAN2, Nokia

R1-1903858 Reply LS on RAN Impact analysis due to TSN RAN2, Ericsson

R1-1903859 Reply LS on TSN integration in the 5G System RAN2, Nokia

R1-1903860 LS response to SA2 on unicast, groupcast and broadcast in NR sidelink RAN2, Huawei

R1-1903861 Reply LS to TSG RAN regarding LTE LAA channel combinations for 5GHz RAN2, Charter Communications

R1-1903862 RAN2 MR-DC enhancement agreements RAN2, vivo

R1-1903865 LS on QoS Support for eV2X over Uu interface SA2, Huawei

R1-1903866 LS on Automatic Restoration of GFBR QOS SA2, Vodafone

R1-1903867 LS in reply to LS on Draft new Recommendation E.RQST – "KPI targets for mobile networks" RAN, Nokia

R1-1903868 Response LS on Invitation to Coexistence Workshop in Vienna RAN, Nokia

R1-1903869 Response LS on Completion of Study on Cellular IoT support and evolution for the 5G System, and LS on Signalling optimization for RRC Inactive N3 path switch RAN, Qualcomm

R1-1904050 LS on UE feature list for NR RAN4, NTT DOCOMO

R1-1904051 LS on NR V2X spectrum allocation 5GAA WG4, Huawei

R1-1904052 Reply LS to IEEE 802.11 working group in relation to certain channel combinations for LAA in 5GHz RAN, Charter Communications

R1-1904053 LS in reply to LS on Draft new Recommendation E.RQST – "KPI targets for mobile networks" SA, Samsung

R1-1904220 LS on full data rate support for UP IP SA3, Qualcomm

// The following LSs were received during the week:

R1-1905706 Reply LS on collision of RRM measurement with UL transmission RAN4, Intel

Decision: to be treated under 7.1.1

R1-1905845 LS on MsgA content size RAN2, Nokia

RAN2 asks RAN1 to take the minimum MsgA content sizes into account (56 and 72 bits depending on whether short or long I-RNTI is requested by the NW from RRC INACTIVE UEs inside the RRCResumeRequest message, respectively) as well as provide any information about the upper bound of the MsgA content size if/when available, and any early information for the power ramping design for MsgA transmission.

Decision: The document is noted.

6 E-UTRA

6.1 Maintenance of E-UTRA Releases 8 – 15

6.1.1 Maintenance of E-UTRA Release 8 – 14

R1-1905564 Chairman's notes on AI 6.1.1 Maintenance of E-UTRA Release 8 – 14 Ad-hoc Chair (Ericsson)

Samsung Exhibit 1026, Page 363 of 900

Decision: The document is endorsed, content incorporated below.

R1-1904372 **Draft CR on PDSCH RE mapping for semi-OL** **Samsung**
R1-1904373 **Discussion on PDSCH RE mapping for semi-OL** **Samsung**
Conclusion:
The PDSCH RE mapping rule for semi-OL is applicable for both rank 1 and rank 2 semi-OL transmissions.

R1-1904509 **Signaling of FD-MIMO capabilities** **Qualcomm Incorporated**
R1-1905562 **Signaling of FD-MIMO capabilities** **Qualcomm Incorporated**

Agreement:
Adopt the following baseband capability signalling for Rel-13 FD-MIMO:
For a UE configured with FD-MIMO, for a band combination for which the UE does not report FD-MIMO capabilities, a configuration related to a set of CCs is supported by the UE if the following inequality is met

$$\sum_{i \in \text{configured CCs}} w_i \cdot l_i \leq y$$

where

- $\boldsymbol{l_i}$ is the maximum number of DL layers configured for CC $\boldsymbol{i}$
- $\boldsymbol{w_i} = \begin{cases} \boldsymbol{x_0}, & \textbf{if CC } \boldsymbol{i} \textbf{ is configured with FD-MIMO and } \boldsymbol{l_i = 2} \\ \boldsymbol{x_1}, & \textbf{if CC } \boldsymbol{i} \textbf{ is configured with FD-MIMO and } \boldsymbol{l_i = 4} \\ \boldsymbol{x_2}, & \textbf{if CC } \boldsymbol{i} \textbf{ is configured with FD-MIMO and } \boldsymbol{l_i = 8} \\ \boldsymbol{1}, & \textbf{if CC } \boldsymbol{i} \textbf{ is not configured with FD-MIMO} \end{cases}$
- $\boldsymbol{y}$ is the "total number of weighted layers" the UE can process

Notes:

- Legacy capability signalling can still be used after this capability is introduced (to e.g. signal a subset of supported band combinations).
- Detailed design of the capability signalling is left to RAN2

Send LS to RAN2 to introduce the following parameters in UE capability signalling (per UE):

- $\boldsymbol{x_i}$ $(\boldsymbol{i = 0, 1, 2})$: Relative weight of processing FD-MIMO with {2, 4, 8} layers with respect to non-FD-MIMO with the same number of layers. $\boldsymbol{x_i}$ **has a range of** $\{\boldsymbol{1, 1.25, 1.5, 1.75, 2, 2.5, 3, 4}\}$
- $\boldsymbol{y}$: "Total number of weighted layers", which is an integer between 2 and 128.

R1-1905576 **[DRAFT] LS on FD-MIMO signalling capabilities** **Qualcomm Incorporated**
Final LS approved in R1-1905577

R1-1904510 **Correction for overlapping MPDCCH search spaces** **Qualcomm Incorporated, Ericsson**
R1-1905542 **Correction for overlapping MPDCCH search spaces** **Qualcomm Incorporated, Ericsson**
Final CRs agreed in R1-1905550 (TS36.213, CR1250, Rel-13), R1-1905551 (TS36.213, CR1251, Rel-14) and R1-1905552 (TS36.213, CR1252, Rel-15)

R1-1904511 **Antenna switching for 6 SRS symbol in UpPTS** **Qualcomm Incorporated**
R1-1905208 **Discussion on 6 SRS symbols antenna switching in UpPTS** **Huawei, HiSilicon**
Conclusion:
The support of antenna switching (in addition to SRS repetition that is currently specified) for 6 symbol SRS in UpPTS is beneficial from a RAN1 perspective. It can be considered for specification in Rel-16 or later releases.

R1-1904512 **Support of scheduling enhancements for SRS carrier switching** **Qualcomm Incorporated**
R1-1904639 **Additional UE capability for SRS carrier switching** **SoftBank Corp.**

Agreement:
Introduce two separate UE capabilities (from Rel-14) for harq-ReferenceConfig-r14 and soundingRS-FlexibleTiming-r14 on a band-pair basis

- For TDD-TDD band-pair, at least one of the capability bits shall be set to true when rf-RetuningTimeDL/rf-RetuningTimeUL is larger than 1 OFDM symbol

R1-1905543 **[Draft] LS to RAN2 on UE capabilities for SRS carrier switching** **Qualcomm**
Final LS approved in R1-1905553

R1-1904513 **Dropping rule for PUSCH in UpPTS + aperiodic SRS + periodic SRS** **Qualcomm Incorporated**
Final CR agreed in R1-1905544 (TS36.213, CR1246, Rel-14) and R1-1905545 (TS36.213, CR1247, Rel-15)
R1-1905068 **On the number of repetitions for DCI format 3/3A for BL/CE UEs** **Intel Corporation**
Conclusion:
The UE can apply the power control command based on the number of repetitions that were needed to decode the MPDCCH

R1-1905069 **On set of candidates for different ALs for MPDCCH in USS** **Intel Corporation**
Final CRs agreed in R1-1905554 (TS36.213, CR1253, Rel-13), R1-1905555 (TS36.213, CR1254, Rel-14) and R1-1905556 (TS36.213, CR1255, Rel-15)

R1-1904862 **Correction on UE procedure for transmitting PSCCH in mode 3** **Sharp**
R1-1904863 **Correction on UE procedure for determining subframes for transmitting PSSCH** **Sharp**
R1-1904900 **Correction on PSSCH power control in SL mode-3** **NEC Corporation**

6.1.2 Maintenance of E-UTRA Release 15

R1-1905565 **Chairman's notes on 6.1.2 Maintenance of E-UTRA Release 15** **Ad-hoc Chair (Ericsson)**
Decision: The document is endorsed, content incorporated below.

R1-1904514 **EPRE for WUS** **Qualcomm Incorporated**
Agreement:
A higher layer parameter wus-PowerBoost with values of {0dB, 1.8dB, 3dB, 4.8dB} is indicated in SIB for MWUS power boosting.

- Send LS to RAN2 to implement this signalling.

R1-1905557 **[DRAFT] LS on EPRE for WUS** **Qualcomm**
Final LS approved in R1-1905578 with a modification to also copy RAN4

Agreement:
The MWUS EPRE relative to CRE EPRE is defined as *wus-PowerBoost*+$\mathbf{10log_{10}}(p \times \mathbf{min}\,(\rho_A^d, \rho_B^d))$, where ρ_A^d and ρ_B^d are the default values for ρ_A and ρ_B relative to CRS EPRE assuming the same transmitted power for symbols with or without CRS, and p is the number of CRS ports.

R1-1904515 **Handling of invalid PRB for frequency hopping of BL/CE UEs with PUSCH CE Mode A and flexible starting PRB** **Qualcomm Incorporated, Ericsson**
R1-1905558 **Handling of invalid PRB for frequency hopping of BL/CE UEs with PUSCH CE Mode A and flexible starting PRB** **Qualcomm Incorporated, Ericsson**
Final CR agreed in R1-1905579 (TS36.211, CR0480, Rel-15)

R1-1904516 **Corrections related to CSI feedback with 64-QAM** **Qualcomm Incorporated**
Final CR agreed in R1-1905546 (TS36.213, CR1248, Rel-15)

R1-1905070 On transmit power level assumptions for WUS in eMTC Intel Corporation
Withdrawn

R1-1905236 Correction on NB-IoT SPS power control Huawei, HiSilicon
Final CR agreed in R1-1905547 (TS36.213, CR1249, Rel-15)

R1-1905237 On DELTA_PREAMBLE value for NPRACH format 2 power control Huawei, HiSilicon
R1-1905549 On DELTA_PREAMBLE value for NPRACH format 2 power control Huawei, HiSilicon
Agreement:
Request RAN2 to introduce the DELTA_PREAMBLE value according to the following table for NB-IoT FDD and TDD.

Preamble Format	DELTA_PREAMBLE value	
	Frame Structure Type 1	Frame Structure Type 2
0, 1	0 dB	0dB
0a, 1a	-	0dB
2	10*log10(1/3) dB	0dB

R1-1905559 [DRAFT] LS on DELTA_PREAMBLE value for NPRACH format 2 power control Huawei, HiSilicon
Final LS approved in R1-1905580

R1-1905238 Correction on NPRACH baseband signal generation Huawei, HiSilicon
Final CR agreed in R1-1905548 (TS36.211, CR0479, Rel-15)

R1-1905527 DCI formats for alternative TBS in 1024QAM Qualcomm Inc.
(TS36.213, CR1244, Rel-15) is agreed.

6.2 LTE Release 16

6.2.1 Additional MTC Enhancements

LTE_eMTC5-Core; WID in RP-190770. Please refer to the WID for detailed scoping

R1-1905566 Chairman's notes on 6.2.1 Additional MTC Enhancements Ad-hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

6.2.1.1 UE-group wake-up signal

R1-1905530 Summary of 6.2.1.1 UE group MWUS Qualcomm

Agreement
For evaluation purpose and down-selection on multiplexing schemes in RAN1#97:
- UE assumes the same WUS max duration and same transmit power for Rel-15 WUS and Rel-16 WUS

Agreement
Down-select one of the following options until RAN1#97 based on evaluation results including power saving gain, usage of resources, etc
- Up to 2 orthogonal WUS resources may be configured in time domain
- Up to 2 orthogonal WUS resources may be configured in frequency domain
- Up to 2 orthogonal WUS resources may be configured per dimension (up to 4 orthogonal WUS resources in total)
- Up to 2 orthogonal WUS resources may be configured either in time or frequency domain (only one of the two can be configured)

Determine in RAN1#97 whether legacy WUS resource is counted as one of the configured WUS resource(s).

Agreement
Rel-15 WUS and Rel-16 WUS can be configured on the same legacy WUS resource via SI
- FFS explicitly or implicitly
- Same WUS parameters are assumed for both Rel-15 and Rel-16 WUS in case both are on the same legacy WUS resource

Agreement

- Per default, all gaps use the same group WUS configuration regarding number of groups and group WUS resource allocation.
- Optionally, eDRX gap(s) may be configured individually if separate from the DRX gap.

R1-1905588 **Remaining issues of 6.2.1.1 UE group MWUS** **Qualcomm**

Agreement
If the group WUS resource is configured to be shared by Rel-15 WUS and Rel-16 WUS, a common WUS for all the group WUS UEs in the same WUS resource can be configured to be legacy WUS or a non-legacy WUS.

R1-1903882	UE-group wake-up signal in LTE-MTC	Ericsson	
R1-1903921	Support of sub-groups for MWUS	Huawei, HiSilicon	
R1-1904054	UE-group wake-up signal for eMTC	vivo	
R1-1904167	UE-group wake-up signal for MTC	Nokia, Nokia Shanghai Bell	
R1-1904228	UE group wake up signal for MTC	Sony	
R1-1905528	UE-group wake-up signal for eMTC	Intel Corporation	(rev of R1-1904264)
R1-1904342	Discussion on Wake-up signal for MTC	ZTE	
R1-1904374	UE-group wake-up signal for eMTC	Samsung	
R1-1904517	UE-group wake-up signal	Qualcomm Incorporated	
R1-1904565	UE-group wake-up signal for Rel-16 MTC	Lenovo, Motorola Mobility	
R1-1904605	Discussion on UE-grouping wake up signal in MTC	LG Electronics	
R1-1904864	Consideration on UE-group wake-up signal for Rel-16 MTC	Sharp	
R1-1904939	Discussion on UE-group wake up signal in MTC	NTT DOCOMO, INC.	
R1-1905419	Design of UE-group wake-up signal for MTC	BUPT	

Late contribution

6.2.1.2 Support for transmission in preconfigured UL resources

R1-1903904 **LTE-M Preconfigured UL Resources Summary RAN1 #96Bis** **Sierra Wireless, S.A.**

Working Assumption#1
In idle mode, updating PUR configurations and/or PUR parameters via L1 signalling after a PUR transmission is supported
- FFS: Which PUR configurations and PUR parameters will be signaled via L1
- FFS: Definition of PUR configurations and PUR parameters

The working assumption will be automatically confirmed if for some cases L2/L3 signaling is not needed. If RAN2 decides that L2/L3 signaling is needed for all cases, the working assumption will be reverted.

Working Assumption#2
For dedicated PUR
- During the PUR search space monitoring, the UE monitors for DCI scrambled with a RNTI assuming that the RNTI is not shared with any other UE
  - Note: It is up to RAN2 to decide how the RNTI is signaled to UE or derived
- FFS if the UE monitors any additional RNTI which may be shared with other UEs.
- Note: The same RNTI may be used over non-overlapping time and/or frequency resources

Send an LS to RAN2 to include two above working assumptions. Ask whether the first bullet in working assumption #2 is feasible. If it is concluded that working assumption #2 is feasible, the working assumption #2 will be automatically confirmed.

R1-1905563 **[DRAFT] LS on PUR Working Assumptions for NB-IoT and LTE-M** **Sierra Wireless**
Decision: The draft LS is endorsed and final version is approved in R1-1905570.

Agreement
The UE monitors the MPDCCH for at least a time period after a PUR transmission
- FFS: Details of the time period
- FFS: UE behaviour if nothing is received in the time period
- FFS: If and how often UE monitors MPDCCH after a PUR allocation in which it has not transmitted

Agreement
The value(s) of RSRP threshold(s) is UE specific

Agreement
The power control parameters within the PUR configuration, shall at least include:
- Target UL power level (P_0) for the PUR transmission

Agreement
For dedicated PUR in idle mode, the PUR configuration is configured by UE-specific RRC signaling.

R1-1905582 **LTE-M Preconfigured UL Resources Summary #2 RAN1 #96Bis Sierra Wireless**

R1-1903883 Support for transmission in preconfigured UL resources in LTE-MTC Ericsson
R1-1905532 LTE-M Pre-configured UL Resources Design Considerations Sierra Wireless, S.A. (rev of R1-1903905)
R1-1903918 UL transmission in preconfigured resource Huawei, HiSilicon
R1-1904168 Transmission in preconfigured UL resources Nokia, Nokia Shanghai Bell
R1-1904230 Considerations in using PUR Sony
R1-1904265 UL transmission in preconfigured resources for eMTC Intel Corporation
R1-1904343 Support for transmission in preconfigured UL resources for MTC ZTE
R1-1904375 Discussion on transmission in preconfigured UL reosurces for MTC Samsung
R1-1904518 Support for transmission in preconfigured UL resources Qualcomm Incorporated
R1-1904566 UL transmission in preconfigured resources for eMTC Lenovo, Motorola Mobility
R1-1904606 Discussion on preconfigured UL resources in MTC LG Electronics
R1-1904747 Consideration for preconfigured uplink resources (PUR) Sequans Communications
R1-1904905 Discussion on LTE-M PUR resource configuration in respect to radio condition ASUSTEK COMPUTER (SHANGHAI)
R1-1904940 Discussion on preconfigured UL resources in MTC NTT DOCOMO, INC.

6.2.1.3 Scheduling of multiple DL/UL transport blocks

R1-1905534 **Feature lead summary for Scheduling of multiple DL/UL transport blocks for LTE-MTC Ericsson**

For further discussion
Which of the following features that should be possible to configure and/or use in combination with scheduling of multiple TBs
- Rel-14 feature for new numbers of repetitions for PUSCH and modulation restrictions for PDSCH/PUSCH in CE mode A
- Rel-14 feature for 2984 bits max UL TBS in 1.4 MHz in CE mode A
- Rel-14 feature on HARQ-ACK bundling in HD-FDD in CE mode A
- Rel-14 features for 5 or 20 MHz max PDSCH/PUSCH channel bandwidths in CE mode A/B
- Rel-14 feature for 10 downlink HARQ processes in FDD in CE mode A
- Rel-14 feature for dynamic HARQ-ACK delay for HD-FDD in CE mode A
- Rel-15 features for flexible starting PRB for PDSCH/PUSCH in CE mode A/B
- Rel-15 feature for PUSCH sub-PRB allocation in CE mode A/B
- Rel-15 feature for 64QAM for non-repeated unicast PDSCH in CE mode A
- Rel-15 feature for uplink HARQ-ACK feedback in DCI in CE mode A/B

Companies are encouraged to provide their preference on this issue.

Agreement
For unicast, the UE is configured for interleaved transmission of subframe repetitions of the respective TBs separately for DL and UL via RRC signaling.

Agreement
For CE mode A, HARQ ACK/NACK feedback bundling on PUCCH can be enabled or disabled by [RRC and/or DCI], when multiple DL transport blocks are assigned by a single DCI (details FFS). If the network does not enable it, each TB has its own separately encoded HARQ ACK/NACK feedback
- FFS: Maximum bundle size

Agreement

For the DL unicast for a UE, when multiple TBs are scheduled by one DCI, the parameter value for number of PDSCH repetitions is the same across all the TBs scheduled by that DCI, and there is only a single parameter field for number of MPDCCH repetitions and only a single parameter field for SRS request.

Agreement
For scheduling of multiple TBs with SC-MTCH, the same parameter values for {MCS, resource assignment, number of repetitions} is used for all TBs

R1-1903884	Scheduling of multiple DL/UL transport blocks in LTE-MTC	Ericsson
R1-1903907	LTE-M Multiple Transport Block Grant Design Considerations	Sierra Wireless, S.A.
R1-1903917	Scheduling of multiple transport blocks	Huawei, HiSilicon
R1-1904169	Scheduling of multiple DL/UL transport blocks	Nokia, Nokia Shanghai Bell
R1-1904231	On scheduling multiple DL / UL transport blocks	Sony
R1-1904266	Scheduling of multiple DL/UL TBs for eMTC	Intel Corporation
R1-1904344	Consideration on scheduling enhancement for MTC	ZTE
R1-1904376	Scheduling of multiple transport blocks for MTC	Samsung
R1-1904519	Scheduling of multiple DL/UL transport blocks	Qualcomm Incorporated
R1-1904567	Design of scheduling of multiple DL/UL transport blocks for MTC	Lenovo, Motorola Mobility
R1-1904607	Discussion on multiple transport blocks scheduling in MTC	LG Electronics
R1-1904749	Scheduling of Multiple UL/DL TBS Considerations	Sequans Communications

6.2.1.4 Coexistence of LTE-MTC with NR

R1-1905535 Feature lead summary for Coexistence of LTE-MTC with NR Ericsson

For further study until RAN1#97

- RAN1 continues to study puncturing and/or rate-matching of outlying LTE-MTC subcarriers for performance improvement of resource block alignment between LTE-MTC and NR until RAN1#97.
  - Assume truncation of 1, 4 or 5 LTE-MTC DL subcarriers in case of an even total number of NR RBs and 2, 3 or 6 LTE-MTC DL subcarriers in case of an odd total number of NR RBs.
  - Consider truncation of outlying LTE-MTC DL subcarriers without the (legacy) UE being aware of the puncturing as a reference case.
  - Assume that no new transmission scheme (for example, single tone transmission) is introduced after the outlying subcarrier is punctured or rate-matched around.
  - Assume that CRS is not truncated.
    - FFS: DMRS
  - Consider both DL and UL aspects including
    - PDSCH, PUSCH, MPDCCH, PUCCH

Conclusion

- RAN1 does not further consider placement of LTE-MTC subcarriers into NR guard band since it has no RAN1 specification impact.

Conclusion

- RAN1 concludes that overlap between NR SSB and LTE-MTC can be avoided using the LTE-MTC DL valid subframe bitmap.

For further study until RAN1#97

- RAN1 continues to study finer-granularity LTE-MTC resource reservation until RAN1#97.
  - Assume that the LTE-MTC resource reservation should accommodate at least part of NR initial CORESET, NR CSI-RS and NR TRS.
  - The reference case is the existing DL/UL subframe-level LTE-MTC resource reservation.
  - Assume that the resource reservation is semi-statically configured. It is FFS whether the eNB can furthermore dynamically override or indicate additional reserved resource via DCI.
    - Companies are encouraged to consider the impact on UE complexity for DCI based indication
  - Consider whether the time-domain granularity of the LTE-MTC valid subframe configuration should be scaled dependent on the NR subcarrier spacing.
  - Consider both DL and UL aspects.
    - PDSCH, PUSCH, PUCCH, MPDCCH

- It is FFS whether and when to drop or postpone LTE-MTC transmissions that would fall into LTE-MTC reserved resources (if introduced).

Conclusion

- No further discussion in RAN1 on the consideration of LTE-MTC transmission outside the legacy LTE system bandwidth in Rel-16.

R1-1903885	Coexistence of LTE-MTC with NR	Ericsson
R1-1903922	On eMTC co-existence with NR	Huawei, HiSilicon
R1-1904170	Coexistence of eMTC with NR	Nokia, Nokia Shanghai Bell
R1-1904345	Coexistence of LTE-MTC with NR	ZTE
R1-1904520	Coexistence of LTE-MTC with NR	Qualcomm Incorporated
R1-1904608	Discussion on coexistence of LTE-MTC with NR	LG Electronics

6.2.1.5 Support of quality report in Msg3 and Connected Mode

Including aperiodic quality report in connection mode using same quality definition as in Msg 3

R1-1905581 Feature summary of DL quality report in MTC Samsung

Agreement

- DL quality report in Msg3 in IDLE mode and DL quality report in connected mode are configured separately.
- DL quality report in Msg3 in IDLE mode is configured per PRACH CE level or per CE mode in the SI.
- DL quality report in connected mode is configured by UE-specific RRC signaling.

Agreement

- For DL quality report in connected mode, DL quality is transmitted via higher layer signaling, e.g. MAC CE or RRC message.

Working Assumption

- For DL quality report in Msg3 for IDLE mode UEs, the narrowband(s) for downlink quality measurement includes at least the narrowband(s) on which MPDCCH of RAR is monitored.

R1-1905589 Remaining issues on DL quality report in MTC Samsung

Agreement

For channel quality report in Msg3, RAN1 send LS to RAN2 requesting the following information:

- Number(s) of available bits for the quality reporting in Msg3
- Whether the quality report in Msg3 is transmitted in RRC or MAC CE

Send LS to RAN2 and CC RAN4. Ask, from RAN2, perspective, whether the above might be different for different cases. Include as part of LS to be handled in the NB-IoT agenda item.

Working Assumption

For DL quality report in CE mode A (PRACH CE level 0, 1), the pre-defined maximum aggregation level is fixed to 24.

R1-1903886	Quality report in Msg3 and connected mode in LTE-MTC	Ericsson
R1-1903919	Channel quality reporting in Msg3	Huawei, HiSilicon
R1-1904171	Support of Quality report in Msg3	Nokia, Nokia Shanghai Bell
R1-1904232	Remaining issues in supporting quality report in Msg3	Sony
R1-1904267	Quality report in Msg3 and connected mode for eMTC	Intel Corporation
R1-1904346	Support of quality report in Msg3 and Connected Mode for MTC	ZTE
R1-1904377	Discussion on quality report in Msg3 and connected mode	Samsung
R1-1904521	Support of Quality report in msg3 and connected mode	Qualcomm Incorporated
R1-1904609	Downlink channel quality report during random access procedure	LG Electronics

6.2.1.6 MPDCCH performance improvement

R1-1905537 **Feature lead summary of MPDCCH performance improvement** **Huawei, HiSilicon**

Agreement
When CSI-based precoding is configured:
- The UE monitors a set of MPDCCH candidates assuming the mapping between DMRS and CRS ports is based on a previously reported PMI.
  - FFS details, including delay for applicability of PMI.
- A fallback mechanism is supported. The details of the fallback mechanism are FFS.

Agreement
For precoding cycling for 2Tx antennas, predefine one precoder set which consists of 2 existing precoders. FFS: Which of the two precoder among the existing 2TX precoders are used.

Agreement
For precoding cycling for 4Tx antennas, predefine one precoder set which consists of 4 existing precoders. FFS: Which of the four precoder among the existing 4TX precoders are used.

Agreement
The precoding cycling in time domain has a granularity of Y_{CH} (granularity of frequency hopping) only.
- Precoder cycling can be used even in case frequency hopping is not used as long as Y_{CH} is configured

R1-1903887 MPDCCH performance improvement in LTE-MTC Ericsson
R1-1903920 On MPDCCH performance improvement Huawei, HiSilicon
R1-1904172 MPDCCH performance improvement Nokia, Nokia Shanghai Bell
R1-1904268 MPDCCH performance improvement Intel Corporation
R1-1904347 Discussion on MPDCCH performance improvement ZTE
R1-1904378 Discussion on MPDCCH performance improvement for MTC Samsung
R1-1904522 Usage of CRS for MPDCCH Qualcomm Incorporated
R1-1904610 Discussion on MPDCCH performance improvement LG Electronics

6.2.1.7 CE mode A and B improvements for non-BL UEs

R1-1905561 **Summary of CE mode A and B improvements for non-BL UEs** **LG Electronics**

Agreement
CSI-RS based CSI feedback is only supported in TM9

Agreement
The supported number of CSI-RS ports is only 8

Conclusion
No further discussion on the modification on the design or configuration for support of CSI-RS for non-BL CE UEs in CE mode A in Rel-16. The baseline is Rel-15 CSI-RS.

Agreement
For CSI feedback of non-BL CE UE, RI is fixed to 1 if it is included as part of reporting on PUCCH or PUSCH

Agreement
MPDCCH and PDSCH are punctured around the REs used for the CSI-RS transmission.

R1-1903888 CE mode improvements for LTE-MTC non-BL UEs Ericsson
R1-1903915 Coverage enhancement for Non-BL UE Huawei, HiSilicon
R1-1904173 CE mode A and B improvements for non-BL UEs Nokia, Nokia Shanghai Bell
R1-1904269 CE mode A and B improvements for non-BL UEs Intel Corporation

R1-1904348 On CE mode A and B improvements for non-BL UE ZTE
R1-1904379 CE Mode A and Mode B improvements for non-BL UEs Samsung
R1-1904523 CE Mode A and B improvements for non-BL Ues Qualcomm Incorporated
R1-1904611 CE mode improvements for non-BL UEs LG Electronics

6.2.1.8 Use of LTE Control Channel Region for DL Transmission

R1-1905533 Summary of Use of LTE Control Channel Region for DL Transmission Nokia, Nokia Shanghai Bell

Conclusion
CRS modulation symbols in OFDM symbols 0 and 1 of the stand-alone carrier are the same as those in the legacy control channel region.

Agreement
When performing rate-matching for PDSCH in the LTE control region, all resource elements shall be counted in the PDSCH mapping, except for the ones reserved for cell-specific reference signals on any antenna port.
- Same as legacy operation

Working Assumption
For MPDCCH mapping, a fixed mapping in time is used. The resource elements used for MPDCCH in the first $l_{MPDCCHStart}$ symbols in the second slot are copied into the first $l_{MPDCCHStart}$ symbols in the first slot.

R1-1903889 Use of LTE control channel region for DL transmission in LTE-MTC Ericsson
R1-1903916 DL transmission on LTE control channel region Huawei, HiSilicon
R1-1904174 Consideration on the usage of LTE control channel region Nokia, Nokia Shanghai Bell
R1-1904233 On use of LTE control channel region for DL transmissions Sony
R1-1904349 Use of LTE control channel region for DL transmission ZTE
R1-1904380 Discussion on use of control channel region Samsung
R1-1904524 Use of control region for eMTC UEs Qualcomm Incorporated
R1-1904612 On the use of LTE control channel region for LTE-MTC DL transmission LG Electronics
R1-1904941 Discussion on the use of LTE control channel region for DL transmission NTT DOCOMO, INC.

6.2.1.9 Use of RSS for measurement improvements

R1-1905459 Summary of the use of RSS for measurement improvements Sony

Agreement
Prioritize future RAN1 work on the following neighbor cells' RSS parameters when reducing the number of signaling bits:
- *ce-rss-freqPos-config*: RSS frequency location (lowest physical resource block number)
- *ce-rss-timeOffset-config*: RSS time offset in number of radio frames

For further discussion until RAN1#97
Further evaluate *which* RSS parameters are likely to be common and/or similar between camped cell and neighbor cell(s). For those RSS parameters that are not common and/or similar discuss how they are signaled.
- Including whether to send LS to RAN2 on RAN1 conclusion on which RSS parameters are likely to be common and/or similar.

Agreement
Support the indication of the number of CRS ports for each neighbor cell in signaling the neighbor cells' RSS parameters.

R1-1905584 Follow up summary of the use of RSS for measurement improvements Sony

For further study
Consider until RAN1#97 the following options for reducing the signaling bits of the neighbor cells' RSS frequency location and RSS time offset:
- Option 1: Reduce the signalling resolution; and then UE searches for exact RSS location

  - The reduced signalling resolution is FFS
- Option 2: Restrict the RSS locations by reducing the number of possible RSS locations
  - The exact restriction method is FFS

Either Option 1 or 2 can be complemented by other methods.

R1-1903890	Use of RSS for measurement improvements in LTE-MTC	Ericsson
R1-1904175	Use of RSS for measurement improvements	Nokia, Nokia Shanghai Bell
R1-1904234	Overhead reduction in neighbour cell RSS signalling	Sony
R1-1904350	Use of RSS for measurement improvement	ZTE
R1-1904525	Measurements based on RSS	Qualcomm Incorporated
R1-1904613	Discussion on the use of RSS for measurement improvement	LG Electronics
R1-1904826	Considerations on RSS for measurement improvements	Huawei Technologies Co. Ltd.

6.2.2 Additional Enhancements for NB-IoT

NB_IOTenh3-Core; WID in RP-190757. Please refer to the WID for detailed scoping

R1-1905567 **Chairman's notes on 6.2.2 Additional Enhancements for NB-IoT** **Ad-hoc Chair (Samsung)**

Decision: The document is endorsed, content incorporated below.

6.2.2.1 UE-group wake-up signal

R1-1905536 **Feature lead summary of UE-group wake-up signal in NB-IoT** **Ericsson**

Agreement

Up to 2 time-multiplexed WUS resources, for both legacy WUS and group WUS, may be configured. FFS whether a group WUS resource may be shared with legacy WUS or not.

Agreement

Group WUS location in relation to legacy WUS may be configured such that:

- If one group WUS resource is configured, that group WUS resource may be configured to coincide with the legacy WUS resource or to occur immediately before the legacy WUS resource, and,
- If two group WUS resources are configured, the first group WUS resource coincides with the legacy WUS resource and the second group WUS resource occurs immediately before the first group WUS resource.

Agreement

Group WUS sequence design is down selected between the following in RAN1#97

- Legacy WUS with shifted scrambling codes
- Legacy WUS with time-frequency short OCCs
- Phase shifted legacy WUS using a suitable subset of the phase increments.
- Legacy WUS with Gold codes

Companies are encouraged to provide evaluation results

R1-1905583 **Further topics for UE-group wake-up signal in NB-IoT** **Ericsson**

Agreement

- Per default, all gaps use the same group WUS configuration regarding number of groups and group WUS resource allocation.
- Optionally, eDRX gap(s) may be configured individually if separate from the DRX gap.

R1-1905769 **Draft LS on WUS gap configurability for NB-IoT** **Ericsson**

R1-1905590 Draft LS on WUS weighting function for NB-IoT Ericsson

R1-1903891	UE-group wake-up signal in NB-IoT	Ericsson
R1-1903909	UE-group wake-up signal	Huawei, HiSilicon

R1-1904055	UE-group wake-up signal for NB-IoT	vivo
R1-1904160	UE-Group WUS in NB-IoT	MediaTek Inc.
R1-1904176	UE group wake-up signal for NB-IoT	Nokia, Nokia Shanghai Bell
R1-1904221	Group Wake-Up Signal for NB-IoT	Fraunhofer IIS, Fraunhofer HHI
R1-1904229	UE group wake up signal for NB-IoT	Sony
R1-1905529	UE-group wake-up signal for NB-IoT	Intel Corporation (rev of R1-1904270)
R1-1904351	Discussion on Wake-up signal for NB-IoT	ZTE
R1-1904381	UE-group wake-up signal for NB-IoT	Samsung
R1-1904526	UE-group wake-up signal	Qualcomm Incorporated
R1-1904568	UE-group wake-up signal for Rel-16 NB-IoT	Lenovo, Motorola Mobility
R1-1904614	Discussion on UE-grouping wake up signal in NB-IoT	LG Electronics
R1-1904865	Consideration on UE-group wake-up signal for Rel-16 NB-IoT	Sharp
R1-1904942	Discussion on UE-group wake up signal in NB-IoT	NTT DOCOMO, INC.

