UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE, INC.,
Petitioner

v.

APEX BEAM TECHNOLOGIES LLC,
Patent Owner.

U.S. Patent No. 10,462,767

Case No. IPR2025-00894

DECLARATION OF FRIEDHELM RODERMUND IN SUPPORT OF A PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,462,767

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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 Petitioner 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 document:

- Version 14.2.0 of technical specification 3GPP TS 36.304 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode (Release 14)") (hereinafter "TS 36.304 V14.2.0", EX1009).
- TDoc R1-165162, which represents a 3GPP document with the title "On Numerology for New Radio Access Technology" (hereinafter "R1-165162", EX1024)

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 Apex Beam Technologies, LLC ("Apex Beam Technologies" or "Patent Owner") is the current assignee of U.S. Patent No. 10,462,767 ("the '767 Patent") (Ex. 1001). I have no financial interest in the Patent Owner or the '767 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 20 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 EX1009 is an authentic copy of technical specification TS 36.304 V14.2.0 published by 3GPP and would have been publicly accessible through ftp.3gpp.org as of March 22, 2017, at the latest.

21. It is my opinion that EX1024 is an authentic copy of 3GPP T-doc R1-165162 that was uploaded and made available via the 3GPP FTP server to 3GPP delegates and the general public by May 14, 2016, at the latest.

IV. PUBLICATION OF 3GPP SPECIFICATIONS AND RELATED DOCUMENTS

A. General Practices

22. Unless otherwise noted, the foregoing and following is an accurate description of 3GPP general practices from 1998 to the present, including in 2016/2017, regardless of whether I use the present or past tense to describe those practices.

23. 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.

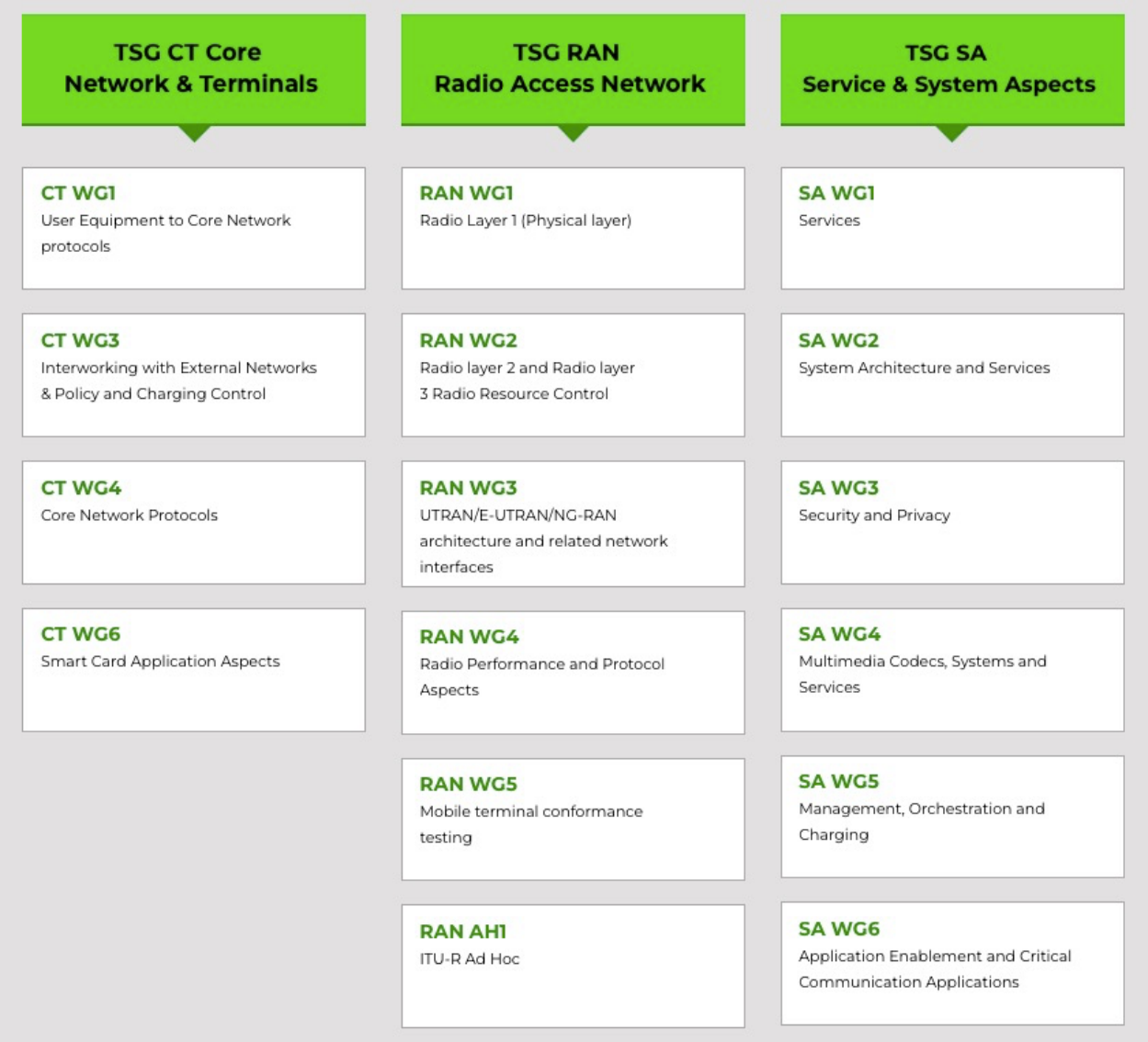
24. 3GPP is the world's leading organization for developing and maintaining cellular telecommunications standards, which it has done since its foundation in 1998. As noted above and in my curriculum vitae, I began working for 3GPP, as part of my work at ETSI, the European-based organizational partner of 3GPP.

25. 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.

26. 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.

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



28. 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 2017 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).

29. 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.

30. As early as December 1998, including in 2017, 3GPP's FTP server was freely accessible to the general public with no login, password, or membership requirement.

31. 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.

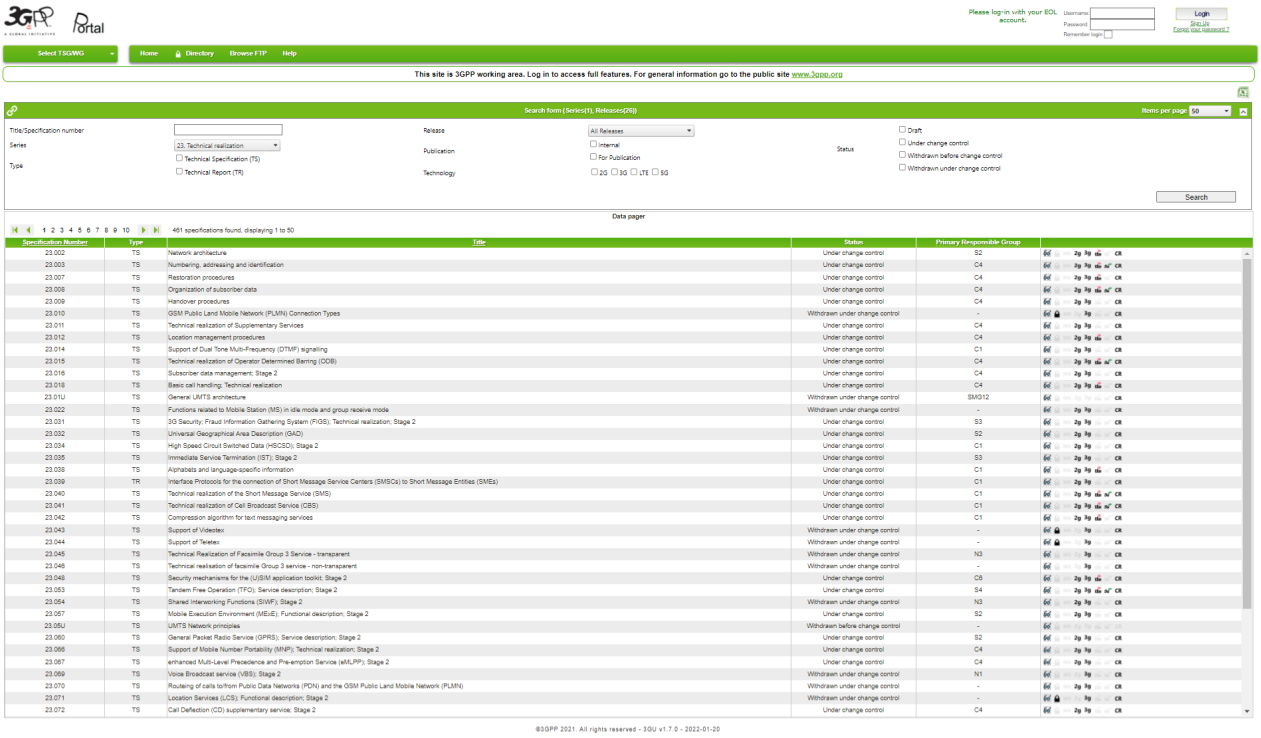
32. Based on my experience with 3GPP and the telecommunications industry, I would expect any person implementing a cellular network or device, e.g., an LTE or 5G network, to consult the corresponding specifications on the 3GPP FTP server, as well as other related documents. The whole purpose of 3GPP 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.

33. By June 1999, 3GPP's FTP server was well-known to persons in the cellular telecommunications industry as a source of public information regarding industry standards and technological advances.

34. 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		

35. 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:



36. 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.

37. 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 website shown in paragraph 33 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.

38. 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.

39. 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).

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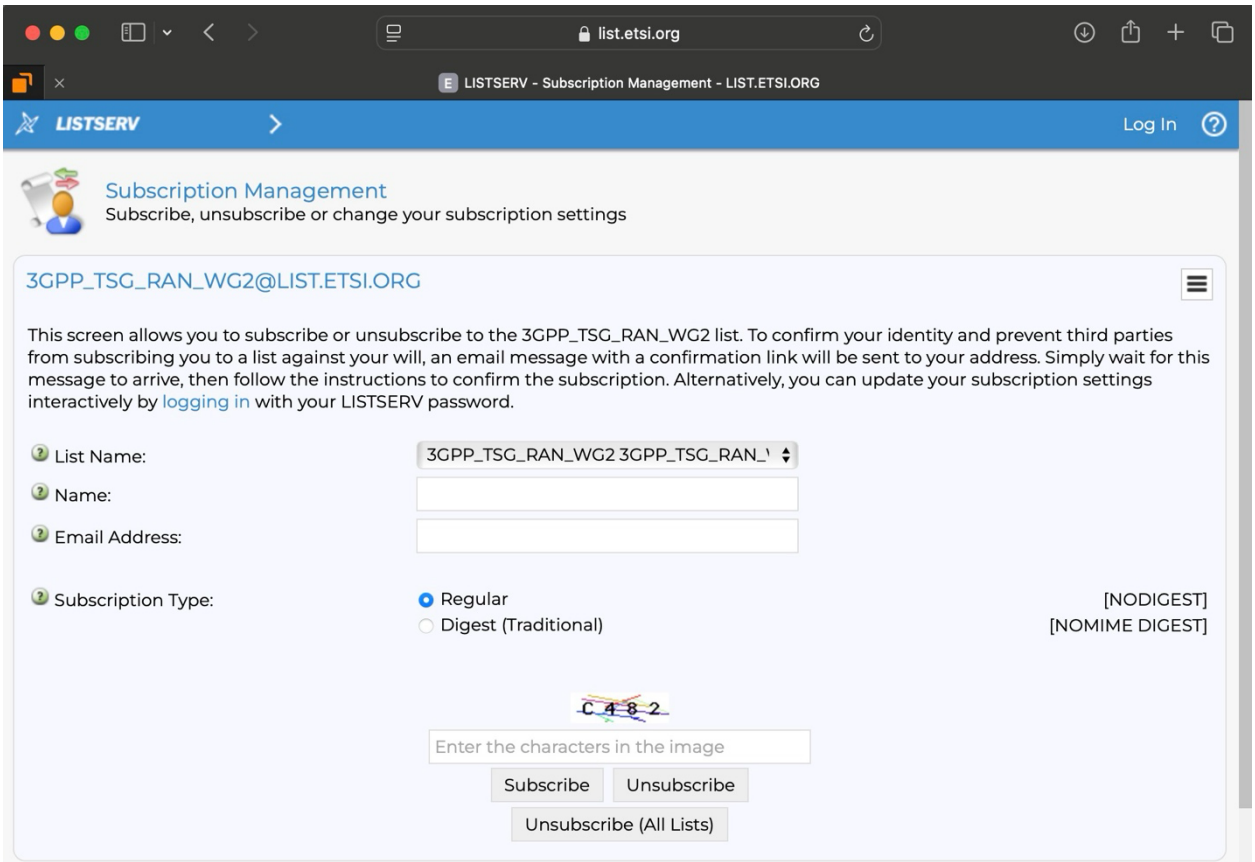
1 https://portal.3gpp.org/Specifications.aspx?q=1&series=45&releases=all&draft=False&underCC=False&withACC=False&withBCC=False&numberNYA=False

40. 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.

41. At least as early as July 1999, all of 3GPP's email archives, including the dedicated email lists for TSG RAN WG2, were freely accessible to the general public with no login, password, or membership requirement and subscription was possible for every interested individual. The screenshot below represents the subscription page of the 3GPP RAN WG2 email list on list.etsi.org[2] demonstrating that this webpage is publicly available and that only an email address and name have to be entered to join the email list. According to my experience, in 2017 the

[2] In the past there was also list.3gpp.org which did not represent a dedicated website but instead redirected to list.etsi.org.

registration webpage looked similar, or, identical:[3]



42. Alternatively, anyone interested can obtain a LISTSERV password for managing subscriptions interactively without email confirmations.

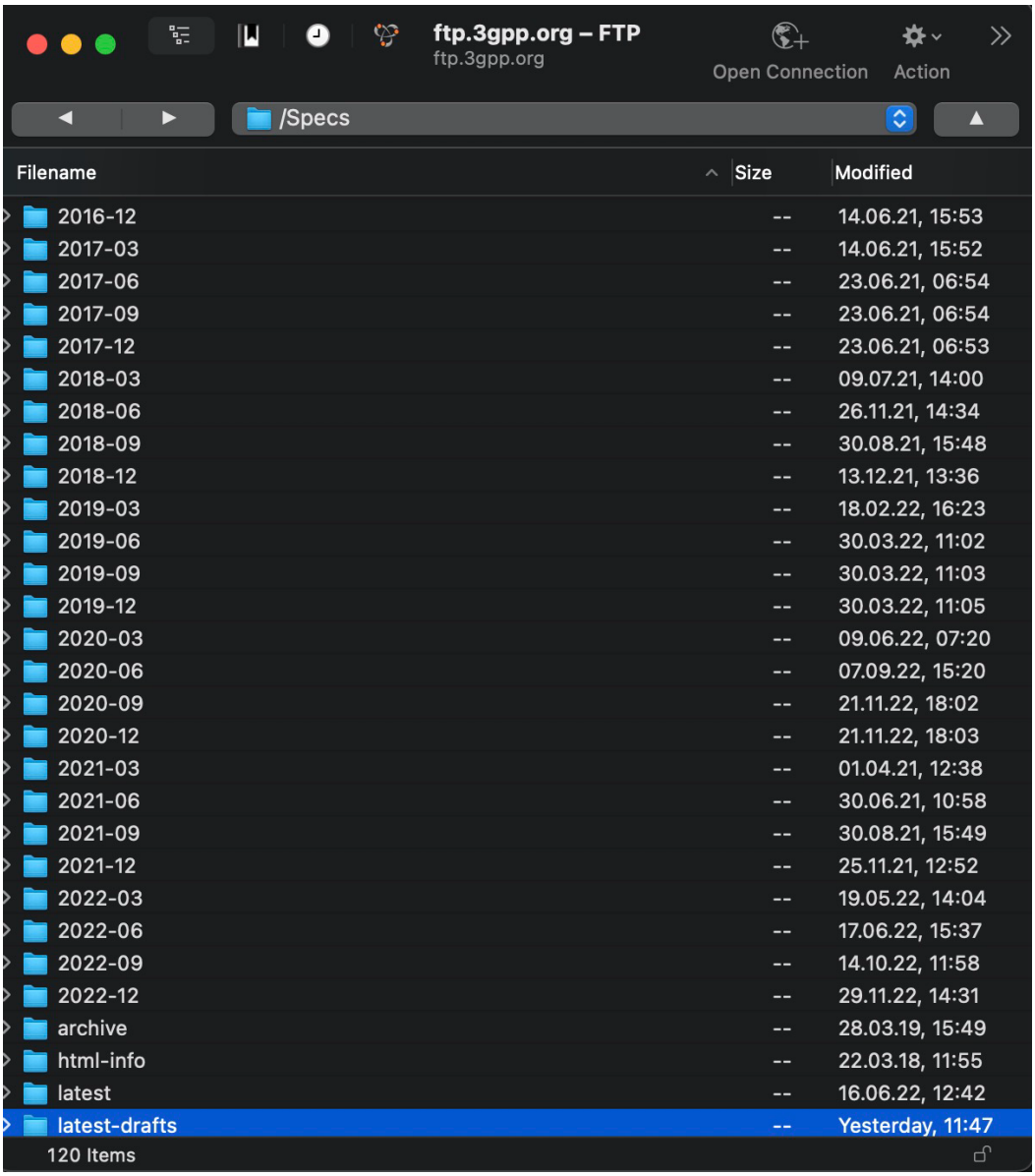
43. Each of 3GPP's member companies typically assigned one or more individuals to regularly participate in these email lists. Thus, not only did the general public have access to the emails in 3GPP's email archives, but some of the most interested members of the public—those working to develop standards for cellular

[3] https://list.etsi.org/scripts/wa.exe?SUBED1=3GPP_TSG_RAN_WG2&A=1

telecommunication—personally received copies of such emails through their participation in the email lists.

44. By June 1999, 3GPP's email archives were well-known to persons in the cellular telecommunications industry as a source of public information and for technical specifications, proposals, meeting announcements, technical discussions and reports regarding industry standards and technological advances.