6.2.2.2 Support for transmission in preconfigured UL resources

R1-1905538 Feature lead summary of Support for transmission in preconfigured UL resources Huawei, HiSilicon

Agreement
In idle mode, a UE can be configured such that TA is always valid within a given cell.
- Up to RAN2 how to implement
  - e.g. PUR Time Alignment Timer or NRSRP Threshold = infinity

Agreement
The value(s) of NRSRP threshold(s) is UE specific

Agreement
The UE monitors the NPDCCH for at least a time period after a PUR transmission.
- FFS: Details of the time period
- FFS: UE behaviour if nothing is received in that time period.
- FFS: If and how often UE monitors NPDCCH after a PUR allocation in which it has not transmitted

Agreement
Reuse existing field(s) of DCI format N0 to convey the dedicated PUR ACK

Agreement
After data transmission on PUR, upon unsuccessful decoding by eNB, the UE can expect an UL grant for retransmission on NPDCCH. Other behaviors are FFS.

Working Assumption#1
In idle mode, updating PUR configurations and/or PUR parameters via L1 signalling after a PUR transmission is supported
- FFS: Which PUR configurations and PUR parameters will be signaled via L1
- FFS: Definition of PUR configurations and PUR parameters

The working assumption will be automatically confirmed if for some cases L2/L3 signaling is not needed. If RAN2 decides that L2/L3 signaling is needed for all cases, the working assumption will be reverted.

Working Assumption#2
For dedicated PUR
- During the PUR search space monitoring, the UE monitors for DCI scrambled with a RNTI assuming that the RNTI is not shared with any other UE
  - Note: It is up to RAN2 to decide how the RNTI is signaled to UE or derived
- FFS if the UE monitors any additional RNTI which may be shared with other UEs.
- Note: The same RNTI may be used over non-overlapping time and/or frequency resources

Send an LS to RAN2 to include two above working assumptions. Ask whether the first bullet in working assumption #2 is feasible. If it is concluded that working assumption #2 is feasible, the working assumption #2 will be automatically confirmed.
(LS is approved in eMTC agenda item – see 6.2.1.2)

R1-1905585 **Updated feature lead summary of Support for transmission in preconfigured UL resources Huawei, HiSilicon**

Agreement
For dedicated PUR in idle mode, the PUR configuration is configured by UE-specific RRC signaling.

R1-1903892 **Support for transmission in preconfigured UL resources in NB-IoTEricsson**
R1-1903906 NB-IOT Pre-configured UL Resources Design Considerations Sierra Wireless, S.A.
R1-1903910 Transmission in preconfigured UL resources Huawei, HiSilicon
R1-1904161 Early Transmission in Preconfigured UL resources in NB-IoT MediaTek Inc.
R1-1904177 Preconfigured Grant for Uplink transmission Nokia, Nokia Shanghai Bell
R1-1904271 UL transmission in preconfigured resources for NB-IoT Intel Corporation
R1-1904352 Support for transmission in preconfigured UL resources for NB-IoT ZTE
R1-1904382 Discussion on transmission in preconfigured UL reosources for NB-IoT Samsung
R1-1904527 Support for transmission in preconfigured UL resources Qualcomm Incorporated
R1-1904569 UL transmission in preconfigured resources for NBIoT Lenovo, Motorola Mobility
R1-1904615 Discussion on preconfigured UL resources in NB-IoT LG Electronics
R1-1904748 Consideration for preconfigured uplink resources (PUR) Sequans Communications
R1-1904916 Discussion on NB-IoT PUR resource configuration in respect to radio condition ASUSTEK COMPUTER (SHANGHAI)
R1-1904943 Discussion on preconfigured UL resources in NB-IoT NTT DOCOMO, INC.
R1-1905119 Discussion on transmission in preconfigured UL resources III
R1-1905211 CBS PUR for NB-IoT Fraunhofer IIS, Fraunhofer HHI

6.2.2.3 Scheduling of multiple DL/UL transport blocks

R1-1905573 **Summary on Multiple TB scheduling enhancement for NB-IoT ZTE**

Agreement
1 bit for RV indication in UL transmission is used regardless of the number of TBs
- Common RV indication is mapped to both TBs

Working Assumption
3 bits are used to indicate scheduled TB number, HARQ process index, NDI for HARQ operation
- FFS: Details coding scheme of these 3 bits

Conclusion
Relationship 2 is not supported in Rel-16.

Agreement
In case 2 TBs are scheduled in the downlink, the timing of the ACK/NACKs for the scheduled TBs is with respect to the last TB scheduled by the DCI, detailed value FFS.
- For the case of 1 TB scheduling, legacy UE behavior is maintained

Agreement
For SC-MTCH multiple TBs scheduling, select one from the three options in RAN1#97
- ***a)*** Modify existing DCI to indicate the number of scheduled TBs (e.g. by adding new field)
- ***b)*** Reuse Rel-15 DCI and use SC-MCCH to indicate TB numbers.
- ***c)*** Support both a) and b)

R1-1903893 Scheduling of multiple DL/UL transport blocks in NB-IoT Ericsson
R1-1903908 NB-IOT Multiple Transport Block Grant Design Considerations Sierra Wireless, S.A.
R1-1903911 Scheduling multiple DL/UL transport blocks Huawei, HiSilicon
R1-1904164 Scheduling of multiple DL/UL transport blocks in NB-IoT MediaTek Inc.
R1-1904178 Scheduling of multiple DL/UL transport blocks Nokia, Nokia Shanghai Bell

R1-1904272	Scheduling of multiple DL/UL TBs for NB-IoT	Intel Corporation
R1-1904353	Consideration on scheduling enhancement for NB-IoT	ZTE
R1-1904383	Scheduling of multiple transport blocks for NB-IoT	Samsung
R1-1904528	Scheduling of multiple DL/UL transport blocks	Qualcomm Incorporated
R1-1904570	Design of scheduling of multiple DL/UL transport blocks for NBIoT	Lenovo, Motorola Mobility
R1-1904616	Discussion on multiple transport blocks scheduling in NB-IoT	LG Electronics

6.2.2.4 Coexistence of NB-IoT with NR

R1-1905539 Feature lead summary of Coexistence of NB-IoT with NR Huawei, HiSilicon

R1-1905586 Updated feature lead summary of coexistence of NB-IoT with NR Huawei, HiSilicon

For further study until RAN1#97:

- RAN1 continues to study finer-granularity NB-IoT resource reservation until RAN1#97.
  - Assume that the NB-IoT resource reservation should accommodate at least part of NR initial CORESET, NR CSI-RS and NR TRS.
  - The reference case is the existing DL/UL subframe-level NB-IoT resource reservation for TDD NB-IoT. For FDD NB-IoT, the reference case is the existing DL subframe-level NB-IoT resource reservation.
  - Assume that the resource reservation is semi-statically configured. It is FFS whether the eNB can furthermore dynamically override or indicate additional reserved resource via DCI.
    - Companies are encouraged to consider the impact on UE complexity for DCI based indication
  - Consider whether the time-domain granularity of the NB-IoT valid subframe configuration should be scaled dependent on the NR subcarrier spacing.
  - Consider both DL and UL aspects.
    - NPDSCH, NPUSCH, NPDCCH
  - It is FFS whether and when to drop or postpone NB-IoT transmissions that would fall into NB-IoT reserved resources (if introduced).

Conclusion
RAN1 concludes that overlap between NR SSB and NB-IoT non-anchor carriers can be avoided using the NB-IoT DL valid subframe bitmap.

For further study until RAN1#97:
RAN1 continues to study the aspects of coexistence of NB-IoT and NR using different SCSs.

R1-1903894	Coexistence of NB-IoT with NR	Ericsson
R1-1903912	Performance enhancements for NB-IoT coexistence with NR	Huawei, HiSilicon
R1-1904159	Coexistence of NB-IoT with NR	MediaTek Inc.
R1-1904179	Coexistence of NB-IoT with NR	Nokia, Nokia Shanghai Bell
R1-1904354	Coexistence of NB-IoT with NR	ZTE
R1-1904529	Coexistence of NB-IoT with NR	Qualcomm Incorporated

6.2.2.5 Support of Quality report in Msg3 and Connected Mode

Including Msg3 quality reporting for non-anchor access and quality reporting in connected mode for anchor and non-anchor carriers

R1-1905540 Feature lead summary of quality report in Msg3 and connected mode Huawei, HiSilicon

Agreement
For channel quality report in connected mode, the channel quality definition is denoted by the number of repetitions that the UE needs to decode hypothetical NPDCCH with BLER of 1%.

Agreement

For channel quality report in connected mode other than Msg3, UE performs measurement on the carrier it is assigned to monitor in USS for NPDCCH and the associated NPDSCH.

- FFS other carrier(s)

Agreement
For channel quality report in Msg3 for non-anchor access, RAN1 send LS to RAN2 requesting the following information:

- Number(s) of available bits for the quality reporting in Msg3
- Whether the quality report in Msg3 is transmitted in RRC or MAC CE

Send LS to RAN2 and CC RAN4. Ask, from RAN2, perspective, whether the above might be different for different cases

R1-1905592 **[DRAFT] Draft LS on channel quality report in Msg3 for NB-IoT and LTE-M** **Huawei, HiSilicon**
Decision: The draft LS is endorsed and final version is approved in R1-1905593

R1-1905587 **Updated Feature lead summary of Support of Quality report in Msg3 for non-anchor access and connected mode** **Huawei, HiSilicon**

Agreement
For channel quality measurement in Msg3 for non-anchor access, the maximum number of carriers reported in Msg3 is no larger than 2.

- FFS detail of the maximum number (1 or 2)

Agreement
eNB can enable/disable channel quality report in Msg3 for non-anchor access via SIB

- FFS details
- FFS whether the field in Rel-14 for anchor access is reused

R1-1903895	Quality report in Msg3 and connected mode in NB-IoT	Ericsson
R1-1903913	Support of quality report in Msg3 and Connected Mode	Huawei, HiSilicon
R1-1904162	Quality report in Msg3 on non-anchor carrier in NB-IoT	MediaTek Inc.
R1-1904180	Support of Quality report in Msg3 on non-anchor carrier	Nokia, Nokia Shanghai Bell
R1-1904273	Quality report in Msg3 for NB-IoT non-anchor access	Intel Corporation
R1-1904355	Support of quality report in Msg3 and Connected Mode for NB-IoT	ZTE
R1-1904384	Discussion on Msg3 report for non-anchor access	Samsung
R1-1904530	Support of quality report in msg3 and connected mode	Qualcomm Incorporated
R1-1904617	Downlink channel quality report during random access procedure on a non-anchor carrier	LG Electronics

6.2.2.6 Presence of NRS on a non-anchor carrier for paging

R1-1905531 **Presence of NRS on a non-anchor carrier for paging (feature lead summary)** **Qualcomm**

Conclusion
There is no consensus in RAN1 to support configuration of NRS for WUS early termination in Rel-16.

Agreement
The subset of POs that have subframes with NRS even when no NPDCCH is transmitted is determined based at least on *nB-r13/nB*

- FFS: *defaultPagingCycle-r13/T*
- Note: The paging frame and the number of UE groups can be derived from *T* and *nB*

Agreement
For the NRS pattern: Define detailed pattern of (M,N) depending on the value of nB:

- If nB >= X, specify the decimation pattern/M/N for each nB.
  - FFS if the value of M/N is different for different POs within a DRX cycle

- For nB < X, all POs have NRS. FFS value of M/N.

where X is a fixed value which will be determined in RAN1#97.

R1-1903896	Presence of NRS on a non-anchor carrier for paging in NB-IoT	Ericsson
R1-1903914	NRS presence on non-anchor carriers for paging	Huawei, HiSilicon
R1-1904163	NRS presence on non-anchor carrier in NB-IoT	MediaTek Inc.
R1-1904181	Presence of NRS on a non-anchor carrier for paging	Nokia, Nokia Shanghai Bell
R1-1904356	Presense of NRS on non-anchor PRB	ZTE
R1-1904385	NRS presence on non-anchor carrier	Samsung
R1-1904531	Presence of NRS on a non-anchor carrier for paging	Qualcomm Incorporated
R1-1904618	Discussion on NRS on a non-anchor carrier	LG Electronics

6.2.3 DL MIMO efficiency enhancements for LTE

LTE_DL_MIMO_EE-Core; WID in RP-182901. Please refer to the WID for detailed scoping

R1-1905568 **Chairman's notes on 6.2.3 DL MIMO efficiency enhancements for LTE** **Ad-hoc Chair (Samsung)**

Decision: The document is endorsed, content incorporated below.

6.2.3.1 Support of enhancing SRS capacity and coverage

6.2.3.1.1 Additional SRS symbols

R1-1905594 **Feature summary on LTE DL MIMO efficiency enhancement** **Huawei, HiSilicon**

Agreement

For aperiodic SRS transmission, any combination of the following features can be simultaneously configured

- Intra-subframe antenna switching
  - At least antenna switching across all antenna ports is supported
  - FFS: Antenna switching across a subset of antenna ports
- Intra-subframe frequency hopping
- Intra-subframe repetition

FFS: Whether above applies at the additional SRS symbols only or for legacy SRS symbols as well

Agreement

At least for the support of SRS repetition $n_{\text{SRS}} = \lfloor l/R \rfloor$, where $l \in \{0,1,\ldots,N_{symb}^{SRS}-1\}$ is the OFDM symbol number, N_{symb}^{SRS} is the number of configured SRS symbols, and R is the repetition factor for the configured UE.

Agreement

The configurable number of additional SRS repetitions can be

- {1, 2, 3, 4, 6, 7, 8, 9, 12, 13}

Above applies per antenna port and per subband

R1-1905571 **Update summary on LTE DL MIMO efficiency enhancement** **Huawei, HiSilicon**

Agreement

A codepoint in the same DCI triggers SRS transmission for one of the following:

- Only aperiodic legacy SRS symbols
- Only aperiodic additional SRS symbols
- Both aperiodic legacy and aperiodic additional SRS symbols within the same subframe

The association of the codepoint and one of the above is configured by RRC signalling. A separate codepoint will be supported for the case of no SRS triggering.

Agreement

The size of the SRS request field for triggering Rel-16 SRS is the same as that of relevant Rel-15 DCI formats.

Agreement
Only Rel-15 DCI formats that support SRS triggering can be used to trigger Rel-16 SRS transmission.

For further study until RAN1#97
Power control on additional SRS symbols and legacy symbols

Agreement
For additional SRS symbols, per-symbol group hopping and sequence hopping are supported.
- In a given time, only one of per-symbol group hopping or sequence hopping can be used by a UE
- FFS: Details such as sequence design

Agreement
In order to address at least possible power change due to frequency hopping or antenna switching for additional SRS symbols, select one of the following options:
- Option 1: A guard period of one symbol is introduced in RAN1 specifications.
- Option 2: No guard period is introduced in RAN1 specifications
  - It is up to RAN4 to introduce a transient period between additional SRS symbols in RAN4 specifications.

Send an LS to RAN4 to ask their view on transient period for frequency hopping or antenna switching (including the time duration needed for this transient period).

R1-1905574 **[Draft] LS on transient period for antenna switching or frequency hopping** Qualcomm
Decision: The draft LS is endorsed and final version is approved in R1-1905575

R1-1904010 Introduction of additional SRS symbols in normal UL subframe Huawei, HiSilicon
R1-1904033 Discussion on additional SRS symbols ZTE
R1-1904056 Remaining issues on additional SRS symbols vivo
R1-1904195 Discussion on additional SRS symbols LG Electronics
R1-1904274 Additional SRS symbols Intel Corporation
R1-1904386 Discussion on additional SRS symbols Samsung
R1-1904532 Additional SRS symbols Qualcomm Incorporated
R1-1904571 Discussion of additional SRS symbols Lenovo, Motorola Mobility
R1-1904601 Discussion on introduction of additional SRS symbols Nokia, Nokia Shanghai Bell
R1-1905103 On Rel-16 LTE SRS enhancements Ericsson

6.2.3.1.2 Other

R1-1904011 Discussion on power control for additional SRS Huawei, HiSilicon

6.2.4 LTE-based 5G Terrestrial Broadcast

LTE_terr_bcast-Core; WID in RP-190732. Please refer to the WID for detailed scoping

R1-1905569 **Chairman's notes on 6.2.4 LTE-based 5G Terrestrial Broadcast** Ad-hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1904533 **Work plan for LTE-based 5G terrestrial broadcast** Qualcomm Incorporated

6.2.4.1 New numerology(ies) for PMCH for support of rooftop reception

R1-1904007 **Discussion on new numerologies for PMCH to support rooftop reception** Huawei, HiSilicon

Agreement:
Consider the following candidates for new numerologies. The choice of candidates (either from the table below or other candidates) should be based on the evaluations from aspects of link/system level performance and UE complexity.

New numerologies for support of rooftop reception in MPMT and HPHT-1 scenarios

T_{cp} (us)	T_u (ms)	T (ms)	Numerology (kHz)	FFT size	Number of MBSFN subframes per 40ms in MBMS-dedicated carrier (with no gap overhead)	Number of MBSFN subframes per 5ms (with gap overhead in mixed-carrier)	CP overhead
386	2.4	2.786	0.417	36846	14	1 (4.3%)	13.9%
300	2.7	3	0.370	41472	13	1 (0%)	10.0%
400	2.6	3	0.385	39936	13	1 (0%)	13.3%
300	2.95	3.25	0.339	45312	12	1 (15.0%)	9.2%
400	2.85	3.25	0.351	43776	12	1 (15.0%)	12.3%
345	3.2	3.545	0.313	49152	11	1 (9.1%)	9.7%
445	3.1	3.545	0.323	47616	11	1 (9.1%)	12.6%
300	3.6	3.9	0.278	55296	10	1 (2.0%)	7.7%
400	3.5	3.9	0.286	53760	10	1 (2.0%)	10.3%

R1-1904534 **Support of longer numerologies for rooftop reception** **Qualcomm Incorporated**

Agreement:
In order to limit the UE complexity, the FFT size should only have factors of 2 and/or 3.

Agreement:
For the design of the new numerology for support of rooftop reception, prioritize the case of no additional non-MBSFN subframes after CAS (i.e., one non-MBSFN subframe every 40ms).

Agreement:
The new numerology is designed based on the following principles:

- There is a whole number of symbols in the MBSFN region (39ms MBSFN region is prioritized)
- The new numerology does not need to be aligned with 10ms/1ms radio frame/subframe boundaries

6.2.4.2 Necessity and detailed enhancements to the physical channels and signals in the CAS

R1-1904008 **On simulation assumptions for CAS evaluation** **Huawei, HiSilicon**
R1-1904535 **Analysis of CAS reception** **Qualcomm Incorporated**
R1-1905330 **Network Simulations Regarding the Performance of the CAS** **EBU**

R1-1905572 **Proposals for online discussion related to CAS** **Qualcomm Incorporated**

Agreement:
Any potential solutions relating to the CAS should seek to preserve the existing numerology. The enhancements (if needed) for channels and signals in the CAS are built upon current channels and signals.

Agreement:
Link level evaluation assumptions for baseline evaluations for channels in CAS are as follows:

Parameter	Values
System BW	10 MHz
Carrier frequency	700 MHz
CP/Numerology	15kHz, NCP/ECP: 4.7 us/16.6us
Doppler frequency	1Hz (rooftop antenna), Up to 120km/h and 250km/h for car-mounted
Channel estimation	Realistic based on RS design
Channel model	To be determined from system level evaluations for different ISDs. TDL-i for NLOS and TDL-v for LOS with the scaled delay spread derived from system level simulations.
Number of Rx antennas at the UE	Rooftop: 1 (baseline) /2 Mobile/car receiver: 2
MCS/Number of bits	Based on current LTE specifications

Agreement:

- The following items are needed for CAS evaluations and companies are encouraged to provide their views on them in RAN1#97:
  - FFT window position;
  - Receiving antenna pointing for rooftop;
  - Whether the transmission of the CAS is single cell or synchronised in an SFN
    - The length of the CP and EI in a synchronised CAS environment.
- For evaluations presented in RAN1#97, companies should provide the options/values used for the above items

Agreement:

For the evaluation of CAS, RAN1 adopts a methodology related to the pathloss model that considers the following:

- Cell reselection procedure (i.e., the UE may select the serving cell depending on the actual pathloss)
- The pathloss may not be constant for a given location
  - The evaluations may consist of multiple drops where the pathloss can be constant for a given drop and be different across drops

6.2.4.3 New numerology for support of mobility of up to 250km/h

R1-1904009 **On the new numerology for PMCH to support mobility** **Huawei, HiSilicon**
R1-1904536 **Numerology with 100us CP** **Qualcomm Incorporated**

Agreement:

The new numerology with T_CP = 100us and Tu = 400us shall be defined as follows:

- Subcarrier spacing Δf = 2.5 kHz
- Subframe duration 1ms
- Slot duration 0.5ms (one symbol per slot, two symbols/slots per subframe)
- No control region

Agreement:

Subframes with Δf = 2.5 kHz are supported in MBSFN subframes on mixed mode carriers

Agreement:

The legacy set of TBS values is the starting point for defining the set of TBS values for subframes with Δf = 2.5 kHz.

- FFS: Additional TBS values

Agreement:

RS patterns for the subframes with Δf = 2.5 kHz shall be chosen based on evaluations.

- FFS: Extensions or modifications to the modulation and TBS index table in 3GPP 36.213.

6.2.4.4 Other

R1-1905331 **Information For Time Variation Models** **EBU**

7 NR

7.1 Maintenance of Release 15 NR

Only essential corrections – a rejected draft CR will be marked in red

R1-1905866 **Corrections to 38.214 including alignment of terminology across specifications** **Nokia**
Friday decision: Revised in R1-1905879, and further updated and endorsed in R1-1905907 (38.214, CR0031r 2).

R1-1905864 **Corrections to 38.211 including alignment of terminology across specifications** **Ericsson**
Friday decision: Updated and endorsed in R1-1905905 (38.211, CR0014r1).

R1-1905865 **Corrections to 38.213 including alignment of terminology across specifications** **Samsung**
Friday decision: Updated and endorsed in R1-1905881 (38.213, CR0038r1).

R1-1905870 **Corrections to 38.212 including alignment of terminology across specifications** **Huawei**
Friday decision: CR0017 to 38.212 is endorsed.

7.1.1 Maintenance for Initial access and mobility

R1-1904672 **Correction of SSB subcarrier spacing parameter name** **Ericsson**
Decision: The draft CR is endorsed with one update ("Reason for change", SSB Case (A-E)). – check later on offline whether it can be part of an alignment CR or not
Friday decision: draft CR to be included in 38.213 alignment CR.

R1-1904718 **Frequency allocation of Msg3 retransmissions** **Nokia, Nokia Shanghai Bell**
No ambiguity in current spec according to Samsung
NTT DOCOMO supports the change proposed by Nokia
Intel: RAN1 should double check with R1-1904868 (Correction on frequency offset for DCI format 0_0 with CRC scrambled by TC-RNTI) from Sharp
Decision: The document is noted. Discuss further offline
Thursday decission: There was no consensus from offline (3 companies consider the change as essential, 3 companies as not essential). The draft CR is not pursued.

R1-1904275 Discussion on Rel-15 CSI-RS resource configuration for RRM Intel Corporation
R1-1904889 **[Draft] CR on CSI-RS resource configuration for RRM measurements** **Intel Corporation**
R1-1905223 On CSI-RS mobility measurements Nokia, Nokia Shanghai Bell
Friday decision: draft CR (R1-1904889) to be included in 38.214 alignment CR.

Wednesday
R1-1905706 **Reply LS on collision of RRM measurement with UL transmission RAN4, Intel**
UE behavior definition for intra-frequency neighbour cell measurements from RAN4 perspective is summarized as below,
In case of frequency range 1 unpaired spectrum,
- For SSB based measurements, **Error! Reference source not found.**

RAN4 is planning to technically endorse the CR for scheduling availability requirement and asks RAN1 feedback as soon as possible if there is any concern
Decision: The document is noted.

Friday session
R1-1905688 **Summary of Rel-15 CRs for NR Mobility** **Intel Corporation**
Decision: The document is noted.
R1-1905753 **[Draft] Reply LS on collision of RRM measurement with UL transmission** **Huawei**
Further updated to R1-1905856

Decision: The draft LS is endorsed and final version is approved in R1-1905880

Agreements:

- From RAN1 perspective, frequency layer for CSI-RS mobility resources is measurement object (MO)
- All CSI-RS resources in a MO shall have the same SCS.
- From RAN1 perspective, CSI-RS resources in the same MO have the same center frequency of the CSI-RS resources.
  - i.e. *startPRB* + floor(*nrofPRBs*/2) of each *CSI-RS-CellMobility* have the same value
- In the LS, also add "RAN1 also discussed other alteratives, which also had comparable number of supporting companies compared with the above:
  - Alt 1: CSI-RS resources in the same MO have the same startPRB.
  - Alt 2: All CSI-RS resources in a MO should be confined within maximum of 264 PRBs for a given SCS.
    - i.e. maximum of (startPRB + nrofPRBs) – minimum of (startPRB) is smaller or equal to 264."

Draft reply LS in R1-1905830, revised to:
R1-1905882 [Draft] Reply LS on clarification about CSI-RS measurement Intel Corporation
Friday decision: The draft reply LS is endorsed. Final LS is approved in R1-1905909 (without change marks).

7.1.2 Maintenance for MIMO

R1-1905797 Chairman's notes of AI 7.1.2 Maintenance for MIMO Ad-Hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

<Codebook based UL transmission>
R1-1904753 Discussion on SRS for configured grant PUSCH ZTE
R1-1904754 Draft CR on time domain behavior of SRS for configured grant PUSCH ZTE
R1-1905639 Summary on Maintenance for UL Codebook based transmission Intel
No further discussion in Rel-15.

<Non-Codebook based UL transmission>
R1-1904473 Corrections on non-codebook based UL transmission to TS38.214 MediaTek Inc.
R1-1905647 Summary of CRs on UL non-codebook based transmission Nokia, Nokia Shanghai Bell
The draft CR in R1-1904473 is endorsed in R1-1905672 (38.214, CR#0026)

<Maintenance on CSI measurement>
R1-1904387 Discussions on aperiodic CSI request Samsung
R1-1905655 Summary of Maintenance for CSI Measurement ZTE
R1-1905662 Draft CR on clarification of aperiodic CSI triggering of inactive BWP Ericsson
The draft CR is rejected.

<Maintenance on CSI reporting>
R1-1905521 Summary of Maintenance for CSI reporting Ericsson
R1-1905645 Summary of maintenance of CSI reporting Ericsson
R1-1904466 Clarification on SSB based L1-RSRP reporting MediaTek Inc.
The draft CR is rejected.

R1-1904756 Draft CR on corrections of UL-SCH indicator description in DCI 0_1 ZTE
The draft CR in R1-1904756 is endorsed. To be included in alignment CR for TS38.212.

R1-1904988 Clarification of Pc ratio Qualcomm Incorporated
R1-1905661 Draft CR on clarification of Pc ratio Ericsson
The text change ~~is~~ only related to section number reference part is endorsed. To be included in alignment CR for TS38.214.

Conclusion
It is common understanding in RAN1 that:

- The *powerControlOffset* ("Pc") ratio is defined as $10 \times \log_{10} \frac{P_{PDSCH}}{P_{CSIRS}}$ dB
- Where
  - P_{PDSCH} is the energy of total PDSCH ports multiplexed on one subcarrier of one OFDM symbol
  - P_{CSIRS} is the energy of all CSI-RS ports multiplexed on one subcarrier of one OFDM symbol

R1-1905107 **Draft CR on correction to RI determination** **Ericsson**
The draft CR is rejected.

R1-1905108 Draft CR on correction to bitwidth of NNZC indicator Ericsson
R1-1905663 **Draft CR on correction to bitwidth of NNZC indicator** **Ericsson**
The draft CR in R1-1905663 is endorsed in R1-1905680 (38.212, CR#0014)

R1-1905109 **Draft CR on Clarification of Activation and Selection commands in 38.214** **Ericsson**
The draft CR in R1-1905109 is endorsed. To be included in alignment CR for TS38.214.

< Maintenance on beam management and QCL>
R1-1905636 **Draft CR summary for beam management and QCL** **Ericsson**

R1-1904757 **Draft CR on QCL indication for PDSCH with slot aggregation** **ZTE**
No further discussion in Rel-15
R1-1904758 **Draft CR on AP-CSI-RS with a large latency of beam switching** **ZTE**
The draft CR is rejected.

R1-1904752 **Handling of Rel-15 NR MIMO leftover issues** **ZTE**

<Maintenance on DMRS>
R1-1905628 **Maintenance of DM-RS** **Qualcomm**

R1-1904899 **Correction on Time-Domain Resource Allocation Assumptions for Co-scheduled UEs** **MediaTek Beijing Inc.**
The draft CR is rejected.

R1-1905104 **Draft CR on DMRS transmission** **CATT**
R1-1905244 **Correction on UE DM-RS transmission procedure for SP-CSI-RNTI** **Huawei, HiSilicon**
Both draft CRs are on the same issue.
The draft CR in R1-1905104 is endorsed. To be included in alignment CR for TS38.214.

R1-1905172 **Draft CR on the validity region of an antenna port for PDCCH and PBCH** **Ericsson**
The draft CR in R1-1905172 is endorsed. To be included in alignment CR for TS38.211.

<Maintenance on PT-RS>
R1-1905643 **Maintenance of PT-RS** **Ericsson**
R1-1904755 Draft CR on alignment of a parameter on PTRS configuration ZTE
R1-1904057 **Draft 38.214 alignment CR** **vivo**
Both R1-1904755 and R1-1904057 are on the same issue.

The draft CR in R1-1904057 is endorsed. To be included in alignment CR for TS38.214.

<Maintenance on SRS>

R1-1905517 Summary of Rel15 SRS maintenance Sony

R1-1904276 Correction on simultaneous SRS transmission Intel Corporation

No further discussion in Rel-15.

R1-1904723 Draft TS 38.214 CR on SRS dropping rule CMCC
R1-1905720 Draft TS 38.214 CR on SRS dropping rule CMCC
R1-1905726 Draft TS 38.214 CR on SRS dropping rule CMCC
R1-1905852 Draft TS 38.214 CR on SRS dropping rule CMCC

The draft CR in R1-1905726 is endorsed. To be included in alignment CR for TS38.214.

R1-1904759 Draft CR on alignment of a notation related to SRS in TS38.211 ZTE

The draft CR in R1-1904759 is endorsed. To be included in alignment CR for TS38.211.

7.1.3 Maintenance for Scheduling/HARQ aspects

R1-1905607 Summary for PDCCH structure and search space NTT DOCOMO

Decision: The document is noted.

R1-1904468 Clarification on PDCCH candidate monitoring MediaTek Inc.

Decision: The document is noted. Discuss further offline related to CRC/pruning

Tuesday: no further action is necessary.

R1-1905250 Correction on PDCCH monitoring Huawei, HiSilicon

Decision: The document is noted. Discuss further offline related to counting of PDCCH BDs using R1-1904468 & R1-1905250

Friday

R1-1905686 Correction on PDCCH monitoring Huawei, HiSilicon

Decision: The draft CR is endorsed. Final CR is agreed in R1-1905883 (38.213, CR0040)

R1-1905116 Correction on physical downlink control channel ASUSTeK

Decision: The draft CR is not pursued.

R1-1904388 PDCCH Monitoring for NR-DC Samsung
R1-1904389 Draft CR on PDCCH Monitoring for NR-DC Samsung, Nokia, Nokia Shanghai Bell
R1-1905241 Discussion on PDCCH monitoring for NN-DC in Rel-15 late drop Huawei, HiSilicon

Decision: The document is noted. Discuss further offline

Tuesday session

Agreements:

- For NR-DC (including late drop UEs), ask RAN2 if it is possible to introduce RRC parameters *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, which are the reference number of cells for blind detection for MCG and SCG, respectively.
  - If yes,
    - *pdcch-BlindDetectionCA* for NR-CA is re-used as the UE capability signalling for NR-DC to determine BD/CCE limit across serving cells over CGs.
    - For MCG and SCG, the UE calculates BD/CCE limit for the CGs by using *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, respectively.
    - The value range of *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG* is [1, 2, …, 16].
    - *pdcch-BlindDetectionMCG* + *pdcch-BlindDetectionSCG* <= *pdcch-BlindDetectionCA*.
    - The information exchange between MCG and SCG (if any) is up to RAN2/RAN3 to discuss.

Draft LS to be prepared in R1-1905689 (to RAN2, cc RAN3)

Thursday session (proposal from offline)

- For NR-DC (including late drop UEs), ask RAN2 if it is possible to introduce RRC parameters *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, which configures ~~are~~ the reference number of cells for blind detection for MCG and SCG, respectively, and RRC parameters *pdcch-BlindDetectionMCG_UE* and *pdcch-BlindDetectionSCG_UE* for optional new UE capability signalling that informs the maximum values for *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, respectively. If yes,
  - The value range of *pdcch-BlindDetectionMCG_UE* and *pdcch-BlindDetectionSCG_UE* is
    - [1, …, *pdcch-BlindDetectionCA*–1] and *pdcch-BlindDetectionMCG_UE* + *pdcch-BlindDetectionSCG_UE* >= *pdcch-BlindDetectionCA* if the UE reports *pdcch-BlindDetectionCA*, and
    - [1, 2, 3] and *pdcch-BlindDetectionMCG_UE* + *pdcch-BlindDetectionSCG_UE* >= the number of DL cells if the UE does not report *pdcch-BlindDetectionCA*.
  - If the UE does not report *pdcch-BlindDetectionMCG_UE* and *pdcch-BlindDetectionSCG_UE*,
    - *pdcch-BlindDetectionCA* for NR-CA is re-used as the UE capability signalling for NR-DC to determine BD/CCE limit across serving cells over CGs if the UE reports *pdcch-BlindDetectionCA*, and
    - the number of configured DL cells is used to determine BD/CCE limit across serving cells over CGs if the UE does not report *pdcch-BlindDetectionCA*.
  - If the UE reports *pdcch-BlindDetectionMCG_UE* or *pdcch-BlindDetectionSCG_UE*, both of them are reported (i.e., not either of them).
  - For MCG and SCG, the UE calculates BD/CCE limit for the CGs by using *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, respectively.
  - The value range of *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG* is [1, 2, …, 15~~16~~].
  - *pdcch-BlindDetectionMCG* + *pdcch-BlindDetectionSCG* <= *pdcch-BlindDetectionCA* if the UE reports *pdcch-BlindDetectionCA*, and *pdcch-BlindDetectionMCG* + *pdcch-BlindDetectionSCG* <= the number of configured DL cells if the UE does not report *pdcch-BlindDetectionCA*.
  - For a UE configured with NR-DC, the UE is always configured with *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*.
  - The information exchange between MCG and SCG (if any) is up to RAN2/RAN3 to discuss.

Friday session

Agreements: Above agreement is updated and agreed as follows:

- For NR-DC (including late drop UEs), ask RAN2 if it is possible to introduce RRC parameters *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, which configures ~~are~~ the reference number of cells for blind detection for MCG and SCG, respectively, and RRC parameters *pdcch-BlindDetectionMCG-UE* and *pdcch-BlindDetectionSCG-UE* for optional new UE capability signalling that informs the maximum values for *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, respectively. If yes,
  - The value range of *pdcch-BlindDetectionMCG-UE* and *pdcch-BlindDetectionSCG-UE* is
    - [1, …, *pdcch-BlindDetectionCA*–1] and *pdcch-BlindDetectionMCG-UE* + *pdcch-BlindDetectionSCG-UE* >= *pdcch-BlindDetectionCA* if the UE reports *pdcch-BlindDetectionCA*, and
    - FFS: [1, 2, 3] and *pdcch-BlindDetectionMCG-UE* + *pdcch-BlindDetectionSCG-UE* >= the maximum number of DL serving cells over CGs that UE can support if the UE does not report *pdcch-BlindDetectionCA*.
  - If the UE does not report *pdcch-BlindDetectionMCG-UE* and *pdcch-BlindDetectionSCG-UE*,
    - *pdcch-BlindDetectionCA* for NR-CA is re-used as the UE capability signalling for NR-DC to determine BD/CCE limit across serving cells over CGs if the UE reports *pdcch-BlindDetectionCA*, and
    - the number of configured DL serving cells over CGs is used to determine BD/CCE limit across serving cells over CGs if the UE does not report *pdcch-BlindDetectionCA*.
  - If the UE reports *pdcch-BlindDetectionMCG-UE* or *pdcch-BlindDetectionSCG-UE*, both of them are reported (i.e., not either of them).
  - *pdcch-BlindDetectionMCG-UE* and *pdcch-BlindDetectionSCG-UE* are per UE capability signalling.
  - FFS: If the UE does not report *pdcch-BlindDetectionCA*, the UE must support at least one NR-DC band combination where the UE behaviour of blind decoding operation is the same as in Rel.15 NR-CA.
  - For MCG and SCG, the UE calculates BD/CCE limit for the CGs by using *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*, respectively.
  - The value range of *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG* is [1, 2, …, 15~~16~~].

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- *pdcch-BlindDetectionMCG* + *pdcch-BlindDetectionSCG* <= *pdcch-BlindDetectionCA* if the UE reports *pdcch-BlindDetectionCA*, and *pdcch-BlindDetectionMCG* + *pdcch-BlindDetectionSCG* <= the number of configured DL serving cells over CGs if the UE does not report *pdcch-BlindDetectionCA*.
- For a UE configured with NR-DC, if the UE reports *pdcch-BlindDetectionCA*, the UE is always configured with *pdcch-BlindDetectionMCG* and *pdcch-BlindDetectionSCG*.
  - FFS: if the UE does not report *pdcch-BlindDetectionCA*.
- The information exchange between MCG and SCG (if any) is up to RAN2/RAN3 to discuss.

R1-1905689 Draft LS on PDCCH monitoring for NR-DC NTT DOCOMO
Friday: Email discussion/approval of the FFSs in the above agreements, including LS, till April 19th – Fred (NTT DOCOMO)

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R1-1905633 Summary of CRs for SFI for Rel.15 Qualcomm
Decision: The document is noted.
Wednesday
R1-1905708 Summary of CRs for SFI for Rel.15 Qualcomm
Decision: The document is noted.

R1-1904058 Draft TS 38.213 CR on corrections for SFI vivo
Decision: The draft CR is endorsed. Check further offline for potential inclusion in an alignment CR.
Friday decision: Draft CR to be included in the alignment CR for 38.213.

R1-1904391 Draft CR on misalignment issue for PDSCH/PUSCH dropping rule Samsung
R1-1904866 Correction on configured scheduling PUSCH repetition with dynamic SFI Sharp
Decision: The documents are noted. Discuss further offline
Wednesday
R1-1905737 Correction on configured scheduling PUSCH repetition with dynamic SFI Qualcomm
Decision: The draft CR is endorsed. Final CR is agreed in R1-1905743 (38.214, CR0028)

R1-1905039 Draft TS 38.213 CR on conflict between serving cell SSB transmission and dynamic SFI vivo
Decision: The document is noted. Discuss further offline
Wednesday: The draft CR is not pursued.

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R1-1905524 Summary of draft CRs on DCI content Ericsson
Decision: The document is noted.
Tuesday
R1-1905674 Summary#2 of draft CRs on DCI content Ericsson
Decision: The document is noted.

R1-1904868 Correction on frequency offset for DCI format 0_0 with CRC scrambled by TC-RNTI Sharp
Decision: The document is noted. Discuss further offline, especially w.r.t. interaction with R1-1904718 if any
Tuesday
Agreements:
- The draft CR in R1-1904868 is endorsed. Check further offline for potential inclusion in an alignment CR.
- Also to update the title of Table 8.3-1 in Subclause 8.3 of TS 38.213 to include Msg3 retransmissions
  - This is to be included in the alignment CR for 38.213

Friday decision: Draft CR in R1-1904868 to be included in the alignment CR for 38.213.

R1-1905248 Correction on DCI size alignment in TS 38.212 Huawei, HiSilicon

Decision: The document is noted. Discuss further offline
Wednesday: The draft CR is endorsed. Final CR is agreed in R1-1905744 (38.212, CR0015)

R1-1905251 **Correction on DCI format ambiguity** **Huawei, HiSilicon**
Related to proposal 3 in R1-1904468 Clarification on PDCCH candidate monitoring MediaTek Inc.
Decision: The document is noted. Discuss further offline
Tuesday conclusion:

A UE is not expected to be configured to monitor a first PDCCH candidate for a DCI format 0_0 and a DCI format 1_0 from a CSS set and a second PDCCH candidate for a DCI format 0_1 and a DCI format 1_1 from a USS set in different CORESETs or in a same CORESET with index p, where p ≠ 0, on an active DL BWP, and

- the DCI formats 0_0/1_0 associated with the first PDCCH candidate and the DCI formats 0_1/1_1 associated with the second PDCCH candidate have same size, and
- the UE receives the first PDCCH candidate and the second PDCCH candidate over a same set of CCEs, and
- the first PDCCH candidate and the second PDCCH candidate have identical scrambling, and
- the DCI formats 0_0/1_0 for the first PDCCH candidate and the DCI formats 0_1/1_1 for the second PDCCH candidate have CRC scrambled by either C-RNTI, or MCS-C-RNTI, or CS-RNTI

No CR is necessary

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R1-1905619 **Summary of draft CRs on UL Control** **Ericsson**
Decision: The document is noted.
Wednesday
R1-1905718 **Summary of draft CRs on UL Control** **Ericsson**
Decision: The document is noted.

R1-1904471 **Draft CR on the determination of the minimum number of PRBs for PUCCH transmission** **MediaTek**
Decision: The document is noted. Discuss further offline
Wednesday
Decision: The two recommendations in R1-1905718 are endorsed (for the second recommendation, the reference section should be updated from 9.2.5 to 9.2.5.1 and 9.2.5.2). To prepare the corresponding draft CRs; R1-1905746 (38.213, CR0036), and R1-1905747 (38.211 – check potential inclusion in an alignment CR)
Thursday
R1-1905796 **CR on the determination of the minimum number of PRBs for PUCCH transmission** **MediaTek, Ericsson**
Decision: The revised CR in R1-1905796 (38.213, CR0036r1) is agreed.
R1-1905747 **Draft CR to 38.211 on determined number of PRBs for PUCCH format 3** **Ericsson**
Decision: The draft CR is endorsed (check further offline for potential inclusion in the 38.211 alignment CR)
Friday decision: Draft CR to be included in the alignment CR for 38.211.

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R1-1905617 **Rel-15 CR summary on long format PUCCH** **Huawei**
Decision: The document is noted.

R1-1904676 **Draft CR on PUCCH format 1** **ZTE**
Decision: The draft CR is endorsed. Final CR is agreed in R1-1905654 (38.211, CR0010)

R1-1904537 **Correction on reference CRC for multi-CSI resource selection** **CATT, Sharp**
Decision: The document is noted. Discuss further offline
Thursday
R1-1905810 **Correction on CRC assumption for multi-CSI resource selection and CSI report(s) selection** **CATT**
Friday decision: The draft CR is endorsed. Final CR is agreed in R1-1905886 (38.213, CR0041).

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R1-1905613 **Summary of CRs on UCI multiplexing on PUSCH Qualcomm**
Decision: The document is noted.
Friday
R1-1905859 **Summary#2 of CRs on UCI multiplexing on PUSCH Qualcomm** (rev of R1-1905816)
Decision: The document is noted.

R1-1904470 **Draft CR on collision handling of PUCCH, PUSCH, and SRS MediaTek Inc.**
Decision: The document is noted. Discuss further offline
Friday conclusion: It is understood for NR Rel-15 that:
- If a PUCCH transmission overlapping with an SRS transmission on a same CC, a UE does not expect that the PUCCH transmission overlaps with other PUCCH/PUSCH transmission(s) in the same PUCCH group
- No spec change is needed.

R1-1904538 **Correction on PUSCH selection for overlapping of PUCCH and PUSCH CATT**
Decision: The document is noted. Discuss further offline
Friday decision: Email discussion to decide potential solution to the issues identified in CR R1-1904538 – until April 19th , Yi (Qualcomm)

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R1-1905525 **Summary of draft CRs on resource allocation Ericsson**
Decision: The document is noted.
Tuesday
R1-1905675 **Summary#2 of draft CRs on resource allocation Ericsson**
Decision: The document is noted.
Wednesday
R1-1905731 **Summary#3 of draft CRs on resource allocation Ericsson**
Decision: The document is noted.
Thursday
R1-1905730 **Summary#4 of draft CRs on resource allocation Ericsson**
Decision: The document is noted.

R1-1904673 **Draft CR on resource mapping related to BWP ZTE**
R1-1904802 Correction on definition of resource block bundles for interleaved VRB-to-PRB mapping Spreadtrum Communications
R1-1905255 Correction on mapping from virtual to physical resource blocks Huawei, HiSilicon
Decision: Discuss further offline, especially w.r.t. the possibility of including to the alignment CR or not
Tuesday
R1-1905682 **Correction on mapping from virtual to physical resource blocks Huawei, HiSilicon, ZTE, Spreadtrum Communications**
Decision: CR0012 to 38.211 is agreed.

R1-1904277 **[Draft] CR on maximum modulation order configured for serving cell Intel Corporation**
Decision: Discuss further offline.
Thursday conclusion
It's commonly understood that
- For DL-SCH, the maximum number of PRBs for LBRM calculation is across all configured DL BWPs of a carrier
- For UL-SCH, the maximum number of PRBs for LBRM calculation is across all configured UL BWPs of a carrier

R1-1905687 **[Draft] CR on maximum modulation order configured for serving cell Intel Corporation**
Friday decision: Draft CR updated to **R1-1905896**, then updated and endorsed in **R1-1905908**. Final CR is agreed in R1-1905910 (38.212, CR0018).

R1-1904467 **Draft CR on the determination of TBS of a PUSCH scheduled by a DCI format 0_0 with CRC scrambled by TC-RNTI MediaTek Inc.**

Decision: The draft CR is not pursued. Discuss further offline whether there is a need to have some clarification in the Chairman's note w.r.t. the issue brought up in R1-1904467

Tuesday: no further action is necessary. The draft CR is not pursued.

R1-1905083 **On support of slot aggregation when scheduled using fallback DCI formats Intel Corporation**

Decision: The document is noted. Discuss further offline

Wednesday conclusion:

- Interpretation 2 in R1-1905083 is the intended behavior.
- FFS clarify this in alignment CR (38.214) (exemplary text can be found in R1-1905731).

Friday decision: Draft CR to be included in the alignment CR for 38.214.

R1-1904675 **Draft CR on UE procedure for PDSCH and PUSCH ZTE**

Decision: The document is noted. Discuss further offline

Wednesday

R1-1905736 **Draft CR on UE procedure for PDSCH and PUSCH ZTE**

Decision: The draft CR is endorsed. Final CR is agreed in R1-1905742 (38.214, CR0027), assuming the following updates:

- ~~CR#1 on UE PDSCH processing procedure time~~
  ~~Correct a typo.~~
- ~~CR#2 on UE PUSCH frequency hopping procedure:~~

This CR covers two aspects: one on typo correction, and the other is w.r.t. UE PUSCH frequency hopping procedure.

and:

There is no impact on gNB and UE behavior for the first correction~~. CR#1~~.

The second correction~~ CR#2~~ is to complete the RE mapping rule when frequency hopping is enabled and transform

R1-1905137 **Draft CR to 38.214 clarifying calculation of DataRate and DataRateCC Ericsson**

R1-1905138 **Calculation of DataRate and DataRateCC in 38.214 Ericsson**

Decision: The documents are noted. Discuss further offline

Friday decision: R1-1905137 is endorsed with final CR agreed in R1-1905887 (38.214, CR0032)

R1-1905516 **Clarification regarding non-full-duplex UE communication Ericsson (Revision of R1-1905178)**

Decision: The document is noted. Discuss further offline

Thursday conclusion: Revisit this CR after RAN4 makes further progress on this topic.

==========

R1-1905608 **Summary for Rel-15 UL transmission procedure NTT DOCOMO**

Decision: The document is noted.

Tuesday

R1-1905692 **Summary for Rel-15 UL configured grant transmision NTT DOCOMO**

Decision: The document is noted.

R1-1905176 **Clarification on CG transmission opportunities Ericsson**

Decision: The document is noted. Discuss further offline

Wednesday

For the issue raised in R1-1905176 and summarized in R1-1905692, option 2 is adopted. Offline to prepare draft CR (R1-1905749)

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Thursday
R1-1905822 **Clarification on CG transmission opportunities** **Ericsson** (rev of R1-1905749)
Decision: The draft CR is endorsed. Final CR is agreed in R1-1905827 (38.214, CR0030).

R1-1905253 **Correction on redundancy version for configured grant** **Huawei, HiSilicon**
Decision: The draft CR is endorsed in principle. Further discussion offline on further clarification regarding UE behaviour. Also discuss potential including to an alignment CR or not.
Tuesday: Clarification on UE behaviour not needed – the spec is already clear.
Friday decision: Draft CR to be included in the alignment CR for 38.214.

R1-1905177 Clarification on DL-SPS transmission Ericsson
R1-1905174 Clarification on Type2 configured grant Ericsson
R1-1905175 Clarification on resource allocation of Type 1 configured grant Ericsson
Decision: Discuss further offline
Thursday: No consensus whether above CRs are essential. The 3 draft CRs are not pursued.

=========
R1-1905612 **Summary for Rel-15 CRs on DL/UL data scheduling and HARQ procedure Qualcomm**
Decision: The document is noted.
Thursday
R1-1905653 **Summary for Rel-15 CRs on DL/UL data scheduling and HARQ procedure Qualcomm**
Decision: The document is noted.
Friday
R1-1905872 **Updated summary for Rel-15 CRs on DL/UL data scheduling and HARQ procedure Qualcomm**
Decision: The document is noted.

R1-1904278 **[Draft] CR on inclusion of TC-RNTI for monitored RNTI for UL-SCH** **Intel Corporation**
Decision: The document is noted. Discuss further offline (especially the updated attached draft CR)
R1-1905758 **[Draft] CR on inclusion of TC-RNTI for monitored RNTI for UL-SCH and inclusion of monitoring PDCCH ordering PRACH on SCell** **Intel Corporation, Qualcomm**
Friday decision: Draft CR is endorsed with final CR agreed in R1-1905888 (38.202, CR0007).

R1-1904279 **Correction to simultaneous reception of DL Channels** **Intel Corporation**
Decision: The document is noted. Discuss further offline (especially the updated attached draft CR), including potentially combined with the one related to R1-1904278
Thursday
R1-1905795 **Correction to simultaneous reception of DL Channels** **Intel Corporation**
Decision: The draft CR is endorsed. Final CR is agreed in R1-1905823 (38.202, CR0006)

R1-1904869 **Clarification of PDSCH processing capability 1** **Sharp**
Decision: The document is noted. Discuss further offline
Friday decision: Draft CR in **R1-1905873** is endorsed with final CR agreed in R1-1905889 (38.213, CR0042).

R1-1905252 **Correction on the timeline condition of multiplexing two HARQ-ACK information in one slot** **Huawei, HiSilicon**
Decision: The document is noted. Discuss further offline (especially the updated attached draft CR)
Friday decision: Updated draft CR in R1-1905850 is endorsed with final CR agreed in R1-1905890 (38.213, CR0043).

=========
R1-1905526 **Summary of Draft CRs on CA and HARQ-ACK Codebook for Rel-15 NR** **Samsung**

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Decision: The document is noted.

Wednesday

R1-1905727 **Offline Summary for Draft CRs on CA and HARQ-ACK Codebook** Samsung

Decision: The document is noted.

Thursday

R1-1905809 **Options for Type-1 HARQ-ACK Codebook Pseudo-code Update** Samsung

Decision: The document is noted.

R1-1904359 **TP for alignment CR to 38.213** NEC Corporation

Decision: The draft CR in R1-1904359 is endorsed, except:

- Removing the addition of "in *DownlinkConfigCommonSIB* or *DownlinkConfigCommon",* 2 occurrences, & adding "in UplinkConfigCommonSIB or UplinkConfigCommon", one occurence)
- Check whether or not to have the change "supplementaryUplinkConfig" including further potential clarification

Further check offline for potential inclusion in an alignment CR or not.

Wednesday

- Agree on the following update:

  If a UE is not provided initialDownlinkBWP, an initial active DL BWP is defined by a location and number of contiguous PRBs, starting from a PRB with the lowest index and ending at a PRB with the highest index among PRBs of a CORESET for Type0-PDCCH CSS set, and a SCS and a cyclic prefix for PDCCH reception in the CORESET for Type0-PDCCH CSS set; otherwise, the initial active DL BWP is provided by initialDownlinkBWP. For operation on the primary cell or on a secondary cell, a UE is provided an initial active UL BWP by initial~~u~~UplinkBWP. If the UE is configured with a supplementary UL carrier, the UE can be provided an initial active UL BWP on the supplementary UL carrier by initialUplinkBWP ~~in supplementaryUplink~~.

Friday decision: Draft CR to be included in the alignment CR for 38.213.

R1-1904371 **[Draft] CR on Timing for secondary cell activation / deactivation** Intel Corporation

Decision: The document is noted. Discuss further offline

Wednesday conclusion:

It is understood that:

a) the "Note: With K1 expressed in msec, the above is equivalent to k = K1 + 4 msec" in the Chairman's minutes from RAN1 #94bis is applicable only for SCS of 15 kHz, and

b) in '$k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\mu} + 1$', the unit of '$k_1$' and of '1' is a slot.

No specification change. Draft CR is not pursued.

R1-1904390 **Draft CR on missing case for DCI format 1_1 with CS-RNTI** Samsung

R1-1904539 **Correction on HARQ-ACK codebook determination** CATT

Decision: The documents are noted. Discuss further offline, especially aspects w.r.t. SPS/CBG

Wednesday decision: Draft CR in R1-1904390 is endorsed. Final CR is agreed in R1-1905750 (38.213, CR0035).

R1-1904677 **Draft CR on Type-1 HARQ-ACK codebook determination** ZTE

Decision: The document is noted. Discuss further offline

Thursday decision: Option 1 in R1-1905809 is adopted. Prepare draft CR in R1-1905825 (38.213)

Friday decision: Updated draft CR in **R1-1905875** is endorsed. Final CR is agreed in R1-1905891 (38.213, CR0044).

R1-1905136 **Draft CR to 38.213 on Clarification of ACK or NACK for TB-based HARQ-ACK codebook** Ericsson

Decision: The document is noted. Discuss further offline, especially w.r.t. whether RAN2 already captures it or not

Wednesday decision: Check in RAN2 whether similar update as in LTE can be made or not.

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R1-1905626 **Summary on Rel-15 NR CRs for CBG retransmission** **LG Electronics**
Decision: The document is noted.

R1-1904540 **Correction on CBG based transmission for UL** **CATT**
R1-1904867 **Correction on CBG based transmission for uplink** **Sharp**
Decision: The draft CR in R1-1904540 (identical to R1-1904867) is endorsed. Further check offline for potential inclusion in an alignment CR or not.
Friday decision: Draft CR to be included in the alignment CR for 38.214.

R1-1904541 **Correction on higher layer parameter for CBGTI in DCI format 1_1** **CATT**
Decision: The draft CR in R1-1904541 (by updating the Clause affected to 7.3.1.2.2) is endorsed. Further check offline for potential inclusion in an alignment CR or not.
Friday decision: Draft CR to be included in the alignment CR for 38.212.

=========
R1-1905646 **Summary of bandwidth part related draft CRs** **MediaTek**
Decision: The document is noted.
Wednesday
R1-1905705 **Summary of bandwidth part related draft CRs** **MediaTek**
Decision: The document is noted.

R1-1904673 Draft CR on resource mapping related to BWP ZTE
Already covered by resource allocation

R1-1904773 **Correcton on BWP configurations** **Ericsson**
Decision: The document is noted. Discuss further offline
Wednesday
Agreements:

- Endorse R1-1904773 and include it in an alignment CR (38.213)
- Replace "*bwp-Id*" with "*BWP-Id*" in TS38.211 & TS38.214 and include this correction in an alignment CR
  - Note: It's because *initialDownlinkBWP* & *initialUplinkBWP* doesn't have parameter "*bwp-Id*"

=========
R1-1905599 **Summary on CRs related to rate-matching in NR** **Nokia, Nokia Shanghai Bell**
Decision: The document is noted.

R1-1904469 **Draft CR on rate matching for PDSCH scheduled by DCI format 1_0** **MediaTek Inc., Nokia and Nokia Shanghai Bell**
Decision: The change in 5.1.4.1 in R1-1904469 is endorsed – check further offline for potential inclusion in an alignment CR.
Discuss further offline of the first change in R1-1904469
Tuesday
Proposals:

- Alt1: Dynamic indication/trigger of *rateMatchPatternGroup1*, *rateMatchPatternGroup2* and *aperiodic-ZP-CSI-RS-ResourceSetsToAddModList* in SPS activation by DCI format 1_1 applies to first PDSCH among triggered SPS PDSCHs
- Alt2: Dynamic indication of *rateMatchPatternGroup1*, *rateMatchPatternGroup2* and *aperiodic-ZP-CSI-RS-ResourceSetsToAddModList* in SPS activation by DCI format 1_1 applies to all triggered SPS PDSCHs
- Others? (maybe invalid?)

Also the behavaior when DCI format 1_0 is used
Thursday

R1-1905752 **Draft CR on rate matching for PDSCH scheduled by DCI format 1_0** **Nokia, Nokia Shanghai Bell, MediaTek Inc.**
Decision: The draft CR is endorsed. Final CR is agreed in R1-1905826 (38.214, CR0029).

R1-1904674 **Draft CR on PDSCH rate-matching** **ZTE**
R1-1905245 **Correction on rate matching indication** **Huawei, HiSilicon**
Decision: The documents are noted. Discuss further offline
Tuesday
R1-1905691 **Draft CR on PDSCH rate-matching** **ZTE, Huawei, Nokia**
Decision: The updated draft CR in R1-1905691 is endorsed. Check further offline for potential inclusion in an alignment CR.
Friday decision: Draft CR to be included in the alignment CR for 38.214.

R1-1905244 Correction on UE DM-RS transmission procedure for SP-CSI-RNTI Huawei, HiSilicon
To be handled under 7.1.2

7.1.4 Maintenance for NR-LTE co-existence

R1-1905798 **Chairman's notes of AI 7.1.4 Maintenance for NR-LTE co-existence** **Ad-Hoc Chair (Ericsson)**
Decision: The document is endorsed, content incorporated below.

R1-1905140 **Handling of LTE-DC and EN-DC in LTE specs** **Ericsson**
Conclusion:
When interpreting text associated with "If UE is configured with SCG" in LTE RAN1 specifications, it is understood that the associated MCG or SCG behaviour applies for EN-DC only when EN-DC is clearly indicated in the specifications (e.g., using "UE is configured for EN-DC")
Note: Further discussion needed on a similar conclusion for NE-DC

R1-1905246 **(Late drop) Correction on UL HARQ for NE-DC with SUO Case 1** **Huawei, HiSilicon**
Final CR is agreed in R1-1905541 (TS36.213, CR1245, Rel-15)
R1-1905247 **Correction on UL/SUL indicator in DCI format 0_0 with CRC scrambled by C-RNTI in TS 38.212** **Huawei, HiSilicon**
R1-1905701 **Correction on UL/SUL indicator in DCI format 0_0 with CRC scrambled by C-RNTI in TS 38.212** **Huawei, HiSilicon**
R1-1905721 **Correction on UL/SUL indicator in DCI format 0_0 with CRC scrambled by C-RNTI in TS 38.212** **Huawei, HiSilicon**
Final CR is agreed in R1-1905787 (TS38.212, CR0016, Rel-15) with the title modified to "Correction on UL/SUL indicator in DCI format 0_0"

R1-1905254 **Correction on reference name of UE capability of additional DMRS for co-existence with LTE CRS** **Huawei, HiSilicon**
Final CR is agreed in R1-1905666 (TS38.211, CR0011, Rel-15)

From AI 5
R1-1903848 **LS on Specification support for SFTD with NR Pcell** **RAN4, Ericsson**
R1-1905820 **Draft CR on SFTD measurements for NE-DC** **Ericsson**
Friday online decision: The draft CR is endorsed and final CR is agreed in R1-1905894 (38.215, CR0006).

R1-1903864 **LS on SFTD measurement for NR-DC in Rel-15** **RAN2, ZTE**
To be addressed in RAN1#97

R1-1905135 Draft reply to RAN4 LS on NR-LTE Co-existence Ericsson

R1-1904888 [DRAFT] Reply LS on Capability signalling of single/dual PA architecture, phase discontinuity, and UL timing alignment aspects Intel Corporation
Final LS is approved in R1-1905669 with the following modifications:

- Update the title to "[DRAFT] Reply LS on Capability signalling of phase discontinuity"
- CC to RAN2

7.1.5 Maintenance for UL power control

R1-1905799 Chairman's notes of AI 7.1.5 Maintenance for UL power control Ad-Hoc Chair (Samsung)
Decision: The document is endorsed, content incorporated below.

R1-1905641 Summary for Al 7.1.5 Maintenance for UL power control ZTE

R1-1905640 Draft CR on addressing SRS closed loop power control issues ZTE
The draft CR in R1-1905640 is endorsed. To be included in alignment CR for TS38.213.

R1-1904762 Draft CR on addressing SRS closed loop power control issues ZTE
The draft CR is rejected.

R1-1904760 Discussion on prioritization for transmission power scaling for DCZTE
The draft CR in R1-1905642 is endorsed. To be included in alignment CR for TS38.213.

R1-1904761 Draft CR on alignment of a PL parameter ZTE
The draft CR in R1-1904761 is endorsed. To be included in alignment CR for TS38.213.

R1-1904849 Correction on one port PUSCH power scaling Ericsson
R1-1905782 Correction on one port PUSCH power scaling Ericsson, Verizon, T-Mobile USA, Sprint, NTT DOCOMO, Orange, Nokia, Intel, Qualcomm, Samsung, ZTE
R1-1905855 Correction on one port PUSCH power scaling Ericsson, Verizon, T-Mobile USA, Sprint, NTT DOCOMO, Orange, Nokia, Intel, Qualcomm, Samsung, ZTE
Note: Huawei/HiSilicon commented that this CR reverts relevant existing RAN1 agreement, modifies UE behavior as currently specified, and requires changes in UE implementation. Huawei/HiSilicon have concerns on this CR but can accept.
The draft CR in R1-1905855 is endorsed. Final CR is agreed in R1-1905871 (38.213, CR#0039)

R1-1904846 Discussion on Rel-15 SRS Power Scaling Ericsson
R1-1904852 Correction on SRS Power Scaling Ericsson
The draft CR is rejected.

R1-1904890 PHR in Dual-Connectivity MediaTek Beijing Inc.
R1-1904901 Discussion on P0_Nominal for virtual PHR ZTE
Withdrawn
R1-1904926 Draft CR on PHR determination and transmission Motorola Mobility, Lenovo
R1-1904927 Draft CR on PC setting for virtual PHR Motorola Mobility, Lenovo
R1-1905697 Draft CR on PHR determination and transmission Motorola Mobility, Lenovo
The draft CR in R1-1905697 is update of R1-1904926 and R1-1904927. The draft CR in R1-1905697 is endorsed and final CR is agreed in R1-1905783 (38.213, CR#0037)

Further discuss until RAN1#97 for NR PHR on LTE, considering the alternatives below and possible updates:

- Alt-1: If the UE indicates a capability for dynamic power sharing between E-UTRA and NR for EN-DC, accumulation of the TPC commands for NR PHR is received up to 4 ms prior to the subframe in which the LTE power headroom report is transmitted for the following cases
  - Configured PUSCH transmission in type 1 PHR.
  - Semi-persistent or periodic SRS transmission in type 3 PHR.
- Alt-2:

- The TPC accumulation, f(i,l), is allowed to include TPC commands up to any time in between the PHR trigger and min{k2} slots prior to the reference slot.
- When NR PH is provided by LTE, it is up to the UE to decide the PHR is based on a reference transmission or real transmission.

R1-1905789 **Summary2 for Al 7.1.5 Maintenance for UL power control** **ZTE**

R1-1904989 Clarification on PHR in EN-DC Qualcomm Incorporated
R1-1905242 Discussion on PHR in ENDC Huawei, HiSilicon
R1-1905249 Correction on PHR in EN-DC Huawei, HiSilicon

7.1.6 Maintenance for URLLC

None

7.1.7 Other

R1-1905800 **Chairman's notes of AI 7.1.7 UE features list** **Ad-Hoc Chair (NTT DOCOMO)**
Decision: The document is endorsed, content incorporated below.

R1-1905679 **Summary on UE feature related discussion in 7.1.7** **NTT DOCOMO, INC.**

Agreements:
Apply following change to "Feature component" of FG 3-5a
For type 1 CSS with dedicated RRC configuration, type 3 CSS and UE-SS, monitoring occasion can be any OFDM symbol(s) of a slot for Case 2, with minimum time separation (including the cross-slot boundary case) between two DL unicast DCIs , between two UL unicast DCIs, or between a DL and an UL unicast DCI in different monitoring occasions where at least one of them is not the monitoring occasions of FG-3-1, for a same UE as

- 2OFDM symbols for 15kHz
- 4OFDM symbols for 30kHz
- 7OFDM symbols for 60kHz with NCP
- ~~14~~11OFDM symbols for 120kHz

Up to one unicast DL DCI and up to one unicast UL DCI in a monitoring occasion except for the monitoring occasions of FG 3-1.
In addition for TDD the minimum separation between the first two UL unicast DCIs ~~in the first monitoring occasion~~ within the first 3 OFDM symbols of a slot can be zero OFDM symbols.

Agreements:
Update "Feature component" of FG 3-5b as below:
PDCCH monitoring occasions of FG-3-1, plus additional PDCCH monitoring occasion(s) can be any OFDM symbol(s) of a slot for Case 2, and for any two PDCCH monitoring occasions belonging to different spans, where at least one of them is not the monitoring occasions of FG-3-1, in same or different search spaces, there is a minimum time separation of X OFDM symbols (including the cross-slot boundary case) between the start of two spans, where each span is of length up to Y consecutive OFDM symbols of a slot. Spans do not overlap. Every span is contained in a single slot. The same span pattern repeats in every slot. The separation between consecutive spans within and across slots may be unequal but the same (X, Y) limit must be satisfied by all spans. Every monitoring occasion is fully contained in one span. In order to determine a suitable span pattern, first a bitmap $b(l)$, $0<=l<=13$ is generated, where $b(l)=1$ if symbol l of any slot is part of a monitoring occasion, $b(l)=0$ otherwise. The first span in the span pattern begins at the smallest l for which $b(l)=1$. The next span in the span pattern begins at the smallest l not included in the previous span(s) for which $b(l)=1$. The span duration is max{maximum value of all CORESET durations, minimum value of Y in the UE reported candidate value} except possibly the last span in a slot which can be of shorter duration. A particular PDCCH monitoring configuration meets the UE capability limitation if the span arrangement satisfies the gap separation for at least one (X, Y) in the UE reported candidate value set in every slot, including cross slot boundary.
For the set of monitoring occasions which are within the same span:

- Processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for FDD
- Processing one unicast DCI scheduling DL and two unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for TDD
- Processing two unicast DCI scheduling DL and one unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for TDD

The number of different start symbol indices of spans for all PDCCH monitoring occasions per slot, including PDCCH monitoring occasions of FG-3-1, is no more than floor(14/X) (X is minimum among values reported by UE).
The number of different start symbol indices of PDCCH monitoring occasions per slot including PDCCH monitoring occasions of FG-3-1, is no more than 7.
The number of different start symbol indices of PDCCH monitoring occasions per half-slot including PDCCH monitoring occasions of FG-3-1 is no more than 4 in SCell.

Agreement:
Apply following modification to "Feature group" of FG 4-19:
SR/HARQ-ACK/CSI multiplexing once per slot using a PUCCH (or HARQ-ACK/CSI piggybacked on a PUSCH) when SR/HARQ-ACK/CSI are supposed to be sent with the same starting symbol on the PUCCH resources in a slot
Apply following modification to "Feature group" of FG 4-19a:
SR/HARQ-ACK multiplexing once per slot using a PUCCH (or HARQ-ACK piggybacked on a PUSCH) when SR/HARQ-ACK are supposed to be sent with different starting symbols in a slot
Apply following modification to "Feature group" of FG 4-19b:
SR/HARQ-ACK/CSI multiplexing more than once per slot using a PUCCH (or HARQ-ACK/CSI piggybacked on a PUSCH) when SR/HARQ-ACK/CSI are supposed to be sent with the same or different starting symbol in a slot
Apply following modification to "Feature group" of FG 4-19c:
SR/HARQ-ACK/CSI multiplexing once per slot using a PUCCH (or HARQ-ACK/CSI piggybacked on a PUSCH) when SR/HARQ-ACK/CSI are supposed to be sent with different starting symbols in a slot

Agreement:
Add following to "Note" of FG 4-27:
If a UE does not indicate supporting any of 4-2, 4-22, and 4-22a, the UE is not expected to be scheduled with more than one group of overlapping PUCCHs without PUSCH in each of the groups

Agreement:
Add following to "Note" of FG 6-6
Note: The terminology 'carrier' in the components in this FG does not refer to 'SUL'.

Proposal **agreed on Friday** (without introduction of new capability (FG0-9a))
Agreements:
Apply following change to "Feature component" of FG 6-9
1) For both NR CA UE and EN-DC UE, same numerology between DL and UL per carrier for data/control channel at a given time
2) For both NR CA UE and EN-DC UE with one NR PUCCH group, different numerologies across NR carriers within the same NR PUCCH groups up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with smaller SCS for data/control channel at a given time
3-1) For NR CA UE with two NR PUCCH groups, different numerologies across NR carriers up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with smaller SCS for data/control channel at a given time
3-2) For EN-DC UE with two NR PUCCH groups, different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1 wherein NR PUCCH is sent on the carrier with smaller SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data/control channel at a given time

Add following to "Note" of FG 6-9

Note: The terminologies 'UL' and 'carrier' in the components in this FG do not refer to 'SUL'. The case with PUCCH on UL carrier with larger SCS than other UL carrier is not supported.