45. 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:



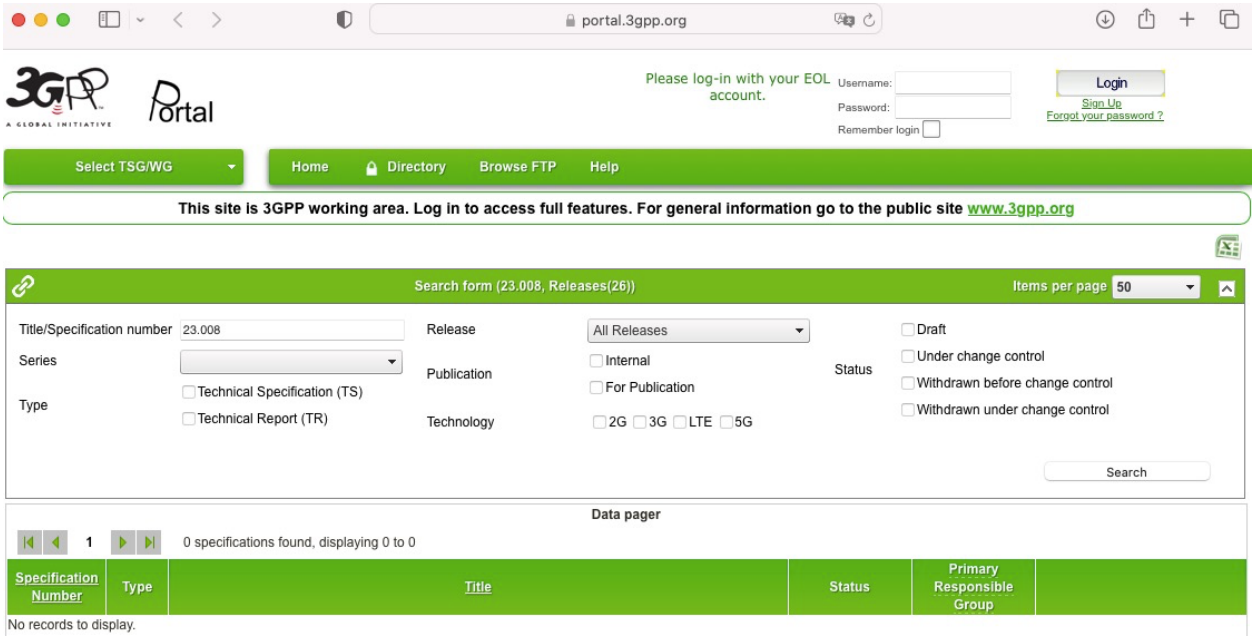
46. While 3GPP aims to upload the updated specifications to both locations at the same time, occasionally there may be a small difference in the upload date, and thus the date stamp, for the same specification uploaded to the two locations. Additionally, specifications which are not yet approved (so 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.

47. 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 one cannot determine whether it represents the first upload of a document to the FTP server.

48. 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

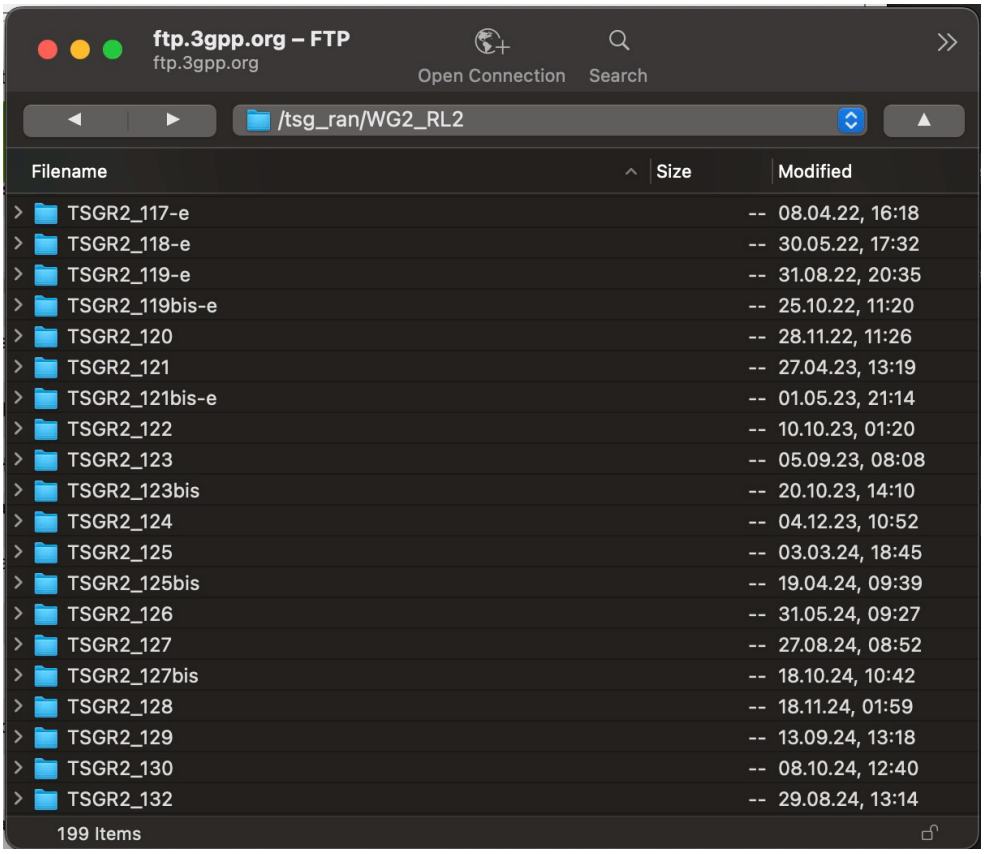
experience, throughout the 2017 timeframe, anyone interested in a particular 3GPP specification could search the 3GPP portal to find and download the latest version of a technical specification using the 3GPP portal in substantially the same manner as they would today:



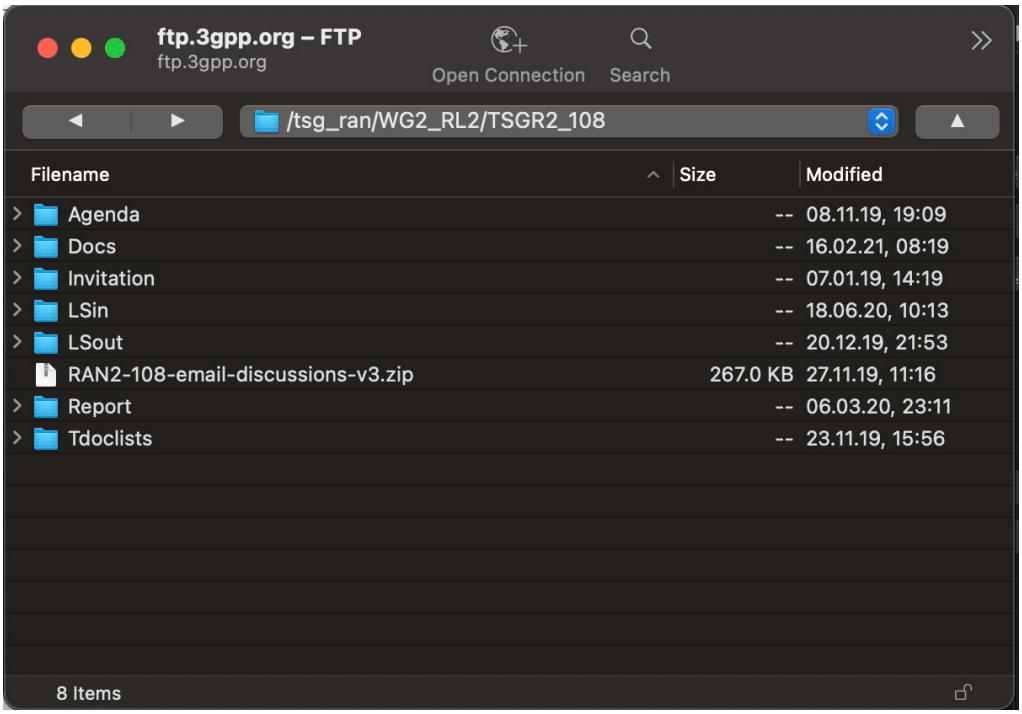
https://portal.3gpp.org/Specifications.aspx; *see, e.g.,* 2015 internet archive https://web.archive.org/web/20150924200802/https://portal.3gpp.org/.

49. 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:



50. 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):



51. 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.

52. 3GPP maintains a set of publicly accessible documents[4] providing further details on its way of working:

[4] 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

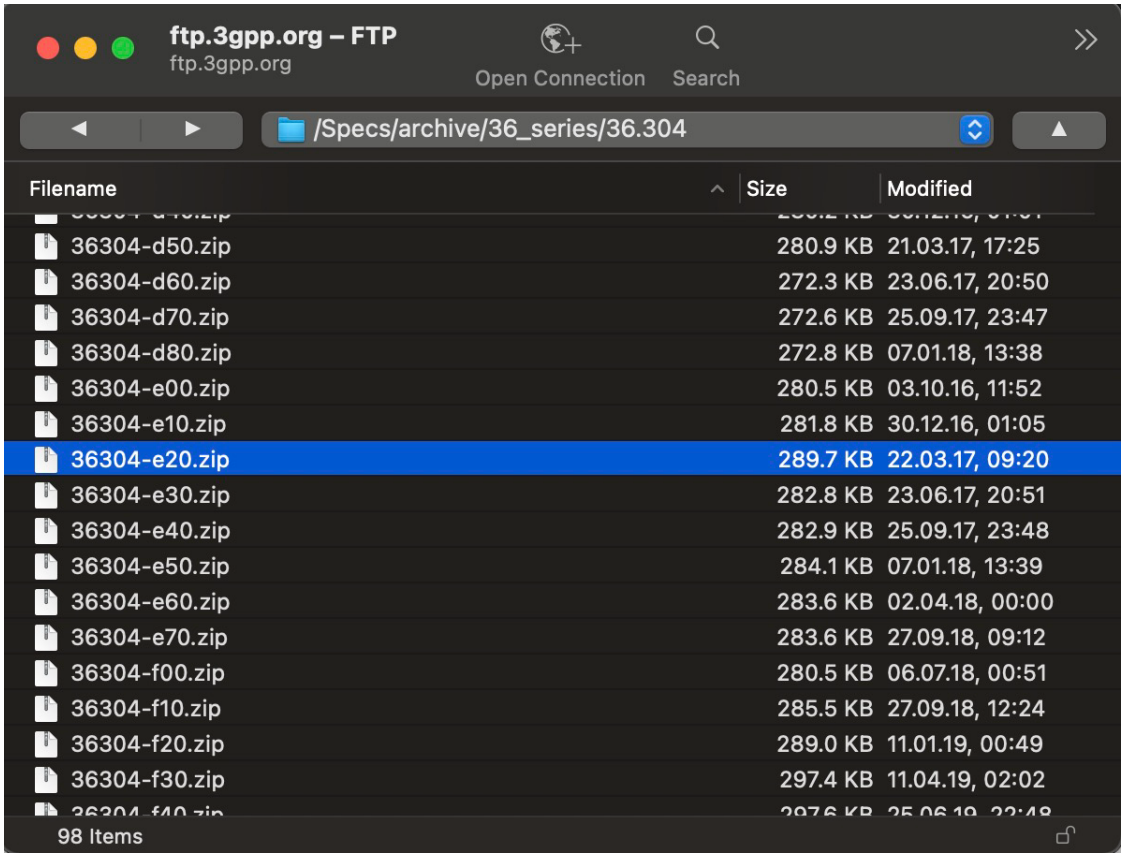
B. Specific Document

1. TS 36.304 V14.2.0

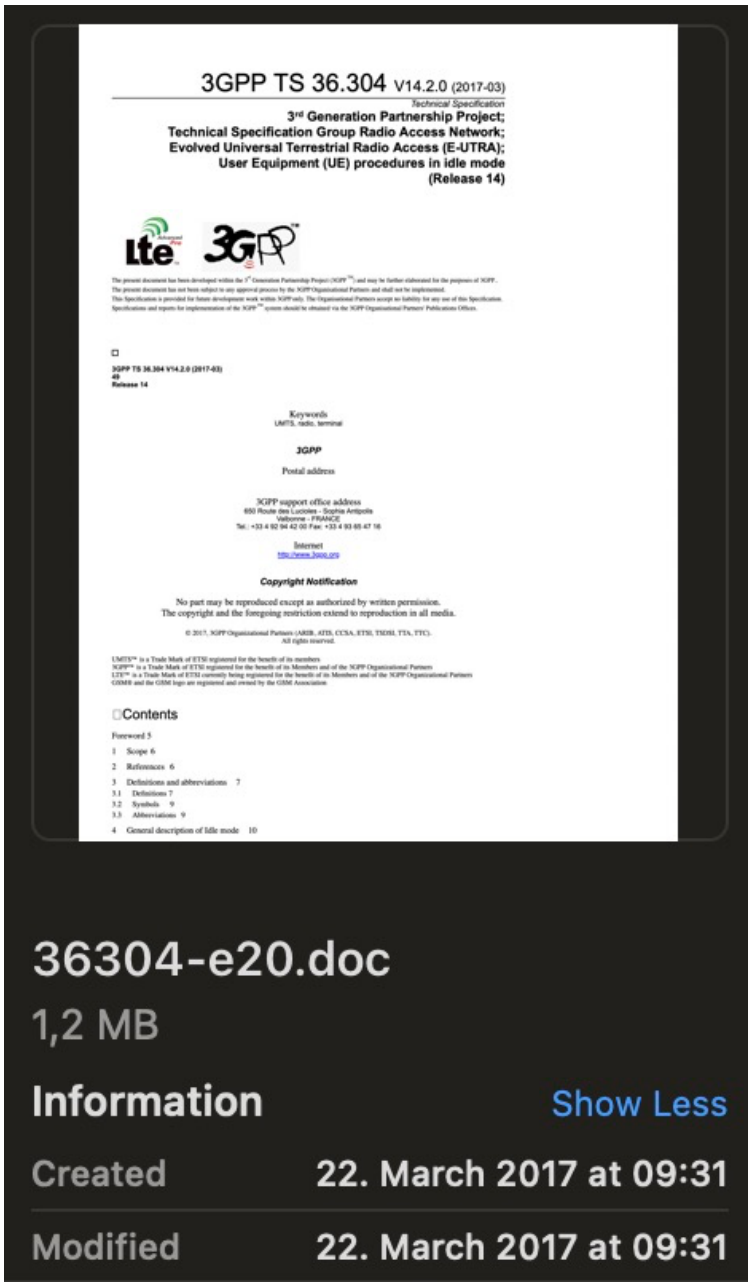
53. Based on my personal knowledge and my review of 3GPP's business records, I recognize EX1009 as a true and correct copy of version 14.2.0 of technical specification 3GPP TS 36.304 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode (Release 14)"), which shows on its cover page "2017-03" as the year (2017) and month (March) during which this document was released by 3GPP.

54. The document was published and freely available on 3GPP's ftp server by March 22, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36304-e20.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20170428002725/http://www.3gpp.org:80/ftp/Specs/archive/36_series/36.304/. 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/36.304, as shown by the screen shot below:



55. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of "22. March 2017", as shown in the screenshot below:

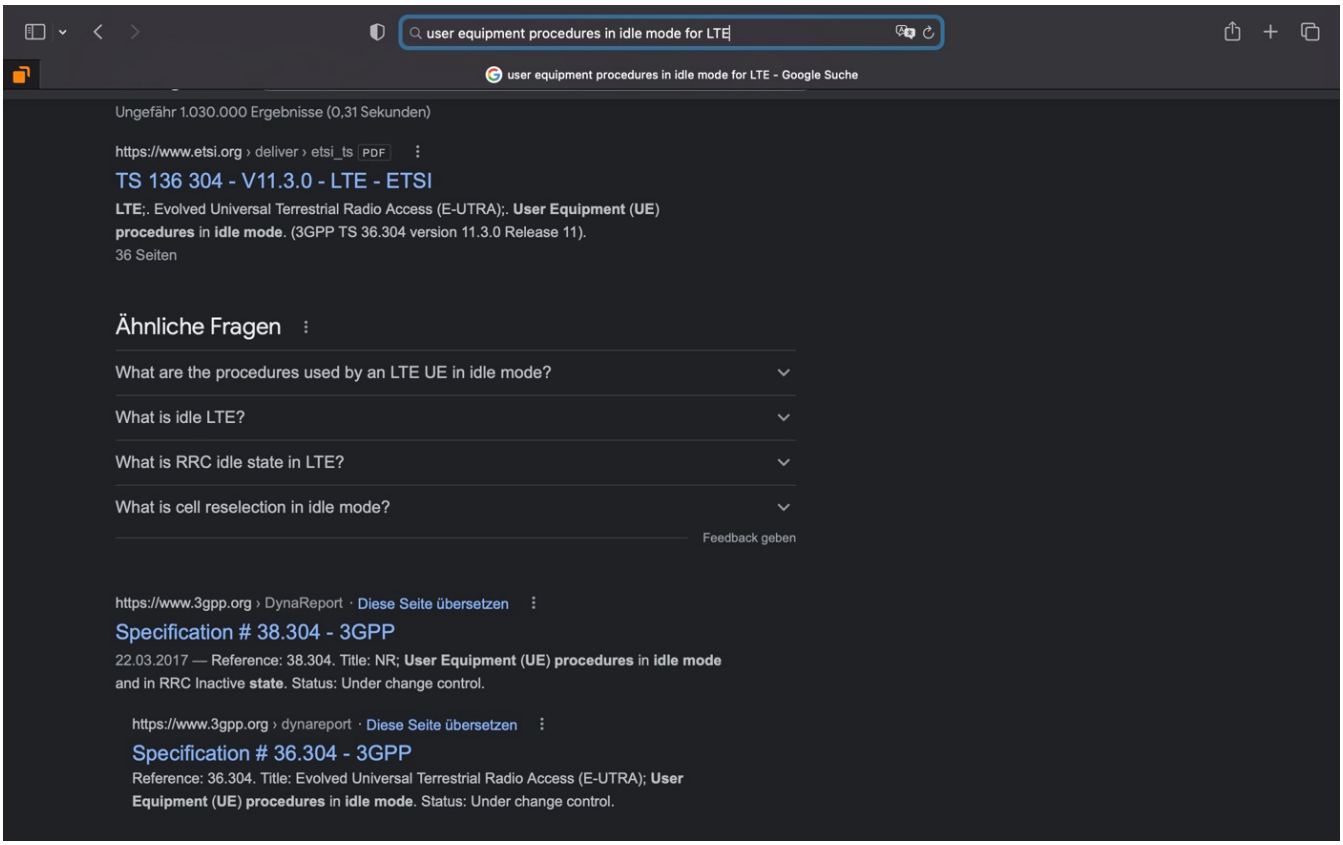


56. This last modified date well aligned with the March 22, 2017, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

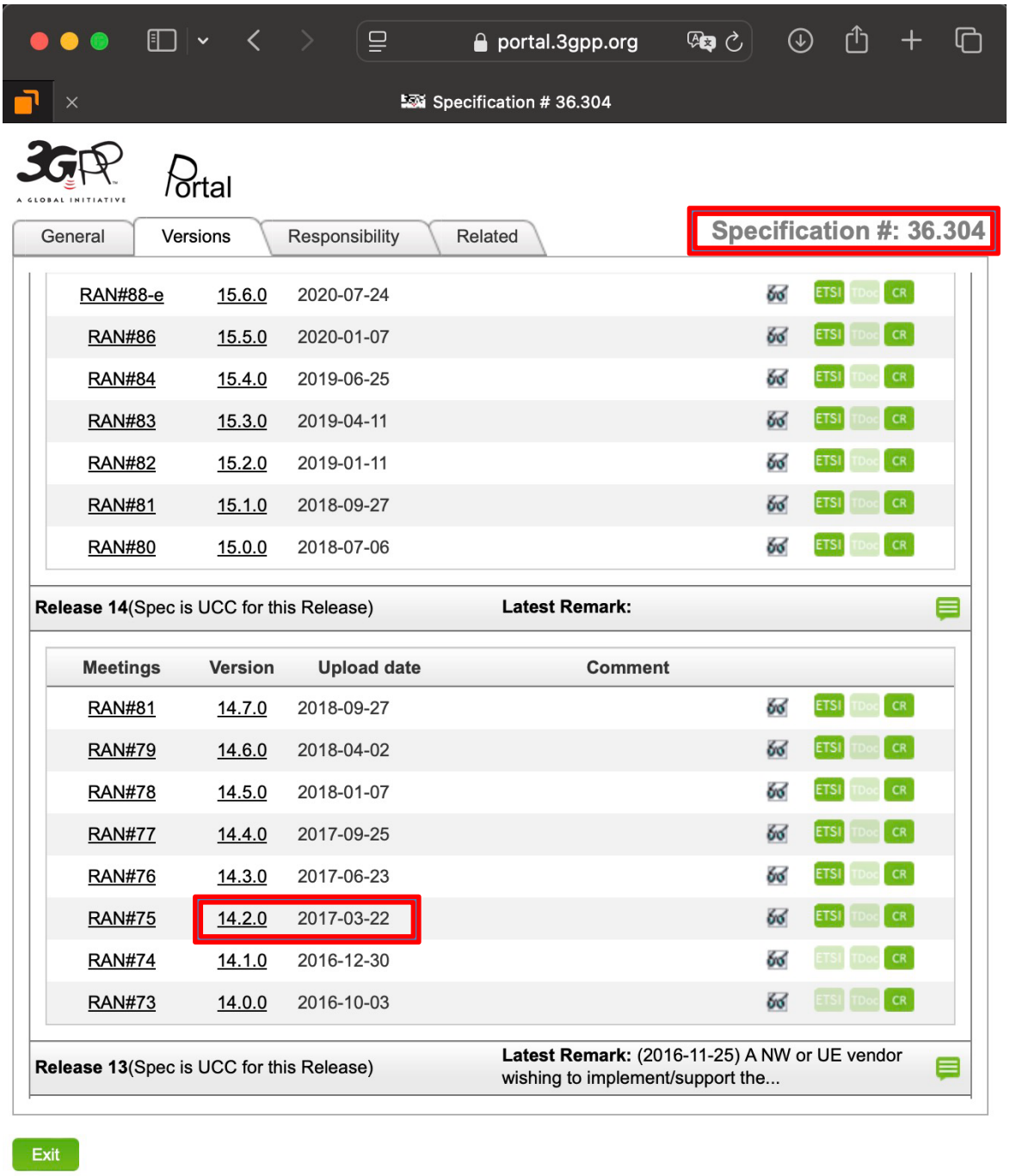
57. Furthermore, the availability of the new RAN2 specification versions which included TS 36.304 V14.2.0 was announced by the RAN WG2 secretary via

the public 3GPP_TSG_RAN_WG2 email exploder on March 22, 2017, as shown in Appendix C. 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 2017.

58. 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 "user equipment procedures in idle mode for LTE" provides the TS number "36.304" as one of the top results as can be seen in the screenshot below:



59. Following the provided search result link “Specification # 36.304 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.304 including version 14.2.0, as shown by the screenshot below:



60. 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 36.304, including version 14.2.0, for download.

61. The above search was performed at the time of writing this report. According to my personal experience, in March 2017 or around that timeframe it would have been similarly straightforward to locate a path to download version 14.2.0 of TS 36.304.

62. 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 March 22, 2017, at the latest.

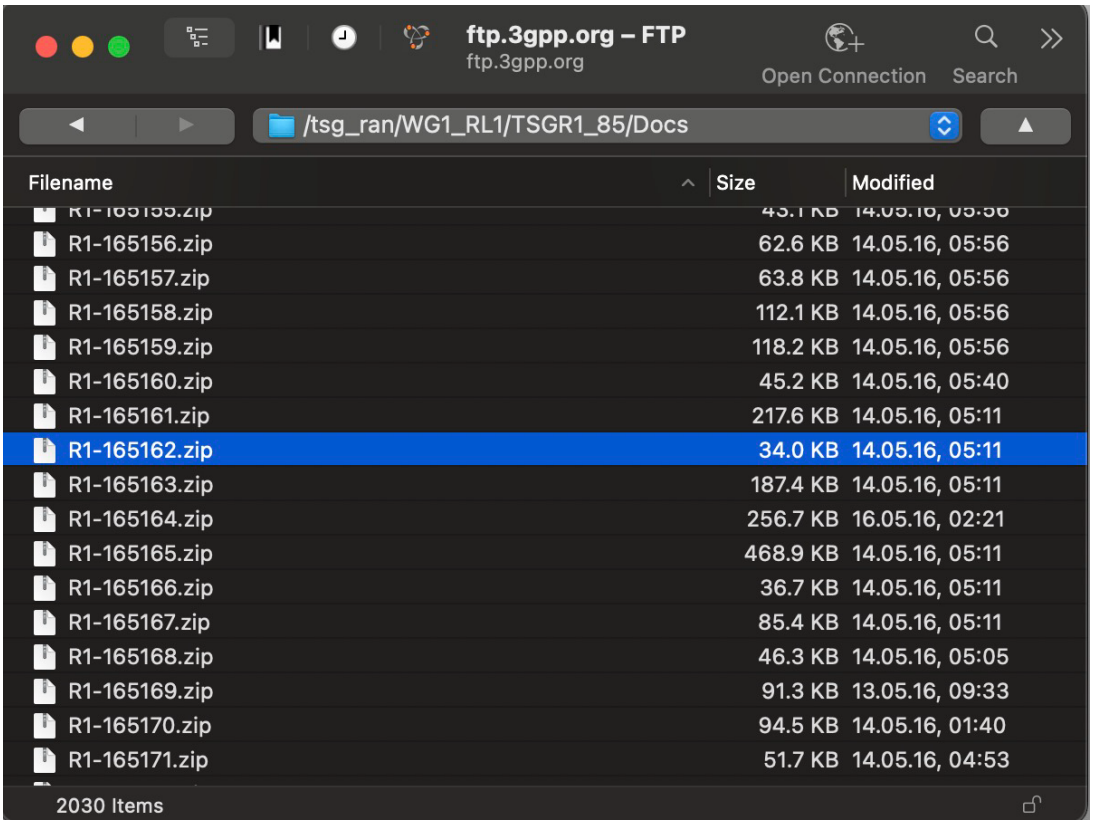
2. TDoc R1-165162

63. Based on my personal knowledge and my review of 3GPP's business records, I recognize EX1024 as a true and correct copy of 3GPP TDoc R1-165162, which represents a 3GPP document with the title "On Numerology for New Radio Access Technology." The document was authored by MediaTek Inc. and discussed and compared different numerologies for 5G New Radio.

64. On its face, R1-165162 refers to the RAN WG1 meeting #85 held on May 23 - 27, 2016, in Nanjing, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information

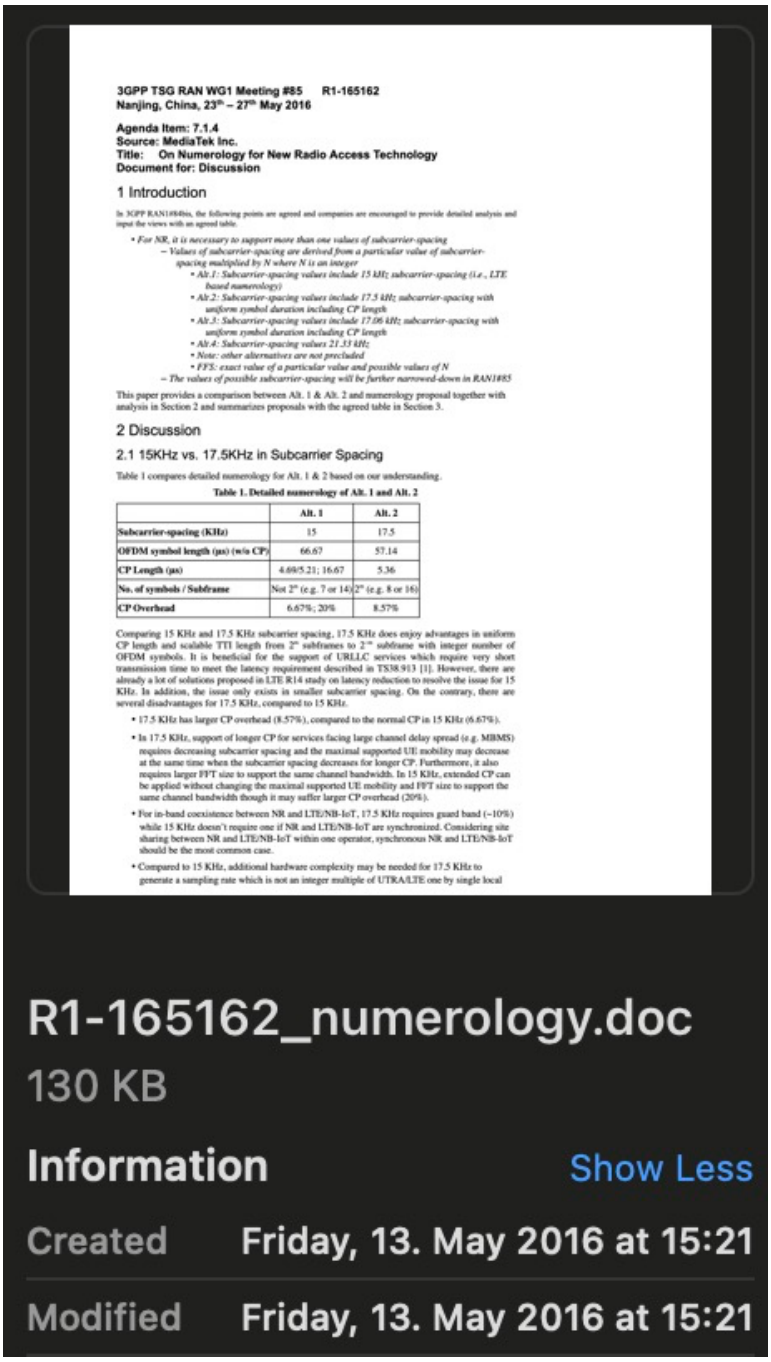
tells me that R1-165162 was available either prior or during or shortly after that meeting to at least all attending 3GPP members.

65. The public availability of the document is confirmed by the date stamp, May 14, 2016, shown on the historic 3GPP FTP server for the corresponding downloadable file ("R1-165162.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20160520080345/http://www.3gpp.org:80/ftp/tsg_ran/WG1_RL1/TSGR1_85/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_85/Docs/Docs as shown in the screenshot below:



66. 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.

67. In addition, metadata information for the downloaded and extracted TDoc file states a last Modified date of "13. May 2016," as shown in the screenshot below.



3GPP TSG RAN WG1 Meeting #85 R1-165162
Nanjing, China, 23th – 27th May 2016

Agenda Item: 7.1.4
Source: MediaTek Inc.
Title: On Numerology for New Radio Access Technology
Document for: Discussion

1 Introduction

In 3GPP RAN1#84bis, the following points are agreed and companies are encouraged to provide detailed analysis and input the views with an agreed table.

- *For NR, it is necessary to support more than one values of subcarrier-spacing*
  - *Values of subcarrier-spacing are derived from a particular value of subcarrier-spacing multiplied by N where N is an integer*
    - *Alt.1: Subcarrier-spacing values include 15 kHz subcarrier-spacing (i.e., LTE based numerology)*
    - *Alt.2: Subcarrier-spacing values include 17.5 kHz subcarrier-spacing with uniform symbol duration including CP length*
    - *Alt.3: Subcarrier-spacing values include 17.06 kHz subcarrier-spacing with uniform symbol duration including CP length*
    - *Alt.4: Subcarrier-spacing values 21.33 kHz*
    - *Note: other alternatives are not precluded*
    - *FFS: exact value of a particular value and possible values of N*
  - *The values of possible subcarrier-spacing will be further narrowed-down in RAN1#85*

This paper provides a comparison between Alt. 1 & Alt. 2 and numerology proposal together with analysis in Section 2 and summarizes proposals with the agreed table in Section 3.

2 Discussion

2.1 15KHz vs. 17.5KHz in Subcarrier Spacing

Table 1 compares detailed numerology for Alt. 1 & 2 based on our understanding.

Table 1. Detailed numerology of Alt. 1 and Alt. 2

	Alt. 1	Alt. 2
Subcarrier-spacing (KHz)	15	17.5
OFDM symbol length (μs) (w/o CP)	66.67	57.14
CP Length (μs)	4.69/5.21; 16.67	5.36
No. of symbols / Subframe	Not 2^n (e.g. 7 or 14)	2^n (e.g. 8 or 16)
CP Overhead	6.67%; 20%	8.57%

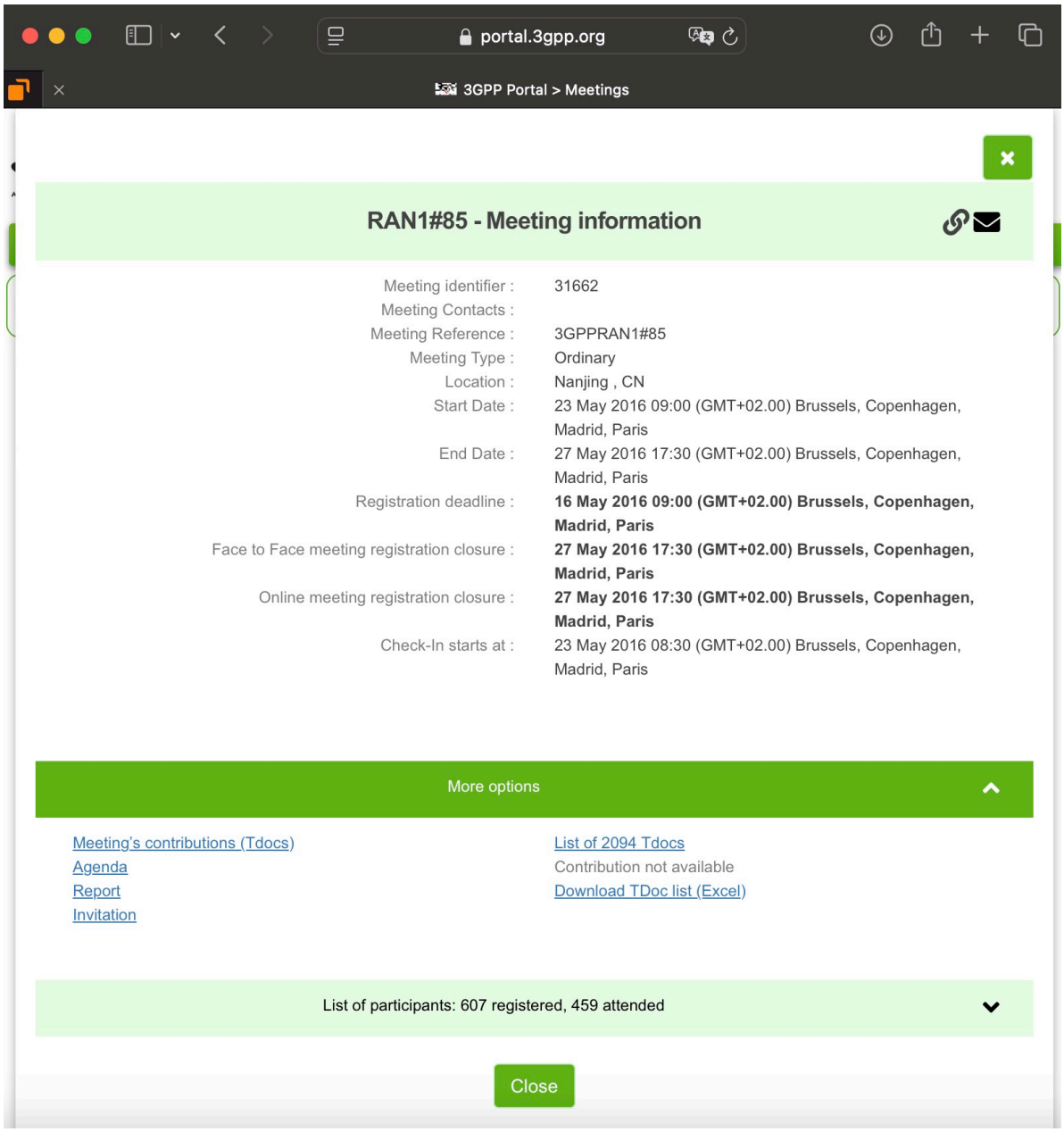
Comparing 15 KHz and 17.5 KHz subcarrier spacing, 17.5 KHz does enjoy advantages in uniform CP length and scalable TTI length from 2^n subframes to 2^nn subframe with integer number of OFDM symbols. It is beneficial for the support of URLLC services which require very short transmission time to meet the latency requirement described in TS38.913 [1]. However, there are already a lot of solutions proposed in LTE R14 study on latency reduction to resolve the issue for 15 KHz. In addition, the issue only exists in smaller subcarrier spacing. On the contrary, there are several disadvantages for 17.5 KHz, compared to 15 KHz.