~~Introduce following new capability~~

	~~6-9a~~	~~Different numerologies across NR carriers within the same NR PUCCH group~~	~~1) For both NR CA UE and EN-DC UE with one NR PUCCH group: different numerologies across NR carriers within the same NR PUCCH groups up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is on the carrier with larger SCS for data/control channel at a given time~~ ~~2-1) For NR CA UE with two NR PUCCH groups: different numerologies across NR carriers up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with larger SCS for data/control channel at a given time~~ ~~2-2) For EN-DC UE with two NR PUCCH groups: different numerologies across NR carriers up to two different numerologies within an NR PUCCH group~~	~~6-5~~			~~Type 3 (per band combination)~~	~~N.A.~~	~~N.A.~~	~~Note: for component 2), 3-1) and 3-2), if a UE indicates support of 6-17 and the SCS of an SUL of a serving cell comprising an SUL is not smaller than the SCSs of an UL of any other serving cells in the same NR PUCCH group, NR PUCCH for the UE can be sent on either the UL or the SUL of the serving cell comprising the SUL.~~		~~Optional with capability signaling~~

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			~~in FR1 wherein NR PUCCH is sent on the carrier with larger SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data/control channel at a given time~~															

Agreements:

Following in "Note" of FG 9[5-13] through 11[5-13c] is deleted.

~~"Fallback" is the same as FG1 [5-5a]~~

Following in "Note" of FG 12[5-13d] through 14[5-13f] is deleted.

~~"Fallback" is the same as FG3 [5-5c]~~

"Feature component" of FG 9[5-13] is updated as below:

Up to 2 unicast PDSCHs per slot per CC only in TDM is supported for Capability 2

UE can report values 'X' and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X DL CCs, the UE may expect to be scheduled with up to 2 PDSCHs per slot with Capability #2 on all of the configured serving cells for which processingType2Enabled is configured and set to enabled

2) No scheduling limitation

3) N1 based on Table 5.3-2 of TS 38.214 for given SCS from {15, 30, 60} kHz

"Feature component" of FG 10[5-13a] is updated as below:

Up to 7 unicast PDSCHs per slot per CC only in TDM is supported for Capability 2

UE can report values 'X' and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X DL CCs, the UE may expect to be scheduled with up to 7 PDSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*

2) No scheduling limitation

3) N1 based on Table 5.3-2 of TS 38.214 for given SCS from {15, 30, 60} kHz

"Feature component" of FG 11[5-13c] is updated as below:

Up to 4 unicast PDSCHs per slot per CC only in TDM is supported for Capability 2

UE can report values 'X' and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X DL CCs, the UE may expect to be scheduled with up to 4 PDSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*

2) No scheduling limitation

3) N1 based on Table 5.3-2 of TS 38.214 for given SCS from {15, 30, 60} kHz

"Feature component" of FG 12[5-13d] is updated as below:

Up to 2 unicast PUSCHs per slot per CC only in TDM is supported for Capability 2

UE can report values 'X' and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X UL CCs, the UE may expect to be scheduled with up to 2 PUSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*

2) N2 based on Table 6.4-2 of TS 38.214 for given SCS from {15, 30, 60} kHz

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"Feature component" of FG 13[5-13e] is updated as below:
Up to 7 unicast PUSCHs per slot per CC only in TDM is supported for Capability 2
UE can report values 'X' and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X UL CCs, the UE may expect to be scheduled with up to 7 PUSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*

2) N2 based on Table 6.4-2 of TS 38.214 for given SCS from {15, 30, 60} kHz
"Feature component" of FG 14[5-13f] is updated as below:
Up to 4 unicast PUSCHs per slot per CC only in TDM is supported for Capability 2
UE can report values 'X' and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X UL CCs, the UE may expect to be scheduled with up to 4 PUSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*

2) N2 based on Table 6.4-2 of TS 38.214 for given SCS from {15, 30, 60} kHz
"Feature component" of FG 1[5-5a] is updated as below:
UE can report values 'X' and 'Fallback', and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X DL CCs, the UE may expect to be scheduled with up to 1 PDSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*, otherwise
  - If Fallback = 'SC', UE supports Capability #2 processing time on lowest cell index among the configured carriers in the band where the value is reported
  - If Fallback = 'Cap1-only', UE supports only Capability #1, in the band where the value is reported

2) No scheduling limitation
3) N1 based on Table 5.3-2 of TS 38.214 for given SCS from {15, 30, 60} kHz
"Feature component" of FG 2[5-5b] is updated as below:
Capability #2 supported only if 1 carrier configured in the band (independent of #carriers configured in other bands)
2) Max PDSCH BW of 136 PRBs on the configured serving cell with for which ***processingType2Enabled*** is configured and set to *enabled*
3) N1 based on Table 5.3-2 of TS 38.214 for 30 kHz SCS
4) UE reports the number of unicast PDSCH per slot for different TBs
"Feature component" of FG 3[5-5c] is updated as below:
UE can report values 'X' and 'Fallback', and supports the following operation, only when all carriers are self-scheduled and all Capability #2 carriers in a band are of the same numerology

- When configured with less than or equal to X UL CCs, the UE may expect to be scheduled with up to 1 PUSCHs per slot with Capability #2 on all of the configured serving cells for which ***processingType2Enabled*** is configured and set to *enabled*, otherwise
  - If Fallback = 'SC', UE supports Capability #2 processing time on lowest cell index among the configured carriers in the band where the value is reported
  - If Fallback = 'Cap1-only', UE supports only Capability #1, in the band where the value is reported

2) N2 based on Table 6.4-2 of TS 38.214 for given SCS from {15, 30, 60} kHz

Agreement:
For Rel-15 late drop, it is agreed to have capability support for synchronous NR-NR DC only wherein MCG is in FR1 and SCG is in FR2.

Agreements:
For Rel-15 late drop

- For the capability parameters and components that are presently not defined as 'across all CC', the same capability signaling structure can be reused for DC as for CA.

- For the capability parameters and components that are presently not defined as 'across all CC' and that are of per band combination, per band per band combination or per CC per band per band combination, the same band combinations need to be allowed to be listed separately for CA and DC with allowing different capability contents.

Agreements:
For the capability parameters and components that are presently defined as 'across all CC' and not defined with FR1/FR2 differentiation where different values are allowed

- These capability parameters should be defined as 'across all CCs and across MCG and SCG'.
  - If there is any mandatory minimum value defined for 'across all CCs', the same mandatory minimum should apply to 'across all CCs and across MCG and SCG'.
  - FFS: whether for some of these parameters per MCG and per SCG capabilities should be additionally introduced
  - FFS: whether for some of these parameters to introduce a limitation on how capabilities can be distributed by configuration across MCG and SCG
- FFS: for capabilities with FR1/FR2 differentiation where different values are allowed

R1-1904119 On interpretation of FG 3-5b Ericsson
R1-1904472 Remaining Issues in R-15 UE Features MediaTek Inc.
R1-1904887 On Rel-15 NR UE feature list Intel Corporation
R1-1904990 NR Features and Capabilities Qualcomm Incorporated
Withdrawn
R1-1904991 UE capabilities for NR-NR dual connectivity Qualcomm Incorporated
R1-1905139 PDCCH Blind decoding capability for late drop Ericsson
R1-1905173 On inconsistent CG and DL-SPS description in 38.214 with 38.321 Ericsson
R1-1905518 Clarifications on Rel-15 UE features Huawei, HiSilicon (Revision of R1-1905243)

From AI 5
R1-1904182 LS on UL sharing applicability in different scenarios RAN2, Nokia
R1-1905227 DRAFT response LS on UL sharing applicability in different scenarios Nokia, Nokia Shanghai Bell
R1-1905256 Draft LS response to RAN2 LS on UL sharing applicability in different scenarios Huawei, HiSilicon
Friday decision: Discuss further in RAN1#97

Friday
R1-1905867 RAN1 NR UE features NTT DOCOMO
R1-1905868 Draft LS on RAN1 NR UE features update NTT DOCOMO
Decision: The documents are for email discussion/approval till April 24th – Hiroki (NTT DOCOMO).

7.2 NR in Release 16

Rel-16 draftCRs related to NR_CLI_RIM-Core
As per decision posted on April 4th, the following draft CRs are endorsed – It is common understanding that the endorsed draft CRs may be further updated later towards the end of Rel-16 to align with the updated version of the spec.
R1-1904647 Introduction of remote interference management Ericsson Rel-16, 38.211, B
R1-1905602 Introduction of UE behaviour for SRS measurements for CLI Nokia Rel-16, 38.214, B
R1-1905603 Introduction of cross layer interference measurements Intel Corporation Rel-16, 38.215, B

7.2.1 Two step RACH for NR

NR_2step_RACH-Core; WID in RP-190711. Please refer to the WID for detailed scoping

R1-1904841 Use Cases and Scenarios for 2-Step RACH Ericsson

7.2.1.1 Channel Structure for Two-Step RACH

Including mapping between the PRACH preamble and the time-frequency resource of PUSCH in msgA+ DMRS, supported MCS(s) and time-frequency resource size(s) of PUSCH in msgA, etc.

R1-1903878 On the channel structure of msgA ZTE, Sanechips

- Proposal 1: Prioritize the msgA channel structure design that each RO is associated with one or multiple POs.
- Proposal 2: Prioritize Alt.4 for the design of relative location between PUSCH occasion(s) and the associated PRACH occasion.
- Proposal 3: The preambles within one RACH occasion mapped to the same PUSCH occasion is preferred. The necessity of preambles mapped to multiple PUSCH occasions can be further studied.
- Proposal 4: As long as the choices of payload size and modulation order are limited, preamble grouping can be used to implicitly indicate the payload size and modulation order.
- Proposal 5: The initial ID for generating the scrambling sequence of msgA can be obtained by RA-RNTI plus preamble index.
- Proposal 6: Reuse the msg3-transformPrecoder configured in RACH-ConfigCommon for the indication of waveform of MsgA PUSCH for 2-step RACH. It is up to RAN2 whether the same IE or different IEs are used for msgA and msg3.
- Proposal 7: Use the same receiving/transmitting beam for msgA PRACH and PUSCH.

Decision: The document is noted.

R1-1903923 Further discussion on channel structure for 2-step RACH Huawei, HiSilicon

- Observation 1: Separate configuration of POs and ROs can achieve good flexibility and reduced overhead.
- Observation 2: Resource configuration for PO groups can reduce the signaling overhead.
- Observation 3: Given the different formats of PRACH and different possible numerology of PUSCH, using a specification fixed value to define the relation between PO and RO is too restrictive.
- Observation 4: Using a single configured value to define the relation between ROs and POs is not flexible, while using multiple offsets values increases overhead.
- Proposal 1: Separate PUSCH resource configuration from PRACH resource is supported.
- Proposal 2: PUSCH resource configuration can be defined for PUSCH occasion groups.
- Proposal 3: One-to-one mapping between preamble and PUSCH resource unit (the combination of time/frequency/DMRS used for PUSCH transmission) should be supported for 2-step RACH.
- Proposal 4: Mapping between PRACH and PUSCH can be defined between PRACH occasion group(s) and PUSCH occasion group(s).
- Proposal 5: Support payload size of 56 and 72 bits for 2-step RACH MsgA, FFS other payload size.
- Proposal 6: The number of supported MCS levels should be limited, FFS the mapping between MCS levels and preamble/DMRS ports.
- Proposal 7: RA-RNTI, DMRS port index, and configurable scrambling ID(s) can be considered for the generation of the scrambling sequence for MsgA PUSCH.
- Proposal 8: The numerology of MsgA PUSCH should be the same as the BWP for MsgA transmission.
- Proposal 9: UCI piggyback in MsgA PUSCH needs to be further studied.

Decision: The document is noted.

R1-1904392 Channel Structure for Two-Step RACH Samsung

- Observation 1: it's enough to reuse the current PRACH configuration table for 2step RO configuration.
- Observation 2: it's beneficial to separate the 2step RACH and 4step RACH.
- Observation 3: it's beneficial for gNB to detect the preamble first before reception of the PUSCH.
- Observation 4: it is beneficial to define the association between RACH resource and PUSCH resource these are associated to the same SSB index.
- Proposal 1: both separate ROs (option 1) and Shared RO but separate preambles (option 2) for 2-step and 4-step RACH could be considered.
- Proposal 2: waveform indication for msgA PUSCH should follow msg.3 waveform indication. Numerology indication for msgA PUSCH should follow that for the UL BWP.
- Proposal 3: a PUSCH resource unit is defined as consisting of a PUSCH T/F resource unit and a DMRS port, which is used to associate with a PRACH preamble in Msg. A.
- Proposal 4: a PUSCH resource unit could potentially include a GP and/or a GB.
- Proposal 5: Association between SSB and PUSCH could use similar association rule between SSB and RACH.
- Proposal 6: a gap between 2step RO and corresponding PUSCH can be considered.
- Proposal 7: the association rule should be defined between RACH resource and PUSCH resource associated to the same SSB index.

- Proposal 8: At least using a single semi-statically configured value for time/frequency relation between PRACH preambles in PRACH occasion(s) and PUSCH occasion(s) (alt.3 for option 2) should be supported if option 2 is adopted.
- Proposal 9: the scrambling ID for PUSCH transmission in 2step RACH Msg A could consider the modified RA-RNTI incorporate with preamble index or DMRS port index.

Decision: The document is noted.

R1-1905667 **Summary of channel Structure for two-step RACH** **ZTE**

Decision: The document is noted.

Proposals:

- PUSCH resource unit for 2-step RACH is defined as
  - The PUSCH occasion and DMRS port / DMRS sequence initialization (using Rel-15) used for an msgA payload transmission.
    - FFS support only one or both of DMRS port / DMRS sequence initialization (using Rel-15)
- Down-select from the following alternatives for the mapping between PRACH preamble and PUSCH resource unit.
  - Alt. 1: At least support one-to-one and multiple-to-one mapping between preambles in each RO and associated PUSCH resource unit.
    - Configurable number of preambles (including one or multiple) mapped to one PUSCH resource unit
    - FFS one-to-multiple mapping
  - Alt. 2: At least support one-to-one mapping between preambles in each RO and associated PUSCH resource unit.
    - FFS multiple-to-one and one-to-multiple mapping
- At least support one-to-one and multiple-to-one mapping between preambles in each RO and associated PUSCH occasion(s).
  - FFS one-to-multiple mapping related to different sizes of PUSCH occasions

Thursday session

R1-1905793 **Updated summary of channel Structure for two-step RACH** **ZTE**

Decision: The document is noted.

Agreements:

- One or more PUSCH occasion(s) within an msgA PUSCH configuration period are configured.
  - FFS msgA PUSCH configuration period, e.g.
    - For opt. 1 with separate PUSCH configuration, msgA PUSCH configuration period may or may not be the same as PRACH configuration period
    - For opt. 2 PUSCH configuration with relative location, msgA PUSCH configuration period is the PRACH configuration period

Agreements:

- PUSCH resource unit for 2-step RACH is defined as
  - The PUSCH occasion and DMRS port / DMRS sequence used for an msgA payload transmission.
    - FFS support only one or both of DMRS port / DMRS sequence
    - The DMRS sequence generation mechanism should follow Rel.15.

Working assumption:

- At least support one-to-one and multiple-to-one mapping between preambles in each RO and associated PUSCH resource unit.
  - Configurable number of preambles (including one or multiple) mapped to one PUSCH resource unit
  - FFS one-to-multiple mapping
- Companies are strongly encouraged to perform additional evaluations/analysis

Agreements:

- Support the PRACH and PUSCH for msgA transmission in different slots. In this case, the numerology for msgA PUSCH follow the numerology configured for the UL BWP for msgA transmission.
  - FFS whether to support PRACH and PUSCH in the same slot for msgA transmission. If supported, down-select from the following option
    - Opt 1: the numerology for msgA PUSCH follows that of msgA preamble
    - Opt 2: gNB configure whether the numerology for msgA PUSCH follows that of msgA preamble or UL

BWP
- Opt 3: a UE is not expected to be configured with different numerology among PRACH preamble, msgA PUSCH and UL BWP for msgA transmission
- Note: in Rel.15 the PRACH and PUSCH transmitted in the same slot for a UE are not supported

Friday session

R1-1905878 Proposal on the additional LLS assumptions for Two-step RACH ZTE

Decision: The document is noted.

Agreements:

- Adopt the following table for the link-level evaluation:

Parameters	Values
The number of PUSCH symbols & PUSCH mapping type	14, Type A; [6], Type B as optional
1) Total Number of PRBs for msgA PUSCH Or 2) number of PRBs per PUSCH occasion Note: either of them should be aligned for scheme comparison	[6, 12] Or [1,2,3]
PUSCH DMRS overhead	[2 or 3] DMRS symbols
Frequency hopping for msgA PUSCH	Company report, enabled/disabled
Preamble format	Format 0/[A1]; [32, 64] preambles in each RO. Other preamble formats or number of preambles are not precluded Note: company report number of SSBs per RO
Number of UEs	1 as a starting point; ~~FFS:~~ 2 or more for evaluation of shared PUSCH occasion ~~or can be reported~~ Power modelling for FFS (Note: before the FFS is resolved, companies to report the detailed modelling) FFS: interference from the adjacent PUSCH ~~resource~~ occasion, including how to model relative SINR, timing, etc.
TBS	1) ~~56~~ 72 bits as starting point ~~for minimum payload size~~, other values are not precluded ~~2) Company report for the evaluation of payload size~~

R1-1904059 Discussion on channel structure for 2-step RACH vivo
R1-1904196 Channel Structure for 2-Step RACH LG Electronics
R1-1904246 Considerations on Channel Structure for Two-Step RACH Sony
R1-1904280 Channel structure for 2-step RACH Intel Corporation
R1-1904357 Discussion on channel structure for 2-step RACH Panasonic Corporation
R1-1904542 Discussion on channel structure for 2-step RACH CATT
R1-1904584 Discussion on channel structure for Two-Step RACH Fujitsu
R1-1904715 On 2-step RACH Channel Structure Nokia, Nokia Shanghai Bell
R1-1904724 Discussion on channel structure for two-step RACH CMCC
R1-1904778 Considerations on the channel structure on 2-step RACH Spreadtrum Communications
R1-1904819 Channel Structure for Two-Step RACH Considerations Sierra Wireless, S.A.
R1-1904842 Channel Structure for Two-step RACH Ericsson
R1-1904848 On PUSCH Transmission in msgA InterDigital, Inc.
R1-1904944 Discussion on Channel Structure for Two-Step RACH NTT DOCOMO, INC.

R1-1904992 Channel Structure for Two-Step RACH Qualcomm Incorporated
R1-1905043 Discussion on channel structure for 2-Step RACH ITRI, NTPU
R1-1905051 On Channel Structure for 2-step RACH OPPO
R1-1905125 Considerations on Channel Structure for Two-step RACH CAICT
R1-1905205 Discussion on channel structure for two-step RACH KDDI Corporation

7.2.1.2 Procedure for Two-step RACH

Including power control for Msg A, msg content for Msg A & Msg B, fallback procedure, etc.

R1-1904716 On 2-step RACH Procedure Nokia, Nokia Shanghai Bell

Observation 1: The size of MsgA is use case dependent, depending on the fields making up MsgA and the size of each field for each use case.
Proposal 1: Study the maximum allowed MsgA payload size.
Observation 2: The 4-step TA mechanism is not applicable to the 2-step RACH.
Observation 3: If no TA mechanism is available, then the PUSCH resources reserved for MsgA need to be dimensioned to the worst-case time misalignment.
Proposal 2: Study mechanisms that allows the UE to operate towards the serving cell, without requiring explicit feedback from the network.
Observation 4: The size of MsgB is use case dependent, depending on the fields making up MsgB and the size of each field for each use case.
Proposal 3: Study the allowed MsgB payload size considering MsgB content from RAN2 for the different 2-step RACH use cases.
Proposal 4: MsgB with contention resolution message doesn't included UL grant field.
Proposal 5: For timing advance in MsgB, the granularity of the TA is based on the subcarrier spacing of the data part of MsgA according to:

Subcarrier Spacing (kHz) of the msgA data part	*Unit*
15	*16*64 Tc*
30	*8*64 Tc*
60	*4*64 Tc*
120	*2*64 Tc*

Observation 5: With a one symbol gap between consecutive time resources for the data part of MsgA, consecutive transmissions from UEs in a cell of radius 10 km at 15 khz don't overlap.
Observation 6: MsgB can be unicast to a single UE with the CRC of the PDCCH scrambled by the C-RNTI of that UE. MsgB can also be group cast to multiple UEs with the CRC of the PDCCH scrambled by a common RNTI that is monitored by multiple UEs.
Observation 7: When MsgB is unicast to one UE, the regular HARQ procedure is used for sending the HARQ-ACK feedback to the gNB when MsgB is received successfully. The absence of HARQ-ACK at the gNB triggers HARQ retransmissions.
Observation 8: In case of a groupcast MsgB, if there is no HARQ-ACK feedback, from the UE to the gNB to indicate reception of MsgB, the design of the system is suboptimal in the sense that the overhead is higher for UL transmissions or for DL transmissions, and this could lead to longer latency.
Observation 9: In case of a groupcast MsgB, with HARQ-ACK feedback from UEs successfully decoding MsgB, the gNB can retransmit the entire payload of the previous transmission, or only retransmit the payload of the UEs from whom no HARQ-ACK feedback is received. There is a tradeoff between HARQ combining gain and single transmission coding gain.
Proposal 6: Support HARQ combining for MsgB when it is groupcast to multiple UEs.
Proposal 7: The gNB can dynamically switch between retransmission of MsgB using the same payload as the previous MsgB transmission on that HARQ process or using only the payload of the UEs from which no HARQ-ACK is received.
Proposal 8: In 2-step RACH, each UE determines a unique HARQ-ACK resource to feedback the HARQ-ACK status of MsgB.
Proposal 9: Study methods to uniquely determine the PUCCH resource for HARQ-ACK feedback when multiple UEs have contention resolution identities in MsgB.
Proposal 10: Sharing the PRACH Occasions and preamble indices between 4-step RACH and 2-step RACH is not supported.
Proposal 11: When a PRACH occasion is shared between 2-step and 4-step RACH procedures, the preamble indices for the 4-step RACH procedure are unique from those of the 2-step RACH procedure.
Proposal 12: For a PRACH occasion that contains 2-step RACH preambles, the following PRACH preamble configurations are supported:

- The PRACH preambles are divided between the 4-step PRACH procedure and 2-step PRACH procedure

- All PRACH preambles are allocated to the 2-step RACH procedure

Proposal 13: MsgA configuration is provided to the UE by System Information.
Proposal 14: The power control in 2-step RACH should consider 2-step power ramping, power offset between the MsgA preamble and the data transmission and the fall back to 4-step.
Proposal 15: For the initial transmission, the power of MsgA data part relative to the power of the preamble is given by:

$$P_{MsgA,Data} = max\left(P_{CMAX}, P_{MsgA,Pre} + P_O + 10\log_{10}(M_{RB}^{PUSCH}) + \Delta_{TF}\right)$$

Proposal 16: If the UE doesn't receive MsgB in response to a MsgA transmission, the UE increments the power of MsgA preamble by Δ_{2-step} and keeps the same power offset between the MsgA preamble and MsgA data part if the preamble is retransmitted with the same spatial filter (beam).
Proposal 17: If the network receives the preamble transmitted by the UE, but doesn't receive the data part of MsgA, as indicated in the MsgB reply to the UE, and if the UE retransmits MsgA using the same spatial filter, the UE keeps the same power of the MsgA preamble and increments the power of MsgA data by $\Delta_{2-step-data}$.
Proposal 18: The UE should fall back to 4-step power ramping, if it has already performed N_{2-step} power ramping or retransmission attempts. After which, the UE can perform additional $N_{4-step-fallback}$ access attempts, each with increasing power given by Δ4-step-fallback.
Observation 10: The data part of MsgA has less coverage than the preamble part of MsgA. Data part of MsgA suffers a higher collision rate than the preambles of MsgA.
Observation 11: Using narrow beams can improve coverage and reduce the probability of collision at the expense of higher system overhead.
Proposal 19: 2-Step RACH supports beam refinement when receiving the data part of MsgA.
Proposal 20: For 2-step RACH, and for UEs in RRC CONNECTED state, the network configures CSI-RS resources that are QCL Type-D with the corresponding SS/PBCH blocks. Each preamble associated with a SS/PBCH Block indicates a CSI-RS resource QCLed with that SS/PBCH Block.
Observation 12: The response time for MsgB, Msg2, or a signal that triggers 4-step RACH can be different leading to different reception windows at the UE.
Proposal 21: Study different options for having the gNB direct the UE to fall back from the 2-step RACH procedure to the 4-step RACH procedure when the preamble is detected by the gNB but the MsgA data signal is not detected.

Decision: The document is noted.

R1-1904843 Procedure for Two-step RACH Ericsson

- Proposal 1: Down-selection between options 2 and 3 for the relation of PRACH resources between 2-step and 4-step RA should be considered, taking into account e.g. the resource overhead, complexity of receiving msgA, 2/4-step distinction robustness, and RA latency.
- Proposal 2: In case the PUSCH for msgA cannot be decoded by gNB but the preamble part is detected, a fallback to ordinary 4-step RA is possible. In this case gNB sends a RAR including a grant for msg3 and UE retransmits msg3 part.
- Proposal 3: MsgA, including both preamble and data parts, can be retransmitted.
- Proposal 4: Further study which parameters should be signalled, and which parameters should be hardcoded to support an open loop power control of msgA.
- Proposal 5: msgA and msgB content and minimum payload size should be based on the input from RAN2 discussions and the maximum payload size for msgA should be simulated based on the simulation assumptions discussed.

Decision: The document is noted.

R1-1904993 Procedures for Two-step RACH Qualcomm Incorporated

Proposal 1: In order to operate two-step RACH in all RRC states and all cell sizes supported by NR Rel-15, the following design objectives should be satisfied:

- configurable waveform, MCS and contents should be supported in msgA transmission, wherein the payload can carry the equivalent content of msg3 in four-step RACH, UP data and piggybacked UCI;
- msgA should support preamble formats specified in NR for both small cells and large cells;
- msgB should enable the completion of two-step RACH procedure when both preamble and payload of msgA are correctly detected, or request re-transmission of payload on granted resources if msgA preamble detection is successful but msgA payload decoding fails.

Proposal 2: Both separate and shared RO can be configured for two-step RACH. When a RO is shared between two-step RACH and four-step RACH, the pool of PRACH preambles can be partitioned into mutually exclusive subsets, which are used by different RACH procedures. FFS whether to augment the pool of preambles for shared RO, as well as the preamble allocation schemes for two-step RACH and four-step RACH on a shared RO.
Proposal 3: The following designs for RO and PO should be supported:

- multiple POs can be configured per RO period, to accommodate different waveform, MCS and payload size;
- multiple two-step RACH UEs can share the same PO, if their msgA transmission use similar configurations for waveform/MCS/payload size;
- to simplify resource size specification for PO, PUSCH resource element in time-frequency domains can be defined;

- resource allocation for PO can be specified relative to RO, by semi-statically or dynamically configured offsets in time and/or frequency domain;
- constrained resource mapping can be configured for asynchronous msgA transmission with potentially large timing offset, wherein the corresponding RO and PO are adjacent in time and overlapping in frequency;
- it is beneficial to balance the resource allocations for RO and PO to achieve a good trade-off in resource utilization efficiency and collision probability.

Proposal 4: Both UE-assisted timing adjustment and gNB-assisted timing adjustment can be applied to msgA transmission or reception.

- For UE-assisted timing adjustment, the UL timing offset estimation can be obtained from DL measurements.
- For gNB-assisted timing adjustment, the UL timing offset can be obtained at least from the msgA preamble processing.

Proposal 5: The following designs for power control procedures can be considered for msgA transmission in two-step RACH:

- OLPC should be applied for msgA preamble and payload;
- power ramping procedures specified for msg1 in NR Rel-15 can be considered for msgA preamble/payload retransmission as well;
- different P_0 targets, power ramping offsets and pathloss compensation schemes can be considered for preamble and payload;
- power control parameters for msgA payload can be dependent on the RRC state, bandwidth, payload size, traffic load and cell coverage;
- when msgA retransmissions are associated with beam switching, power ramping procedures should be considered jointly with beam switching procedures.

Proposal 6: Two-step RACH can fallback to four-step RACH. The fallback procedures can be triggered by events such as timer expiration, counter overflow or partial detection of msgA.
Proposal 7: Allow configurations in which UE can determine its UL beam for msgA preamble in the same manner as for four-step RACH, and use the same UL beam for both preamble and payload of msgA.
Proposal 8: Allow configuration of POs with slot-repetition, and allow different repeated slots to use different transmit beams.
Proposal 9: Allow UCI reporting in msgA.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Emad (Nokia)

Thursday session

R1-1905764 **Feature lead summary 2-step RACH procedure** **Nokia, Nokia Shanghai Bell**

Decision: The document is noted.

Agreements:

- For the relation of PRACH resources between 2-step and 4-step RACH, the network has the flexibility to configure the following options:
  - Option 1: Separate ROs are configured for 2-step and 4-step RACH
  - Option 2: Shared RO but separate preambles for 2-step and 4-step RACH

Agreements:

Further study the granularity of the time advance command, if supported in MsgB:

- E.g.,-Based on the subcarrier spacing of MsgA PUSCH using a 12-bit TA command, where the granularity of the TA command is determined according to the following table.

Subcarrier Spacing (kHz) of the ~~msgA~~ PUSCH ~~data part~~	*Unit*
15	*16*64 Tc*
30	*8*64 Tc*
60	*4*64 Tc*
120	*2*64 Tc*

- Other options/variations are not precluded

Agreements:

Samsung Exhibit 1026, Page 407 of 900

For 2-step RACH preamble power control parameter configuration, further study and down select from the following options:

- Option 1: Power control parameters can be separately configured for 2-step and 4-step RACH.
  - If a power control parameter is not configured for 2-step RACH, the corresponding power control parameter of 4-step RACH is used instead for 2-step.
- Option 2: The corresponding power control parameter of 2-step RACH preamble follows that of 4-step RACH preamble.

Proposals:
The MsgA PUSCH Tx power is determined at least based on an offset from the MsgA PRACH Tx power. FFS offset, including the following options:

- Option 1: Offset configured for 2-step RACH
- Option 2: Offset is the release 15 delta_preamble_msg3
- Option 3: Offset is the release 15 delta_preamble_msg3 + configurable offset

Friday session

R1-1905874 Feature lead summary#3 2-step RACH procedure Nokia, Nokia Shanghai Bell

Decision: The document is noted.

Agreements:
For the determination of the PUSCH Tx power, further study at least the following components including possible down selection:

- An offset relative to the preamble received target power
  - Option 1.1: Offset configured for 2-step RACH
  - Option 1.2: Offset is the release 15 delta_preamble_msg3
  - Option 1.3: Offset is the release 15 delta_preamble_msg3 + configurable delta
- An offset relative to the MsgA PRACH Tx power for the MsgA PUSCH Tx power configured for 2-step RACH.
- Transmission bandwidth of MsgA PUSCH
- MsgA PUSCH Transport format (Δ_{TF}). Further study the following options for further down selection
  - Option 2.1: deltaMCS configured for 2-step separate from 4-step
  - Option 2.2: reuse deltaMCS of 4-step RACH
- Preamble received target power.
- Pathloss. Further study the following options for further down selection
  - Option 4.1: Full pathloss compensation ($\alpha = 1$)
  - Option 4.2: Partial pathloss compensation alpha configured for 2-step separate from that of 4-step RACH.
  - Option 4.3: Partial pathloss compensation using msg3-alpha.
- RS resource index for pathloss estimation.
- Total power ramp-up requested by higher layers for MsgA PUSCH Tx:
  - Option 6.1: from the first to the current MsgA PUSCH transmission ($\Delta P_{rampuprequested}$).
  - Option 6.2: from the first to the latest random access MsgA preamble transmission ($\Delta P_{rampuprequested}$).
  - Note: Latest means most recent transmitted.
- Power reduction priority rule in CA/DC

Agreements:

- For MsgA Tx beam selection further study at least the following options:
  - Option 1: The MsgA PRACH and MsgA PUSCH use the same Tx spatial filter (beam).
  - Option 2: The MsgA PRACH and MsgA PUSCH use same or different Tx spatial filter (beam) up to UE implementation.
    - No spec impact expected.
    - Note: in 4-step RACH it is up to UE implementation to decide the beams for Msg1 and Msg3.
  - Option 3: The MsgA PRACH and MsgA PUSCH use same or different Tx spatial filter (beam) under network control/assistance.
- MsgA retransmission, if supported, is defined as a retransmission of MsgA PRACH (with a re-selection of preamble) and MsgA PUSCH. Further study at the following options:
  - Option 1: Using the same payload for MsgA PUSCH.
  - Option 2: MsgA PUSCH payload can be different.
  - FFS: Conditions for MsgA retransmission and relation to fall back.
- FFS: retransmission of PUSCH only.
- FFS: retransmission of PRACH only.