- 17.5 KHz has larger CP overhead (8.57%), compared to the normal CP in 15 KHz (6.67%).
- In 17.5 KHz, support of longer CP for services facing large channel delay spread (e.g. MBMS) requires decreasing subcarrier spacing and the maximal supported UE mobility may decrease at the same time when the subcarrier spacing decreases for longer CP. Furthermore, it also requires larger FFT size to support the same channel bandwidth. In 15 KHz, extended CP can be applied without changing the maximal supported UE mobility and FFT size to support the same channel bandwidth though it may suffer larger CP overhead (20%).
- For in-band coexistence between NR and LTE/NB-IoT, 17.5 KHz requires guard band (~10%) while 15 KHz doesn't require one if NR and LTE/NB-IoT are synchronized. Considering site sharing between NR and LTE/NB-IoT within one operator, synchronous NR and LTE/NB-IoT should be the most common case.
- Compared to 15 KHz, additional hardware complexity may be needed for 17.5 KHz to generate a sampling rate which is not an integer multiple of UTRA/LTE one by single local

R1-165162_numerology.doc
130 KB
Information Show Less
Created Friday, 13. May 2016 at 15:21
Modified Friday, 13. May 2016 at 15:21

68. This last modified date is consistent with the May 14, 2019, upload date of the document, and the standard business practice among 3GPP participants to upload submissions shortly after completing them.

69. The final meeting report of the RAN WG1 meeting #85 held on May 23 - 27, 2016, in Nanjing, China, can be found in Appendix D. According to the 3GPP website at https://portal.3gpp.org/Meetings.aspx#/ which is shown by the screenshot below, that meeting was attended by 459 individuals (out of 607 registered participants):



70. The meeting report mentions R1-165162 on page 118 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 E[5]. R1-165162 is listed in row 1204 and is tagged as "available" which clearly shows the document was available at the meeting. Furthermore, the "Upload" date is shown as "2016-05-14" as can be seen by the screenshot below:

	TDoc #	Title	Source	TDoc Status	Reservation date	Uploaded
1						
1204	R1-165162	On Numerology for New Radio Access Technology	MediaTek Inc.	available	2016-05-13 07:00:54	2016-05-14 05:11:18

71. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, EX1024 is an authentic copy of 3GPP TDoc R1-165162 that was uploaded and made available via the 3GPP FTP server to the general public by May 14, 2016, at the latest.

V. AVAILABILITY FOR CROSS-EXAMINATION

72. 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

[5] Given the size of the document list with over 2000 rows (documents) and over 30 columns the Appendix only includes the columns relevant for this declaration: TDoc, Title, Source, TDoc Status, Reservation date, Uploaded.

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

73. 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

74. 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.

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

Dated: April 26, 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"*

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

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)

- ”Unlocking the internet of things and driving the need for interoperability”, Global Telecoms Business, December 2013
- “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

Appendix B

Appendix	Description
A	Curriculum Vitae of Friedhelm Rodermund
B	List of Appendices
C	Email sent via 3GPP_TSG_RAN_WG2@LIST.ETSI.ORG announcing the availability of TS 36.304 V14.2.0
D	Meeting report of the RAN WG1 meeting #85 held on May 23 - 27, 2016, in Nanjing, China
E	Document list of the RAN WG1 meeting #85 held on May 23 - 27, 2016, in Nanjing, China

Appendix C

3GPP_TSG_RAN_WG2 Archives
March 2017, Week 4

New in LISTSERV 17.0

3GPP_TSG_RAN_WG2@LIST.ETSI.ORG

Subject: RAN2 CR implementation status, v7
From: Juha Korhonen <Juha.Korhonen@ETSI.ORG>
Reply To: Juha Korhonen <Juha.Korhonen@ETSI.ORG>
Date: Wed, 22 Mar 2017 09:18:21 +0000
Content-Type: multipart/alternative
Parts/Attachments: text/plain (1345 bytes) , text/html (34 kB)

Dear All,

I have uploaded updated draft for 36.331, Rel-14 (v6) to the draft specs folder.
I have also made a few more final specs available via 3GU.
See the table below for details.

I am aiming to make all the remaining specs available as final versions today.

BR,
Juha

Overview of RAN2 CR implementation status after RAN#75 - 22.03.2017

spec	REL-12	REL-13	REL-14	CRs	rapporteur
25.300	0	1	2	3	Amaanat Ali (Nokia)
25.302	0	1	0	1	Amaanat Ali (Nokia)
25.306	0	0	1	1	Cecilia Eklöf (Ericsson)
25.331	2	3	6(v2)	11	Ritesh Shreevastav (Ericsson)
36.300	0	4	27(v2)	31	Benoist Sebire (Nokia)
36.302	0	2	7(v2)	9	Chunli Wu (Nokia)
36.304	0	4(v2)	10(v2)	14	Jarkko Koskela (Nokia)
36.305	0	0	2(v2)	2	Masato Kitazoe (Qualcomm)
36.306	0	4(v2)	17(v3)	21	Ravi Kuchibhotla (Motorola)
36.321	0	6(v2)	18(v3)	24	Mats Folke (Ericsson)
36.322	0	1	1	2	Toru Uchino (NTT DOCOMO)
36.323	0	1	3(v2)	4	Seung June Yi (LGE)
36.331	1	25(v3)	52(v6)	78	Himke van der Velde (Samsung)
36.355	0	0	4(v2)	4	Masato Kitazoe (Qualcomm)
36.360	0	1	1	2	Seung June Yi (LGE)
36.750	0	0	1	1	Zhuo Chen (CMCC)
total	**3**	**53**	**152**	**208**	

blue: draft spec is available for review
yellow: updated draft spec (based on review comments) is available for review
green: the final version is uploaded and available via 3GU or ftp.

The draft specifications for review are available here:
ftp://ftp.3gpp.org/tsg_ran/WG2_RL2/Specifications/201703_draft_specs_after_RAN_75/

All draft specs will be implemented with revision marks.

Appendix D

Source:	**MCC Support**
Title:	**Final Report of 3GPP TSG RAN WG1 #85 v1.0.0 (Nanjing,China, 23rd – 27th May 2016)**
Document for:	**Approval**



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Main facts summary

3GPP TSG WG RAN1 #85 meeting, hosted by the Chinese Friends of 3GPP, was held at Shangri-La Hotel Nanjing, China.
The meeting started at 9:00 on Monday 23rd May and finished at 17:10 on Friday 27th May 2016.
The number of attending delegates, having signed the participants' paper list, was **458.**

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

The number of contribution documents for this meeting was 2026, and those documents were categorized as followed.

Agenda Item	Input Document	Treated Document
All	2026	955

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

1 Opening of the meeting

Mr Satoshi Nagata (RAN1 Chairman) welcomed the participants of the RAN WG1 85 meeting and opened the meeting at 09:00. Mr Tong Hui from CMCC welcomed the delegates on behalf of the Chinese Friends of 3GPP , CATT, CATR, China Mobile, China Unicom, Coolpad, Huawei, Lenovo, Nokia, Oppo, Qualcomm, Samsung, ZTE 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)

2 Approval of Agenda

R1-163960 **Draft Agenda of RAN1#85 meeting** **RAN1 Chair**
Satoshi Nagata (Chairman) proposed the agenda for the meeting, as well the schedule of the week.
Discussion: Vodafone asked clarifying the overlap between NR session and NB-IoT maintenance on Tuesday's afternoon Chair → it will highly depend on the progress achieved during Monday's afternoon maintenance session.
Decision: The agenda is approved.

3 Approval of Minutes from previous meeting

R1-165448 **Final Report of 3GPP TSG RAN WG1 #84 bis v2.0.0 ETSI (R1-163961)**
The document was presented by Patrick Mérias (ETSI Mobile Competence Center) and provides the outcomes of last meeting in Korea.
Discussion: MCC→ report is revised as one agreement of the email thread [84b-06] was overlooked in R1-163961.
Few typos/editorials also corrected.
Decision: The document is approved.

4 Incoming Liaison Statements

Dual connectivity related

R1-163969 **LS on RLM for PSCell in dual connectivity RAN2, Intel**
The document was presented by Hong He from Intel and informs RAN1 and RAN4 about discussion that took place related to RLM for PSCell in dual connectivity. RAN2 has the understanding that if eNB does not configure the timers/constants for RLM then the consequence is that RLF due to physical layer failure will never be triggered for the PSCell.
Decision: The document is noted.

R1-164121 **Discussion on RLM for PSCell in dual connectivity Intel Corporation**
The document was presented by Hong He from Intel and deals with the potential spec changes on the UE behavior of RLM on PSCell in dual connectivity (DC) in order to reduce power consumption.
Discussion: Corresponding draft CR in R1-164122.
Decision: The document is noted.
R1-164122 **Draft CR on correction on RLM for PSCell in dual connectivity Intel Corporation**
Clarify that the downlink radio link quality of the PSCell of the SCG shall be monitored by the UE for the purpose of indicating out-of-sync/in-sync status to higher layers, only if the UE is configured with a SCG and the parameter *rlf-TimersAndConstantsSCG* provided by the higher layers is not set to release.
Discussion: Qualcomm→ case where UE is not configured should be considered.
Decision: The document is noted. Continue offline discussion.
Friday
R1-165724 **Correction on RLM for PSCell in dual connectivity Intel Corporation, Panasonic Rel-13 36.213 13.1.1 LTE_SC_enh_dualC-Core, TEI13 CR0684 F**
Decision: The document is agreed.

LAA related

R1-163973 **LS to RAN on new RAN4 TR for documenting multi-node tests for LAA RAN4, Ericsson**
The document states that a new RAN4 TR can be defined to document the multi-node tests for Rel-13 LAA operation. The same TR can be used to introduce new multi-node tests in future releases also, if needed.
Discussion: No comment.
Decision: The document is noted.

R1-164114 **LS regarding 3GPP LTE based technologies operating in the unlicensed bands City of New York (Counsel to the Mayor of)**
The document was presented by RAN1 Chair on behalf of NYC. The letter lists a number of WiFi-based applications and use cases the City of New York has committed to deliver to their residents and raises concerns on the potential impact of 3GPP standardizedf LTE-Unlicensed regarding lower level WiFi signals.
The letter also refers to the review of the incoming LS from WiFi Alliance (R1-163388) and IEEE 802 (R1-163375).
Discussion: Qualcomm suggested focusing on the replies to WFA and IEEE and, when ready copy NYC.
Decision: The document is noted.

R1-164393 **Draft response LS to 802dot11 regarding LAA Qualcomm Incorporated**
The document was presented by Peter Gaal from Qualcomm. Reply to R1-163375.
Discussion: Broadcom → let's review the content of the reply LS offline.
Decision: The document is noted. Continue offline discussion.
Friday
R1-165998 **Draft Response LS to IEEE 802.11 regarding LAA Qualcomm**
Decision: The document is noted and final LS is agreed in R1-166040.

R1-164394 **Draft response LS to WFA regarding LAA** **Qualcomm Incorporated**
The document was presented by Peter Gaal from Qualcomm. Reply to R1-163388.
Discussion: Broadcom → let's review the content of the reply LS offline.
Decision: The document is noted. Continue offline discussion.
Friday
R1-165999 **Draft response LS to WFA regarding LAA** **Qualcomm Incorporated**
Decision: The document is noted and final LS is agreed in R1-166041

R1-165449 **Review of 3GPP LAA Specification Rel. 13** **IEEE 802 LAN/MAN SC**
The document was presented by RAN1 Chair on behalf of IEEE. IEEE 802 would appreciate an acknowledgment from 3GPP RAN that the LAA Rel. 13 specification will not be complete until all outstanding issues raised by all stakeholders, including 3GPP RAN1, IEEE 802 and the Wi-Fi Alliance, have been resolved.
Discussion: Qualcomm → RAN's reply is more appropriate.
Decision: The document is noted. RAN1 understanding is that RAN should reply to IEEE.

eMTC related

R1-163974 **LS on continuous uplink transmission in eMTC** **RAN4, Intel**
The document was presented by Debdeep Chatterjee from Intel and asks RAN1 to clarify the expected eMTC UE behaviour:
- Is RAN1 considering the introduction of any mechanism for maintaining frequency and timing accuracy in eMTC, for example similar to the mechanism used in NB-IoT?

Decision: The document is noted.

R1-165224 **Discussion on continuous uplink transmissions in eMTC** **Intel Corporation**
The document was presented by Debdeep Chatterjee from Intel.
- Observation 1: Maintaining 0.1ppm of frequency accuracy during prolonged UL transmission bursts spanning multiple seconds can be extremely challenging and expensive, if not impossible, for HD-FDD eMTC UEs.
- Observation 2: Introduction of UL compensation gaps is not expected to impact eMTC UEs in CE mode A or those UEs that only support CE mode A.
- Proposal 1: UL compensation gaps are introduced for eMTC UEs long uplink (i.e. PUSCH/PRACH) transmissions.
  - During the UL gaps, the UE may switch to the DL and performs time/frequency synchronization
  - The UL gap is defined by a gap period (X ms) and gap length (Y ms)
  - The values of X and Y are to be determined by RAN4 and are fixed in the specifications.
- Proposal 2: Send an LS response to RAN4 indicating RAN1 support for the introduction of UL gaps for HD-FDD eMTC UEs with long UL transmissions (of PUSCH and PRACH) and asking them to determine the values of the maximum duration of continuous UL transmission and the UL gap length for eMTC UEs.

Decision: The document is noted.
R1-165225 **Draft reply LS on continuous uplink transmissions in eMTC** **Intel Corporation**
Discussion: ZTE's proposal in R1-165133.
Intel→ let's get feedback from RAN4.
Qualcomm, Huawei requested more time for review during the week.
Decision: The document is noted.

R1-165133 **Discussion on UL gap for eMTC** **ZTE**
Proposal 1: Mechanism of uplink compensation gaps in NB-IoT can be reused for Rel-13 eMTC.
- *For any PUSCH transmission with duration greater than X ms, a final UL gap of duration Y ms is inserted at the end of the PUSCH transmission.*
- *It is preferable that the value of X and Y equals to the multiples of maximum of Y_{ch}.*

Decision: The document is noted.
Continue offline discussion under AI 6.1.5– (Intel)

NB-IoT related

R1-163963 **LS on NB-IoT RRM requirements** **RAN2, Huawei**
The document was presented by Matthew Webb from Huawei.
- RAN2 assumes that RSRQ is only used for cell selection. RAN2 would like to RAN4 to further provide the value range of q-Qual for NB-IoT.
- RAN2 agrees RSRP is used for both cell selection and cell reselection and would like to ask RAN4 to provide range of q-RxLev.

- RAN2 assumes that Pcompensation is used in the cell selection criteria S: Srxlev = Qrxlevmeas – Qrxlevmin – Pcompensation – Qoffsettemp and would like to ask RAN4 whether this in line with RAN4's understanding and if so to provide parameters and the associated value ranges to calculate the Pcompensation.
- RAN2 assumes that NB-IoT supports additionalSpectrumEmission and additionalPmax per band (8 bands), and this is mandatory for the UE. RAN2 would like to ask RAN4 whether this assumption is correct and to provide value ranges for relevant parameters.
- RAN2 would also like to ask RAN4 to provide feedback on whether a NB-IoT carrier is identified by <EARFCN, offset>

Discussion: No action to RAN1.
Decision: The document is noted.

R1-163964 **Reply LS on per-UE configuration to allow exception reporting RAN2, Qualcomm**

The document was presented by Peter Gaal from Qualcomm and states that at least one use case for per-UE configuration to allow exception reporting is to prevent abuse of the RRC establishment cause mo-ExceptionData because exception data is handled with priority in the network. RAN2 requests CT1 and SA2 to consider how to prevent applications in the UE from abusing the RRC access cause in the upper layers.
Discussion: No action to RAN1.
Decision: The document is noted.

R1-163965 **Reply LS on direct SI update indication for NB-IoT RAN2, Ericsson**

The document was presented by Asbjorn Grovlen from Ericsson and confirms that

- The system information change indication (1bit for Systeminfomodification and 1bit for systemInfoModification-eDRX) carried in DCI is supported.
- RAN2 will capture this direct indication bit field for NB-IoT in TS 36.331.

Discussion: Already captured in RAN1 spec.
Decision: The document is noted.

R1-164120 **LS on direct indication DCI bits for NB-IoT RAN2, Huawei**

The document was presented by Matthew Webb from Huawei and RAN2 agreed to assume that 6 "spare" bits are included in DCI for future use, as shown in the following table:

Table : Direct Indication information

Bit	Field
1	*systemInfoModification*
2	*systemInfoModification-eDRX*
3, 4, 5, 6, 7, 8	Not used, and shall be ignored by category NB UE if received.

Discussion: Already captured in RAN1 spec.
Decision: The document is noted.

R1-163966 **Response to LS on questions on CIoT RAN2, Vodafone**

The document was presented by RAN1 chair on behalf of Vodafone.
Discussion: No action to RAN1.
Decision: The document is noted.

R1-163967 **Reply LS on NB-IoT RAN2, Huawei**

The document was presented by Matthew Webb from Huawei and confirms that:

- 2 bits in NB-MIB will be used to indicate the two LSB of HyperSFN,
- Regarding paging and system information, RAN2 is under discussion and would like to inform RAN1 later the decision,
- The NB-SIB1 modification period is 40.96s.

Discussion: Already captured in RAN1 spec.
Decision: The document is noted.

R1-163971 **Response LS on Reply LS on questions on NB-IOT RAN3, Nokia**

The document was presented by Michel Robert from Nokia and states that RAN3 has agreed the new *NAS PDU Transmission Delay Indicator* IE in the S1AP Initial UE Message message of the attached CR against TS36.413 which is one of the draft RAN3 CRs for cIOT optimization. This IE represents an expected delay for the transmission of the NAS PDU as a factor relative to the delay assumed at the MME without this indication. RAN3 is still considering whether this IE could additionally be introduced for the UP cIOT optimization.
Discussion: No action to RAN1.
Decision: The document is noted.

R1-164119 **Reply LS on questions on NB-IOT** **RAN2, Nokia**
The document states that RAN2 agreed not to adjust NAS timers based on the coverage level in NB-IoT. RAN2 agreed that NAS timers should be long enough i.e. taking into account the worst transmission delay in NB-IoT. RAN2 may provide further feedback about transmission delay of the NAS PDU in non-NB-IoT later.
Discussion: No action to RAN1.
Decision: The document is noted.

R1-165417 **LS on TB sizes for SI-messages for NB-IoT** **RAN2, Ericsson**
The document was presented by Asbjorn Grovlen from Ericsson and asks RAN1 to feedback early at RAN1#85 meeting whether adding two new TB sizes of 56 bits and 120 bits for SI messages is possible, and if so, to inform RAN2 which values of ITBS/ISF from TS 36.213 should be used.
Discussion: Contributions available on the topic, for review during the week.
Decision: The document is noted.

UTRA related

R1-163962 **Reply LS on Cell FACH DTx/DRx Enhancements signalling** **RAN2, Qualcomm**
The document was presented by Vasanthan Raghavan from Qualcomm and provides the following feedback:
- RAN2 specification does not allow configuring the UE to only listen to one HS-SCCH every FACH DRX cycle.
- RAN2 specification allows configuring the UE to listen to two HS-SCCH sub-frames every FACH DRX cycle in the 2-level FACH DRX mechanism.

Decision: The document is noted.

Mobility enhancement related

R1-163968 **LS on the feasibility of mobility enhancement solutions** **RAN2, ZTE**
The document was presented by Zhisong Zuo from ZTE and raises:
- Q1: Would the accuracy of the TA value calculated according to the schemes in the attachment be sufficient for transmitting PUSCH/PUCCH/SRS at the target cell in either synchronous or asynchronous network? (RAN1/RAN4)
- Q2: Assuming the TA value can be calculated accurately, would starting PUCCH/PUSCH/SRS transmission directly (i.e. without power ramping step) be feasible? (RAN1/RAN4)
- Q5: Is it feasible that the UE performs simultaneous transmission to two intra-frequency cells in either synchronous or asynchronous network in the following two cases? (RAN1/RAN4)
  - Case 1: PUSCH/PUCCH/SRS to one intra-frequency cell and PUSCH/PUCCH/SRS/PRACH preamble to another intra-frequency cell
  - Case 2: PUSCH/PUCCH/SRS to one intra-frequency cell and PRACH preamble in the other intra-frequency cell

Decision: The document is noted.

R1-164644 **Draft reply LS on the feasibility of mobility enhancement solutions** **ZTE**
The document was presented by Zhisong Zuo from ZTE.
Decision: The document is noted.

R1-165226 **Discussion on feasibility of mobility enhancement solutions** **Intel Corporation**
The document was presented by Seunghee Han from Intel.
Discussion: Intel → RAN1 should discuss further based on the discussion in Section 3.
Decision: The document is noted.
R1-165227 DRAFT Reply LS on the feasibility of mobility enhancement solutions Intel Corporation
Decision: The document is withdrawn.

R1-165370 **Discussion on the mobility enhancements solutions** **Nokia, Alcatel-Lucent Shanghai Bell**
The document was presented by Jari Lindholm from Nokia and provides views to the questions in R1-163968. Some changes to the physical layer specifications may need to be done. Changes related to RACH-less handover are more straightforward (e.g. modification to SSTD measurement) but further studies are needed for make-before-break type of operation. It should be noted that currently RAN2, RAN3 and RAN4 have TU allocation for this work item but RAN1 does not have, so RAN1 cannot do detailed studies on these issues.
Discussion: Ericsson, Huawei → no TU allocated, further studies needed → that's should be the answer.
Decision: The document is noted. RAN1 will liaise to RAN2 and tell RAN2 that further study is needed in RAN1. Prepare a draft reply LS to RAN2 – (ZTE)
Friday

R1-165986 **[Draft]Reply LS on the feasibility of mobility enhancement solutions** **ZTE**
Decision: The document is noted and final LS is agreed in R1-165996.

eLAA related

R1-163970 **LS on RAN2 agreements on eLAA** **RAN2, Huawei**
The document was presented by Xiayuan from Huawei.
Decision: The document is noted. For information to RAN1.

V2X related

R1-163975 **LS on EPC procedures for providing eNB with V2X authorization information** **SA2, LGE**
The document was presented by Hanbyul Seo from LGE and discusses EPC procedures for providing the eNB with V2X authorization information. Following two questions were raised:

- Whether it is required to have an indication to differentiate between a UE and an RSU implemented as a UE (i.e. UE-type RSU) from the PC5 radio resource allocation perspective?
- Whether it is required to have separate indications for different UE types/roles (i.e. Vehicle UE and Pedestrian UE) from the PC5 radio resource allocation perspective?

Discussion: No action to RAN1.
NEC has prepared a reply LS in R1-165452.
Decision: The document is noted.

R1-165414 **Reply LS on EPC procedures for providing eNB with V2X authorization information** **SA1, LGE**
The document was presented by Hanbyul Seo from LGE and feedbacks SA1'view whether it is acceptable to distinguish between the UE-type RSU, Vehicle UEs (UE in vehicle or installed in a vehicle) and Pedestrian UEs.

- From service requirements' perspective, there is no need to differentiate UEs.

Discussion: No action to RAN1.
Decision: The document is noted.

R1-165415 **Reply LS on V2X message characteristics SA3, TNO**
The document was presented by RAN1 chair on behalf of TNO and informs RAN2 that SA3 is studying the security of V2X and will provide the requested size of a possible security overhead in due course.
Discussion: No action to RAN1.
Decision: The document is noted.

NR related

R1-163972 **LS on Parameters for WP5D Sharing and compatibility studies** **RAN4, Ericsson**
The document was presented by Stefan Parkvall from Ericsson and asks RAN1 to take note of the intentions of RAN4 to prepare a response to parameters 3 to 7.4 in R1-163390 and to any additional RF parameter of relevance. RAN4 also asks RAN1 to keep RAN4 informed about any progress on NR access scheme parameters, in particular for aspects that are believed to have any direct or indirect impact on RF characteristics such as unwanted emission levels, sensitivity, etc. This includes, but may not be limited to, the following parameters:

- Access technique (No. 1 in the LS)
- Modulation parameters (No. 2 in the LS)
- Channel spacing (No. 3 in the LS)
- Channel bandwidth (No. 4 in the LS)
- Signal bandwidth (No. 5 in the LS)
- Beam forming parameters
- Power dynamic range (No. 6.1 in the LS)
- SINR performance

RAN4 will keep RAN1 updated in its progress on the relevant sharing parameters and plans to send a more detailed LS to RAN1 at the May WG meetings. A first response from RAN1 would be very helpful during the May meetings, followed by a second response in August.
Decision: The document is noted. To be handled under AI 7.1.

R1-164260 **Formation of IEEE 1914 Next Generation Fronthaul Interface Working Group IEEE 1914 Next Generation Fronthaul Interface (NGFI) Working Group**

The document was presented by RAN1 Chair and informs about the creation of IEEE 1914 Next Generation Fronthaul Interface (NGFI) Working Group to develop IEEE 1914.1 Standard for Packet-based Fronthaul Transport Networks. The scope of this project includes:

- Transport network architecture for the transport of mobile fronthaul traffic (e.g., Ethernet-based), including user data, management and control plane traffic.
- Requirements and definitions for the fronthaul networks, including data rates, timing and synchronization, quality of service etc.

Decision: The document is noted. RAN3 in charge of replying.

R1-164286 **LS on Remaining Issues on Path Loss Scenarios New York University Wireless**

The document was presented by RAN1 Chair and provides NYU WIRELESS observations regarding the recent RAN1 84Bis channel modeling activity.

Discussion: Further discussion can be handled during the channel model session.

Decision: The document is noted.

The following LS have been received in the course of the week:

R1-165655 LS to RAN1 on RAN2 agreements related to V2X RAN2, LGE
R1-165722 Reply LS on questions on NB-IOT CT1, Nokia
R1-165723 LS to RAN1 on SPS RAN2, LGE
R1-165727 LS on V2V transmission path selection RAN2, Huawei
R1-165753 Reply LS on NB-IoT RRM requirements RAN4, Huawei
Decision: The document is noted. See AI 6.1.6
R1-165754 LS on RRM measurement for NB-IOT RAN4, Ericsson
Decision: The document is noted. See AI 6.1.6
R1-165817 Response LS on PUSCH transmission for eLAA RAN4, Nokia
Decision: The document is noted. See AI 6.2.1.1
R1-165838 LS to RAN1 on RAN2 agreement on eLAA RAN4, Nokia
Decision: The document is noted. See AI 6.2.1.5
R1-165894 Response to LS on uplink transmission gap in NB-IoT RAN4, Sony
Decision: The document is noted. See AI 6.1.6
R1-165895 LS on Tx Gaps for Frequency Error Correction RAN4, Qualcomm
Decision: The document is noted. See AI 6.1.6
R1-166004 Response LS on realistic power amplifier model for NR waveform evaluation RAN4, Nokia
Decision: The document is noted. See AI 7.1.2

5 UTRA

R1-165865 Chairpersons' summary of the UMTS sessions UMTS Session Chairpersons (Huawei, Ericsson)

The document was presented by Carmela Cozzo from Huawei and Florent Munier from Ericsson.

Decision: The document is endorsed and content is incorporated as below.

5.1 Maintenance of UTRA Releases 4 – 13

5.1.1 FDD

R1-164364 Clarifications to DCH enhancements feature Qualcomm Europe Inc.(France)

Decision: The document is noted.

Proposal 1: Disallow multiple "maximum TTI" channels each with a transport format with zero transport blocks.
Proposal 2: Transmit UL TPC on DL when there is UL SRB transmission in the case of single transport channel configurations with 40 ms TTI.
Conclusion: Proposal 2 is agreed. Whether it impacts the specifications is FFS.
Proposal 3: Specify DL synchronization behavior in the context of DCH enhancements.
Proposal 4: When TFCI 0 is indicated UL DPCCH is transmitted on both frames.
Proposal 5: NodeB should transmit TPC command on the first slot after gap.
Proposal 6: Disallow the concurrency of PCA2 and DCH enhancements.
Proposal 7: NodeB shall transmit in 20 ms mode when it doesn't detect UL reliably.

Conclusion: Proposal 7 is agreed. Whether it impacts the specifications is FFS.
Proposal 8: Disallow DCH enhancements with PS mapped to HS or EUL in the absence of CPC for 20 ms only mode.
Email discussion on proposals 2/4/7/8 from R1-164364 until June 8, 2016 – (Qualcomm)

R1-164365 **Clarifications on DCH enhancements feature** **Qualcomm Europe Inc.(France)**
Decision: The document is noted. Further revised in R1-165862.
R1-165862 **Rel-12 25.214 CR0747 F**
Decision: The document is agreed.
R1-164366 **Clarifications on DCH enhancements feature (Mirror Rel-13)** **Qualcomm Europe Inc.(France)**
Decision: The document is noted. Further revised in R1-165863.
R1-165863 **Rel-13 25.214 CR0748 A**
Decision: The document is agreed.
R1-164367 Clarifications on DCH enhancements feature Qualcomm Europe Inc.(France)
Decision: The document is noted. Further revised in R1-165515.
R1-165515 **Rel-12 25.212 CR0339 F**
Decision: The document is agreed.
R1-164368 Clarifications on DCH enhancements feature (Mirror Rel-13) Qualcomm Europe Inc.(France)
Decision: The document is noted. Further revised in R1-165516.
R1-165516 **Rel-13 25.212 CR0340 A**
Decision: The document is agreed.

R1-165336 Clarification on UL DPCH 10ms Mode Ericsson
Decision: The document is noted. (25.212 12.1.0 UTRA_DCHenh-Core CR0337 F)
For email approval until June 8, 2016 - (Ericsson)
R1-165337 Clarification on UL DPCH 10ms Mode Ericsson
Decision: The document is noted. (25.212 13.0.0 UTRA_DCHenh-Core 0338 A)

Not pursued.
R1-165338 Clarification on measuring the transmitted code power for the downlink DPCH slot formats #17 and #18
Ericsson Rel-12 25.215 12.1.0 UTRA_DCHenh-Core 0207 F
R1-165339 Clarification on measuring the transmitted code power for the downlink DPCH slot formats #17 and #18
Ericsson25.215 13.0.0 UTRA_DCHenh-Core 0208 A

5.1.2 TDD
None

5.2 Multi-Carrier enhancements for UMTS - WID in RP-152290.

5.2.1 Performance evaluation
R1-165084 **Further evaluation results for [2+10]ms TTI in DB-DC-HSUPA** **Huawei, HiSilicon**
Decision: The document is noted.
R1-165085 **Further evaluation results for [10+10]ms TTI in DB-DC-HSUPA and DC-HSUPA** **Huawei, HiSilicon**
Decision: The document is noted.
R1-165325 **Further Evaluation of Multicarrier Enhancements for DC HSUPA** **Ericsson**
Decision: The document is noted.
R1-165326 Further Evaluation of Multicarrier Enhancements for DB-DC HSUPA Ericsson
Decision: The document is noted.
TP of evaluation in R1-165084/5 revised in R1-165509
R1-165509 **TP on Evaluation results** **Huawei, HiSilicon**
Decision: The document is noted and TP is agreed.

5.2.2 Other
R1-165086 **Impact on legacy terminals** **Huawei, HiSilicon**
Decision: The document is noted.
R1-165087 **TP on impact on legacy terminals** **Huawei, HiSilicon**
Decision: The document is noted.
R1-165088 **Impact on specifications** **Huawei, HiSilicon**

Decision: The document is noted.
R1-165089 **TP on impact on specifications Huawei, HiSilicon**
Decision: The document is noted.
R1-165090 **Conclusion on MultiCarrier enhancements Huawei, HiSilicon**
Decision: The document is noted.
R1-165327 **Impact of Multicarrier Enhancements on L1 Mechanisms and standards Ericsson**
Decision: The document is noted.
R1-165328 **View on the conclusions for the SI on Multicarrier Enhancements for UMTS Ericsson**
Decision: The document is noted.
R1-165329 **Text proposal: Evaluation of Multicarrier Enhancements Ericsson**
Decision: The document is noted. Revised in R1-165508
R1-165508 **Text proposal: Evaluation of Multicarrier Enhancements Ericsson**
Decision: The document is noted and TP is agreed
R1-165513 **Text proposal: Evaluation of Multicarrier Enhancements Qualcomm**
Decision: The document is noted and TP is agreed
R1-165330 **Text proposal: Impact of Multicarrier Enhancements on L1 Mechanisms and standards Ericsson**
Decision: The document is noted.
R1-165331 **Text proposal: View on the conclusions for the SI on Multicarrier Enhancements for UMTS Ericsson**
Decision: The document is noted.
R1-165088 and R1-165330 captured in R1-165507
R1-165507 **Text proposal on impact on specifications and UE implementation Ericsson**
Decision: The document is noted and TP is agreed
R1-165510 **TP on conclusions for the Multicarrier Enhancements for UMTS Huawei**
Decision: The document is noted and TP is agreed

Agreements
In summary, among the new proposed dual carrier solutions (including the DB-DC-HSUPA) 2ms+10ms or 10ms+10ms overall provide benefits depending on how much path loss is present and how much power is allocated to the primary carrier, and may outperform 2ms+2ms DC- and DB-DC HSUPA. However the performance of single carrier is larger than the proposed dual carrier configurations when grant limitation does not occur.

- **Simulations and scenarios:** Scenarios discussions spanned multiple DC-HSUPA and DB-DC-HSUPA scenarios, and also single carrier HSUPA. The scenarios vary in terms of TTI lengths in each subcarrier, power setting per subcarrier and maximum transmitted UE power. Control channel overhead was not taken into consideration in the evaluation (see Section x.x.x). Several companies presented link simulations
- **In good coverage** i.e. when the UE is near the base station, legacy dual carrier 2ms+2ms TTI outperforms both for DB-DC-HSUPA and DC-HSUPA. It is also observed that 10ms+10ms in DC-HSUPA and 2ms+10ms in DB-DC-HSUPA outperform single carrier HSUPA.
- **In medium coverage** dual carrier configurations (i.e., 2ms+2ms and 10ms+10ms DC-HSUPA, as well as 2ms+2ms, 2ms+10ms and 10ms+10ms DB DC-HSUPA) are outperformed by single carrier 2 or 10 ms TTI only when it is possible to allocate the power of the single carrier with a value exceeding the power allocated to the primary uplink frequency of the DC or DB-DC cases. Among the new proposed dual carrier solutions (including the DB-DC-HSUPA) 2ms+10ms or 10ms+10ms overall provide similar benefits depending on how much path loss is present and how much power is allocated to the primary carrier, and outperforms 2ms+2ms DC- and DB-DC HSUPA. The UE-NodeB distance where the legacy 2ms DC-HSUPA (DB-DC-HSUPA) is outperformed by either the single carrier or the proposed dual carrier (i.e. DC or DB-DC HSUPA) configurations depends on the power configuration.
- **In poor coverage** (e.g. near the cell boundary)**,** single carrier configuration with 10ms TTI dominates the overall performance.

R1-165511 LS on RAN1 multi-carrier enhancements for UMTS agreements RAN1
Decision: The document is agreed.

Updated TR in R1-165514.
Email discussion on updated TR25.707 until Monday June 6, 2016 (Huawei)

5.3 DTX/DRX enhancements in CELL_FACH - WID in RP-160185.

5.3.1 DRX improvements

R1-164362 **HS-SCCH DRX lite design with enhanced servicing ability Qualcomm Europe Inc.(France)**

Decision: The document is noted.

R1-164363 **Open Issues on HS-SCCH DRx lite proposal** **Qualcomm Europe Inc.(France)**

Decision: The document is noted.