R1-1903879 On 2-step RACH procedures ZTE, Sanechips
R1-1903924 Further discussion on 2-step RACH procedure Huawei, HiSilicon
R1-1904060 Discussion on 2-step RACH procedure vivo
R1-1904197 Discussion on 2-Step RACH Procedure LG Electronics
R1-1904247 Discussion on Procedure for 2-step RACH Sony
R1-1904281 Procedure for 2-step RACH Intel Corporation
R1-1904358 Discussion on 2-step RACH procedure Panasonic Corporation
R1-1904393 Procedure for Two-step RACH Samsung
R1-1904725 Discussion on procedure for two-step RACH CMCC
R1-1904779 Considerations on the random access procedure on 2-step RACH Spreadtrum Communications
R1-1904820 Procedure for Two-step RACH Considerations Sierra Wireless, S.A.
R1-1904850 Discussion on Procedures for Two-Step RACH InterDigital, Inc.
R1-1904928 2-step RACH procedure Motorola Mobility, Lenovo
R1-1904945 Discussion on Procedure for Two-step RACH NTT DOCOMO, INC.
R1-1905044 Discussion on procedure for 2-Step RACH ITRI, NTPU
R1-1905052 On Procedure for 2-step RACH OPPO
R1-1905126 Considerations on Procedure for Two-step RACH CAICT
R1-1905207 Discussion on procedure for two-step RACH KDDI Corporation
R1-1905670 2-step RACH Procedure Feature lead summary Nokia, Nokia Shanghai Bell

7.2.1.3 Other

R1-1903880 Analysis on the collision probability of msgA ZTE, Sanechips
R1-1903881 Preliminary evaluation results for 2-step RACH ZTE, Sanechips
R1-1904061 Evaluation for 2-step RACH vivo
R1-1904198 Discussion on preamble selection for 2-Step RACH LG Electronics
R1-1904199 Discussion on RAR detection in 2step RACH procedure LG Electronics
R1-1904684 Preliminary results for 2-step RACH evaluations Huawei, HiSilicon
R1-1904685 Other issues for 2-step RACH Huawei, HiSilicon
R1-1904717 2-step RACH latency and resource reservation Nokia, Nokia Shanghai Bell
R1-1904844 Evaluation methodology and metrics for Two-Step RACH Ericsson
R1-1905515 Initial results on coverage and msgA configurations Ericsson (Revision of R1-1904845)
R1-1904994 Other Considerations for Two-Step RACH Qualcomm Incorporated

7.2.2 NR-based Access to Unlicensed Spectrum

NR_unlic-core; WID in RP-190706. Please refer to the WID for detailed scoping

R1-1905801 Chairman's notes of AI 7.2.2 Study on NR-based Access to Unlicensed Spectrum Ad-Hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1904995 Draft Response LS on short control signaling in NR-U Qualcomm Incorporated

R1-1905748 Draft Response LS on short control signaling in NR-U Qualcomm Incorporated
Final LS is approved in R1-1905860

7.2.2.1 Physical Layer Signals and Channels

7.2.2.1.1 Initial access signals/channels

DRS design, PRACH under OCB requirement, identify if 60KHz PRACH is needed,

R1-1903870 Considerations on initinal access signals and channels for NR-U ZTE, Sanechips

R1-1905597 Initial access signal and channels in NR unlicensed band Huawei, HiSilicon (Revision of R1-1903925)
R1-1904062 Discussion on initial access signals and channles vivo
R1-1904192 Initial Access Signals and Channels for NR-U Nokia, Nokia Shanghai Bell
R1-1904248 Initial access signals and channels for NR-U Sony
R1-1904282 Initial access signals/channels for NR-unlicensed Intel Corporation
R1-1904332 Initial access signals and channels Ericsson
R1-1904403 Initial access signals and channels for NR-U Samsung
R1-1904479 On Initial Access Signals and Channels for NR-U MediaTek Inc.
R1-1904546 Discussion of NR-U Initial access signals/channels CATT
R1-1904585 Consideration on PRACH in NR-U Fujitsu
R1-1904593 NR-U PRACH design Panasonic Corporation
R1-1904602 Discussion on NR-U DRS design ETRI
R1-1904619 Physical layer design of initial access signals and channels for NR-U LG Electronics
R1-1904658 Discussion on initial access in NR-U NEC
R1-1904800 Discussion on DRS in NR-U Spreadtrum Communications
R1-1904837 Additional RACH Opportunities for NR-U Convida Wireless
R1-1904870 Initial access signals/channels for NR-U Sharp
R1-1904891 Initial access signals/channels for NR-U OPPO
R1-1904946 Initial access signals and channels for NR-U NTT DOCOMO, INC.
R1-1904996 Initial access signals and channels for NR-U Qualcomm Incorporated
R1-1905071 On initial access signals/channels Beijing Xiaomi Mobile Software
R1-1905148 Initial access signals and channels for NR-unlicensed WILUS Inc.

R1-1905634 Feature lead summery on initial access signals and channels for NR-U Qualcomm Incorporated

Agreement:
PRB/RE-interlaced PRACH is not considered further. Consider the following alternatives should be studied further as options.

- Alt 1: Legacy NR PRACH sequence of length 139 mapped to contiguous subcarriers, with repetitions in frequency
  - FFS: Guard bands between repetitions
  - FFS: Number of repetitions
  - FFS: Whether repetitions are constrained to be contiguous in frequency or not
- Alt 2: A single PRACH sequence mapped to contiguous PRBs according to one of the following alternatives
  - Alt 2.1: ZC sequence with longer length than 139
  - Alt 2.2: New sequence with longer length than 139

R1-1905785 Feature lead summary on initial access signals and channels for NR-U Qualcomm Incorporated

Agreement:
Only coreset #0 lengths of 1 and 2 symbols are supported for NR-U

Agreement:
Select one of the following options in RAN1 #97:

- Alt 1: Legacy SSB positions in a slot
  - Support Type0-PDCCH in symbol (#0, #1) for length-2 coreset 0 and symbol (#0) for length-1 coreset 0 at least for the first SSB in a slot
  - Support Type0-PDCCH in symbol (#6, #7) for length-2 coreset 0 and symbol #6 or symbol #7 for length-1 coreset 0 for the second SSB in a slot
    - FFS: configurable between symbols #6 and #7 for the length-1 coreset 0 for the second SSB in a slot
- Alt2: New SSB positions in a slot
  - Support Type0-PDCCH in symbol (#0, #1) for length-2 coreset 0 and symbol (#0) for length-1 coreset 0 for the first SSB in a slot

- Support Type0-PDCCH in symbol (#7, #8) for length-2 coreset 0 and symbol (#7) for length-1 coreset 0 for the second SSB in a slot
- Alt 3: Legacy SSB positions in a slot
  - Support Type0-PDCCH in symbol (#0, #1) for length-2 coreset 0 and symbol (#0) for length-1 coreset 0 for the first SSB in a slot
  - Support Type0-PDCCH in symbol (#7) for coreset 0 for the second SSB in a slot

7.2.2.1.2 DL signals and channels

Impact to PDCCH, dynamic PDCCH monitoring, impact to PDSCH to support flexible starting point due to LBT, mechanism to detect COT start for UE power saving, COT structure indication

R1-1903871	Considerations on DL reference signals and channels design for NR-U	ZTE, Sanechips
R1-1903926	DL channels and signals in NR unlicensed band	Huawei, HiSilicon
R1-1904063	Discussion on physical DL channel design in unlicensed spectrum	vivo
R1-1904166	DL signals and channels for NR-U	PANASONIC
R1-1904193	On DL signals and channels	Nokia, Nokia Shanghai Bell
R1-1904249	DL Signals and Channels for NR-U	Sony
R1-1904283	DL signals and channels for NR-unlicensed	Intel Corporation
R1-1904333	DL signals and channels for NR-U	Ericsson
R1-1904404	DL signals and channels for NR-U	Samsung
R1-1904480	DL Signals and Channels for NR-U operation	MediaTek Inc.
R1-1904586	On DL signals and channels for NR-U	Fujitsu
R1-1904603	DL signals and channels for NR-U	ETRI
R1-1904620	Physical layer design of DL signals and channels for NR-U	LG Electronics
R1-1904851	DL signals and channels for gNB initiated COT	InterDigital, Inc.
R1-1904871	Downlink structure and procedure for NR-U operation	Sharp
R1-1904892	DL signals and channels for NR-U	OPPO
R1-1904947	DL signals and channels for NR-U	NTT DOCOMO, INC.
R1-1904974	On COT detection and structure indication for NR-U	Apple Inc.
R1-1904997	DL signals and channels for NR-U	Qualcomm Incorporated
R1-1905059	Discussion on the DL signals and channels for NR-U	Beijing Xiaomi Mobile Software
R1-1905086	Discussion on DL signals and channels in NR unlicensed	Google Inc.
R1-1905087	DL signals and channels for NR-U	ASUSTEK COMPUTER (SHANGHAI)
R1-1905127	Discussions on DL signals and channels design in NR-U	CAICT
R1-1905181	DL Frame Structure and COT Aspects for NR-U	Motorola Mobility, Lenovo

R1-1905710 Feature lead summary for NR-U DL Signals and Channels Motorola Mobility, Lenovo

Agreement:
Only further discuss/consider Option 3 (PDSCH mapping type B with durations other than 2/4/7 symbols) as potential enhancements to PDSCH transmissions.

7.2.2.1.3 UL signals and channels

Block interlaced PUCCH design, block interlaced PUSCH design, flexible starting point for PUSCH due to LBT, SRS enhancement

R1-1903872	Considerations on UL reference signals and channels design for NR-U	ZTE, Sanechips
R1-1903927	UL channels and signals in NR unlicensed band	Huawei, HiSilicon
R1-1904064	Discussion on physical UL channel design in unlicensed spectrum	vivo
R1-1904184	NR-U uplink signals and channels	Nokia, Nokia Shanghai Bell
R1-1904284	UL signals and channels for NR-unlicensed	Intel Corporation
R1-1904334	UL signals and channels for NR-U	Ericsson
R1-1904405	UL signals and channels for NR-U	Samsung
R1-1904481	UL Signals and Channels for NR-U operation	MediaTek Inc.

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R1-1904581	UL signals and channels for NR-U	Lenovo, Motorola Mobility
R1-1904594	NR-U UL signals and channels	Panasonic Corporation
R1-1904621	Physical layer design of UL signals and channels for NR-U	LG Electronics
R1-1904659	Discussion on UL Signals and Channels in NR-U	NEC
R1-1904774	Discussion on UL signals and channels in NR-U	Spreadtrum Communications
R1-1904838	Flexible starting point for PUSCH due to LBT	Convida Wireless
R1-1904872	UL signals and channels for NR-U	Sharp
R1-1904893	UL signals and channels for NR-U	OPPO
R1-1904948	UL signals and channels for NR-U	NTT DOCOMO, INC.
R1-1904998	UL signals and channels for NR-U	Qualcomm Incorporated
R1-1905128	Discussions on UL signals and channels design in NR-U	CAICT
R1-1905149	UL channels for NR-unlicensed	WILUS Inc.

R1-1905671 Feature lead summary for UL Signals and Channels Ericsson

Agreement:
For a 20 MHz carrier bandwidth, if enhancements to PF0 and PF1 are supported, a mapping to physical resources of at least one full interlace is supported

- FFS: Whether or not to support enhancements to PF0/1.
- Companies are encouraged to provide user multiplexing capacity and UCI payload analysis for enabling the decision for relevant use cases

Agreement:
Support RRC configuration of an SRS resource to start at any OFDM symbol within a slot by extending the RRC parameter *startPosition* of *resourceMapping* of *SRS-Config* for Rel-16 to have a value range 0..13.

R1-1905767 Feature lead summary#2 for UL Signals and Channels Ericsson

Agreement:
Decisions on which additional PUCCH formats (enhanced or combination of legacy and enhanced) are supported should be at least based on the following.

- Which PUCCH format(s) are to be used at least for the following use cases:
  - HARQ ACK prior to dedicated PUCCH resource configuration
  - HARQ ACK, SR, CSI and combinations thereof after dedicated PUCCH resource configuration
- Specification impact, e.g., UE procedures in 38.213 and 38.212, for all proposed PUCCH formats to be supported
- User multiplexing capacity and UCI payload analysis for all proposed PUCCH formats to be supported
- In-band and out-of-band emissions

Agreement:
The following common set of evaluation assumptions and reporting metrics are used for enhanced PUCCH design

Evaluation assumptions

Property	Value
Carrier frequency	5 GHz
Channel bandwidth	20 MHz
Channel model	TDL-C
Delay scaling	At least 10ns, 100ns with 300 ns optional
Antenna configuration at BS*	(M,N,P) = (1,1,2) with omni-directional antenna element
Antenna configuration at UE	Single omni-directional antenna element
Antenna port virtualization	No beamforming and no beam selection
Frequency offset	0 ppm
UE speed	3 km/h
Subcarrier spacing	15/30 kHz (with other SCS optional)
Number of code-division multiplexed users if applicable	1 user, with other cases optional
Interference assumption	No inter-cell interference
* See Table 7-1 of R1-1704144	

Reporting metrics

Parameter	Value	Notes
Enhanced PUCCH Format		e.g., E-PF0, E-PF1, E-PF2, E-PF3
Number of OFDM symbols used for PUCCH resource		e.g., 1, 2, 4, 14
Number of RBs used for PUCCH resource (N_RB)		At least 1 full interlace assumed (Assume interlace design for 20 MHz carrier bandwidth as agreed in RAN1AH#1901 for 15kH and 30 kHz is used)
Frequency domain OCC configuration details (if applicable)		Include length and type of OCC, mapping of OCCs to control symbols and reference (DMRS) symbols, OCC cycling (if applicable)
Time domain OCC configuration details (if applicable)		Include length and type of OCC, mapping of OCCs to control symbols and reference (DMRS) symbols
Number of multiplexed users, e.g., by code division if applicable		1 user is assumed as baseline Companies are to report other cases if evaluated
Waveform		e.g., CP-OFDM or DFT-s-OFDM
PUCCH encoder type		e.g., Reed Muller or Polar
SCS		15KHz, 30KHz
Noise level, Np (dBm)		Np = -174 + 10*log10(SCS*12*N_RB) + NF NF = 5dB
Required SNR (dB)		Required SNR needed to fulfil detection criterion(1)(2), read from simulation curve
Cubic Metric		Note: Single value reported in dB
P_max (dBm)		Maximum allowed transmit power under PSD limit of 10dBm/MHz measured in any 1MHz chunk and considers the RBs used for the PUCCH resource
Backoff (dB)		Backoff is computed as the cubic metric. Note: If cubic metric is not used, information on the backoff metric used should be provided.
P_TX (dBm)		P_TX = min(P_max, 23- Backoff) is maximum allowed transmit power for the waveform considering backoff
MCL (dB)		MCL = P_TX – SNR – Np
PUCCH payload size(s) (bits)		If multiple payload sizes evaluated, then MCL to be plotted vs. PUCCH payload size
PUCCH encoding rate(s)		If multiple payload sizes evaluated, then multiple encoding rates to be reported (if applicable)

(1) For PUCCH payloads of 1 or 2 bits, detection criterion assumes that the PUCCH payload consists of randomly drawn HARQ ACK/NACK bits and is defined as P(ACK to Error) ≤ 1% and P(NACK to ACK) ≤ 0.1%. Error is defined as NACK or DTX where the decision region for DTX is determined to ensure that the maximum P(DTX to ACK) ≤ 1% for the case when the input to the receiver is noise only.
(2) For PUCCH payloads greater than 2 bits follow the requirements in TS38.104 Section 8.3

Note:
- Companies should provide details of RE mapping in frequency and time of enhanced PUCCH formats that are evaluated

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- Companies should provide details about channel estimation assumptions, e.g. practical, ideal
- Definition of SNR to be reported with evaluation metrics

7.2.2.2 Physical Layer Procedure

7.2.2.2.1 Channel access procedures

channel access mechanisms for LBE and FBE, potential LBT requirement exceptions (notes in TR for channel access); extension to channel access mechanisms, CWS adjustment enhancement, possible extension on top of ED for coexistence, CG COT sharing and CWS update, channel access mechanism for wideband operation.

R1-1903873 Discussion on Channel access procedure for NR-U ZTE, Sanechips
R1-1903928 Coexistence and channel access for NR unlicensed band operations Huawei, HiSilicon
R1-1904065 Discussion on the channel access procedures vivo
R1-1904186 Channel access and co-existence for NR-U operation Nokia, Nokia Shanghai Bell
R1-1904250 Channel access for NR unlicensed operations Sony
R1-1904285 Channel access mechanism for NR-unlicensed Intel Corporation
R1-1904335 Channel access mechanisms for NR-U Ericsson
R1-1904406 Channel access procedures for NR-U Samsung
R1-1904482 On channel access procedure MediaTek Inc.
R1-1904587 Discussion on channel access for wideband operation and COT sharing Fujitsu
R1-1904596 Channel access procedures for NR-U Panasonic Corporation
R1-1904622 Channel access procedure for NR-U LG Electronics
R1-1904681 Discussion on BWP switching and LBT Google Inc.
R1-1904853 Channel access in NR-U InterDigital, Inc.
R1-1904873 Channel access procedure for NR-U Sharp
R1-1904894 Channel access procedures for NR-U OPPO
R1-1904949 Channel access procedures for NR-U NTT DOCOMO, INC.
R1-1904999 Channel access procedures for NR unlicensed Qualcomm Incorporated
R1-1905089 Discussion on channel access procedure Google Inc.
R1-1905150 Channel access procedure for NR-unlicensed WILUS Inc.
R1-1905183 Extensions for Channel Access Procedures Motorola Mobility, Lenovo

R1-1904187 Feature Lead's Summary on Channel Access Procedures Nokia, Nokia Shanghai Bell

Conclusion:
If a category 2 LBT with a duration of 25 microseconds is required, no changes to the baseline method as followed in LAA for such LBT are needed

R1-1905766 Feature Lead's Summary #2 on Channel Access Procedures Nokia, Nokia Shanghai Bell

Agreement:
The following agreement from the SI is updated as shown:

Table 7.2.1.3.1-1: Channel access schemes for ~~initiating a COT by~~ gNB as LBE device

	Cat 2 LBT	Cat 4 LBT
DRS alone or multiplexed with non-unicast data (e.g. OSI, paging, RAR)	When the DRS duty cycle ≤1/20, and the total duration is up to 1 ms: 25 μs Cat 2 LBT is used (as in LAA)	When DRS duty cycle is > 1/20, or total duration > 1 ms Cat4 with any channel access priority class value can be used
DRS multiplexed with unicast data	N/A except for the cases discussed in the Note below	Channel access priority class is selected according to the multiplexed data
PDCCH and PDSCH	N/A except for the cases discussed in the Note below	Channel access priority class is selected according to the multiplexed data

Agreement:

For a UCI-only transmission on PUSCH in a channel occupancy initiated by the UE, Cat4 with lowest channel access priority class value can be used by the UE

Agreement:
For LBT by a UE prior to transmission of a UL burst within a gNB-initiated channel occupancy as LBE device, for gap durations shorter than 25 microseconds, choose one of the following alternatives

- Alt 1: Cat 2 LBT can be indicated (FFS: explicit and/or implicit) to the UE if the gap is 16 microseconds (allowing for implementation tolerances)
- Alt 2: Cat 2 LBT is not indicated to the UE for gaps less than 25 microseconds
- Notes (applicable to both alternatives):
  - This means that the gNB ensures that gaps between 16 and 25 microseconds do not occur
  - This doesn't change the previous agreement for Cat 1 and Cat 2 LBT for gaps of 16 microseconds or less
- FFS: Conditions on channel occupancy after a Cat. 1 or Cat. 2 LBT after a gap of 16 microseconds or less

7.2.2.2.2 Enhancements to initial access procedure

DRS transmission, frame timing and QCL from detected SSB, 4-step RACH enhancement, SR enhancements, RLM/RRM, etc.

R1-1903874 Discussion on enhancement of the initial access procedure for NR-U ZTE, Sanechips
R1-1903929 Initial access in NR unlicensed Huawei, HiSilicon
R1-1904066 Discussion on initial access procedure for NR-U vivo
R1-1904222 On Enhancements to Initial Access Procedures for NR-U Nokia, Nokia Shanghai Bell
R1-1904251 Enhancements to initial access procedures for NR-U Sony
R1-1904286 Enhancements to initial access and mobility for NR-unlicensed Intel Corporation
R1-1904336 Enhancements to initial access procedure Ericsson
R1-1904407 Enhancements to initial access procedure for NR-U Samsung
R1-1904483 Enhancements to initial access procedure MediaTek Inc.
R1-1904547 Discussion of NR-U initial access procedure CATT
R1-1904588 Enhancements to initial access procedure and scheduling request procedure for NR-U Fujitsu
R1-1904595 NR-U PRACH resource enhancement Panasonic Corporation
R1-1904623 Initial access and mobility for NR-U LG Electronics
R1-1904801 Discussion on initial access and mobility in NR-U Spreadtrum Communications
R1-1904854 Initial access and mobility procedures in NR-U InterDigital, Inc.
R1-1904874 Initial access procedure for NR-U Sharp
R1-1904895 Enhancements to initial access procedure for NR-U OPPO
R1-1904950 Enhancements to initial access procedure for NR-U NTT DOCOMO, INC.
R1-1905000 Initial access and mobility procedures for NR-U Qualcomm Incorporated
R1-1905040 RACH resources in time domain enhancements ITRI
R1-1905074 NR-U initial access procedure enhancements Xiaomi
R1-1905118 Discussion on Enhancements to Initial Access Procedure for NR-U Potevio
R1-1905151 Enhancement to initial access procedure for NR-unlicensed WILUS Inc.
R1-1905685 Initial access procedure for NR-U Motorola Mobility, Lenovo (rev of R1-1905184)
R1-1905213 Initial access enhancement for NR-U KT Corp.

R1-1905635 Feature lead summary #1 of Enhancements to initial access procedure Qualcomm Incorporated

Agreement:
The maximum DRS transmission window duration is 5 ms.

- The maximum number of candidate SSB positions within a DRS transmission window, Y, is selected as Y = 10 for 15 kHz SCS and Y = 20 for 30 kHz SCS.
  - Note: The number of starting points for DRS transmissions with the 5 ms window that can use a Cat. 2 LBT is to be discussed further as part of channel access discussions.
- FFS: If the DRS transmission window is configurable, and if yes, how to configure and indicate the window, including the range of configurable values.

Agreement:
For a given cell, the UE may assume that the PBCH DMRS sequence index is the same for SS/PBCH blocks that are transmitted at the same candidate positions across DRS transmission windows.

R1-1905786 **Feature lead summary #2 of Enhancements to initial access procedure** **Qualcomm Incorporated**

Agreement:
UE determines serving cell timing from the detected SSB candidate position, where the SSB candidate positions within the DRS transmission window are indexed from 0,…,Y-1 (Y = 10 for 15 kHz SCS and Y = 20 for 30 kHz SCS).

7.2.2.2.3 HARQ enhancement

NR HARQ enhancements, additional A/N transmission opportunities, multi-TTI grants

R1-1903875	Discussion on scheduling and HARQ for NR-U	ZTE, Sanechips
R1-1905648	HARQ enhancement in NR unlicensed	Huawei, HiSilicon (rev of R1-1903930)
R1-1904067	Discussion on HARQ operation for NR-U	vivo
R1-1904183	HARQ scheduling and feedback for NR-U	Nokia, Nokia Shanghai Bell
R1-1904252	HARQ enhancement for NR-U	Sony
R1-1904287	Enhancements to HARQ for NR-unlicensed	Intel Corporation
R1-1904337	HARQ and scheduling enhancements for NR-U	Ericsson
R1-1904408	HARQ enhancement for NR-U	Samsung
R1-1904484	Enhancements to HARQ for NR-U operation	MediaTek Inc.
R1-1904582	HARQ enhancement for NR-U	Lenovo, Motorola Mobility
R1-1904589	Scheduling/HARQ enhancements for NR-U	Fujitsu
R1-1904599	HARQ enhancement for NR-U	Panasonic Corporation
R1-1904624	HARQ procedure for NR-U	LG Electronics
R1-1904786	Discussion on HARQ enhancements for NR-U	Spreadtrum Communications
R1-1904855	Enhanced HARQ procedures for NR-U	InterDigital, Inc.
R1-1904875	HARQ enhancement for NR unlicensed operation	Sharp
R1-1904896	HARQ enhancements for NR-U	OPPO
R1-1904951	HARQ enhancement for NR-U	NTT DOCOMO, INC.
R1-1905001	Enhancements to Scheduling and HARQ Operation for NR-U	Qualcomm Incorporated
R1-1905041	HARQ enhancements for NR-U	ITRI
R1-1905060	Discussion on the HARQ enhancement for NR-U	Beijing Xiaomi Mobile Software
R1-1905129	Discussions on HARQ enhancements in NR-U	CAICT
R1-1905259	On HARQ Enhancements and UL Scheduling	Charter Communications

R1-1905649 **Feature lead summary of HARQ enhancements for NR-U** **Huawei**

Agreement:
A non-numerical value is added to the possible range of PDSCH-to-HARQ-timing-indicator values defined in Rel-15, and is used to indicate to the UE that the HARQ-ACK feedback for the corresponding PDSCH is postponed until the timing and resource for the HARQ-ACK feedback is provided by the gNB.

Agreement:
Restrict further discussion on HARQ codebook to the following:

- For dynamic HARQ codebook:
  - PDSCH grouping by explicitly signalling a group index in DCI scheduling the PDSCH
  - gNB can request HARQ-ACK feedback in the same PUCCH for all PDSCHs in the same group
  - Option 1:
    - One PUCCH can carry HARQ-ACK feedback for one or more PDSCH groups
    - DCI can request HARQ-ACK feedback for one or more PDSCH groups
    - FFS one of the two options below

- C-DAI/T-DAI can be accumulated across multiple PDSCH groups for which feedback is requested in the same PUCCH
- C-DAI/T-DAI is accumulated only within one PDSCH group

- FFS: New ACK-Feedback Group Indicator for each PDSCH Group
- The number of HARQ-ACK bits for one PDSCH group is constant between a first HARQ-ACK feedback transmission and a HARQ-ACK feedback re-transmission, i.e. the PDSCH group cannot be enlarged after the first feedback transmission

- Option 2:
  - One PUCCH can carry HARQ-ACK feedback for a single PDSCH group
    - FFS: Feedback for more than one PDSCH group
  - DCI can request HARQ-ACK feedback for a single PDSCH group
    - FFS: Requests for more than one PDSCH group
  - C-DAI/T-DAI is accumulated within one PDSCH group
  - A reset indicator signals new HARQ-ACK feedback for a PDSCH group
  - The number of HARQ-ACK bits for one PDSCH group may not be constant between a first HARQ-ACK feedback transmission and a HARQ-ACK feedback re-transmission

- Semi-static codebook. Options FFS.
- If request/trigger for one-shot group HARQ ACK feedback for all configured HARQ processes is introduced (at least for non-CBG HARQ), select one or more of the following candidate schemes:
  - The request is carried in a UE-specific DCI carrying a PUSCH grant
  - The request is carried in a UE-specific DCI carrying a PDSCH assignment
  - The request is carried in a UE-specific DCI not scheduling PDSCH nor PUSCH
  - The request is carried in a UE-common DCI
  - The request can be used for UE configured with dynamic or semi-static HARQ codebook
- Note: The discussion on preconfigured/pre-indicated multiple opportunities in frequency domain in different LBT subbands is a separate discussion

7.2.2.2.4 Configured grant enhancement

R1-1903876	Discussion on configured grant for NR-U	ZTE, Sanechips
R1-1903931	Transmission with configured grant in NR unlicensed band	Huawei, HiSilicon
R1-1904068	Discussion on the enhancements to configured grants	vivo
R1-1904185	On support of UL transmission with configured grants in NR-U	Nokia, Nokia Shanghai Bell
R1-1904253	Enhancements to Configured Grants in NR-U	Sony
R1-1904288	Enhancements to configured grants for NR-unlicensed	Intel Corporation
R1-1904338	Configured grant enhancement	Ericsson
R1-1904409	Configured grant enhancement for NR-U	Samsung
R1-1904485	Discussion on NR-U configured grant	MediaTek Inc.
R1-1904625	Discussion on configured grant for NR-U	LG Electronics
R1-1904660	Discussion on configured grant enhancement in NR-U	NEC
R1-1904683	Configured grant enhancements for NR-U	Panasonic Corporation
R1-1904856	Discussion on configured grant enhancements for NR-U	InterDigital, Inc.
R1-1904897	On configured grant for NR-U	OPPO
R1-1905002	Enhancements to configured grants for NR-U	Qualcomm Incorporated
R1-1905258	NR-U Configured Grant Enhancements	Charter Communications
R1-1905678	Feature lead summary on Configured grant enhancement	vvo
R1-1905792	**Outcome of offline discussion on Configured grant enhancement**	**Vivo**

Agreement:
Select from the following additional options for type 1 and type 2 configured grant time domain resource allocation mechanism in NR by RAN1#97

- Option 1: A bitmap to selectively enable or disable configured UL transmission opportunities as per NR Rel-15 configurations.
  - FFS: A bit in the bitmap can correspond to a slot or sub-slot or group of slots

- FFS: duration of bitmap in time, e.g. 40ms
- Option 2: A mechanism based on multiple NR Rel-15 configurations
  - FFS: Whether any further enhancement is needed to Rel-16 beyond what is being considered in the URLLC WI
- Option 3: Configuration in addition to the Rel-15 baseline of one or more of the following aspects:
  - Multiple offsets within an active configuration
  - Duration of transmission for an offset
- Option 4: A bitmap to configure UL transmission opportunies to replace current time domain resource configuration
  - FFS: A bit in the bitmap can correspond to a slot or sub-slot or group of slots
  - FFS: duration of bitmap in time, e.g. 40ms
  - Note: This is importing LAA AUL functionality into NR

7.2.2.2.5 Wide-band operation

Including wide band operation for DL/UL with multiple serving cells, and wideband operation for DL/UL with one serving cell, except channel access mechanisms

R1-1903877	Discussion on Wide-band operation for NR-U	ZTE, Sanechips
R1-1903932	NRU wideband BWP operation	Huawei, HiSilicon
R1-1904069	Discussion on wideband operation in NR-U	vivo
R1-1904165	Wideband operation in NR unlicensed	PANASONIC
R1-1904194	On wideband operation in NR-U	Nokia, Nokia Shanghai Bell
R1-1904254	Wideband operation for NR Unlicensed	Sony
R1-1904289	Wideband operation for NR-unlicensed	Intel Corporation
R1-1904339	Wideband operation for NR-U	Ericsson
R1-1904410	Wide-band operation for NR-U	Samsung
R1-1904486	Wideband operation for NR-U	MediaTek Inc.
R1-1904583	Wide-band operation for NR-U	Lenovo, Motorola Mobility
R1-1904590	On wideband operation for NR-U	Fujitsu
R1-1904604	Wideband operation for NR-U	ETRI
R1-1904626	Wide-band operation for NR-U	LG Electronics
R1-1904785	Discussion on wideband operation in NR-U	Spreadtrum Communications
R1-1904839	Wideband operation for NR-U	Convida Wireless
R1-1904857	NR-U Wideband operation	InterDigital, Inc.
R1-1904876	Wideband operation and UL/DL indication for NR-U	Sharp
R1-1904898	Wideband operation for NR-U	OPPO
R1-1904952	Wide-band operation for NR-U	NTT DOCOMO, INC.
R1-1905003	Wideband operation for NR-U operation	Qualcomm Incorporated
R1-1905062	Discussion on the wideband operation for NR-U	Beijing Xiaomi Mobile Software
R1-1905152	Wideband operation for NR-unlicensed	WILUS Inc.
R1-1905260	Wideband Operation for NR-U	Charter Communications
R1-1905630	Summary on wide-band operation for NR-U	LG Electronics
R1-1905779	**Summary #2 on wide-band operation for NR-U**	**LG Electronics**

Agreement:
For UL transmissions in a serving cell with carrier bandwidth greater than LBT bandwidth, for the case where UE performs CCA before UL transmission, support at least Alt. 1 among the following alternatives

- Alt. 1: UE transmits the PUSCH only if CCA is successful at UE in all LBT bandwidths of the scheduled PUSCH.
- Alt. 2: UE transmits the PUSCH in all or a subset of LBT bandwidths of the scheduled PUSCH for which CCA is successful at the UE.
  - Decision on whether this alternative is supported will depend on feedback from RAN4
  - FFS on restrictions to the subset of LBT bandwidths, e.g., only contiguous LBT bandwidths allowed, based on feedback from RAN4
- Necessity of guard bands within the scheduled PUSCH should be determined by RAN4
- FFS: Whether this applies also to configured grant PUSCH
- FFS: Whether this applies also to PUCCH

R1-1905857 [Draft] LS to RAN4 on UL wideband operation LG Electronics
R1-1905858 [Draft] LS to RAN4 on UL wideband operation LG Electronics
Friday decision: The draft LS is endorsed. Final LS is approved in R1-1905895.

Agreement:

- Support a mechanism for a UE to detect gNB is transmitting across
- Multiple carriers
- Multiple LBT bandwidths in a carrier.
- The following mechanisms are to be considered:
- Option 1: Explicit indication via PDCCH
  - FFS: The type of PDCCH (e.g., group common PDCCH or UE-specific PDCCH)
  - FFS: Signaling details of the indication
- Option 2: Explicit indication via selection of a PDCCH DM-RS sequence from a set of PDCCH DM-RS sequences
  - FFS: Details of the indication
- Option 3: Via UE implementation, i.e., implicit method based on NR-based signal such as DM-RS and/or corresponding PDCCH detection
  - FFS: Which signals/channels or combination of signals/channels could be used by the UE
- Note: Above options are not mutually exclusive

7.2.2.3 Other

R1-1903933 Generic design of spectral-domain modulation sequences for 5G NR-U PRACH waveform Huawei, HiSilicon
R1-1903934 Performance evaluation of initial signals Huawei, HiSilicon
R1-1903935 Further evaluation of coexistence in 6GHz Huawei, HiSilicon
R1-1904340 Evaluation results for enhanced PRACH design Ericsson
R1-1904341 Enhanced PUCCH design details Ericsson
R1-1904411 Evaluation results for directional LBT Samsung
R1-1904412 Discussion on HARQ-ACK codebook design Samsung
R1-1904413 Discussion on time/freq-domain enhancements for RACH resources Samsung
R1-1904414 Discussion on multple msg.1 transmisson procedure Samsung
R1-1904686 Discussion on the LS reply to IEEE Huawei, HiSilicon
R1-1905232 On aperiodic reference signals for NR-U Ericsson
R1-1905233 On the duration of the DRS transmission window Ericsson
R1-1905234 Draft LS to RAN4 on SS/PBCH Block SCS and time domain pattern for 5 and 6 GHz bands Ericsson
R1-1905235 Evaluation assumptions for PUCCH design Ericsson
R1-1905275 Spectrum utilization in 20MHz channel bandwidth for 60 kHz SCS Huawei, HiSilicon
R1-1905276 System evaluation of DRS transmission window Huawei, HiSilicon

7.2.3 Integrated Access and Backhaul for NR

NR_IAB-core; WID in RP-190712. Please refer to the WID for detailed scoping

7.2.3.1 Extensions of SSBs for inter-IAB-node discovery and measurements

R1-1903936 **SSB-based discovery and measurement for IAB** **Huawei, HiSilicon**

- Proposal 1: For IAB node discovery and measurements, multiple sets of SSB transmission configurations can be configured and at least the following information should be provided for each set: periodicity, offset, SSB-to-transmit indexes, SCS, and central frequency.
- Proposal 2: For IAB node discovery and measurements, multiple sets of SSB measurement configurations can be configured and at least the following information should be provided for each set: the frequency and SCS of SSB, the set of SSBs to be measured and the SSB measurement timing configurations (SMTC).
  - The maximum of number of SMTC windows configured for an IAB node is 4.
- Proposal 3: For inter IAB node discovery and measurements, the following muting rule should be specified: The SSB set TX should be muted if the SSB set TX and RX are overlapped.

Decision: The document is noted.

R1-1904415 **Support of SSBs for IAB Node Discovery and Measurement** **Samsung**

- Proposal 1: UP to 3 STC should be supported per IAB node for inter-node measurement and topology information, e.g., hop order, should be taken into account for STC and SMTC to reduce signalling overhead.
- Proposal 2: Numerology including CP and SCS information, periodicity, offset, duration, SSB index, and frequency location of SSBs should be configured for STC. The dependence of multiple STC should be explored to reduce signalling overhead and following solutions can be considered.
  - Assuming the same numerology for initial access and inter-node discovery SSBs;
  - Assuming the same periodicity, offset, duration and SSB index for multiple STC;
    - Further assuming the same SSB index for initial access and inter-node discovery SSBs.
- Proposal 3: Consecutive SSB should be supported when configuring multiple STC and some offset values can be implicitly derived to reduce signalling overhead.
- Proposal 4: It should be allowed to measure multiple neighbouring nodes in each SMTC and RRC parameter pci-list should be configured independently for each SMTC.
- Proposal 5: SMTC duration should be extended at least two times.
- Proposal 6: When SMTC collides with STC at one IAB node, SMTC is overridden by STC, i.e., instead of measuring other nodes, the node transmits SSB based on STC.
- Proposal 7: Coordinated STC/SMTC across multiple IAB nodes should be supported and multiple pci-list parameters can be configured.
- Proposal 8: The maximum number of SMTC windows that can be configured for an IAB node, referred as max(N_{RX}), is 3.
- Proposal 9: The synchronization procedure when the primary backhaul link fails due to blockage and backhaul link switching happens needs to be clarified.
- Proposal 10: More than one SMTC should be configured in RRC_IDLE state.
- Proposal 11: For solution 1-A, SSB positions within one SSB burst set can be coordinated across multiple IAB nodes to enable inter IAB node discovery subject to half-duplex constraint.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Xinghua (Huawei)

Thursday session

R1-1905832 **Summary of 7.2.3.1 Extensions of SSBs for inter-IAB-node discovery and measurements** **Huawei**

Decision: The document is noted.

Agreement**:**

- The Rel-15 SSB mapping pattern within a half frame is reused for IAB node discovery and measurements

Agreements:

For IAB node discovery and measurements, at least the following information should be provided in STC

- SSB center frequency
- SSB subcarrier spacing
- SSB transmission periodicity
  - 5, 10, 20, 40, 80, 160, 320, 640 subframes are supported.
- SSB transmission timing offset in half frame(s)
- The index of SSBs to transmit
  - The SSBs to be transmitted in the half frame
- FFS configuration information other than above
- FFS some of the parameters can have default values, e.g. reuse the same value of the cell-defining SSBs.
- Note: The detailed signaling design is up to RAN3.

Agreements:

For IAB node discovery and measurements, an IAB node DU can be configured with zero, one or multiple STCs.

- FFS the maximum number of STCs
- FFS the dependency of multiple STCs

Agreement:

- For IAB node discovery and measurement, the maximum number of SMTC windows that can be configured for an IAB node is 4.

R1-1904070	Discussion on extension of SSBs for inter-IAB-node discovery and measurements	vivo
R1-1904203	Discussion on SSBs for inter-IAB-node discovery and measurements	LG Electronics
R1-1904290	SSBs for inter-IAB-node discovery and measurements	Intel Corporation
R1-1904640	SSB TX/RX for IAB inter-node measurements	Nokia, Nokia Shanghai Bell
R1-1904726	Discussion on extensions of SSBs for inter-IAB-node discovery and measurements	CMCC
R1-1904810	Discussion on configurations for SSB Tx and Rx	ZTE, Sanechips
R1-1904832	SSB-based IAB node discovery and measurements	Ericsson
R1-1904953	Extensions of SSBs for inter-IAB-node discovery and measurements	NTT DOCOMO, INC.
R1-1905004	Updated proposal for SSB extensions for IAB	Qualcomm Incorporated

7.2.3.2 Extension of RACH occasions and periodicities for backhaul RACH resources

R1-1905595 **IAB RACH extensions** **Ericsson** (rev of R1-1904833)

- Observation 1: Indicating invalid ROs to MT/UE is needed when backhaul ROs (partly) overlapped with the ROs configured for an adjacent hop.
- Observation 2: Indicating invalid ROs to MT/UE is already available in Rel-15 by providing TDD-UL-DL-ConfiguartionCommon to MT/UE and setting the corresponding RO symbols in TDD-UL-DL-ConfiguartionCommon to non-UL resource type.
- Proposal 1: The parent node can provide respective prach-ConfigIndex to IAB nodes and UEs, with the IAB-node configuration modified by additionally provided parameters, such as offset and scaling factor.
- Proposal 2: The frame-level offset can range from 0 to βx-1 for periodicity x, where β is the periodicity scaling factor.
- Proposal 3: The subframe/slot-level offset can range from 0 to L-1, where L is the number of subframes or slots in a frame.
- Proposal 4: Specification allows new ROs after applying the provided offset to be (partly) overlapped with the original ones.
- Proposal 5: Extending ROs for backhaul RACH resources using offset can be generally applied to all existing configurations leaving it up to the network to not use resulting configurations that may not fit other system constraints.
- Proposal 6: The periodicity scaling factor can take the values 1, 2, 4, and 8.

Decision: The document is noted.

R1-1904954 **Extension of RACH occasions and periodicities for backhaul RACH resources** **NTT DOCOMO, INC.**

- Proposal 1: The IAB-node/donor is able to provide RACH configuration including *prach-ConfigurationIndex* for child IAB-node MT separately from that for access UE.
- Proposal 2: By using the scaling factor applicable to the parameter 'x' in the PRACH configuration table, effective 'x' values of {32, 64} are supported.
  - For PRACH configurations with 'x' = 2^N, scaling factor of 2^M is supported, where M = 1, 2, …, 6-N.
- Proposal 3: For an offset y_offset to the parameter 'y' (frame-based offset) in the PRACH configuration table, full flexibility of frame-based offset is supported, i.e., effective 'y' value achieved by y_offset supports all possible integer values from 0 to 'x'-1.
  - For an offset to the slot/subframe number (slot/subframe-based offset), if it is supported, possible offset values should be limited with consideration of TDD DL/UL patterns as current slot number values supported in PRACH configuration table.
- Proposal 4: For IAB-node MT, a PRACH occasion in a PRACH slot is invalid if it is within DU-available (e.g., "hard" or "soft") resource according to semi-static DU resource configuration.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Luca (Qualcomm)

Thursday session

R1-1905738 **Summary of section 7.2.3.2 – Extension of RACH occasions and periodicities for backhaul RACH resources** **Qualcomm**

Decision: The document is noted.

Agreements:

The periodicity of a backhaul RACH configuration in frames takes the form x_iab = x * λ where:

- x is the periodicity of an existing RACH configuration,

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- λ is a scaling factor taking values in {1, 2, 4, 8, 16, 32, 64} subject to the constraint x_iab ≤ 64.

Agreement:
The frame containing backhaul ROs is identified by (n_{SFN} mod x_iab) = ((y + Δy) mod x_iab) where Δy denotes a time offset in frames taking values in the range from 0 to x_iab – 1.

Agreements:
The subframe (slot) number for a RO of a backhaul RACH configuration is identified by (Sn + Δs,) mod L, where:

- Sn is the subframe (slot) number of an existing RACH configuration,
- Δs denotes a time offset in subframes (slots) taking values in the range from 0 to L – 1, where L is the number of subframes (slots) in a frame.

NOTE: The usage of the terms subframe or slot is meant to align to the terminology used in the existing RACH configuration tables in TS 38.211, e.g. subframe in Tables 6.3.3.2-2 and 6.3.3.2-3, and slot in Table 6.3.3.2-4.

Agreement:
The validity of ROs for backhaul RACH configurations is regulated by the rules defined in Rel-15 for existing RACH configurations.

Agreement:
Partial overlap of ROs between RACH configurations used in two adjacent links (upstream towards the parent and downstream towards the children from an IAB node perspective) is allowed.

R1-1903937	RACH design for IAB	Huawei, HiSilicon
R1-1904204	Discussion on RACH occasions and periodicities for backhaul RACH resources	LG Electronics
R1-1904291	RACH enhancements for NR IAB	Intel Corporation
R1-1904416	Support of RACH Occasions and Periodicity for IAB RACH	Samsung
R1-1904641	Enhancements on RACH for IAB	Nokia, Nokia Shanghai Bell
R1-1904727	Discussion on PRACH enhancements to support NR Backhaul links	CMCC
R1-1904811	Discussion on backhaul RACH enhancement	ZTE, Sanechips
R1-1905005	Updated proposal for RACH extension for IAB	Qualcomm Incorporated
R1-1905048	Extension of RACH configuration for backhaul link	OPPO
R1-1905130	Discussion on RACH occassions and periodicities for backhaul RACH resources	CAICT

7.2.3.3 Mechanisms for resource multiplexing among backhaul and access links

R1-1904205 Discussions on resource multiplexing among backhaul and access links LG Electronics

- Proposal 1: One DU configuration is configured to a DU and it is applied to all child links.
- Proposal 2: Configuration of DU link direction (DL/UL/F) can be based on legacy semi-static SFI configuration.
- Proposal 3: It seems desirable to minimize restriction on the location of DU Hard/Soft/NA resource.
- Proposal 4: Discuss whether slot format configuration by SI for access UEs also can be applied to MT configuration or not.
- Proposal 5: When a node configures link direction dynamically for its child node or access UE, it should not be violated its DU configuration.
- Proposal 6: If the availability is not configured for a DU soft resource, the DU cannot assume it can use the resource.
- Proposal 7: It is considerable that an IAB node request its DU soft resource availability to its parent node.
- Proposal 8: DU hard is assumed in access SSB transmission resource.
- Proposal 9: DU hard is assumed in STC resource and DU NA is assumed in SMTC resource. In case of SMTC and STC collision,
  - DU hard is assumed if STC period > SMTC period.
  - DU NA is assumed if STC period < SMTC period.
- Proposal 10: An IAB node should know all of the DU resource configurations (D/U/F/H/S/NA) of its child IAB node DUs.

Decision: The document is noted.

R1-1905006 Updated IAB resource management framework Qualcomm Incorporated

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- Observation 1: In some cases, e.g. cases with multi-parents and /or cases with interference from some neighbour IAB-node, link-specific resource partition may not be achieved by per-DU configuration with knowledge of child's resource configuration.
- Proposal 1: Per-Link configuration shall be supported by semi-static configuration of resource type.
- Observation 2: Three Types of resolution rules can be considered for handling potential conflicting configuration between DU resource type and semi-static signal/channel allocation:
  - Type1 to avoid confliction by constraining resource configuration
  - Type2 to allow conflicting configuration and apply default behaviour,
  - Type3 to allow conflicting configuration and override default behaviour.
- Observation 3: For conflicting configuration between DU resource type and UE/MT-specific semi-static signals/channels, Type2 resolution rule of applying default behaviour defined by resource type can be an acceptable option with less spec effort than option1 and Option3.
- Observation 4: For conflicting configuration between DU NA/Soft resources and cell-specific signals/channels configured at DU, Type2 resolution rule of applying default behaviour defined by resource type can cause significant performance impact.
- Observation 5: For potential conflicting configuration between DU Hard resources and cell-specific signals/channels configured at co-located MT, Type2 resolution rule of applying default behaviour defined by resource type can be an acceptable option, since IAB-node DU can decide to give priority to co-located MT based on performance impact.
- Observation 6: Pros and cons of using Type1 resolution rule with confliction avoidance versus using Type3 resolution rule with overridden behaviour are listed:
  - Smaller configuration complexity can be achieved by Type3 than Type1 rule.
  - Inter-IAB confliction issues, for cases e.g. with overlapping SSB cross parent and child nodes, can be caused when Type3 rule is used but can be avoided when Type1 rule is used.
- Proposal 2: For potential conflicting configuration between DU NA/Soft resource and cell-specific signals/channels (e.g. SSB, SI, PRACH) configured at DU, following confliction resolution rules can be supported (to be down-selected)
  - Type1: A resource with cell-specific signals/channels configured at DU shall not be indicated as type NA/Soft at DU.
  - Type3: If a DU NA/Soft resource is configured with cell-specific signals/channels, DU can assume it can use this resource for configured cell-specific signals/channels but not for other signals/channels.
- Proposal 3: For potential conflicting configuration between DU Hard resource and cell-specific signals/channels (e.g. SSB, SI, PRACH) configured at co-located MT, following confliction resolution rules can be supported (to be down-selected):
  - Type2: If a cell-specific signal/channel is to be transmitted or received by co-located MT at this resource, DU shall follow its default behaviour to decide whether to give priority to co-located MT based on system performance.
  - Type3: If a cell-specific signal/channel is to be transmitted or received by co-located MT at this resource, DU shall always give priority to co-located MT.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Luca (Qualcomm)

Thursday session

R1-1905739 **Summary of section 7.2.3.3 – Mechanisms for resource multiplexing among backhaul and access links** **Qualcomm**

Decision: The document is noted.

Agreements:

- In case of Hard or Soft Indicated Available DU resources, no additional exception cases need to be defined for cell specific signals/channels to be transmitted or received by the MT in the same resource (e.g. SS/PBCH blocks, SI reception, RACH).
  - The decision on whether to give priority to the DU or to the MT for the use of the resource (e.g. in case of MT RACH transmission) is left to the IAB node implementation.
    - The IAB shall fulfill its performance requirements in terms of measurement and transmission of cell specific signals / channels.
- In case of NA or Soft not Indicated Available DU resources, for potential conflicting configuration between NA and Soft not Indicated Available DU resources and cell-specific signals/channels (e.g. SSB, SI, PRACH) configured at the DU, the following alternatives are to be considered (to be down-selected):

  - Alt 1): A resource with cell-specific signals/channels configured at DU shall not be configured as type NA or Soft without being Indicated Available.
  - Alt 2): If a DU NA or Soft resource is configured with cell-specific signals/channels, the resource is treated as if it were a Hard DU resource.
- FFS the cell specific signals/channels. The list may include (not necessarily an exhaustive list)
  - SSB transmissions
  - Broadcast system information
  - Configured periodic CSI-RS
  - PRACH resources
  - Resources for scheduling requests

Agreements:
- An IAB node has the ability to be made aware of the semi-static DU resource configuration (D/U/F/H/S/NA) of all its child IAB nodes.
  - in the case the full DU resource configuration information of its child IAB nodes is not necessary, ensure that only the necessary configuration information is signaled to the IAB node.
    - FFS the necessary configuration information.

Agreements:
- An explicit indication of availability of a Soft resource by the parent node makes the resource available to the child node, irrespective of the outcome of any implicit determination of availability by the child node.
- The parent node does not need to be aware of the outcome of an implicit determination of availability of a DU Soft resources at a child node.

R1-1903938	Resource multiplexing between backhaul and access in IAB	Huawei, HiSilicon
R1-1904071	Discussion on resource multiplexing among backhaul and access links	vivo
R1-1904292	Mechanisms for resource multiplexing among backhaul and access links	Intel Corporation
R1-1904417	Resource Multiplexing between Backhaul and Access Links	Samsung
R1-1904642	Mechanisms for resource multiplexing among backhaul and access links	Nokia, Nokia Shanghai Bell
R1-1904661	Discussion on IAB	NEC
R1-1904728	Discussion on resource multiplexing among backhaul and access links	CMCC
R1-1904812	Resource multiplexing between backhaul and access link	ZTE, Sanechips
R1-1904834	IAB resource configuration and coordination	Ericsson
R1-1904877	DL control search spaces for resource management for IAB	Sharp
R1-1904955	Mechanisms for resource multiplexing among backhaul and access links	NTT DOCOMO, INC.
R1-1905131	Discussion on mechanisms for resource multiplexing among backhaul and access links	CAICT
R1-1905210	Discussions on resource multiplexing among backhaul and access links	CEWiT

7.2.3.4 Mechanism to support the "case-1" OTA timing alignment

R1-1904813 Discussion on OTA timing mechanism ZTE, Sanechips

- Proposal 1: RAN1 selects one assumption from following two options, before looking into delay of applying T_delta and signaling carrying T_delta.
  - Option 1: The change of TA at child node causes the change of T_delta at parent node.
  - Option 2: The change of TA at child node does not cause the change of T_delta at parent node.
- Proposal 2: Each of IAB node and donor node signals to the child IAB node its own estimated DL-Tx timing variation on child link, where this timing variation represents the statistics variation from the "ideally synchronized network wide" DL-Tx timing.

Decision: The document is noted.

R1-1904643 Open items with IAB Case #1 timing Nokia, Nokia Shanghai Bell

- Observation 1: The child node DU TX timing adjustment can be handled with proper TA control loop implementation and T_delta signaling considering the actual used switching gap at the parent node.
- Observation 2: The TA control can be considered to be stabilized during the IAB connection setup and integration phase before the IAB DU operation is activated and T_delta is needed.

- Observation 3: IAB DU DL TX timing adjustment due the change of T_delta value, while the IAB DU is active, has to be done in a way that it does not affect the services of the access UEs.
- Proposal 1: T_delta signaling jointly with TA control is sufficient for IAB node synchronization.
- Proposal 2: The time when to send the initial T_delta value can be left for implementation.
- Proposal 3: The initial value of T_delta can be applied as such for the DU TX timing when the IAB DU operation is activated.
- Proposal 4: It is up to RAN4 to decide about the timing adjustment while meeting the assumed synchronization accuracy requirements without affecting UEs.
- Proposal 5: RAN1 is asked to discuss whether the IAB node synchronization in the multi-connectivity scenario needs to be specified or can it be left for implementation.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Wenfeng (ZTE)

Thursday session

R1-1905778 Mechanism to support the "case-1" OTA timing alignment ZTE

Decision: The document is noted.

Agreements:

In order to align the DL TX timing of the IAB node with the DL TX timing of the parent node by setting DL TX timing of the IAB node (TA/2 + T_delta) ahead of its DL Rx timing, T_delta should be set to the (-1/2) of time interval at the parent node between the start of UL RX frame i for the IAB node and the start of DL TX frame i.

- The setting of T_delta is not necessarily specified.
- Note: The above setting of T_delta assumes that, for the same purpose, TA should be the time interval at the IAB node between the start of UL TX frame i and the start of DL RX frame i.
- Send LS to RAN4 for timing clarification. (Xinghua, Huawei)

R1-1905841 [draft] LS on clarification of OTA timing alignment for IAB Huawei

Decision: The draft LS is endorsed with the following updates:

- IAB_eCore
- Fix meeting location for the August meeting
- Fix the top blue box in the appendex from UL to DL

Final LS is approved in R1-1905842.

Agreement:

- In case the calculated TA/2 + T_delta at IAB node is negative, the IAB node should not adjust its DL-Tx timing.

R1-1903939 DL transmission timing alignment for IAB Huawei, HiSilicon
R1-1904293 Mechanism to support the "case-1" OTA timing alignment Intel Corporation
R1-1904418 Support of Case 1 OTA Timing Alignment Samsung
R1-1904835 IAB OTA Timing Alignment Ericsson
R1-1904956 Mechanism to support the "case-1" OTA timing alignment NTT DOCOMO, INC.
R1-1905007 Updated IAB node synchronization framework Qualcomm Incorporated

7.2.3.5 Other

Including RAN1 aspects related to signalling for L2 transport and resource management as in the WID, any remaining issues for SSB/RMSI periodicity for NR initial access

R1-1903940 Beam management reference signals for IAB MT Huawei, HiSilicon
R1-1903941 On backhaul link radio link failure handling for IAB Huawei, HiSilicon
R1-1903942 Consideration on slot format configuration for IAB Huawei, HiSilicon
R1-1904206 Discussion on scenario with same cell ID among IAB nodes LG Electronics
R1-1904836 Resource for IAB up-stream (MT) transmission Ericsson
R1-1905596 Clarifications on IAB ITA Timing Alignment Ericsson

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Late submission

7.2.4 5G V2X with NR sidelink

5G_V2X_NRSL; WID in RP-190766. Please refer to the WID for detailed scoping

R1-1905389 **On TR 37.985, "Overall description of Radio Access Network (RAN) aspects for Vehicle-to-everything (V2X) based on LTE and NR" Huawei**

Guide to the workplan for delivering TR 37.985, following RAN#83 decision to create a new external TR in response to an LS from 5GAA, requesting easier identification of vehicular features. TR 37.985, being 37-series, is a joint LTE and NR TR.

Decision: The document is noted.

R1-1905436 **Work plan for WI on 5G V2X with NR sidelink LG Electronics, Huawei**

Decision: The document is noted.

7.2.4.1 Physical layer structure for sidelink

Including sidelink signals, channels, bandwidth parts, and resource pools

R1-1904294 **Sidelink physical structure design for NR V2X communication Intel Corporation**

- Proposal 1: Confirm working assumption to use only Option 3 for PSCCH/PSSCH multiplexing
- Proposal 2:
  - Define two PSCCH formats. Both PSCCH formats are described by localized physical structure composed of M consecutive symbols and N consecutive PRBs (PSCCH sub-channel)
    - PSCCH Format 1: M = 3 and N = 8
    - PSCCH Format 2: M = 13 and N = 2 (in case of ECP M = 11)
  - PSCCH sub-channel is allocated within PSSCH sub-channel
- Proposal 3: Define the PSCCH to have (pre)-configured location inside of PSSCH sub-channel
- Proposal 4: Design the PSCCH DMRS based on the PDCCH DMRS with the following modifications
  - Introduce a randomized Cyclic Shift (CS) to orthogonalize transmissions that are possibly colliding with other transmissions
  - Introduce a frequency shift of the DMRS in the second OFDM symbol of a PSCCH relative to the first symbol
- Proposal 5: For the PSCCH transmission, use rank-1 transmit diversity scheme based on pre-coder cycling
- Proposal 6: Use the PDCCH polar code for the PSCCH
- Proposal 7: For PSSCH transmissions, use pre-coder cycling in combination with open loop spatial multiplexing
- Proposal 8: The PDSCH encoding and mapping should be used for PSSCH
  - Consider CBG in the case the OFDM symbol(s) corrupted by a not fully settled AGC is used for PSSCH transmission
- Proposal 9:Use one Optimized DMRS pattern per SCS
  - Use CS to orthogonalize the ports from one user
  - Use CS and FDM or TD-OCC to orthogonalize the antenna ports from different users
  - Location of the OFDM symbols with DMRS should be (pre)-configured per sub-channel and slot length
- Proposal 10: Calculate the CQI/RI feedback based on the PSSCH DMRS
- Proposal 11: PSFCH is transmitted in the last two available SL symbols in a slot with one symbol gap before PSFCH
- Proposal 12:
  - For 60 kHz SCS in FR1, PSFCH is transmitted in the last three available SL symbols in a slot with one symbol gap before PSFCH
  - For 120 kHz SCS in FR2, PSFCH is transmitted in the last three available SL symbols in a slot with one symbol gap before PSFCH
- Proposal 13: A single PSFCH carries up to four HARQ-ACK bits
  - For one and two HARQ-ACK bits, NR PUCCH format 0 is reused with two and four phase shifts, respectively
  - For four HARQ-ACK bits, a 2 PRB sequence with phase shifts is used
- Proposal 14: The two PSFCH symbols are constructed by repetition of one-symbol PSFCH for one, two and four bits
- Proposal 15: PSFCH sequence and resource within a sub-channel is a function of the source UE ID
- Proposal 16:
  - Timescale for switching b/w UL and SL BWPs should be clarified with RAN4
  - In TDD,
    - SL BWP, UL BWP and DL BWP have the same center frequency
  - In FDD,

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        - Either SL BWP is allocated inside of UL BWP or UL BWP is allocated inside of SL BWP
            - FFS if center frequency of SL-BWP and UL-BWP should be aligned
- Proposal 17:
    - The smallest resource pool granularity in time should be a slot
    - Resource pools should only consists of contiguous PRBs (Option 1)

Decision: The document is noted.

R1-1905351 **Discussion on physical layer structure in NR V2X CATT**

Proposal 1: Both slot-based and mini-slot-based resource allocation should be considered as the granularities of resource allocation and resource pool in time domain, but a sidelink resource pool should have only one fixed granularity of resource allocation in time domain.
Proposal 2: For the frequency granularity, the concept of sub-channel can be reused in NR V2X.
Proposal 3: For NR V2X, option 3 should be supported. The structure of option 3 can be expanded beyond the scope presented in RAN1# 94
Proposal 4: The variable size of PSCCH in both time and frequency domain can be considered
Proposal 5: NR PUCCH Format 0 should be considered as the starting point for the design of sidelink HARQ feedback.
Proposal 6: If the sequence-based feedback channel is adopted, PSFCH might not need the AGC RS for tuning.
Proposal 7: The DMRS pattern and generation of NR Uu PDCCH should be a start point for NR V2X PSCCH.
Proposal 8: The DMRS sequence generation for PSSCH:

- For unicast or groupcast, the reference signal sequence should be generated based on the destination ID .
- For broadcast, the reference signal sequence should be generated based on the decimal representation of CRC on the PSCCH transmitted in the same subframe

Proposal 9: 15kHz SCS should not be considered for ultra-high-speed scenarios for NR V2X FR1.
Proposal 10: For 30kHz SCS, 4-symbol DMRS within a slot will be sufficient in meeting the BLER performance requirements of NR V2X FR1.
Proposal 11: For 60kHz SCS, 3-symbol DMRS within a slot will be sufficient in meeting the BLER performance requirements of NR V2X FR1.
Proposal 12: NR V2X should support the flexible DMRS patterns:

- A DMRS pattern should be selected based on the subcarrier spacing and UE speed for unicast and groupcast.
- A DMRS pattern should be selected based on the subcarrier spacing for broadcast.

Proposal 13: The flexible DMRS pattern in frequency domain should be considered for NR V2X.
Proposal 14: The RS used for CSI measurement shall be further evaluated and down-selected from the following options:

- Option 1: dedicated CSI-RS
- Option 2: DMRS
- Option 3: AGC-RS

Proposal 15: The AGC RS should be considered in the V2X sidelink channel for CSI acquisition, AGC tracking and along with DMRS for channel estimation before every data transmission.

Decision: The document is noted.

R1-1905412 **Discussion on physical layer structure for 5G V2X** **Xiaomi Communications**

- Observation 1: if PSCCH/PSSCH is multiplexed in TDM mode in a single slot, protection on PSCCH over AGC adjustment is needed.
- Proposal 1: The guard period and AGC protection can be integrated in a single symbol to reduce the overhead.
- Proposal 2: At least a DMRS pattern specific for CP-OFDM is supported
- Observation 2: NR PDSCH DMRS design can be considered as the baseline for PSSCH
- Proposal 3: The density of DMRS in time domain and frequency domain could be dynamic or semi-static configured according to different carrier frequency, numerology and channel status between transmitter and receiver(s).
- Observation 3: Better PSCCH demodulation performance can be achieved by removing DMRS symbols in PSCCH and using PSSCH DMRS to demodulate PSCCH.

Decision: The document is noted.

Monday conclusion: Discuss further offline – Jeongho (Samsung)

Tuesday session

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R1-1905665 **Feature lead summary for 7.2.4.1 Physical layer structure for side link** **Samsung**
Decision: The document is noted.

Agreements:
- Polar code adopted for Rel-15 NR DCI is applied to PSCCH.
- LDPC codes used for Rel-15 NR DL-SCH is applied to a transport block delivered by PSSCH.

Agreement:
- The starting symbol and the number of symbols for a PSCCH are assumed to be known to the receiving UE before decoding the PSCCH.

Agreements:
- For the purpose of evaluation of PSCCH design, RAN1 assumes 60 bits, 90 bits, 120 bits as the total SCI sizes including 24 bits CRC.
    - Other sizes are not precluded.

Friday session
R1-1905877 **Feature lead summary#3 for 7.2.4.1 Physical layer structure for side link** **Samsung**
Decision: The document is noted.

Agreement: QPSK is used for PSCCH.

Working assumption: Transmission of 1 TB with up to 2 layers in a PSSCH is supported.

Agreements:
- At least for transmission perspective of a UE in a carrier, at least TDM between PSCCH/PSSCH and PSFCH is allowed for a PSFCH format for sidelink in a slot.
    - FFS the details of the corresponding PSFCH format
    - FFS whether it is also applicable from system/resource pool perspective or not
    - i.e., in this case, there is no simultaneous transmission of PSCCH and PSFCH and there is no simultaneous transmission of PSSCH and PSFCH.
    - FFS FDM between PSCCH/PSSCH and a PSFCH format which uses last symbol(s) available for sidelink in a slot
    - FFS TDM/FDM between PSCCH/PSSCH and other PSFCH format(s), if supported, which is/are different from the PSFCH format which uses last symbol(s) available for sidelink in a slot

R1-1903943	Sidelink physical layer structure for NR V2X	Huawei, HiSilicon
R1-1904072	Physical layer structure for NR sidelink	vivo
R1-1904255	Discussion on physical layer structure for NR sidelink	Sony
R1-1904328	Design of NR V2X Physical Layer Structures	Fraunhofer HHI, Fraunhofer IIS
R1-1904419	On Physical Layer Structures for NR V2X	Samsung
R1-1904492	On sidelink physical layer structure	MediaTek Inc.
R1-1904575	Discussion on physical layer structure for NR sidelink	Lenovo, Motorola Mobility
R1-1904652	Physical layer structure for NR sidelink	NEC
R1-1904793	Discussion on physical layer structure for sidelink	Spreadtrum Communications
R1-1904805	Physical layer structure for sidelink	TCL Communication Ltd.
R1-1904814	NR sidelink physical layer structure	ZTE, Sanechips
R1-1904906	On Physical Layer Structure for NR sidelink	China Telecommunications
R1-1904917	Physical layer structure for NR-V2X	OPPO
R1-1905711	Considerations on Physical Layer aspects of NR V2X	Qualcomm Incorporated (rev of R1-1905008)
R1-1905088	Discussion on sidelink structure in NR V2X	ASUSTEK COMPUTER (SHANGHAI)
R1-1905099	Physical layer structure for NR V2X	ITL
R1-1905123	Views on physical layer design for NR V2X sidelink	Mitsubishi Electric RCE
R1-1905332	Discussion of physical layer structure for sidelink	Nokia, Nokia Shanghai Bell

R1-1905374 Discussion on physical layer structure for NR sidelink Fujitsu
R1-1905380 Discussion on physical layer structure for sidelink in NR V2X Panasonic
R1-1905391 Physical layer structure for NR sidelink Sharp
R1-1905400 On Physical Layer Structure for NR V2X Sidelink InterDigital, Inc.
R1-1905421 NR Sidelink Physical Layer Structure NTT DOCOMO, INC.
R1-1905437 Discussion on physical layer structure for NR sidelink LG Electronics
R1-1905475 PHY layer structure for NR sidelink Ericsson

7.2.4.2 Resource allocation for NR sidelink

7.2.4.2.1 Mode 1

R1-1903950 Sidelink resource allocation mode 1 Huawei, HiSilicon

Proposal 1: To meet latency and reliability requirements, NR sidelink mode 1 dynamic scheduling supports allocation of SL time-frequency repetition patterns (TFRP)s indicating the time/frequency locations of the repetitions for a given TB in DCI and SCI.
Proposal 2: TFRPs are configured via RRC for type-1 configured grant and indicated in DCI for configured grant type 2.
Proposal 3: For configured grant type-1, Rx UE is configured through RRC signaling from gNB and no SCI is transmitted from Tx UE
Proposal 4: For configured grant type-2, Rx UE is configured through RRC signaling from gNB and activation/deactivation SCIs indicating the contents of activation/deactivation DCI are sent from Tx UE
Proposal 5: Multiple configurations of SL configured grants are supported for UEs operating under mode 1.
Proposal 6: To maintain reliable SL transmissions when a UE experiences RRC connection interruption, gNB provides a configuration allowing use of current configured grant(s) until a configured threshold (on e.g. time) is reached, irrespective of whether the UE switches its SL mode of operation.
Proposal 7: In addition to assigning resource pools to multiple UEs within a given area, geographic zones for NR SL are designed to allow:
- Spatial re-use for UEs that are sufficiently far apart;
- Assigning resources to UEs based on UE motion

Proposal 8: UEs may report measurements, or information derived from such measurements (e.g., preferred resources), to support sidelink scheduler.
Proposal 9: UE may report to gNB information on its ability to suppress interference to/from other UEs, to assist gNB scheduling.
Proposal 10: Configuration of resource pools based on e.g. direction or speed of travel of UEs that use the pool is supported.
Observation 1: Switching from Mode 1 to Mode 2 sidelink operation due to short-term interruptions in RRC connectivity can impact the performance of advanced V2X use cases.
Observation 2: Procedures for switching among resource allocation modes, or simultaneous usage of them, need to account for maintaining the QoS needed by ongoing services for a UE.
Observation 3: UE motion may adversely impact the performance of sidelink resource allocation.

Decision: The document is noted.

R1-1905422 NR Sidelink Resource Allocation Mechanism Mode 1 NTT DOCOMO, INC.

- Proposal 1: Support multiple configured grants based operation for NR SL mode 1.
- Observation 1: Multiple configured grant(s) configuration and (de)activation, were/will be discussed in URLLC session for Uu interface, and similar mechanism can be reused for SL multiple configured grant(s) based operation.
- Proposal 2: Specification impact of LTE Uu to scheduling NR sidelink is up to RAN2 discussion.
- Proposal 3: SR configuration for SL and UL should be distinguished, and the detail is up to RAN2 discussion.
- Proposal 4: A common SR/BSR procedure should be used, when TX UE request resource(s) for either initial TB transmission or TB retransmission.
- Proposal 5: RAN1 further discuss to enable RX UE to feedback HARQ ACK/NACK to gNB.
- Observation 2: To request sidelink CSI report, it seems that the following are feasible solutions:
  - DCI transmitting to RX UE to request SL CSI reporting.
  - DCI transmitting to TX UE to request SL CSI reporting, and TX UE further forwards the CSI request to RX UE.
- Proposal 6: Support resource preemption mechanism in PHY layer to enable low latency packet transmission.

Decision: The document is noted.

R1-1905476 **Uu-based sidelink resource allocation** **Ericsson**

- Observation 1: The use of consecutive repetitions (like in PDSCH or PUSCH) leads to severe half duplex issues.
- Observation 2: LTE Uu delivers type-1 grant to NR mode-1 UEs through RRC signaling. Details are up to RAN2.
- Observation 3: From RAN1 point of view, no further work is required for having control of NR mode-1 UEs over LTE Uu.
- Proposal 1 Dynamic sidelink grants are valid for K retransmissions of a TB, equally spaced in time.
  - K and the spacing between repetitions are signaled in SCI
- Proposal 2 A new DCI format is introduced to convey dynamic sidelink grants.
- Proposal 3 The size of the new DCI format is the same as one of the existing DCI formats. A new RNTI is used for scrambling the new DCI format.
- Proposal 4 A UE may use the transmission opportunities in a configured grant for different TBs or for retransmission of a TB.
- Proposal 5 For sidelink configured grant type-1 and grant type-2, the gNB provides:
  - Time-frequency resources (time and frequency allocation, periodicity, offset, etc.) to be used by the UE for transmission.
    - The UE shall not transmit if it does not have data to transmit or if the grant cannot accommodate the TB.
  - Optionally, ranges of values for other parameters (e.g., MCS, number of layers, etc.) from which the UE can autonomously select one for each TB transmission.
- Proposal 6 NR sidelink supports having multiple simultaneously configured grants for sidelink. Corresponding identifying fields are introduced in DCI (for type-2 only) and RRC.
- Proposal 7 For sidelink configured grant type-1 and grant type-2, the following periodicities are supported: {1, 2, 5, 10, 20, 50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000} ms.
- Proposal 8 The DCI format used for providing sidelink dynamic grants is also used for activation of type-2 sidelink configured grants but scrambled with a different RNTI.
  - Zero-padding is used to align the size of DCI carrying dynamic grants and configured grants type-2.
- Proposal 9 A field in DCI identifies the type-2 configured grant that is activated/deactivated.
- Proposal 10 Each DCI schedules a single SL type-2 configured grant.

Decision: The document is noted.