R1-165332 **A view on DRX enhancements in CELL_FACH** **Ericsson**

Decision: The document is noted.

QC proposal for HS-SCCH DRX Lite Design was noted. The following considerations for DRX Improvements are listed:

- Enable the network to schedule the UE in more than one subframe (Rx Burst of e.g. 0.4, 0.8 frames)
- Investigate the possibility of using HS-SCCH control information rather than HS-SCCH orders
- For example Mechanism and reliability
- Enable 640 ms mode in HS-SCCH /HS-DSCH DRX in CELL FACH mode in addition to existing values present in IE *HS-DSCH DRX cycle$_{FACH}$*

R1-165512 **LS on HS-SCCH DRx Design in Cell Fach RAN1, Qualcomm**

Decision: The document is agreed.

Conclusion

Based on the analysis performed, the following observations have been made:

- Observation 1: The proposals made on the "DRX enhancements area" may certainly bring benefits in terms of battery savings based on creating more opportunities for the UE to stay in a sleep period.
- Observation 2: The analysis made in this contribution aims at keeping the impact on the specifications as low as possible, encouraging at the same time the use of the solutions that are already available in the standard.

- Proposal 1: Take observations 1 and 2 on "DRX enhancements" into account, and discuss the technical details within the TSG RAN WG2 since most of it design (i.e., a part from the assessment on the potential gains and the design of the HS-SCCH orders) is connected to the RAN2 specifications.

5.3.2 DTX improvements

R1-165091 **Evaluation results for DTX in CELL_FACH** **Huawei, HiSilicon**

Decision: The document is noted.

R1-165092 **Further considerations on the design of DTX in CELL_FACH** **Huawei, HiSilicon**

Decision: The document is noted.

Huawei will come back with revised results with an updated model according to the following:

- Back off timer starts as soon as the buffer of the UE is empty (TEBS)
- Account for blocking rate and noise rise (cell capacity issues).

R1-165333 **An assessment on the potential gains associated to the introduction of DTX in CELL_FACH** **Ericsson**

Decision: The document is noted.

R1-165334 **On applying DTX on the UL DPCCH prior to an E-DCH retransmission in CELL_FACH** **Ericsson**

Decision: The document is noted.

R1-165335 **Summary of the potential gains and technical implications of introducing DTX in CELL_FACH** **Ericsson**

Decision: The document is noted.

Agreement: It may be possible to configure, the "Back-off" timer and the number of "Common E-DCH resources" available in the cell as a function of the CELL_FACH traffic, in order to achieve a trade-off between:

- amount of uplink interference,
- E-DCH resource blocking rate,
- Cell capacity

6 E-UTRA

6.1 Maintenance of E-UTRA Releases 8 – 13

6.1.1 Maintenance of E-UTRA Release 8 – 12

None.

6.1.2 Maintenance of Release 13 LTE carrier aggregation enhancement beyond 5 carriers

R1-164196 **Draft 36.213 CR Clarification on PUCCH format 4/5 resource derivation CATT**

The document (draft CR to 36.213) was presented by Fang Chen Cheng from CATT.

Discussion: Huawei → UE behavior is not correctly captured. Doesn't work.

Decision: The document is noted.

- UE behaviour of TPC mapping is different for PUCCH formats 3, 4, and 5 in Rel-13 compared to that of PUCCH format 3 in Rel-12
  - No spec change is needed

R1-164733 **HARQ-ACK Codebook on PUSCH for TDD Samsung**

The document was presented by Aris Papasakellariou from Samsung.

- Proposal: For TDD and a UE configured with more than 5 cells, the HARQ-ACK codebook in the PUSCH is determined as for FDD.

Discussion: Late change according to Huawei – would like to understand spec impact, may need more time.

Decision: The document is noted. Continue offline discussion – (Samsung)

Friday: Email discussion until June 30th – (Samsung)

R1-164926 **Correction on citations to a DAI bits table ITRI**

The document from ITRI clarifies that the DAI bits should be expressed in Table 5.3.3.1.2-2 but not in Table 5.3.3.1.1-2 which is not existed in the specification.

Decision: The document is noted and CR0205 to 36.212 is agreed.

6.1.3 Maintenance of Release 13 licensed-assisted access to unlicensed spectrum

R1-164395 **Draft CR on CWp adjustment Qualcomm Incorporated**

The document (draft CR to 36.213) was presented by Srinivas Yerramalli from Qualcomm and clarifies that when the contention window size is increased, it is done so for every access priority class.

Discussion: Indication of rev in CR coversheet not needed.

Nokia, Huawei believe the change is not needed.

Decision: The document is noted.

LGE: following document addresses the same topic:

R1-164491 **Correction on CWS update for multiple channel access priority classes LG Electronics**

The document specifies the eNB behavior to adjust CWS for all channel access priority classes at the same time.

Decision: The document is noted. Continue offline discussion (Qualcomm)

Friday:

R1-166039 **CR on CWp adjustment Qualcomm Incorporated**

Decision: The document is noted and CR0687 to 36.213 is agreed.

R1-164396 **DCI Format 1C signaling and expected UE behavior Qualcomm Incorporated**

The document was presented by Srinivas Yerramalli from Qualcomm and suggests adding the following statement to section 13A of 36.213.

The UE is not expected to monitor PDCCH with CRC scrambled by CC-RNTI outside of the Active Time defined in [8] in order to determine the configuration of occupied OFDM symbols in any subframe within the Active Time.

Discussion: Panasonic → second part of the sentence may be removed.

Decision: The document is noted.

R1-164397 Draft CR on DCI Format 1C signaling and expected UE behavior Qualcomm Incorporated

Discussion: Indication of rev in CR coversheet not needed.

Decision: The document is noted. Continue offline discussion (Qualcomm)

Friday:

R1-165766 **[DRAFT] LS on DRX and Reception of PDCCH scrambled by CC-RNTI Panasonic**

Decision: The document is noted and final LS is agreed in R1-166038.

R1-164405 **Draft CR on clarification for channel sensing Qualcomm Incorporated**

The document was presented by Srinivas Yerramalli from Qualcomm and clarifies that the time quanta of re-attempting sensing the medium is a slot of duration 9 μs instead of Td.

Discussion: Indication of rev in CR coversheet not needed.

Decision: The document is noted. Continue offline discussion (Qualcomm)

Friday:

R1-166022 **CR on clarification for channel sensing Qualcomm Incorporated**

Decision: The document is noted and CR0686 to 36.213 is agreed.

R1-164490 **Discussion on CWS update for multiple channel access priority classes LG Electronics**

The document was presented by … from LGE.

Suggestion: Option 1 is supported for Rel-13 LAA.

- Option 1: eNB can change the channel access priority every DL transmission burst.
- Option 2: eNB can change the channel access priority class only when the adjusted CWS is the minimum value.
- Note that additional specification work is not necessary to support Option 1.

Discussion: Seems that all are fine with option 1 – no need to capture anything.

Decision: The document is noted.

R1-164492 **Clarification on DL ending partial subframe LG Electronics**

The document was presented by … from LGE and proposes a TP for section 13A of 36.213 to clarify the UE behaviour for the reception of DL ending partial subframe and discusses the duration of PDCCH in DL ending partial subframe.

Discussion: Panasonic → doesn't see the need for Rel-13, may be addressed in Rel-14.

Decision: The document is noted.

R1-165324 **Draft CR on LAA DL Multichannel access BROADCOM LIMITED**

The document (draft CR to 36.213) was presented by Sindhu Verma from Broadcom and suggests extending to all the channels in the same sub-band across multiple groups the restriction of 4 slots pause before resuming countdown of the backoff counter on a CAT4 LBT channel.

Decision: The document is noted. Continue offline discussion – (Broadcom)

6.1.4 Maintenance of Release 13 elevation beamforming/full-dimension MIMO for LTE

R1-164123 **Evaluation of MU-MIMO performance with Rel-13 DM-RS Intel Corporation**

The document was presented by Yuan Zhu from Intel and provides views on the two alternatives for the DM-RS sets of possibly multiplexed DM-RS antenna ports.

Decision: The document is noted.

R1-165105 **Clarification of OCC=2 and OCC=4 MU-MIMO Transmission Ericsson**

The document was presented by Mark Harrison from Ericsson.

- Clarify the specification of OCC=2 codepoints to either support OCC=2 only coscheduling or mixed OCC=2 and OCC=4 coscheduling.
  - Support mixed OCC=2 and OCC=4 transmission on ports 7, 8, 11, and 13 unless there is consensus among UE vendors that performance is a significant concern given UE implementation, considering that the Rel-12 table is also available.
    - Specify UE behaviour as proposed in the first correction shown in section **Error! Reference source not found.**, and in the corresponding CR [R1-165105].
  - Otherwise, specify UE behavior to support OCC=2 only coscheduling on ports 7 and 8, as proposed in [R1-163688].

Decision: The document is noted.

R1-165106 MU-MIMO with Mixed Orthogonal Cover Code Length Ericsson

The document (CR0655 to 36.213) was presented by Mark Harrison from Ericsson.

- When a UE is scheduled with OCC=2 and a single layer on port 7, UE assumptions support PDSCH transmission on port 8 and 13 to other UEs.
- When a UE is scheduled with OCC=2 and a single layer on port 8, UE assumptions support PDSCH transmission on port 7 and 11 to other UEs.

Decision: The document is noted.

R1-164317 **Correction on UE assumption on DMRS ports ZTE**

The document (draft CR to 36.213) clarifies the UE assumption in case of the new DMRS table in DCI formats 2C and 2D is configured for single-antenna port transmission scheme.

Discussion: Aligned with Intel.

Decision: The document is noted and agreed as CR0672 to 36.213 in R1-165538.

R1-164734 **Draft CR on FD-MIMO codebooks (36.213)** **Samsung**
Corrections to ensure alignment with the FD-MIMO codebook agreements made in RAN1#82b and RAN1#83.
Decision: The document is noted and agreed as CR0666 to 36.213 in R1-165528.

R1-164735 **Draft CR on CSI-Reporting-Type in TS 36.213** **Samsung**
The document suggests changing the field name 'CSI-reporting-Type' to 'eMIMO-Type'.
Decision: The document is noted and agreed as CR0667 to 36.213 in R1-165529.

R1-164736 **Clarification on non-PMI based CSI reporting in TS 36.213** **Samsung**
Observation: Two options for UE assumption on precoding matrix for PUSCH mode 3-0/PUCCH mode 2-0 are available.

- *Alternative 1: Remove all assumptions on precoding matrix in non-PMI based CSI reporting mode descriptions.*
- *Alternative 2: Release the assumption that 'a single precoding matrix is selected from the CBSR' and clarify that 'for each subband a preferred precoding matrix is selected from the codebook subset assuming transmission only in the subband' in non-PMI based CSI reporting mode descriptions.*

Proposal: Support both options in observation and revise the corresponding descriptions in the current specification.
Discussion: No consensus.
Decision: The document is noted.
R1-164737 Draft CR on non-PMI based CSI reporting in TS 36.213 Samsung
Decision: The document is not treated.

6.1.5 Maintenance of Release 13 further LTE physical layer enhancements for MTC

R1-165932 **Chairman's Notes of Agenda Item 6.1.5 on eMTC CRs** **Ad-hoc chair (Qualcomm)**
The document was presented by Wanshi Chen from Qualcomm and provides the outcomes of eMTC maintenance session.
Decision: The document is endorsed. Contents incorporated below.

Terminology
R1-164833 **Correction on the usage of CEModeA and CEModeB for eMTC in TS 36.211** **Huawei, HiSilicon**
Decision: The document is withdrawn.
R1-165450 **Correction on the usage of CEModeA and CEModeB for eMTC in TS 36.213** **Huawei, HiSilicon** (R1-164834)
Decision: The document is noted and agreed as CR0669 to 36.213 in R1-165531.

PBCH
R1-164402 **Remaining issues for eMTC** **Qualcomm Incorporated**
Decision: The document is noted.
R1-165082 **Draft CR for clarification of MPDCCH over empty CRS tones in PBCH repetition** **Qualcomm Incorporated**
Decision: The document is noted and agreed as CR0247 to 36.211 in R1-165532.

DCI definition
R1-164835 **Correction on the DCI payload size for eMTC in TS 36.212** **Huawei, HiSilicon**
Decision: The document is noted and agreed as CR0207 to 36.212 in R1-165533.
R1-165386 **Frequency hopping flag definition in DCI formats for BL/CE UE** **Ericsson**
Decision: The document is noted, revised in and agreed as revision 1 of CR0206 to 36.212 in R1-165540
R1-165392 **Definition of number of MPDCCH repetitions for BL/CE UE** **Ericsson**
Decision: The document is noted and CR0662 to 36.213 is agreed.

MPDCCH
R1-164402 **Remaining issues for eMTC** **Qualcomm Incorporated**
Decision: The document is noted.

R1-165671 **Scrambling sequence initialization for PDSCH** **Qualcomm Incorporated, NTT DOCOMO**
Decision: The document is noted and the CR is endorsed. Final CR0252 to 36.211 is agreed in R1-165703.
R1-164401 **Draft CR for scrambling sequence initialization** **Qualcomm Incorporated**

Decision: The document is noted and agreed as CR0248 to 36.211 in R1-165534.

R1-165081 **Draft CR for clarification on starting subframe for MPDCCH** **Qualcomm Incorporated**
Decision: The document is noted and the CR is endorsed. Final CR0681 to 36.213 is agreed in R1-165672.

R1-164602 **eMTC MPDCCH corrections for 36.213** **Sequans Communications**
Decision: The document is noted and revision 1 of CR0653 to 36.213 is agreed in R1-165746.

R1-164843 **On MPDCCH AL and search space for 8 EREGs per ECCE in TS 36.213.** **Huawei, HiSilicon**
Decision: The document is noted and agreed as CR0670 to 36.213 in R1-165536.
R1-164844 **On MPDCCH AL for 8 EREGs per ECCE in TS 36.211.** **Huawei, HiSilicon**
Decision: The document is noted and the CR is endorsed. Final CR0249 to 36.211 is agreed R1-165623

R1-164916 **draft CR on MPDCCH quasi co-location** **Panasonic Corporation**
Decision: The document is noted and agreed as CR0671 to 36.213 in R1-165537.

R1-165382 **Draft LS on MPDCCH configuration for BL/CE UE** **Ericsson**
Decision: The document is noted. Final LS is approved in R1-165748 with the following update:

~~In case #3 above, the two MPDCCH PRB sets can operate as a single MPDCCH PRB consisting of up to 6 PRBs which means that the two sets share so many properties that RAN1 considers that it might be more efficient from RRC signalling point of view to configure them using a single EPDCCH-SetConfig entity with numberPRB-Pairs-v1310 set to 'n6' instead of two separate entities. The second EPDCCH-SetConfig entity specified in TS 36.331 V13.1.0 would then not be used by BL/CE UEs in Rel-13.~~

~~However, f~~For case #3 above, from RAN1 specification point of view it is necessary to know the PRB indices of the 2 PRBs and the 4 PRBs, respectively. RAN1 notes that if the resourceBlockAssignment-r11 can be used to point out the PRB indices of the 2 PRBs then it is trivial to deduce the PRB indicates of the other 4 PRBs in a 6-PRB narrowband for BL/CE UEs. The second EPDCCH-SetConfig entity specified in TS 36.331 V13.1.0 would then not be used by BL/CE UEs in Rel-13.

R1-165385 **Enable cross-subframe channel estimation for BL/CE UE** **Ericsson**
Decision: The document (CR0246 to 36.211) is noted and revised in:
R1-165802 **Enable cross-subframe channel estimation for BL/CE UE** **Ericsson**
Decision: The document is noted and CR0246 is postponed. Revisit in RAN1#86.

R1-165389 **Overlapping MPDCCH search spaces for BL/CE UE** **Ericsson**
Decision: The document (CR0659 to 36.213) is noted and revised in:
R1-165867 **Overlapping MPDCCH search spaces for BL/CE UE Ericsson**
Decision: The document is noted and CR0659 is postponed. Revisit in RAN1#86.

R1-165390 **MPDCCH search space for random access in connected mode for BL/CE UE** **Ericsson**
Decision: The document (CR0660 to 36.213) is noted and revised in:
R1-165868 **MPDCCH search space for random access in connected mode for BL/CE UE** **Ericsson**
Decision: The document (CR0660rev1 to 36.213) is noted and revised in:
R1-165958 **MPDCCH search space for random access in connected mode for BL/CE UE** **Ericsson**
Decision: The document is noted and revision 2 of CR0660 to 36.213 is for email approval until June 3rd – (Ericsson).

R1-165393 **PRB locations for Type0 MPDCCH search space for BL/CE UE** **Ericsson**
Decision: The document is noted and CR0663 to 36.213 is agreed.

PDSCH
R1-164124 **Draft CR on PDSCH scrambling for eMTC** **Intel Corporation**
Decision: The document is noted.
R1-165312 **Scrambling Sequence for paging MPDCCH and PDSCH** **Nokia, Alcatel-Lucent Shanghai Bell**
Decision: The document (draftCR to 36.211) is noted and revised in:

R1-165578 **Scrambling Sequence for paging MPDCCH and PDSCH** **Nokia, Alcatel-Lucent Shanghai Bell, Intel, Ericsson**
Decision: The document is noted and the CR is endorsed. Final CR0251 to 36.211 is agreed R1-165686.

R1-164927 **Some corrections for eMTC** **ITRI**
Decision: The document is noted and CR0245 to 36.211 is agreed.

R1-165279 **Correction on PDSCH reception timing for eMTC** **Nokia, Alcatel-Lucent Shanghai Bell**
Decision: The document is noted and the CR is endorsed. Final CR0679 to 36.213 is agreed in R1-165636.

R1-165387 **Starting OFDM symbol for SIB1-BR for BL/CE UE** **Ericsson**
Decision: The document is noted and CR0657 to 36.213 is agreed.
R1-165388 **Collision between SIB1-BR and SI message for BL/CE UE** **Ericsson**
Decision: The document is noted and CR0658 to 36.213 is agreed.

PUSCH
R1-164124 **Draft CR on PDSCH scrambling for eMTC** **Intel Corporation**
Decision: The document is noted.
R1-164488 **Correction of cyclic hopping term for PUSCH DMRS** **NEC**
Decision: The document is noted.
Conclusion: Regarding the issues discussed in R1-164125 and R1-164488, no CR is necessary.