Monday conclusion: Continue offline discussion – Ricardo (Ericsson)

Thursday

R1-1905834 **Feature lead summary#2 on Resource allocation for NR sidelink. Mode 1** **Ericsson**

Decision: The document is noted. Revisit the issue 2.4 as in R1-1905834 in RAN1#97.

Agreements:

- A dynamic grant provides resources for one or multiple sidelink transmissions of a single TB.
- A configured grant (type-1, type-2) provides a set of resources in a periodic manner for multiple sidelink transmissions.
  - UE decides which TB to transmit in each of the occasions indicated by a given configured grant.
  - FFS: whether different transmissions of a TB can take place across multiple configured grants.
  - Other restrictions on what can be transmitted in a given configured grant (e.g., based on QoS, destination UE, etc.) are up to RAN2.

R1-1903947 Sidelink resource allocation mode 2 for NR V2X Huawei, HiSilicon
R1-1904073 Discussion on mode 1 resource allocation mechanism vivo
R1-1904295 Network controlled sidelink resource allocation design for NR V2X communication Intel Corporation
R1-1904329 Resource Allocation for Mode 1 NR V2X Fraunhofer HHI, Fraunhofer IIS
R1-1904420 On Resource Allocation for NR V2X Mode 1 Samsung
R1-1904493 On NR SL mode-1 resource allocation MediaTek Inc.
R1-1904576 Discussion on resource allocation for NR sidelink Mode 1 Lenovo, Motorola Mobility
R1-1904653 Mode 1 resource allocation mechanism for NR sidelink NEC
R1-1904679 Discussion on Mode 1 Resource Allocation ASUSTEK COMPUTER (SHANGHAI)
R1-1904795 Discussion on NR sidelink mode 1 resource allocation Spreadtrum Communications
R1-1904806 Resource allocation for NR sidelink Mode 1 TCL Communication Ltd.

R1-1904918 Mode 1 resource allocation for NR SL OPPO
R1-1905076 NR Sidelink Resource Allocations using Mode 1 ITRI
R1-1905333 Discussion of Resource allocation for sidelink - Mode 1 Nokia, Nokia Shanghai Bell
R1-1905341 Mode 1 resource allocation schemes on sidelink ZTE, Sanechips
R1-1905352 Discussion on resource allocation mechanism for sidelink Mode 1 in NR V2X CATT
R1-1905392 Resource allocation mode 1 for NR sidelink Sharp
R1-1905401 NR Sidelink Resource Allocation for Mode 1 InterDigital, Inc.
R1-1905438 Discussion on resource allocation for NR sidelink Mode 1 LG Electronics

7.2.4.2.2 Mode 2

R1-1904074 Discussion on mode 2 resource allocation mechanism vivo

- Observation 1: Cross-slot scheduling/reservation is beneficial for dynamic resource reservation to reduce collision in NR V2X.
- Observation 2: Counter based resource allocation can be used for aperiodic traffic in NR V2X.
- Observation 3: RSRP and RSSI measurement can be used to identify the occupied resource in counter-based resource allocation in NR V2X.
- Observation 4: QoS requirement (e.g. latency, reliability, etc.) of the packet can be considered for generation of some parameters for counter based resource allocation, such as the counter value, RSRP/RSSI threshold, etc.
- Observation 5: The average PRR of one-shot transmission is better than that of counter based resource allocation.
- Proposal 1: Multi-slot scheduling should be supported in NR V2X.
- Proposal 2: Rate-matching is performed if partial aggregated resource collides with the reserved resource of another UE.
- Proposal 3: Transmission type of unicast, groupcast and broadcast should be taken into consideration for resource reservation.
- Proposal 4: NR V2X should support resource pre-emption mechanism to guarantee the low latency or high priority packet transmission.
- Proposal 5: Priority and resource allocation information should be included in SCI to identify the occupied resource.
- Proposal 6: One-shot transmission with resource reservation is supported in NR V2X.
- Proposal 7: The aggregation level of slots should be indicated in the SCI for identification of occupied resource in semi-static resource allocation.
- Proposal 8: UE could perform dynamic resource allocation when the next reserved transmission occasion cannot meet the QoS requirement.
- Proposal 9: Receiver based sensing and resource selection scheme is supported in NR V2X.
- Proposal 10: For receiver-based resource allocation, mechanisms should be supported for sending the resource assignment from receiver to transmitter.
- Proposal 11: For receiver-based resource allocation, mechanism should be supported for sending the service request from the transmitter to the receiver/scheduling UE.
- Proposal 12: The UE autonomous resource selection mechanism can be reused for receiver-based scheme to support periodic traffic.
- Proposal 13: In receiver-based scheme for aperiodic traffic, additional candidate selection can be applied at the transmitter, and cross-slot reservation/scheduling can also be considered.

Decision: The document is noted.

R1-1905342 Mode 2 Resource allocation schemes on sidelink ZTE, Sanechips

- Observation 1: TFRP may introduce restriction on sidelink resource utilization.
- Observation 2: Retransmission rules must be defined together with TFRP in order to obtain the half-duplex benefit.
- Observation 3: Using TFRP based resource selecting on sidelink shows no performance improvement.
- Proposal 1: For mode 2 resource reservation, initial transmission resource reservation is supported.
- Proposal 2: SL-RSSI should be used while SCI in not decoded.
- Proposal 3: It is suggested to reuse legacy sidelink resource selection principle as the baseline.
- Proposal 4: For sidelink resource allocation, TFRP is not supported.

Decision: The document is noted.

R1-1905375 Geographic Information based Dynamic TFRP Resource Selection Procedure in NR-V2X Fujitsu

- Observation-1: The geographic information based dynamic TFRP scheme can provide the very reliable resource selection, and fulfill the stringent requirement in terms of PRR and latency.
- Proposal-1: Each UE broadcasts its geographic information, for the purposes of group forming, communication range based ACK/NAK feedback, and so forth.

- Proposal-2: Introduce a new parameter V-LID, whereby UE-ID and TFRP can be one by one linked for dynamic TFRP resource mapping.
- Proposal-3: Separate the TFRP resources into two types; the mandatory resource, and the optional resource. Both TFRP resources are flexibly controlled by each UE, to overcome the UE initialization and the transmission with large size packet.
- Proposal-4: Introduce two mapping tables in each UE, one is TABLE_sci, acquired by sensing mechanism within the communication range, and the other is TABLE_ref, updated between V-LID (or TFRP) and UE-ID, based on the location information. The correlation between two tables is implemented in each UE to find out the best TFRP resource for each UE.

Decision: The document is noted.

Monday conclusion: Continue discussion offline – Sergey (Intel)

Tuesday session

R1-1905717 Summary for AI 7.2.4.2.2 Mode-2 Resource Allocation Intel Corporation

Decision: The document is noted.

Proposal for a working assumption

- NR V2X Mode-2 supports resource reservation for a PSSCH feedback-based HARQ retransmission
  - FFS how to handle reserved but unused resources, if any

Proposals:

- NR V2X supports at least an initial transmission of a TB without reservation at least for aperiodic traffic
  - It is also supported to use this mechanism for every TB
- NR V2X supports reservation of a sidelink resource for an initial transmission of a TB at least for periodic traffic
  - Support at least the reservation of an initial transmission by an SCI scheduling other TB

R1-1905009 Sidelink Resource Allocation Mechanism for NR V2X Qualcomm Incorporated
R1-1905477 Resource allocation for Mode-2 transmissions Ericsson

Thursday (from offline)

Agreements:

- NR V2X supports an initial transmission of a TB without reservation, based on sensing and resource selection procedure
- NR V2X supports reservation of a sidelink resource for an initial transmission of a TB at least by an SCI associated with a different TB, based on sensing and resource selection procedure
  - This functionality can be enabled/disabled by (pre-)configuration
- FFS Standalone PSCCH transmissions for resource reservations are supported in NR V2X

R1-1904256 Discussion on NR V2X mode 2 resource allocation Sony
R1-1904296 Sidelink resource allocation design for NR V2X communication Intel Corporation
R1-1904330 Resource Allocation for Mode 2 NR V2X Fraunhofer HHI, Fraunhofer IIS
R1-1904421 On Resource Allocation for NR V2X Mode 2 Samsung
R1-1904494 On sidelink resource allocation mechanism MediaTek Inc.
R1-1904577 Discussion on resource allocation for NR sidelink Mode 2 Lenovo, Motorola Mobility
R1-1904654 Mode 2 resource allocation mechanism for NR sidelink NEC
R1-1904666 Discussion on NR V2X Sidelink Retransmission ETRI
R1-1904729 Discussion on sidelink resource allocation mechanism CMCC
R1-1904796 Discussion on NR sidelink mode 2 resource allocation Spreadtrum Communications
R1-1904807 Resource allocation for NR sidelink Mode 2 TCL Communication Ltd.
R1-1904821 Resource Allocation Mode 2 Mechanism Kyocera
R1-1904922 Support of mode 2a resource allocation for NR-V2XOPPO
R1-1904975 Considerations on NR V2X mode 2 resource allocation mechanism Apple Inc.
R1-1905072 Discussion on sidelink resource allocation Asia Pacific Telecom co. Ltd
R1-1905077 Discussion on NR Sidelink Resource Allocation for Mode 2 ITRI

R1-1905084 Discussion on Mode 2 resource allocation in NR V2X ASUSTEK COMPUTER (SHANGHAI)
R1-1905155 Consideration on Mode 2 resource allocation for NR sidelink KT Corp.
R1-1905334 Discussion of Resource allocation for sidelink - Mode 2 Nokia, Nokia Shanghai Bell
R1-1905353 Discussion on resource allocation mechanism for sidelink Mode 2 in NR V2X CATT
R1-1905381 Discussion on resource allocation mechanism of mode 2 in NR V2X Panasonic
R1-1905393 Resource allocation mode 2 for NR sidelink Sharp
R1-1905402 NR Sidelink Resource Allocation Mechanism for Mode 2 InterDigital, Inc.
R1-1905413 On Mode 2 resource allocation of V2x communications Xiaomi Communications
R1-1905423 NR Sidelink Resource Allocation Mechanism Mode 2 NTT DOCOMO, INC.
R1-1905439 Discussion on resource allocation for NR sidelink Mode 2 LG Electronics

7.2.4.2.3 Other

Including transmitter UE operation of simultaneous configuration of Mode 1 and Mode 2 for a UE (this is to be discussed after the design of mode 1 only and mode 2 only)

R1-1904422 System Level Evaluations for NR V2X Sidelink Resource Allocation Samsung
R1-1904423 Considerations on Channel Structures in Sensing Slots for NR V2X Sidelink Samsung
R1-1905343 Simulation of mode 2 Resource allocation schemes ZTE, Sanechips
R1-1905376 Discussion on Reservation and Sensing based Resource Selection Methods for NR-V2X Sidelink Communication Fujitsu
R1-1905377 Dynamic Sidelink Bi-mode Transmission under gNB Configuration Fujitsu
R1-1905440 Discussion on simultaneous configuration of Mode 1 and Mode 2 for a UE LG Electronics
R1-1905450 Details of LTE Uu configuration of NR sidelink Huawei, HiSilicon
R1-1905490 On SCI and SFCI formats Ericsson
R1-1905491 Pre-emption in resource allocation Ericsson
R1-1905492 On Mode-1 HARQ indication to gNB Ericsson
R1-1905499 Detailed system-level evaluation results Ericsson
Withdrawn
R1-1905502 UE reports for NR V2X Ericsson
R1-1905898 Simultaneous Mode 1 and Mode 2 operation for NR sidelink Huawei, HiSilicon

7.2.4.3 Sidelink synchronization mechanism

R1-1904424 On Synchronization Mechanisms for NR V2X Samsung

- Proposal 1: RAN1 shall strive for a unified S-SSB block structure for FR1 and FR2. For FR1, single S-SSB with configurable time-domain location within a period shall be supported.
- Proposal 2: Each S-SSB should contain 2 symbols mapped for S-PSS and 2 symbols mapped for S-SSS, and the BW of S-SSB and the number of symbols for S-SSB shall be determined based on the performance of PSBCH.
- Proposal 3: NR V2X shall support 336 sidelink synchronization IDs, wherein the IDs are divided into three sets (X+Y+Z=336):
  - X IDs are used for in-coverage UEs
  - Y IDs are used for out-of-coverage UEs;
  - Z IDs are used for UEs synchronized to GNSS;
  - FFS: values of X, Y and Z.
- Proposal 4: The number of sequences for S-SSS is same as the number of sidelink synchronization IDs, and the sequences for generating S-SSS can be down-selected from the sequences for generating NR Rel-15 SSS.
- Proposal 5: The number of sequence for S-PSS is 1.
- Proposal 6: The length of sequence for S-PSS and S-SSS is 127, as in NR Rel-15.
- Proposal 7: The sequence of S-PSS shall to be designed to have low cross-correlation with the sequences of NR Rel-15 PSS and SSS, and the following alternatives can be considered:
  - Alt 1: Using the same polynomial of generator as in NR Rel-15 PSS and different cyclic shift.
  - Alt 2: Using a different polynomial of generator from NR Rel-15 PSS.
- Proposal 8: NR V2X shall target for one-shot decoding of PSBCH and the coding rate shall target for around 0.02 to 0.03.
- Proposal 9: NR V2X synchronization procedure should take into account V2X operation scenarios.
- Observation 2: In NR V2X under DC environments, interference can be reduced if master node can configure the type of the synchronization reference that UE has to follow and the corresponding parameters to be used for S-SSB transmission.

- Observation 3: In NR V2X under DC environments, the coverage of the S-SSB can be increased if master node configures the type of the synchronization reference that UE has to follow and the corresponding parameters to be used for S-SSB transmission.
- Proposal 10: The synchronization priority between eNB and gNB is (pre-)configured.
- Proposal 11: Whether or not for V2X UE to use a sidelink RS for synchronization purpose is left to UE implementation.

Decision: The document is noted. Further revised in R1-1905824.

R1-1905010 **Synchronization design for NR V2X** **Qualcomm Incorporated**

- Proposal 1: NR sidelink SSB has a bandwidth of 11 RBs.
- Proposal 2: S-PSS is transmitted on two consecutive OFDM symbols, S-SSS is transmitted on two separated OFDM symbols.
- Proposal 3a: NR S-PSS sequences are orthogonal to NR Uu PSS sequences.
- Proposal 3b: NR SLSS has 336 IDs, the combination of {2 S-PSS candidates + 168 S-SSS IDs} is preferred.
- Proposal 4: Revaluate the time/frequency error requirements for NR V2X data/control and synchronization signal transmissions.
- Proposal 5a: Introduce non-SLSS based synchronization enhancements.
- Proposal 5b: To support non-SLSS based synchronization, UE transmits its GNSS coverage state in (e.g. in MAC header or in control information) of its data/control transmission.
- Proposal 6: Introduce reduced complexity synchronous-SLSS based synchronization enhancements (with reduced search window for SyncRef UEs).
- Observation 1: Specification impact to support reduced-complexity synchronization procedures (non-SLSS based synchronization and synchronous-SLSS based synchronization) is expected to be quite low.
- Observation 2: The reduced-complexity synchronization procedures would supplement the SLSS-based synchronization and their support is expected be up to UE capability.
- Observation 3: Simulation results indicate significant advantage of reduced-complexity synchronization procedures (non-SLSS based and synchronous-SLSS based synchronization) in terms of system synchronization performance (average fraction of packets dropped) as compared GNSS-only synchronization.
- Observation 4: Reduced-complexity synchronization procedures promises to yield most of the synchronization benefits of fully asynchronous SLSS-assisted synchronization, while at significantly lower UE complexity of implementation.

Decision: The document is noted.

R1-1905078 **On Sidelink Synchronization Issues and Mechanisms for NR V2X** **ITRI**

- Proposal 1: The working assumption for the synchronization source priority table for GNSS-based synchronization and gNB/eNB-based synchronization is confirmed.
- Proposal 2: The synchronization source priority table for GNSS–based synchronization should be used if the UE detects no gNB/eNB in a carrier which is (pre-)configured as the carrier which potentially includes gNBs/eNBs used as sync reference.
- Proposal 3: The synchronization source priority table for gNB/eNB-based synchronization should be used if the UE detects an gNB/eNB in a carrier which is (pre-)configured as the carrier which potentially includes gNBs/eNBs used as sync reference.
- Proposal 4: The reference with the largest received signal strength can be selected when there are two or more references of a same priority to be selected as the highest priority.
- Proposal 5: The sequence types for NR-PSS and NR-SSS are agreed to be reused to that for S-PSS and S-SSS in NR V2X. However, some parameters, including the number of sequences, the values of cyclic shift and so on, should be revised for S-PSS and S-SSS in order to meet the purposes and requirements for NR V2X, where the details are FFS.
- Proposal 6: The content of PSBCH for NR V2X are FFS.
- Proposal 7: In the design of S-SSB, adoption of larger subcarrier spacing should be considered in the cases of high UE speed & high carrier frequency to alleviate inter-carrier interference due to Doppler effect for NR V2X.
- Proposal 8: Based on comparable effective SNR for total 4 combinations agreed in last RAN1 meeting, the total energy per SSB should be half in combination 2, compared to that in the other three combinations
- Proposal 9: For Sidelink RS based synchronization, the adopted RS can be DM RS or other RS as long as the length of the RS is large enough. Besides, in order to reduce specification impact, no new RS is supported and the Sidelink RS based synchronization procedure is achieved by UE implementation.
- Proposal 10: For a case that NR V2X UEs located in different cells transmit SLSS/PSBCH with different subcarrier spacing, or in-coverage NR V2X UEs and out-of-coverage NR V2X UEs transmit SLSS/PSBCH with different subcarrier spacing, a new synchronization mechanism should be considered for NR V2X. The details are FFS.

Decision: The document is noted.

Monday conclusion: Continue offline discussion – Teng (CATT)

Tuesday session

R1-1905623 **Feature lead summary on AI 7.2.4.3 Sidelink synchronization mechanism CATT**

Decision: The document is noted.

Agreements:

- RAN1 will consider the design of NR SLSS where
  - S-PSS of LTE and NR candidates have similar PAPR.
  - S-SSS of LTE and NR candidates have similar PAPR.
  - SLSS design should take into consideration PAPR difference between S-PSS and S-SSS.

Agreements:

- In NR V2X, S-SSB bandwidth is 11RBs.
  - PSBCH spans 11RBs.
- The S-SSB is designed following combination 1.
  - Length-127 M-sequences for S-PSS and length-127 Gold sequences for S-SSS
  - Two symbols are used for each of S-PSS and S-SSS, respectively.

Proposal:

- The number of NR V2X SSID is 336.

R1-1905723 **Evaluation on number of SSID Huawei**

Decision: The document is noted.

Agreement:

- For the evaluation of PSBCH performance, the payload size of NR V2X PSBCH is 56 bits including 24 bits of CRC.

R1-1903946 Sidelink synchronization mechanisms for NR V2X Huawei, HiSilicon
R1-1904075 Sidelink synchronization mechanism vivo
R1-1904297 Sidelink synchronization design for NR V2X communication Intel Corporation
R1-1904495 Discussion on sidelink based synchronization mechanism MediaTek Inc.
R1-1904655 Synchronization mechanism for NR sidelink NEC
R1-1904667 Discussion on NR V2X sidelink synchronization ETRI
R1-1904792 Discussion on synchronization mechanism for NR V2X Spreadtrum Communications
R1-1904808 Sidelink synchronization mechanism TCL Communication Ltd.
R1-1904816 Discussion on synchronization mechanism in NR V2X ZTE, Sanechips
R1-1904919 Discussion of synchronization mechanism for NR-V2X OPPO
R1-1904976 Considerations on NR V2X synchronization mechanism Apple Inc.
R1-1905124 Discussion on sidelink synchronization mechanism for NR V2X ITL
R1-1905257 On synchronization procedures for NR V2X sidelink Mitsubishi Electric RCE
R1-1905335 Discussion of Sidelink synchronization mechanism Nokia, Nokia Shanghai Bell
R1-1905354 On design and evaluation of S-SSB for NR V2X Sidelink CATT
R1-1905387 Sidelink synchronization mechanism for NR V2X Sequans Communications
R1-1905394 Synchronization mechanism for NR sidelink Sharp
R1-1905403 Synchronization Signals Evaluations and Procedures for NR V2X Sidelink InterDigital, Inc.
R1-1905414 On Synchronization for 5G V2X Xiaomi Communications
R1-1905424 NR Sidelink Synchronization Mechanism NTT DOCOMO, INC.
R1-1905441 Discussion on NR sidelink synchronization mechanism LG Electronics
R1-1905478 On Synchronization procedures for V2X Ericsson

7.2.4.4 In-device coexistence between LTE and NR sidelinks

R1-1904496 **In-device coexistence of NR V2X and LTE V2X MediaTek Inc.**

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- Observation 1: LTE V2X is estimated to be active approximately about 1-3% of the time, minimum required NR sidelink latency performance can be achievable by long-term TDM with proper LTE sidelink resource configuration.
- Observation 2: No need for short term time scale TDM for coexistence of periodic LTE V2X traffic and periodic NR V2X traffic.
- Observation 3: Coexistence of aperiodic LTE V2X traffic with aperiodic NR V2X traffic is not feasible for short-term TDM due to dynamic resource selection/configuration.
- Observation 4: Coexistence issue with aperiodic LTE V2X traffic can be avoided if selected/configured resources for periodic NR V2X traffic are readily available at the LTE module.
- Observation 5: It is feasible to drop aperiodic NR V2X packet to prioritize periodic/semi-static LTE traffic in most Tx-Tx and Tx-Rx scenarios.
- Proposal 1: Minimum achievable latency performance by long-term time-scale TDM needs to be understood in NR sidelink when LTE resources are configured sporadically in time.
- Proposal 2: UE should not be required to process either packet when the packets collide due to network misconfiguration in long-term TDM. It can be up to UE implementation to process either packet when feasible.
- Proposal 3: Always prioritize periodic/semi-static LTE V2X packets over aperiodic NR V2X packets in Tx-Tx, Tx-Rx, and Rx-Tx cases with short-term TDM.
- Proposal 4: The Rx-Rx in-device coexistence issue is left to UE implementation.
- Proposal 5: Support network assistance indication messages that allow UEs to inform the network after a packet collision occur due to in-device coexistence of LTE-V2X and NR-V2X.
- Proposal 6: Indication message sent by an in-coverage UE to gNB should provide information on collision type and affected packet traffic.
    - Exact message content FFS.

Decision: The document is noted.

R1-1905336 **Discussion of In-device coexistence between LTE and NR sidelinks** **Nokia, Nokia Shanghai Bell**

- Proposal 1: The achievable accuracy of subframe boundary alignment in case of GNSS based and network based synchronization is studied. RAN4 may be better group to study this issue.
- Proposal 2: Study further how common priority level definition between NR SL and LTE SL transmissions should be specified.
- Proposal 3: For inter-band FDM operation semi-static configuration of maximum TX power of each NR SL carrier is supported.

Decision: The document is noted.

R1-1905442 **Discussion on in-device coexistence between LTE and NR sidelinks** **LG Electronics, General Motors, Volkswagen AG**

- Observation: SA2 WG agreed that V2X layer provides QoS parameter (e.g., priority) for each traffic/packet to AS layer. One of purposes for this operation is to enable for AS layer to compare different RAT traffics/packets in terms of priority.
- Proposal 1: To handle TX/TX overlap in short term TDM solutions, higher layer provided priority information for each RAT traffic/packet is used to decide which RAT TX is prioritized (e.g., traffic/packet TX with lower priority is omitted).
- Proposal 2: To handle TX/RX overlap in short term TDM solutions, if a UE can know the priority information of receiving RAT traffic/packet (e.g., by successfully decoding QoS field in SCI), the priority information of receiving and transmitting RAT traffics/packets is used to decide which RAT RX or RAT TX is prioritized (e.g., traffic/packet TX or RX with lower priority is omitted).

Decision: The document is noted.

Monday conclusion: Continue discussion offline – Arjun (Qualcomm)

Thursday session

R1-1905722 **Summary of Coexistence Aspects in NR-V2X** **Qualcomm**

Decision: The document is noted.

Conclusion:

- RAN1 does not see any specification impact for support of Long Term Time-Scale TDM for coexistence of NR and LTE sidelinks

Working assumption:

- For Tx/Tx overlap,

- If packet priorities of both LTE and NR sidelink transmissions are known to both RATs prior to time of transmission subject to processing time restriction, then the packet with a higher relative priority is transmitted
  - In case the priorities of LTE and NR SL transmissions are the same, then it is up to UE implementation as to which transmission is chosen (e.g., taking into account congestion, etc.)
- If packet priorities of both LTE and NR sidelink transmissions are not known to both RATs prior to time of transmission subject to processing time restriction, then it is up to UE implementation to manage Tx/Tx overlaps (e.g., LTE transmissions are always prioritized, etc.)
- RAN1 does not assume any impact to LTE physical layer specifications

R1-1903953	In-device coexistence between LTE and NR sidelinks	Huawei, HiSilicon
R1-1904076	In-device coexistence between NR and LTE sidelinks	vivo
R1-1904298	In-device coexistence for LTE V2X and NR V2X sidelink communication	Intel Corporation
R1-1904425	On Coexistence between LTE and NR PC5	Samsung
R1-1904578	In-device coexistence between LTE and NR sidelinks	Lenovo, Motorola Mobility
R1-1904657	Discussion the prioritization between NR and LTE sidelinks	NEC
R1-1904923	Discussions on NR and LTE V2X in-device coexistence	OPPO
R1-1905011	Co-existence aspects for NR-V2X and LTE-V2X	Qualcomm Incorporated
R1-1905344	In-device coexistence between NR V2X and LTE V2X	ZTE, Sanechips
R1-1905355	Discussion on in-device coexistence of LTE and NR sidelink in NR V2X	CATT
R1-1905404	In-device Coexistence of LTE and NR V2X Sidelinks	InterDigital, Inc.
R1-1905479	In-device coexistence between LTE and NR sidelinks	Ericsson

7.2.4.5 Physical layer procedures for sidelink

Including HARQ, CSI acquisition for unicast, and power control

R1-1905012 Physical layer procedures for sidelibk Qualcomm Incorporated

- Proposal 1: Confirm the working assumption that both options i.e. NACK only and ACK/NACK options are supported.
- Proposal 2: Specify the Rel-14 LTE-V2X Zone ID concept to put UE location information in the SCI to assist distance based NACK feedback.
- Proposal 2b: Zone size should be pre-configured to all UEs.
- Proposal 2c: LSB (10bits) of zone IDs are transmitted in SCI.
- Proposal 3: Minimum communication range is transmitted in SCI to assist distance based NACK feedback.
- Proposal 3b: 5 bits are sufficient to represent minimum communication range which can be represented in either number of zones or configured quantised steps of meters.
- Proposal 4: Single SCI format is defined for TX-RX distance and/or RSRP based HARQ feedback.
- Proposal 4b: System wide RRC pre-configuration parameter indicate if the "minimum communication range" field is interpreted as distance or RSRP value.
- Proposal 4c: TX-RX distance and RSRP are not required to be transmitted together in SCI. Only TX-RX distance is transmitted in SCI and RSRP can be RRC configured parameter if both TX-RX distance and RSRP are used together to decide HARQ feedback transmission.
- Proposal 5: No need to over optimise the system for the case of DTX as UEs can always get benefitted by retransmissions cause by NACK feedback from some other UE in the group.
- Proposal 6: No need to handle destructive channel sum effect of HARQ-NACK transmission from multiple UEs.
- Proposal 7: Frame structure as shown in Figure 2 and 3 (System Wide HARQ feedback resources) are used for HARQ feedback transmissions.
- Proposal 7b: Frame structure as shown in Figure 2 and 3 (System Wide HARQ feedback resources) is applicable for both NACK only and ACK/NACK HARQ feedback for groupcast.
- Proposal 8: Layer-1 destination ID is derived from L2 destination ID by selecting a fixed (8bits) number of LSBs
- Proposal 9: Layer-1 Source ID is included as part of PSCCH is derived from the L2 Source ID by selecting a fixed number (8 bits) of LSBs
- Proposal 10: Specify a joint CQI/RI table in the specification. RX UE sends index of this table to TX UE in PSSCH.
- Proposal 11: Introduce support for a mechanism to disable HARQ operation for both groupcast and unicast traffic if the channel congestion level.

Decision: The document is noted.

R1-1905405 On Physical Layer Procedures for NR V2X Sidelink InterDigital, Inc.

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- Proposal 1: Confirm the working assumption of supporting both options of HARQ schemes (i.e., HARQ-NACK and HARQ-ACK/NACK) for sidelink groupcast.
- Proposal 2: The HARQ-ACK/NACK scheme is used for small group size, low congested channel condition and high reliable data service, while the HARQ-NACK scheme is used otherwise.
- Proposal 3: A UE can skip decoding PSSCH for retransmission if the UE received previous PSSCH successfully in groupcast and no HARQ-ACK feedback for the retransmission.
- Proposal 4: RSRP is not solely used to dynamically determine HARQ feedback in sidelink groupcast.
- Proposal 5: RAN1 to support dynamic disabling of HARQ feedback for NR V2X sidelink unicast and groupcast, based on data QoS or channel congestion condition.
- Proposal 6: The (pre-)configuration of sidelink HARQ feedback timing depends on data QoS or UE capability.
- Proposal 7: The layer-1 destination (group) ID and source ID are derived from layer-2 destination (group) ID and source ID, respectively.
- Proposal 8: The layer-1 source ID should be large enough (e.g., 16 bits) to avoid ID collison .
- Proposal 9: The layer-1 source ID, HARQ process ID, NDI and RV should not be contained in SCI for sidelink broadcast or sidelink unicast/groupcast where HARQ feedback is disabled.
- Proposal 10: CBG-based HARQ scheme can be considered at least for NR V2X sidelink unicast.
- Proposal 11: The mechanism of transmitter UE reserving HARQ feedback resources should be supported in NR sidelink.
- Proposal 12: confirm the working assumption for the parts of no subband-based CSI reporting and enable/disable of CSI reporting.
- Proposal 13: based on the outcome of RLM measurement for AS link management support, no support of periodic CSI reporting can be confirmed.
- Proposal 14: a minimum set of configuration from NR Uu CSI framework can be specified for V2X unicast.
- Proposal 15: Sidelink CSI measurement RS (S-CSI-RS) and sidelink CSI interference measurement resource (S-CSI-IM) are used independently from PSSCH DM-RS.
- Proposal 16: Transmission schemes should be specified for rank-1 and rank-2 for CQI/RI calculation.
- Proposal 17: Antenna virtualization is up to UE implementation when a number of antennas implemented is larger than 2Tx.
- Proposal 18: DM-RS of PSSCH is used for SL-RSRP measurement for OLPC.
- Proposal 19: Open-loop power control based on sidelink pathloss should be supported for NR V2X groupcast.

Decision: The document is noted.

R1-1905443 **Discussion on physical layer procedure for NR sidelink** **LG Electronics**

- Observation 1: To avoid the resource collision in SL HARQ feedback transmission, it could be beneficial if the time/frequency location of PSFCH is correlated with the corresponding PSSCH transmission.
- Observation 2: Considering dynamic groupcast operation and PSFCH resource overhead (e.g., vehicle platoon consisting of up to 20 UEs shall be supported according to TS 22.186), only NACK based SL HARQ feedback could be beneficial.
- Observation 3: It is necessary to clarify how PSFCH resources for HARQ feedback for groupcast are configured in an upper layer in terms of related procedure, link management between UEs within a group.
- Observation 4: For only NACK based SL HARQ feedback (i.e., Option 1) in groupcast,
- Randomized sequence selection per receiver UE could be beneficial to mitigate the destructive channel sum effect of HARQ-NACK transmissions from multiple receiver UEs.
- Using null resource element could be beneficial to determine the presence of HARQ NACK transmissions from receiver UEs.
- Observation 5: TX-RX distance based SL HARQ feedback would be supported using the same physical layer procedure if the necessary information is provided in Layer-1 ID(s) included in SCI.
- Observation 6: For accurate channel measurement and/or interference measurement, it would be beneficial that UE receiving SL-CSI-RS knows the transmit power of the SL-CSI-RS.
- Observation 7: When OLPC based on DL PL between TX UE and gNB is enabled, SL TX power values among TX UEs with different distance from gNB can be different. This may lead to SL performance degradation due to in-band emission problem.
- Observation 8: When UE transmit power is limited, PSD boosting for PSCCH can be beneficial for coverage at the expense of high specification works.
- Proposal 1: In PSFCH TX slot, at least implicit mechanism for determining the frequency-domain and/or code-domain resource of PSFCH is supported by using at least slot where the associated PSSCH is transmitted and/or sub-channel(s) where the associated PSSCH is mapped on.
  - FFS details on implicit mapping rule.
- Proposal 2: Within a resource pool, it is not expected that PSFCH and PSSCH are FDMed in the same set of symbols.

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- Proposal 3: Confirm the following WA with LS to RAN2:
  - Working assumption:
    - When HARQ feedback is enabled for groupcast, support (options as identified in RAN1#95):
      - Option 1: Receiver UE transmits only HARQ NACK
      - Option 2: Receiver UE transmits HARQ ACK/NACK
  - Send LS to RAN2 to inform the RAN1's status on HARQ feedback for groupcast.
- Proposal 4: Additional condition can be defined to enable and disable HARQ feedback. Such condition can include service type/requirement and congestion level.
- Proposal 5: RAN1 can send an LS to RAN2 to ask them to consider the possibility of supporting TX-RX distance based SL HARQ feedback using the physical layer procedure which decides the transmission of SL HARQ feedback based on Layer-1 ID(s) included in SCI.
- Proposal 6: For CQI/RI measurement, support aperiodic CSI-RS transmitted together with PSSCH. SCI indicate whether CSI-RS is included in PSSCH or not.
  - FFS: Details in SCI field(s) to be used for CSI-RS triggering.
- Proposal 7: For CQI/RI reporting, SCI can indicate whether PSSCH contains CQI/RI report.
- FFS: Details in SCI field(s) to be used to indicate content(s) of PSSCH.
- Proposal 8: At least for unicast, long-term measurement and feedback (e.g., RSRP, RSRQ) are supported for the purpose of e.g., AS level link management, QoS prediction, initial TX parameter setting.
- Proposal 9: At least for unicast, if the following two OLPC schemes are enabled simultaneously, in-coverage TX UE transmits at a power no larger than the calculated power (i.e., upper limit of SL TX power) by using OLPC 2.
  - OPLC 1: OLPC based on SL PL between TX UE and RX UE
  - OLPC 2: OLPC based on DL PL between TX UE and gNB
- Proposal 10: For SL pathloss estimation, down select one of following:
  - Option 1: UE transmitting RS for RSRP measurement performs higher layer filtering.
  - Option 2: UE receiving RS for RSRP measurement performs higher layer filtering.
- Proposal 11: For SL-CSI-RS transmission, down select one of followings:
  - Option 1: (Pre)configuration indicates the transmit power of SL-CSI-RS for CQI/RI measurement.
  - Option 2: UE indicate the instantaneous transmit power of SL-CSI-RS when SL-CSI-RS is transmitted.
- Proposal 12: Further study is necessary on how to handle SL TX power difference depending on the position of in-coverage TX UE (e.g., TX resource pool separation based on DL RSRP), when OLPC based on DL PL between TX UE and gNB is enabled.