R1-164402 **Remaining issues for eMTC** **Qualcomm Incorporated**
Proposal 1: Capture the agreement that for R=1 the invalid subframes are overridden for the transmission of PUSCH/PUCCH.
Decision: The document is noted.
R1-165080 **Draft CR for overriding of valid-invalid subframes for R=1** **Qualcomm Incorporated**
Decision: The document is noted and the CR is endorsed. Final CR0250 to 36.211 is agreed in R1-165673.

R1-164842 **Correction on RV determination for PUSCH in TS 36.213.** **Huawei, HiSilicon**
Decision: The document is noted and the CR is endorsed. Final CR0675 to 36.213 is agreed in R1-165624.

R1-165395 **Correction on collision of dynamically scheduled data and semi-statically scheduled data for Rel-13 eMTC** **Ericsson**
Conclusion: CR in R1-165395 is agreed in principle. As this CR is intended to replace 36.213 CR0637r1 (agreed in R1-163787 – Ran1#84bis), final CR0637r2 to 36.213 is agreed in R1-165568

Continuous UL transmission
R1-163974 **LS on continuous uplink transmission in eMTC** **RAN4, Intel**
Decision: The document is noted.

Not treated.
R1-165413 Continuous Uplink Transmission in eMTC Sony
R1-165133 Discussion on UL gap for eMTC ZTE
R1-165134 Draft reply LS on continuous uplink transmission in eMTC ZTE

R1-165562 **WF on UL gaps for eMTC** **Intel Corporation, Sony, Sequans, Sierra Wireless, ZTE**
Decision: The document is noted. Revised in:
R1-165681 **WF on UL gaps for eMTC** **Intel Corporation, Sony, Sequans, Sierra Wireless, ZTE, Qualcomm, Ericsson**
Decision: The document is noted. Further revised in:
R1-165874 **WF on UL gaps for eMTC** **Intel Corporation, Sony, Sequans, Sierra Wireless, ZTE, Qualcomm, Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, Nordic Semiconductor, Spreadtrum, KT Corporation, Nubia Technology, NEC, InterDigital, CATT**
Decision: The document is noted.

Proposal:

- UL compensation gaps are introduced for HD-FDD eMTC UEs long transmissions PUSCH/PRACH.
  - During the UL gaps, the UE may switch to the DL and performs time/frequency synchronization.
  - Note that the UE is not required to process DL channels during the UL gaps.
  - The UL gap is defined by a gap period (X ms) and gap length (Y ms).
  - The values of X and Y are to be determined by RAN4 and are fixed in the specifications.
    - Note: From RAN1 perspective, it may be beneficial to align the values of X and Y with the maximum frequency hopping granularity
- 1 bit capability signaling is introduced to enable more capable HD-FDD UEs to indicate that they do not need UL gaps during long UL transmissions to maintain the required frequency accuracy.
  - This bit is included in msg3, and also in the capability report of the UE.
- UL compensation gaps are applicable for PRACH and Msg3 transmissions during initial access regardless of the UE capability
  - For PRACH transmission, gaps do not apply if between two PRACH transmissions there is at least Z ms.
    - RAN4 to decide the value of Z
  - Note that for PDCCH ordered PRACH, the UE applies gaps following the capability signaling.
- During the UL gap durations, the corresponding PUSCH/PRACH transmissions are dropped
- Send an LS response to RAN4 and RAN2 informing them of the above and requesting:
  - RAN4 to determine the values of X, Y, and Z for eMTC UEs considering worst case coverage;
  - RAN2 to provide signaling support for the above capability signalling

Objected by: Huawei, HiSilicon

- Reason from Huawei, HiSilicon: it's a new feature, not essential, and there are other ways to approach this situation. Since it impacts multiple work groups, it should be handled at the RAN plenary.

Continue discussion offline, aim for concluding in RAN1 this week.

R1-165953 **WF on UL gaps for eMTC** **Intel Corporation, Sony, Sequans Communications, Verizon, Sierra Wireless, ZTE, Qualcomm, Ericsson , AT&T, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, NTT DoCoMo, SoftBank Mobile, CATT, Panasonic, NEC, KT Corporation, MediaTek, LG Electronics, Nordic Semiconductor, Spreadtrum, Nubia Technology, InterDigital, Virtuosys, Sharp, WILUS Inc.**

Decision: The document is noted.

Proposal:

- UL compensation gaps are introduced for HD-FDD eMTC UEs long transmissions PUSCH/PRACH.
  - During the UL gaps, the UE may switch to the DL and perform time/frequency synchronization.
  - Note that the UE is not required to process DL channels during the UL gaps.
  - The UL gap is defined by a gap period (X ms) and gap length (Y ms).
  - The values of X and Y are to be determined by RAN4 and are fixed in the specifications.
    - Note: From RAN1 perspective, it may be beneficial to align the values of X and Y with the maximum frequency hopping granularity
- 1 bit capability signaling is introduced to enable more capable HD-FDD UEs to indicate that they do not need UL gaps during long UL transmissions to maintain the required frequency accuracy.
  - This bit is included in msg3, and also in the capability report of the UE.
- UL compensation gaps are applicable for PRACH and Msg3 transmissions during initial access regardless of the UE capability.
  - For PRACH transmission, gaps do not apply if between two PRACH transmissions there is at least Z ms.
    - RAN4 to decide the value of Z
  - Note that for PDCCH ordered PRACH, the UE applies gaps following the capability signaling.
- During the UL gap durations, the corresponding PUSCH/PRACH transmissions are dropped.
- Send an LS response to RAN4 and RAN2 informing them of the above and requesting:
  - RAN4 to determine the values of X, Y, and Z for eMTC UEs considering worst case coverage;
  - RAN2 to provide signaling support for the above capability signalling

Objected by: Huawei, HiSilicon

- Reason from Huawei, HiSilicon: it's a new feature, not essential, and there are other ways to approach this situation. Since it impacts multiple work groups, it should be handled at the RAN plenary. In addition, RAN4 wishes to study this, and RAN1 should take no action.

Intel: it is NOT a valid concern that the WF would impact multiple working groups
Further discussion till Friday.

Friday

R1-166015 WF on UL gaps for eMTC Intel Corporation, Sony, Sequans Communications, Verizon, Sierra Wireless, ZTE, Ericsson , AT&T, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, NTT DoCoMo, SoftBank Mobile, CATT, Panasonic, NEC, KT Corporation, MediaTek, LG Electronics, Nordic Semiconductor, Spreadtrum, Nubia Technology, InterDigital, Virtuosys, Sharp, WILUS Inc.
Decision: The document is noted.

R1-166035 WF on UL gaps for eMTC Intel Corporation, Sony, Sequans Communications, Verizon, Sierra Wireless, ZTE, Ericsson, Qualcomm, AT&T, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, NTT DoCoMo, SoftBank Mobile, CATT, Panasonic, NEC, KT Corporation, MediaTek, LG Electronics, Nordic Semiconductor, Spreadtrum, Nubia Technology, InterDigital, Virtuosys, Sharp, WILUS Inc.
Decision: The document is agreed.

R1-165784 [DRAFT] Reply LS on continuous uplink transmission in eMTC Intel
Decision: The document is noted and final LS is agreed in R1-166042.

Collision between PUCCH and PUSCH

R1-164597 Collision between PUCCH and PUSCH Sequans Communications
Decision: The document is noted.

R1-164599 Correction for collision between PUCCH and PUSCH Sequans Communications
Decision: The document is noted.

R1-165280 Correction on UCI multiplexing on PUSCH Nokia, Alcatel-Lucent Shanghai Bell
Decision: The document is noted.

R1-165394 Multiplexing of UCI and PUSCH for BL/CE UE Ericsson
Decision: The document is noted.

R1-164840 Correction on collision between PUCCH and PUSCH in TS 36.213 Huawei, HiSilicon
Decision: The document is noted.

R1-165708 Correction on UCI multiplexing on PUSCH Nokia, Alcatel-Lucent Shanghai Bell
Decision: The document is noted and the CR0683 to 36.213 is endorsed, with the following update:

- For a BL/CE UE, and remove BL/CE in the sub-bullets
- Double-check whether FDD/TDD or FS1/FS2 is used, and align the terminology if necessary
- The CR in R1-165625 is withdrawn.

Final CR agreed in R1-165767 (CR0683r1), which is further revised and revision 2 is agreed in R1-165791

Decision: The document is noted.

PUCCH

R1-164837 Correction on the supported PUCCH format for CEModeA in TS 36.213 Huawei, HiSilicon
Decision: The document is noted and draft CR is endorsed. Final CR in R1-165625 – wihtdrawn according to the conclusion to R1-165767).

R1-164838 Clarification on collision between SR and PDSCH with repetitions in TS 36.213 Huawei, HiSilicon
Decision: The document is noted. Draft CR is postponed till next meeting. Revisit in RAN1#86.

R1-165383 PUCCH frequency retuning for BL/CE UE Ericsson
Decision: The document is revised in:

R1-165869 PUCCH frequency retuning for BL/CE UE Ericsson
Decision: The document is noted.

R1-165903 WF on PUCCH frequency retuning for BL/CE UE Ericsson, Qualcomm, NEC, Sequans, Virtuosys, Softbank, NTT DoCoMo, Sierra Wireless, CATT, Sony, Altair, LG Electronics, InterDigital, Huawei, HiSilicon, Verizon, AT&T, ZTE
Decision: The document is noted.

Proposal:

- Revoke the following RAN1#84 agreement:

- Shortening of PUCCH 1/1a/1b in the first slot of a subframe is realized by using in the first slot with PUCCH 1/1a/1b resource mapping from symbols 1 through 6 in the first slot while maintaining the existing PUCCH 1/1a/1b DM-RS locations.

- Agree the following proposal:
  - For PUCCH 1/1a/1b, UL retuning gaps are generated by puncturing of the affected SC-FDMA symbols: last symbol and first symbol of the prior and the latter subframe respectively
    - However, if the prior subframe is an SRS subframe, shortened format of legacy behaviour is applied, i.e., shortened format is applied in the prior subframe, and first symbol of the latter subframe is punctured.

Objected by Samsung:

- Reasons: othogonality is broken for multiplexing different UEs, difficult to acheive the target of 10^-3 performance

Further discussion till Friday.

Friday

Samsung still maintained their opinion – performances will be broken – suggested having an email discussion and revisit at next meeting.

Chair: can we have it as working assumption? Samsung: no

Ericsson→ what will the outcomes of an email discussion be?

NO consensus.

CSI definition

R1-164399 **Clarification on CSI measurements** **Qualcomm Incorporated**

Decision: The document is noted.

R1-165542 **Clarification of CSI measurements** **Qualcomm Incorporated (R1-164400)**

Decision: The document is noted. Email discussion on the issue raised in R1-164399 and R1-165542 until June 10th

R1-164738 **Draft CR on CSI Reporting** **Samsung**

Decision: The document is noted. The first change in R1-164738 is endorsed. Final CR0674 to 36.213 is agreed in R1-165622

R1-164839 **Correction on PDSCH transmission scheme assumed for TM9 CSI reference resource in TS 36.213** **Huawei, HiSilicon**

Decision: The document is noted. The change in R1-164839 is endorsed. Final CR0685 to 36.213 is agreed in R1-165737

R1-164739 **Draft CR on A-CSI reporting for TM6** **Samsung**

Decision: The document is noted and the draft CR endorsed. Final CR0673 to 36.213 is agreed in R1-165621

SRS handling

R1-164841 **Correction on SRS frequency location in TS 36.213** **Huawei, HiSilicon**

Decision: The document is noted. The change in R1-164841 is agreed in principle, further discussion offline especially regarding the wording. Final CR0678 to 36.213 is agreed in R1-165627

R1-165278 **Channel interleaver correction for eMTC** **Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted and the CR is endorsed. Final CR0208 to 36.212 is agreed in R1-165635

Random access

R1-164836 **Clarification on Msg3 PUSCH repetition level in TS 36.213** **Huawei, HiSilicon**

Decision: The document is noted and the CR is endorsed. Final CR0208 to 36.212 is agreed in R1-165626

R1-164865 **Correction on the determining PRACH starting subframe in TS 36.211** **Huawei, HiSilicon**

Decision: The document is noted and the draft CR is postponed. Revisit in RAN1#86.

R1-165314 **MCS for Random Access Response Grant** **Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is revised in:

R1-165579 **MCS for Random Access Response Grant** **Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted and the draft CR is endorsed. Final CR0682 to 36.213 is agreed in R1-165687.

Paging occasion overlap

R1-164398 Discussion on paging occasion overlap for eMTC Qualcomm Incorporated
Decision: The document is noted and the topic is postponed. Revisit in RAN1#86.

R1-165543 Correction on DCI payload size Qualcomm
Decision: The document is noted.
R1-165646 Correcting configuration parameter for number of PRB-pairs Sequans Communications
Decision: The document is noted and the draft CR is endorsed. Final CR0680 to 36.213 is agreed in R1-165682

Not treated.
R1-165785 Draft 36.211 eMTC CR capturing RAN1 #84bis and #85 agreements Ericsson
R1-165786 Draft 36.212 eMTC CR capturing RAN1 #84bis and #85 agreements Ericsson
R1-165787 Draft 36.213 eMTC CR capturing RAN1 #84bis and #85 agreements Ericsson
R1-165993 CAT-M1 Coverage Enhancement Analysis Sierra Wireless, Ericsson, Sequans

6.1.6 Maintenance of Release 13 NB-IoT

R1-165933 Chairman's Notes of Agenda Item 6.1.6 on NB-IoT CRs Ad-hoc chair (Qualcomm)
The document was presented by Wanshi Chen from Qualcomm and provides the outcomes of NB-IoT maintenance session.
Decision: The document is endorsed. Contents incorporated below.

R1-165111 Introduction of NB-IoT Motorola Mobility 36.213 13.1.1 CR0656 B
Decision: The document is already agreed (decision taken during email thread [84b-02].
R1-165396 36.201CR0014r1 Introduction of NB-IoT Nokia, Alcatel-Lucent Shanghai Bell 36.201 13.1.0 CR0014r1 B
Decision: The document is already agreed (decision taken during email thread [84b-02].

R1-165754 LS on RRM measurement for NB-IOT RAN4
RAN4 LS providing the definitions of NRSRP and NRSRQ.
Decision: The document is noted.
R1-165753 Reply LS on NB-IoT RRM requirements RAN4
Decision: The document is noted.
R1-165894 Response to LS on uplink transmission gap in NB-IoT RAN4
Decision: The document is noted.
R1-165895 LS on Tx Gaps for Frequency Error Correction RAN4
Decision: The document is noted.

R1-164026 Updated Draft NB-IoT CR to 36.213 post Busan Motorola Mobility Germany GmbH
R1-164305 Introduction of LTE Physical Layer Enhancements for NB-IoT Motorola Mobility Germany GmbH
R1-164662 Introduction of NB-IoT Ericsson
Decision: The document is noted and CR0033 to 36.214 is agreed.

PSS/SSS
R1-164403 Potential issues of NB-SSS in asynchronous deployment Qualcomm Incorporated
Decision: The document is noted.
Conclusion:
- There is no consensus to standardize a solution to address the issue identified in R1-164403 and there is no consensus to send an LS to RAN4.

SI Handling
R1-164863 On TBS values for NB-SI transmission Huawei, HiSilicon
Decision: The document is noted.
R1-165127 Remaining issue on SI messages for NB-IoT ZTE
Decision: The document is noted.
R1-165231 TBS values and resource mapping for SI messages Intel Corporation
Decision: The document is noted.

R1-165602 **WF on TBS for NB-IoT SI-messages Huawei, HiSilicon, CATT, Ericsson, Intel, Nokia, ASB, QC, Sony, Vodafone**
Decision: The document is noted. Also supported by MediaTek.

Agreement:
- It is feasible to support additional TBS of 56, and 120 bits for SI-messages (not including SIB1-NB)
- Recommend RAN2 to select:
  - $I_{SF} = 1$, $I_{TBS} = 1$ (for 56 bits); and
  - $I_{SF} = 1$, $I_{TBS} = 4$ (for 120 bits)
- Send an LS to RAN2 based on the above bullets, draft LS in R1-165694, agreed in R1-165710

R1-165663 **WF on SI messages for NB-IoT ZTE, Nubia Technology**
Decision: The document is noted.

NPDCCH
R1-164291 **Monitoring of NPDCCH after NPDSCH/NPUSCH transmission Sony**
Decision: The document is noted.

Agreement:
- An NB-IoT UE is required to monitor for NB-PDCCH for UL and DL grant 3 ms after the end of the NB-PUSCH transmission.
  - Up to the editor how to capture the bullet

R1-164404 **On NPDCCH search space Qualcomm Incorporated**
Decision: The document is noted.
R1-165629 **WF on collision with SI transmission and overlapping NPDCCH search space Qualcomm, Ericsson, MediaTek, Huawei, Hisilicon, ZTE**
Decision: The document is noted.

Agreement:
- A UE is not required to monitor an NPDCCH search space that ends later than 4ms before the beginning of the next NPDCCH search space.
  - The above rule also applies to partial NPDCCH search space period.
- Subframes of NPDSCH/NPDCCH for unicast, paging, and RAR that overlap with SI transmission are postponed to the next valid DL subframes

R1-164847 **Clarification on NPDCCH monitoring in 36.213 Huawei, HiSilicon**
Decision: The document is noted.

Agreement:
- Clarify that "the corresponding NB-PDSCH or NB-PUSCH transmission" includes the ACK/NACK transmission on NPUSCH format 2 scheduled in DCI Format N1.
- An NB-IoT UE that has received a NPDCCH order is not required to monitor NPDCCH for any further DL or UL grant during the time period between the end of the NPDCCH order and the start of the ordered NPRACH transmission.

R1-164877 **Discussion on Scheduling Delay with Transmission Gaps CMCC**
Decision: The document is noted.
R1-165139 **Discussion on starting subframe of NPDCCH search space MediaTek Inc.**
Decision: The document is noted.
R1-165670 **WF on NPDCCH starting subframe MediaTek, LGE, Huawei, HiSilicon**
Decision: The document is noted. Also supported by Samsung.