Decision: The document is noted.

Monday conclusion: Continue discussion offline – Hanbyul (LGE)

Wednesday session

R1-1905624 **Feature lead summary for agenda item 7.2.4.5 Physical layer procedures for sidelink** **LG Electronics**

Decision: The document is noted.

Agreements:

- Confirm the following working assumption:
  - When HARQ feedback is enabled for groupcast, support (options as identified in RAN1#95):
    - Option 1: Receiver UE transmits only HARQ NACK
    - Option 2: Receiver UE transmits HARQ ACK/NACK
- Note: RAN1 has not concluded the respective applicability of option 1 vs. option 2 yet
- Send LS to RAN2 to inform RAN1's agreement on HARQ feedback for groupcast – draft LS to be prepared in R1-1905790 (Hanbyul, LGE)

Friday

Above working assumption is confirmed.

R1-1905790 **[Draft] LS on sidelink HARQ feedback for groupcast** **LG Electronics**

Decision: The draft LS is endorsed. Final LS is approved in R1-1905906.

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R1-1905892 **Feature lead summary#2 for agenda item 7.2.4.5 Physical layer procedures for sidelink** **LG Electronics**
Decision: The document is noted.

Agreements:
- In HARQ feedback for groupcast,
  - When Option 1 is used for a groupcast transmission, it is supported
    - all the receiver UEs share a PSFCH
    - FFS: a subset of the receiver UEs share a PSFCH
    - FFS: all or a subset of receiver UEs share a pool of PSFCH.
  - When Option 2 is used for a groupcast transmission, it is supported
    - each receiver UE uses a separate PSFCH for HARQ ACK/NACK.
    - FFS: all or a subset of receiver UEs share a PSFCH for ACK transmission and another PSFCH for NACK transmission
  - FFS on which entity and how to allocate PSFCH resource to the receiver UE(s)
  - FFS whether or not to additionally support a mixture of option 1 and option 2 for a groupcast transmission
- Note: Each PSFCH is mapped to a time, frequency, and code resource.

Working assumption:
- Regarding the use of TX-RX geographical distance and/or RSRP in determining whether to send HARQ feedback for groupcast
  - Support at least the use of TX-RX geographical distance
    - FFS whether or not to additionally use L1-RSRP
- Companies are encouraged to perform additional evaulations/analysis

Agreements:
- It is supported, in a resource pool, that within the slots associated with the resource pool, PSFCH resources can be (pre)configured periodically with a period of N slot(s)
  - N is configurable, with the following values
    - 1
    - At least one more value >1
      - FFS details
  - The configuration should also include the possibility of no resource for PSFCH. In this case, HARQ feedback for all transmissions in the resource pool is disabled
- HARQ feedback for transmissions in a resource pool can only be sent on PSFCH in the same resource pool

Agreements:
- Support at least Sidelink CSI-RS for CQI/RI measurement
  - Sidelink CSI-RS is confined within the PSSCH transmission

R1-1904299 **Design of physical layer procedures for NR V2X sidelink communication** **Intel Corporation**
R1-1904815 **Discussion on PHY procedures for sidelink** **ZTE, Sanechips**

R1-1903944 Sidelink physical layer procedures for NR V2X Huawei, HiSilicon
R1-1904077 Physical layer procedure for NR sidelink vivo
R1-1904257 Discussion on HARQ feedback for NR V2X communication Sony
R1-1904331 Physical Layer Procedures for NR V2X Fraunhofer HHI, Fraunhofer IIS
R1-1904426 On Physical Layer Procedures for NR V2X Samsung
R1-1904497 Discussion on V2X Physical layer procedure MediaTek Inc.
R1-1904579 Discussion on physical layer procedures for NR sidelink Lenovo, Motorola Mobility
R1-1904656 Physical layer procedures for NR sidelink NEC
R1-1904680 Discussion on sidelink physical layer procedure on NR V2X ASUSTEK COMPUTER (SHANGHAI)
R1-1904730 Discussion on HARQ feedback for NR V2X CMCC
R1-1904794 Discussion on physical layer procedures for sidelink Spreadtrum Communications

R1-1904809	Physical layer procedures for sidelink	TCL Communication Ltd.
R1-1904822	Physical Layer Procedures for CSI Acquisition in Unicast	Kyocera
R1-1904920	Physical layer procedure for NR-V2X sidelink	OPPO
R1-1904977	Considerations on NR V2X physical layer procedures	Apple Inc.
R1-1905079	Discussion on NR V2X Sidelink Physical Procedures	ITRI
R1-1905101	Physical layer procedure for NR V2X	ITL
R1-1905337	Discussion of Physical layer procedures for sidelink	Nokia, Nokia Shanghai Bell
R1-1905356	Discussion on physical layer procedures for sidelink in NR V2X	CATT
R1-1905378	Further Study on TX-RX Distance based HARQ Feedback	Fujitsu
R1-1905382	Discussion on physical layer procedures for sidelink in NR V2X	Panasonic
R1-1905388	On HARQ procedure for NR sidelink	Sequans Communications
R1-1905395	Physical layer procedures for NR sidelink	Sharp
R1-1905415	On HARQ operation for 5G V2x communications	Xiaomi Communications
R1-1905420	Considerations on transmission type and HARQ feedback timing for multiple SL grants	CAICT
R1-1905425	NR Sidelink Physical Layer Procedure	NTT DOCOMO, INC.
R1-1905480	Physical layer procedures for sidelink	Ericsson

7.2.4.6 QoS management for sidelink

Including congestion control and support for QoS management

R1-1903952 QoS management for NR sidelink Huawei, HiSilicon

- Proposal 1: There is a single parameter carried in SCI relating to QoS.
- Proposal 2: Support multiplexing structure 'Option 3' with different configurations of PSCCH duration to meet different QoS requirements.
- Proposal 3: At least CBR-based congestion control is supported and enhancements are needed to LTE CBR mechanism.
- Proposal 4: For conflict between NR uplink and NR sidelink:
  - Per-packet QoS comparison is used for NR sidelink groupcast and broadcast.
  - Mapping of QoS parameters between NR uplink and NR sidelink unicast is needed, then QoS requirement can be compared.
- Proposal 5: For overlap between NR sidelink Tx and LTE sidelink Tx in short term time-scale coordination TDM solution, QoS mapping rules should be defined between NR sidelink unicast and LTE sidelink.

Decision: The document is noted.

R1-1904924 Considerations on congestion control for NR-V2X OPPO

- Observation 1: The definition of CBR of LTE-V2X can be re-used in NR-V2X.
- Observation 2: Whether to support CR computation based on new QoS parameter needs FFS.
- Observation 3: It is beneficial for UE to report CR to network if simultaneous mode 1 and mode 2 is supported in NR-V2X.
- Proposal 1: For PSCCH and PSSCH multiplexing option 3, CBR measurement is only performed within PSSCH resource pool, not within PSCCH resource pool. FFS for other PSCCH and PSSCH multiplexing options if supported.
- Proposal 2: CR evaluation in NR-V2X is limited within subframes [n-a, n-1].
- Proposal 3: In NR-V2X, CR should be used to evaluate the total resource usage per UE, not per transmission mode.
- Proposal 4: The transmission parameter range is (pre-)configured according to CBR range.
- Proposal 5: The transmission parameter range is (pre-)configured according to QoS parameter. FFS which QoS parameter can be used.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Torsten (Nokia)

Friday

R1-1905622 Feature Lead Summary for 7.2.4.6 QoS management Nokia

Decision: The document is noted.

Agreements:

Support at least NR CBR as congestion metric for NR sidelink congestion control.

- LTE CBR is the baseline for defining NR CBR.

Proposal:
- LTE V2X sidelink congestion control is the starting point for defining NR sidelink congestion control.

Friday decision: Revisit in RAN1#97

R1-1904078	QoS management for sidelink	vivo
R1-1904300	QoS aware congestion control for NR V2X sidelink communication	Intel Corporation
R1-1904427	On QoS Management for NR V2X	Samsung
R1-1904791	Considerations on sidelink QoS management	Spreadtrum Communications
R1-1904817	Discussion on QoS management	ZTE, Sanechips
R1-1904924	Considerations on congestion control for NR-V2X	OPPO
R1-1905013	QoS management and congestion control for sidelink	Qualcomm Incorporated
R1-1905080	Discussion on QoS management for sidelink	ITRI
R1-1905338	Discussion of QoS management for sidelink	Nokia, Nokia Shanghai Bell
R1-1905357	Discussion on QoS management for sidelink in NR V2X	CATT
R1-1905406	Congestion control and QoS Management for NR-V2X	InterDigital, Inc.
R1-1905426	Congestion Control for NR Sidelink	NTT DOCOMO, INC.
R1-1905444	Discussion on QoS management for NR sidelink	LG Electronics
R1-1905481	On congestion control for NR SL	Ericsson

7.2.4.7 Support of NR Uu controlling LTE sidelink

R1-1904079 Support of NR Uu controlling LTE sidelink vivo

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Decision: The document is noted.

R1-1904580 Discussion on support of NR Uu controlling LTE sidelink Lenovo, Motorola Mobility

- Proposal 1: For the gNB (cross RAT) scheduling LTE PC5 communication, RAN1 decide between:
  - A new DCI format specifically for this (LTE PC5) purpose and with exactly the same content as LTE DCI 5A
  - A common NR DCI format for NR and LTE PC5 scheduling; here the receiving PC5 transmitter UE needs to "internally" translate the content of the received NR PC5 DCI in to LTE DCI format 5A. In this case, a flag can indicate if the PC5 grant is for LTE or NR.
- Proposal 2: Support NR DCI based activation/deactivation with minimal standardization effort based on the existing configured grant procedure e.g. with an additional indication in the DCI about the cross RAT scheduling.
- Proposal 3: The LTE SL assistance information delivered by NR Uu RRC signaling should indicate that the assistance information (i.e. resource request) is for LTE PC5.
- Proposal 4: Cross RAT scheduling should further study about the timing offset difference due to different slot boundary (i.e.,. considering different numerology) used between NR and LTE.
- Proposal 5: Further study delivering the timing offset information whether it should be a fixed value in the standard or a value configured via higher layer signaling or indicated via NR DCI.

Decision: The document is noted.

R1-1904731 Discussion on support of NR Uu controlling LTE sidelink CMCC

- Observation 1: When NR Uu schedules LTE sidelink, it is necessary to provide the same or competitive performance as LTE Uu scheduling LTE sidelink mode 3
- Proposal 1: DCI-based activation/deactivation should be support for sidelink mode 3-like RRC-configured SPS scheduling.
- Observation 2: Specification impact of DCI-based activation/deactivation is quite small.
- Proposal 2: For supporting sidelink mode 3-like RRC-configured SPS scheduling with DCI-based activation/deactivation,

- DCI format size could be aligned among NR sidelink grant, LTE sidelink activation/deactivation and NR Uu fallback DCI.
- a clear timing reference point of DCI-based activation/deactivation should be defined considering that SCS of the PDCCH may be equal or larger than 15kHz.

- Observation 3: It would be easy to support NR Uu dynamically scheduling LTE sidelink if DCI-based activation/deactivation is supported.

Decision: The document is noted.

Tuesday conclusion: Continue offline discussion – Phillippe (Huawei)

Wednesday session

R1-1905762 **Feature lead summary for AI 7.2.4.7: NR control for LTE sidelink Huawei**

Decision: The document is noted.

Agreements:

Regarding RRC-based versus DCI-based activation/release of LTE sidelink SPS, RAN1 agrees to make the choice on the basis of at least:

- Spec impact
- Flexibility
- Performance, including latency
- Implementation complexity
- Timing of the activation/deactivation

R1-1903951	NR Uu control for LTE sidelink	Huawei, HiSilicon
R1-1904301	Design of NR Uu controlling LTE sidelink	Intel Corporation
R1-1904428	On NR Uu controlling LTE sidelink	Samsung
R1-1904498	Discussion on NR Uu configuring LTE sidelink	MediaTek Inc.
R1-1904925	On support of NR Uu controlling LTE sidelink	OPPO
R1-1905014	NR Uu control of LTE sidelibk	Qualcomm Incorporated
R1-1905081	The discussions on NR-Uu assisted LTE sidelink in V2X communications	ITRI
R1-1905339	Discussion of Support of NR Uu configuring LTE sidelink	Nokia, Nokia Shanghai Bell
R1-1905345	Discussion on NR Uu controlling LTE sidelink	ZTE, Sanechips
R1-1905358	Discussion on support of NR Uu controlling LTE sidelink in NR V2X	CATT
R1-1905407	Discussion on NR Uu Controlling LTE Sidelink	InterDigital, Inc.
R1-1905427	Support of NR Uu Controlling LTE Sidelink	NTT DOCOMO, INC.
R1-1905435	Support of NR Uu controlling LTE sidelink	Panasonic Corporation
R1-1905445	Discussion on NR Uu controlling LTE sidelink	LG Electronics
R1-1905482	NR Uu controlling LTE sidelink transmissions	Ericsson

7.2.4.8 Other

Including other aspects as led by other WGs (with RAN1 as secondary) as in the WID, e.g., UE report to assist gNB scheduling, AS level link management for unicast, etc.

R1-1905620 Feature Lead Summary for NR-V2X AI - 7.2.4.8 Others InterDigital

R1-1905763 **Feature Lead Summary#2 for NR-V2X AI - 7.2.4.8 Others InterDigital**

Decision: The document is noted.

Agreements:

- No new reference signal dedicated to SL RLM is introduced.
  - Existing SL RS is reused for SL RLM/RLF
    - Note: CSI-RS is not precluded
  - RAN1 has no intention to introduce RS transmitted in a periodic manner only for SL RLM purposes
  - FFS:
    - Whether SL RS is transmitted in a stand-alone manner for SL RLM/RLF

Agreements:

- Regarding metric for SL RLM/RLF declaration, RAN1 discussed the following (to be further studied):
  - Reuse IS/OOS metric in Uu RLM as much as possible but considering the condition that RAN1 has no intention to introduce RS transmitted in a periodic manner only for SL RLM purposes
  - Other metrics, e.g., congestion control metric (similar to CBR in LTE), consecutive HARQ-NACKs, etc.
  - Note: RAN1 expects further input from RAN2 to further progress on this topic

To prepare reply LS using the above two agreements – Moonil (InterDigital), R1-1905788

Thursday

R1-1905788 [Draft] Reply LS on SL RLM / RLF in NR V2X for unicast InterDigital

Decision: The draft LS is endorsed with the following update:

RAN1 has agreed that no new reference signal dedicated to SL RLM is introduced and existing SL RS is reused for SL RLM/RLF (i.e., a SL RS introduced for other purpose(s) is reused for SL RLM/RLF. The details are still being discussed in RAN1).

Final LS is approved in R1-1905863.

Proposal:

- For further evaluation of NR V2X, 2Tx/2Rx is taken as an additional simulation assumption for FR1

Friday session

Agreement:

- For further evaluation of NR V2X,
  - 2Tx/2Rx is taken as an additional simulation assumption for FR1.

R1-1904226 V2X antenna model and pathloss correction Fraunhofer HHI, Fraunhofer IIS, Huawei, HiSilicon

Decision: The document is noted, for emaill discussion/approval till April 18th – Matthew (Huawei)

R1-1903945	Sidelink reference signal design for NR V2X	Huawei, HiSilicon
R1-1903948	System level evaluations on sidelink for NR V2X	Huawei, HiSilicon
R1-1903949	Link level evaluations on sidelink for NR V2X	Huawei, HiSilicon
R1-1904080	Discussion on RLM in NR sidelink	vivo
R1-1904429	On AGC settling issues with evaluation results for NR V2X	Samsung
R1-1904430	On Sidelink RLM	Samsung
R1-1904431	On DMRS Design for NR V2X	Samsung
R1-1904432	On Sidelink Feedback Channel Format	Samsung
R1-1904433	On Sidelink HARQ Procedure	Samsung
R1-1904434	On Sidelink CSI Procedure	Samsung
R1-1904435	On Sidelink Power Control	Samsung
R1-1904499	Enhancements to UE assistance information	MediaTek Inc.
R1-1904687	Frame and slot structure for sidelink	Huawei, HiSilicon
R1-1904688	Sidelink CSI	Huawei, HiSilicon
R1-1904689	Design and contents of PSCCH and PSFCH	Huawei, HiSilicon
R1-1904690	BWP operation for V2X sidelink	Huawei, HiSilicon
R1-1904691	Power control and power sharing for V2X sidelink	Huawei, HiSilicon
R1-1904692	Sidelink measurements	Huawei, HiSilicon
R1-1904818	Discussion on UE reporting	ZTE, Sanechips
R1-1904921	Discussion of RLM for Unicast	OPPO
R1-1904978	Considerations on NR V2X scheduling mechanism	Apple Inc.
R1-1905329	Discussion on AS level link management for unicast	ZTE, Sanechips
R1-1905340	Discussion on Sidelink groupcast HARQ	Nokia, Nokia Shanghai Bell
R1-1905379	Other aspects on physical layer procedures for NR-V2X	Fujitsu
R1-1905408	Sidelink RLM/RLF for NR V2X	InterDigital, Inc.
R1-1905416	System-level evaluation about HARQ feedback in NR V2X groupcast	ZTE, Sanechips
R1-1905446	Discussion on AS level link management for unicast	LG Electronics

R1-1905754 Simulation profile update for including 2 RX antenna and high congestion scenario LG Electronics, General Motors, Volkswagen AG, Hyundai Motors, TOYOTA InfoTechnology Center (rev of R1-1905447)
R1-1905493 Link level evaluations of NR PSCCH Ericsson
R1-1905494 Link level evaluations of NR PSSCH Ericsson
R1-1905495 On data–DMRS collision for SL Ericsson
R1-1905496 On L1 measurements for NR sidelink Ericsson
R1-1905497 On NR sidelink resources and short-slot format Ericsson
R1-1905498 On link adaptation for sidelink groupcast Ericsson
R1-1905500 Simultaneous operation of Mode 1 and Mode 2 Ericsson
R1-1905501 On Layer 1 IDs Ericsson
R1-1905503 On Details of S-SSB design Ericsson
R1-1905504 [Draft] LS on inter-RAT mapping of QoS parameters for in-device coexistence Ericsson
R1-1905505 [Draft] Reply LS on SL RLM / RLF in NR V2X for unicast Ericsson
R1-1905506 On SL RLM / RLF in NR V2X for unicast Ericsson
R1-1905507 Updated simulation assumptions Ericsson
R1-1905761 System-level evaluations on sidelink for NR V2X with 2Rx and 4Rx Huawei, HiSilicon
R1-1905853 L1 source and destination IDs for V2X Huawei, HiSilicon
R1-1905854 On RLM and RLF in V2X Huawei, HiSilicon
R1-1905897 On antenna management for NR V2X Huawei, HiSilicon
R1-1905899 PSFCH formats for NR V2X Huawei, HiSilicon

7.2.5 Study on solutions for NR to support Non Terrestrial Network (NTN)

FS_NR_NTN_solutions; SID in RP-190710. Please refer to the SID for detailed scoping

R1-1905802 Chairman's notes of AI 7.2.5 Study on solutions for NR to support Non Terrestrial Network (NTN) Ad-Hoc Chair (Ericsson)
Decision: The document is endorsed, content incorporated below.

R1-1905204 Skeleton proposal for TR 38.821 chapter related to RAN1 THALES, Nokia, Nokia Shanghai Bell

7.2.5.1 Link-Level and System-Level Evaluations

Including evaluation methodology, deployment scenarios, etc.

R1-1905206 Doppler shift compensation in NTN THALES
R1-1904648 Scenarios, Requirements and Simulation Assumptions in NTN Nokia, Nokia Shanghai Bell

R1-1903997 Discussion on performance assessment for NTN Huawei, HiSilicon
R1-1904302 Considerations on performance evaluation for NTN Intel Corporation
R1-1904436 Considerations on NTN system-level and link-level simulations Samsung
R1-1904548 Simulation assumption for NTN evaluation CATT
R1-1904668 Considerations on HARQ evaluation for Non-Terrestrial Networks ETRI
R1-1904765 Considerations on the simulation assumption and methodology for NTN ZTE
R1-1905097 On NTN link level and system level evaluations Ericsson
R1-1905216 Key satellite parameters and simulation assumptions for NTN ESA
R1-1905699 NTN channel model clarifications for link-level and system-level evaluation of NTN Thales, Nokia, Huawei, Fraunhofer

R1-1905700 NTN evaluation assumptions summary Thales
R1-1905794 NTN evaluation assumptions summary Thales

Agreement:
The following tables are used for calibration:

Table A-1: System Level Simulation parameters for configuration scenario A

Configuration scenario	A (GEO – transparent) (Note 1)
Frequency band	S-band / Ka- Band
Maximum Bandwidth per beam (DL + UL)	S-band : FFS Ka band : FFS
Satellite characteristics (G/T, EIRP density, antenna diameter)	Set 1 : Table 2 and 3 Set 2 : FFS
Satellite antenna pattern	TR 38.811v15.0.0 section 6.4.1 Bessel function
Satellite polarization configuration	FFS
Beam layout	FFS. At least a hexagonal beam layout is considered for NTN evaluations.
Number of beams	FFS
Frequency re-use factor	FFS
Deployment scenarios	Base-line : Rural Additional deployment scenario results can be provided
~~Fast fading model~~	~~Frequency selective channel model from TR 38.811v15.0.0~~
UEs outdoor/indoor distribution	100% outdoor distribution for UEs
UEs coverage distribution	X=10 UEs per beam with uniform distribution in all the beams should be considered for NTN evaluation. • FFS: Other values of X
UE configuration	S-band : Handheld (optional) Others (Note 2) (optional) Ka-band : VSAT Others (Note 2) (optional)
UE orientation	VSAT: Ideal Tracking serving beam; Handheld: Random Others (Note 2) : FFS
UE antenna and polarization configurations	S-band : Handheld : FFS Others (Note 2) : FFS Ka-band : VSAT : FFS Others (Note 2) : FFS
UE antenna noise figure, antenna temperature, G/T	S-band : Handheld : FFS Others (Note 2) : FFS Ka-band : VSAT : FFS Others (Note 2) : FFS
Handover Margin	FFS
UE attachment	FFS
~~Receiver~~	~~FFS~~
~~CSI reference signals configuration~~	~~FFS~~
~~Scheduler~~	~~FFS~~
~~Traffic model~~	~~FFS~~
Metrics for calibration	Base line : Coupling loss, Geometry Optional : FFS
~~Metrics for performance evaluation~~	~~Base line : UE throughput (5%, 50%, 95%)~~ ~~Optional : FFS~~
Note 1 : Typical impairment values (additional frequency error, SNR loss) due to the feeder link except for delay can be considered to be negligible. When available, specific values can be considered in the evaluation and should be reported. Note 2 : Moving platforms (e.g., aircrafts, vessels), building mounted device.	

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Table A-2 : System Level Simulation parameters for configuration scenarios C2/D2

Configuration scenario	C2 (LEO – transparent – moving beams) (Note 1) / D2 (LEO – regenerative – moving beams)
Frequency - Band	S-band / Ka- Band
Maximum Bandwidth per beam (DL + UL)	S-band : FFS Ka band : FFS
Satellite characteristics (G/T, EIRP density, antenna diameter)	Set 1 : Table 2 and 3 Set 2 : FFS
Satellite antenna pattern	TR 38.811v15.0.0 section 6.4.1 Bessel function
Satellite polarization configuration	FFS
Beam layout	FFS. At least a hexagonal beam layout is considered for NTN evaluations.
Number of beams	FFS
Frequency re-use factor	FFS
Deployment scenarios	Base-line : Rural Additional deployment scenario results can be provided
~~Fast fading model~~	~~Frequency selective channel model~~
UEs outdoor/indoor distribution	100% outdoor distribution for UEs
UEs coverage distribution	X=10 UEs per beam with uniform distribution in all the beams should be considered for NTN evaluation. • FFS: Other values of X
UE configuration	S-band : Handheld Others (Note 2) (optional) Ka-band : VSAT Others (Note 2)
UE orientation	VSAT: Ideal Tracking serving beam; Handheld: Random Others (Note 2) : FFS
UE antenna and polarization configurations	S-band : Handheld : FFS Others (Note 2) : FFS Ka-band : VSAT : FFS Others (Note 2) : FFS
UE antenna noise figure, antenna temperature, G/T	S-band : Handheld : FFS Others (Note 2) : FFS Ka-band : VSAT : FFS Others (Note 2) : FFS
Handover Margin	FFS
UE attachment	FFS
~~Receiver~~	~~FFS~~
~~CSI reference signals configuration~~	~~FFS~~
~~Scheduler~~	~~FFS~~
~~Traffic model~~	~~FFS~~
Metrics for calibration	Base line : Coupling loss, Geometry Optional : FFS
~~Metrics for performance evaluation~~	~~Base line : UE throughput (5%, 50%, 95%)~~ ~~Optional : FFS~~
Note 1 : Typical impairment values (additional frequency error, SNR loss) due to the feeder link except for delay can be considered to be negligible. When available, specific values can be considered in the evaluation and should be reported. Note 2 : Moving platforms (e.g., aircrafts, vessels), building mounted device.	

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Table 2: Example of satellite parameters and payload characteristics for downlink transmissions

Satellite orbit		GEO	LEO-1200	LEO-600
Satellite altitude		35'786 km	1'200 km	600 km
Equivalent satellite antenna aperture (Note1)	**S-band**	22 m	2 m	2 m
Satellite EIRP density		59 dBW/MHz	40 dBW/MHz	34 dBW/MHz
Satellite beam diameter		300 km	150 km	70 km
~~Max Satellite Doppler shift (Note 2)~~		~~up to 300 Hz [~ 0.15 ppm]~~	~~40 kHz [20 ppm]~~	~~48 kHz [24 ppm]~~
~~Max Satellite Doppler rate (Note 2)~~		~~N/A~~	~~180 Hz/s [0.09 ppm/s]~~	~~544 Hz/s [0.27 ppm/s]~~
~~Satellite amplifier~~		~~Table 9 in Annex 2~~	~~Table 9 in Annex 2~~	~~Table 9 in Annex 2~~
~~Satellite phase noise~~		~~Table 6 in Annex 1~~	~~Table 6 in Annex 1~~	~~Table 6 in Annex 1~~
Equivalent satellite antenna aperture (Note1)	**Ka-band**	5 m	0.5 m	0.5 m
Satellite EIRP		40 dBW/MHz	10 dBW/MHz	4 dBW/MHz
Satellite beam diameter		130 km	40 km	20 km
~~Max Satellite Doppler shift (Note 2)~~		~~Up to 3 kHz [~ 0.15 ppm]~~	~~400 kHz [20 ppm]~~	~~480 kHz [24 ppm]~~
~~Max Satellite Doppler rate (Note 2)~~		~~N/A~~	~~1.80 kHz [0.09 ppm/s]~~	~~5.44 kHz [0.27 ppm/s]~~
~~Satellite amplifier~~		~~Table 8 in Annex 2~~	~~Table 9 in Annex 2~~	~~Table 9 in Annex 2~~
~~Satellite phase noise~~		~~Table 7 in Annex 1~~	~~Table 7 in Annex 1~~	~~Table 7 in Annex 1~~
Note 1: This value is equivalent to the antenna diameter to be used in Sec. 6.4.1 of TR38.811v15.0.0.				

Table 3: Example of satellite parameters and payload characteristics for uplink transmissions

Parameters/Scenarios		GEO	LEO-1200	LEO-600
~~Satellite amplifier~~		~~N/A (linear region)~~	~~N/A (linear region)~~	~~N/A (linear region)~~
Equivalent satellite antenna aperture (Note1)	**S-band**	22 m	2 m	2 m
G/T		19 dB K^{-1}	11.2 dB K^{-1}	11.2 dB K^{-1}
~~Max Satellite Doppler shift (Note 2)~~		~~up to 300 Hz [~ 0.15 ppm]~~	~~40 kHz [20 ppm]~~	~~48 kHz [24 ppm]~~
~~Max Satellite Doppler rate (Note 2)~~		~~N/A~~	~~180 Hz/s [0.09 ppm/s]~~	~~544 Hz/s [0.27 ppm/s]~~
Equivalent satellite antenna aperture (Note1)	**Ka-band**	5 m	0.5 m	0.5 m
G/T		22 dB K^{-1}	13 dB K^{-1}	13 dB K^{-1}
~~Max Satellite Doppler shift (Note 2)~~		~~N/A~~	~~600 kHz [20 ppm]~~	~~720 kHz [24 ppm]~~
~~Max Satellite Doppler rate (Note 2)~~		~~N/A~~	~~2.7 kHz [0.09 ppm/s]~~	~~8.16 kHz [0.27 ppm/s]~~
Note 1: This value is equivalent to the antenna diameter to be used in Sec. 6.4.1 of TR38.811v15.0.0.				

Agreement:
A snapshot of satellite and UE positions is considered during the SLS run time and for throughput evaluation.
Note: Doppler and fading effects will be captured separately

Agreement:
A, C2, D2 NTN scenarios for both S-Band and Ka-Band should be prioritized for RAN1 NTN Evaluation. Further prioritization among the relevant combinations of these configuration scenarios can be considered.

Agreement:
Typical impairment values (additional frequency error, SNR loss) due to the feeder link except for delay can be considered to be negligible.

- When available, specific values can be considered in the evaluation and should be reported.

Agreement:

For calibration and performance evaluation, the rural scenario will be considered as the baseline scenario.

- Companies can also provide additional deployment scenario results.

Agreement:
The frequency selective channel model should be considered for all deployment scenarios.

Agreement:
100% outdoor distribution for UEs should be considered for NTN evaluations.

Agreement:
X=10 UEs per beam with uniform distribution in all the beams should be considered for NTN evaluation.

- FFS: Other values of X

Agreement:
Adopt the following table to define which kind of UE should be assumed in each NTN scenario.

Frequency band	Scenario	VSAT		Handheld		Others (Note)	
		YES	NO	YES	NO	YES	NO
< 6 GHz (S-Band)	A (GEO – transparent)		X	optional		optional	
	C2 (LEO – transparent – moving beams)		X	X		optional	
	D2 (LEO – regenerative – moving beams)		X	X		optional	
> 6 GHz (Ka-Band)	A (GEO – transparent)	X			X	X	
	C2 (LEO – transparent – moving beams)	X			X	X	
	D2 (LEO – regenerative – moving beams)	X			X	X	
Note: Moving platforms (e.g., aircrafts, vessels), building mounted device							

Agreement:
Adopt the following table to define which mobility cases should be studied in each NTN scenario.

Frequency band	Scenario	VSAT	Handheld	Others
		Velocity assumptions	Velocity assumptions	Velocity assumptions
< 6 GHz (S-Band)	A (GEO – transparent)	-	3km/h; Optional: 30 km/h	1000 km/h; Optional: 500 km/h; Optional: 120 km/h
	C2 (LEO – transparent – moving beams)	-	3km/h; Optional: 30 km/h	1000 km/h; Optional: 500 km/h; Optional: 120 km/h
	D2 (LEO – regenerative – moving beams)	-	3km/h; Optional: 30 km/h	1000 km/h; Optional: 500 km/h; Optional: 120 km/h
> 6 GHz (Ka-Band)	A (GEO – transparent)	0 km/h	-	1000 km/h; Optional: 500 km/h; Optional: 120 km/h
	C2 (LEO – transparent – moving beams)	0 km/h	-	1000 km/h; Optional: 500 km/h; Optional: 120 km/h
	D2 (LEO – regenerative – moving beams)	0 km/h	-	1000 km/h Optional: 500 km/h; Optional: 120 km/h

Agreement:
At least a hexagonal beam layout is considered for NTN evaluations.

7.2.5.2 Physical layer control procedures

R1-1905095 On physical layer control procedures for NTN Ericsson

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R1-1905015 Physical Layer Procedures for NTN Qualcomm Incorporated

R1-1903999 Discussion on data transmission related procedures for NTN Huawei, HiSilicon
R1-1904243 Discussion on physical layer control procedures Sony
R1-1904303 Discussion on control procedures for NTN Intel Corporation
R1-1904437 Physical layer control procedures in NTN Samsung
R1-1904549 Physical layer procedure enhancement for NTN CATT
R1-1904644 Doppler compensation in initial access procedure in NR-NTN MediaTek Inc.
R1-1904649 Uplink Power Control and CSI Feedback in NTN Nokia, Nokia Shanghai Bell
R1-1904766 Discussion on the physical control procedure for NTN ZTE
R1-1905055 Physical layer control procedures for NTN Asia Pacific Telecom co. Ltd
R1-1905215 On Timing Advance for NTN Dish Network

R1-1905728 Feature lead summary on physical layer control procedures for NTN Ericsson
R1-1905807 Feature lead summary#2 on physical layer control procedures for NTN Ericsson
R1-1905818 Feature lead summary#3 on physical layer control procedures for NTN Ericsson
R1-1905861 Feature lead summary#4 on physical layer control procedures for NTN Ericsson

7.2.5.3 Uplink timing advance/RACH procedure

Including PRACH sequence/format/message

R1-1904767 Discussion on the TA and PRACH for the NTN ZTE
R1-1904000 Discussion on timing advance and RACH procedures for NTN Huawei, HiSilicon

R1-1904225 Timing Advance Adjustments for Satellite Communications (NTN) Fraunhofer IIS, Fraunhofer HHI
R1-1904244 Discussion on uplink timing advance and RACH procedure Sony
R1-1904304 Discussion on TA and RACH procedure for NTN Intel Corporation
R1-1904438 Uplink timing advance/RACH procedure and Synchronization for NTN Samsung
R1-1904550 PRACH design and UL timing advance CATT
R1-1904591 Issues on Timing Advance and RACH for NTN Panasonic
R1-1904645 Timing Advance and RACH in NR-NTN MediaTek Inc.
R1-1904650 Doppler Compensation, Uplink Timing Advance, Random Access and UE Location in NTN Nokia, Nokia Shanghai Bell
R1-1904669 Considerations on propagation delay for Non-Terrestrial Networks ETRI
R1-1904732 Considerations on Timing Advance for Non-Terrestrial Networks CMCC
R1-1904858 On initial access and RACH procedures for NTN InterDigital, Inc.
R1-1905016 RACH Procedure and UL Timing Control for NTN Qualcomm Incorporated
R1-1905090 On adapting random access procedures for NTN Ericsson
R1-1905180 On Timing Advance in NTN THALES

R1-1905732 Summary of 7.2.5.3 on UL timing and PRACH ZTE
R1-1905812 Updated summary of 7.2.5.3 on UL timing and PRACH ZTE

7.2.5.4 More delay-tolerant re-transmission mechanisms

Include capability to deactivate the HARQ mechanisms

R1-1904646 Delay-tolerant re-transmission mechanisms MediaTek Inc.
R1-1904439 HARQ procedure in NTN Samsung

R1-1904003 Discussion on HARQ for NTN Huawei, HiSilicon
R1-1904242 Consideration on delay-tolerant HARQ for NTN Sony
R1-1904551 HARQ consideration for NTN CATT
R1-1904592 Views on HARQ Issues for NTN Panasonic