Agreement:
- The formula for starting subframe of NPDCCH is updated as $(10n_f + \lfloor n_s/2 \rfloor) \bmod T = \lfloor \alpha_{\text{Offset}} T \rfloor$ where
  - α_{offset} is signaled via RRC {0, 1/8, 1/4, 3/8}, i.e., α_{offset} is an UE-specific parameter configured by RRC for USS and cell-specific and PRACH resource specific parameter for CSS for RAR/Msg 3 re-tx/Msg 4

Send an LS to RAN2, draft LS in R1-165695 (to update "two additional parameters", potentially include other possible new parameters) – (Huawei)

R1-165695 **[DRAFT]LS on RRC parameter list for NB-IoT Huawei**

Decision: The document is noted, revised in R1-165709, which is endorsed. Final LS is agreed in R1-165906.

R1-165730 **L1 parameters list for NB-IoT Huawei**

Decision: The document is noted and included in R1-165906.

R1-165229 **Some remaining issues on NPDCCH related to TS 36.213 Intel Corporation**

Decision: The document is noted.

Agreements:

- Adopt the recommended changes to Section 16.4.1 and Section 16.6 of TS 36.213 as indicated in Section 2 of R1-165229
- If the higher layer parameter NBIoT-Operation-mode (or operationMode) indicates in-band mode of operation (i.e., set to '00' or '01'), the starting OFDM symbol for NPDCCH ($l_{\mathrm{NPDCCHStart}}$) is given by the higher layer parameter lteControlRegionSize.

PDSCH

R1-165228 **On resource allocation for SIB1-NB in TS 3.213 Intel Corporation**

Decision: The document is noted.

Agreement: The proposed text change in R1-165228 is endorsed

R1-165230 **On scrambling initialization for NPDSCH Intel Corporation**

Decision: The document is noted.

Agreements:

- For NPDSCH carrying SIB1-NB, the scrambling is reinitialized at the first subframe carrying a repetition of the codeword.
- For NPDSCH carrying SI messages other than SIB1-NB, the scrambling is reinitialized at the first subframe carrying a repetition of the codeword.

A/N Timing

R1-164100 **Time reference for A/N transmission Huawei, HiSilicon**

Decision: The document is noted.

R1-164126 **Time domain resource allocation for NPUSCH with 1-bit A/N feedback Intel Corporation**

Decision: The document is noted.

R1-165000 **Time Reference for Ack/Nack Transmission Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

R1-165124 **Remaining issues on UL Transmission reference for NB-IoT ZTE**

Decision: The document is noted.

R1-165539 **WF on time reference of ACK/NACK of NPDSCHHuawei, HiSilicon, CATT, Intel, Panasonic, u-blox, ZTE**

Decision: The document is noted.

R1-165664 **WF on time reference of ACK/NACK of NPDSCH Huawei, HiSilicon, CATT, Intel, Panasonic, u-blox, ZTE, Samsung, China Unicom, Astri, NEUL, CATR**

Decision: The document is noted. Also supported by China Telecom, Potevio.

R1-165651 **WF on Time Reference for Ack/Nack Transmission Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Sony, Verizon, AT&T, LG, Sierra Wireless**

Decision: The document is noted.

R1-165884 **WF on Time Reference for Ack/Nack Transmission Ericsson**

Decision: The document is noted.

Agreements:

- A/N transmission delay is relative to the end of the corresponding NPDSCH transmission plus 12ms.

- Introduce both odd and even numbers for the time offset for 15 kHz ACK/NACK.
- It is proposed to use the following timing offsets in the DCI instead of {0, 2, 4, 6} ms for 15kHz ACK/NACK transmission.
  - {0 2 4 5}

DL & UL Gap

Decision: The document is noted.

R1-164290 **UL Transmission Gap Duration Sony**

Decision: The document is noted.

R1-164376 **On UL transmission gaps and related RAN4 analysis Huawei, HiSilicon**

Decision: The document is noted.

R1-165126 **Potential issue on value of DL Gap configuration for NB-IoT ZTE**

Decision: The document is noted.

R1-165131 **Issues on NPRACH UL Gap configuration ZTE**

Decision: The document is noted.

R1-165644 **WF on clarification for timing of DL transmission ZTE, MTK, HW, HiSilicon, Sony**

Decision: The document is noted.

Agreement: If NPUSCH UL Gap is inserted at the end of NPUSCH transmission, the UE resumes monitoring of N-PDCCH from the end of the UL gap.

R1-165645 **WF on NPRACH UL gapZTE, MTK,Sony**

Decision: The document is noted.

Agreement: If a NPRACH UL Gap is inserted at the end of NPRACH opportunity, the start of RAR detecting window is from the end of the UL gap.

RACH

R1-164862 **Clarification on UL grant in NB-RAR in 36.213 Huawei, HiSilicon**

Decision: The document is noted.

Agreement: When $I_{delay} = 0$ for UL grant in NB-RAR, $k_0 = 13$.

R1-164939 **Clarification on repetition and Pseudo-random hopping of NPRACH NEC Corporation**

Decision: The document is noted.

R1-165355 **NB-IoT-NPDCCH ordered PRACH Ericsson**

Decision: The document is noted.

R1-165652 **WF on NPDCCH ordered PRACH Ericsson**

Decision: The document is noted. Also supported by ZTE.

Agreement:

- Introduce the tone index in DCI format N1 for the NPDCCH ordered PRACH.
- A field of 6 bits in DCI format N1 should be used to indicate the tone index as
  - Indicate the absolute tone index.
  - The tone index in DCI format N1 has to indicate a tone in a PRACH resource matching the PRACH repetitions.
    - A tone outside this PRACH resource is not allowed.

PUSCH

R1-164998 **Handling of cyclic shift in UL DMRS sequence selection Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

R1-165130 **Comments on NPUSCH format 1 and TP for 36.213 ZTE**

Decision: The document is noted.

Conclusion: The TP in R1-165130 is endorsed

R1-165128 **Remaining issues on DMRS for NPUSCH format 2 ZTE**

Decision: The document is noted.

R1-165630 **WF on NB-IoT UL DMRS Hopping** **Qualcomm**
Decision: The document is noted. Also supported by Panasonic.

Agreements:

- To adopt the legacy LTE group hopping, as defined in Sec. 5.5.1.3, TS36.211, for NB-IoT UL DMRS for N-PUSCH format 1:
  - The group hopping pattern is revised from legacy LTE with *30* replaced by M in the following equations
    - $u = \left(f_{gh}(n_s) + f_{ss}\right) \bmod M$
    - $f_{gh}(n_s) = \begin{cases} 0 & \text{if group hopping is disabled} \\ \left(\sum_{i=0}^{7} c(8n_s + i) \cdot 2^i\right) \bmod M & \text{if group hopping is enabled} \end{cases}$
    - $c_{init} = \left\lfloor \frac{n_{ID}^{RS}}{M} \right\rfloor$
    - $f_{ss}^{PUSCH} = \left(N_{ID}^{cell} + \Delta_{ss}\right) \bmod M$
    - $f_{ss}^{PUSCH} = n_{ID}^{RS} \bmod M$
  - In the above, M=30, 14, 12, and 16 for, respectively, 12-tones, 6-tone, 3-tone and single-tone cases.
  - The group-hopping pattern is reset:
    - Every subframe for multi-tone transmission
    - Every RU for single-tone transmission
  - The group-hopping for single-tone transmission only applies to the Hadmard sequence index
  - n_{ID}^{PUSCH} is not defined, and $n_{ID}^{RS} = N_{ID}^{Ncell}$.
- Send an LS to RAN2 (cc-RAN4) to inform the above including the need to have
  - a new cell-specific RRC parameter, Group-hopping-enabled, to enable and disable the group hopping,
  - a new UE-specific RRC parameter, Disable-group-hopping to disable the function despite it is enabled by the cell-specific parameter unless the PUSCH transmission corresponds to a Random Access Response Grant or a retransmission of the same transport block as part of the contention based random access procedure,
  - a new RRC parameter for the offset, Δ_{ss} (the same range of the one in LTE)

Post meeting: It is noticed that LS sent to RAN2 did not include RAN4 – see email thread [85-26].

Collision Handling

R1-164846 **Clarifications on collision handling in 36.211 and 36.213** **Huawei, HiSilicon**
Decision: The document is noted.
R1-164991 **NB-IoT - Collision handling** **Ericsson**
Decision: The document is noted.
R1-165125 **Collision handling for NB-IoT** **ZTE**
Decision: The document is noted.
R1-165132 **On collision between NPRACH and NPUSCH** **ZTE**
Decision: The document is noted.

General/Multiple

R1-164493 **Discussion on remaining issues on NB-IoT** **LG Electronics**
Decision: The document is noted.

Agreement:

- When a UE is configured with additional PRB in inband where anchor PRB is in guard band
  - If same-PCI indicator is true, the behaviour is defined the same in all cases
  - If same-PCI indicator is not true, the behaviour is defined the same in all cases

R1-164494 **Discussion and comments on NB-IoT CRs** **LG Electronics**
Decision: The document is noted.

Agreement:

- Introduce the following definition in 36.211:
  - N: A constant equal to 2048 for Δf=15kHz , 4096 for Δf=7.5kHz and 8192 for Δf=3.75kHz

R1-164577 **Clarifications for NB-IoT CRs** **Spreadtrum Communications**
Decision: The document is noted. The first change in R1-164577 is to be handled by the editor.

R1-165002 **Non-anchor PRB location for NB-IoT multi-carrier operation** **Nokia, Alcatel-Lucent Shanghai Bell**
Decision: The document is noted.
R1-165129 **Comments on UE procedures for NB-IoT and TP for 36.213** **ZTE**
Decision: The document is noted.

Agreement: The TP in R1-165129 is endorsed

Others
R1-164848 **Draft 36.300 section 5 CR for NB-IoT** **Huawei**
Decision: The document is noted.

Agreement:
- The draft CR in R1-164848 is endorsed (removing the changes on changes), send an LS to RAN2 – (Huawei)
- **R1-165600** (the updated CR)
- The draft LS is in R1-165601, with the final LS agreed in R1-165711

R1-164917 **Clarification of antenna port usage of NB-IoT** **Panasonic Corporation**
Decision: The document is noted.

Agreement:
- When the same-PCI indicator is set to true, to use antenna port 0 and 1 for the transmission of NRS, NPDCCH, NPDSCH and NBPCH. When the same-PCI indicator is set to false, to use new antenna port (for example port 1000 and 1001) for the transmission of NRS, NPDCCH, NPDSCH and NBPCH.
  - How to capture the bullet is up to the editor
- A UE may assume the antenna ports 1000 – 1001 of a serving cell are quasi co-located (as currently defined in 36.213 that is to introduced in 36.211) with respect to delay spread, Doppler spread, Doppler shift, average gain, and average delay.
  - How to capture the bullet is up to the editor

R1-165879 **WF on NPDCCH search space monitoring** **MediaTek, Nokia, Huawei, Hisilicon, Qualcomm, Sony, ZTE**
Decision: The document is noted.

Agreement:
- UE is not required to simultaneously monitor CSS for paging and CSS for RAR/Msg 3 re-tx/Msg 4.

R1-165949 **WF on NPUSCH format 2 Phase Rotation** **ZTE**
Decision: The document is noted.
- ZTE: it is noted for single-tone modulation, the waveform phase transition requirement agreed in previous meeting does not apply for NPUSCH format 2.

Not treated.
R1-165683 On NSSS design and SFN index detection ambiguity Intel Corporation
R1-165747 WF on NB-IoT Multi-PRB operation LG Electronics, Nokia, ASB
R1-165788 WF on NB-IoT UL DMRS Hopping Qualcomm

Friday

R1-165985 **WF on UL gaps for NB-IoT** **Huawei, HiSilicon, Sony, Ericsson, MediaTek, Vodafone, ZTE, Nubia Technology, Spreadtrum, u-blox**
Decision: The document is noted. Revised in:

R1-166023 WF on UL gaps for NB-IoT Huawei, HiSilicon, CATT, Ericsson, Intel, MediaTek, Nokia, Samsung, Sony, u-blox, Vodafone, ZTE, Nubia Technologies
Decision: The document is agreed.

R1-166009 [DRAFT]LS on NB-IoT Performance Huawei, HiSilicon, Vodafone, Deutsche Telekom, CMCC, China Telecom, China Unicom, NTT DOCOMO
Decision: The document is noted, revised in R1-166024. Further revised in:
R1-166036 [DRAFT]LS on NB-IoT Performance Huawei, HiSilicon, Vodafone, Deutsche Telekom, CMCC, China Telecom, China Unicom, NTT DOCOMO
Decision: The document is noted and final LS is agreed in R1-166037.

Rapporteur shall submit the list of all agreements by May 30th.
Editors will provide updated NB-IoT CRs to 36.211, 36.212, 36.213 and 36.214 by June 3rd , for email approval by June 7th.

6.1.7 Other

R1-165093 Correction on search space to decode the PDCCH configured by the SC-N-RNTI TD Tech Ltd
36.213 13.1.1 LTE_SC_PTM-Core CR0654 F
If a UE is configured by higher layers to decode PDCCH with CRC scrambled by the SC-N-RNTI, the UE shall monitor common search space to decode the PDCCH with CRC scrambled by the SC-N-RNTI.
Decision: The document is noted and CR0654 to 36.213 is agreed.

R1-165168 Introduction of 60ms periodicity for wideband CQI/PMI reporting Nokia, Alcatel-Lucent Shanghai Bell, Apple, Broadcom, Ericsson, Intel, Mediatek 36.213 13.1.1 TEI13 draftCR B
Tables 7.2.2-1A and 7.2.2-1C are modified so that some of the currently reserved $I_{CQI/PMI}$ values are used to define 60ms CQI/PMI reporting periodicity and associated offsets.
Decision: The document is noted and agreed as CR0668 to 36.213 in R1-165530.

6.2 LTE Release 14

6.2.1 Enhanced Licensed-Assisted Access to Unlicensed Spectrum - *WID in RP-160407*.

R1-165934 Chairman's Notes of Agenda Item 6.2.1 on eLAA Ad-hoc chair (Nokia, Ericsson)
The document was presented by Matthew Baker from Nokia and provides the outcomes of the eLAA session.
Decision: The document is endorsed. Contents incorporated below.

Friday
Email approval regarding the remaining yellow colour parts as highlighted below until June 6th – (Ericsson)

Editors will submit draft CRs (36.201, 36.211, 36.212, 36.213, 36.214 (if needed)) until August 18th.
Rapporteur shall submit agreement and WA lists until June 30th.

6.2.1.1 PUSCH design

TPC and PHR

R1-165557 WF on Uplink Power Control in eLAA LG Electronics, ZTE Microelectronics, Nubia, Intel
Decision: The document is noted.

Agreement:
- UE's path-loss calculation for the open loop power control for uplink is based on the CRS in DRS within DMTC
  - Note: There may be no specification impact

Agreement:
- PHR for a subframe shall be calculated based on the scheduled uplink transmissions in LAA SCells regardless of whether the actual transmission is performed or not performed

Resource Allocation for eLAA

R1-165817 **Response LS on PUSCH transmission for eLAA** **RAN4, Nokia**
Decision: The document is noted.

R1-165800 **WF on PUSCH resource allocation for eLAA** **Huawei, HiSilicon, Intel, Qualcomm, NTT DOCOMO, LGE**
Decision: The document is noted.

Agreement
- Confirm the previous working assumption
  - the 10RBs are spaced equally in frequency domain for 20MHz
    - Example for 20MHz eLAA SCell: interlace 0 is composed of RBs 0,10,20,...,90
    - Scheduling 70 UL RBs is not supported

Agreement: One interlace is composed of 10RB/interlace for 10MHz

- Companies are encouraged to provide their preference on the RA alternatives
  - Alt 1: UL resource allocation type 0
    - Supported by: Intel, LGE, Samsung, Huawei, HiSilicon, ZTE, Lenovo, Sharp, Panasonic, WILUS
  - Alt 2: bitmap based resource allocation
    - Qualcomm, NTT DOCOMO, Nokia, ASB, Ericsson, Kyocera, CATT, Mediatek, Fujitsu
    - 2nd preference: ZTE, Sharp, WILUS
  - Alt 3: predefined resource allocation patterns with the number of bits being same or less than Alt. 1
    - Define all contiguous patterns + the patterns in the set [0+5, 1+6, ….]
    - Define all contiguous patterns + other patterns
      - Examples provided in R1-164055
    - Define some number of patterns based on the number of interlaces allocated
      - More patterns for fewer interlaces
    - 2nd preference: Huawei, HiSilicon
  - Alt 4: RRC configure between Alt 1 and Alt 2
    - 2nd preference: Intel

Alt 1: Objected by: Qualcomm, Nokia, Mediatek
Alt 2: Objected by: Huawei, HiSilicon, Intel
Alt 3: Objected by: LGE, Intel, Nokia, Mediatek
Alt 4: Objected by: Qualcomm, Mediatek, Panasonic

Scheduling, HARQ, Signaling

Agreement:
- For LAA uplink, DCI 0B and DCI 4B can schedule PUSCH transmission in maximum N_sf subframes, where N_sf is configurable by UE-specific RRC
  - DCI 0B: DCI format supporting PUSCH multi-subframe scheduling with TM1 for LAA SCell
  - DCI 4B: DCI format supporting PUSCH multi-subframe scheduling with TM2 for LAA SCell
  - N_sf value range is N_min to N_max
  - Value of N_min: 2
  - Value of N_max is 4
  - DCI payload sizes of DCI 0B and DCI 4B are decided by configured N_sf value
  - RRC signalling can enable or disable DCI 0B and DCI 4B independently

Agreement:
- UE may be configured to detect multiple uplink grants which may be chosen without restriction from DCI 0A/4A/0B/4B
  - Maximum number of uplink grants to be transmitted for a single UE in a subframe is 4
  - DCI 0A: DCI format supporting PUSCH single-subframe scheduling with TM1 for LAA SCell
  - DCI 4A: DCI format supporting PUSCH single-subframe scheduling with TM2 for LAA SCell

Working assumption:
- The new DCI formats along with all the applicable legacy DCI formats are subject to the blind decoding reduction mechanisms defined in Rel-13.

- FFS: Whether any further enhancements to the reduction mechanisms on a per DCI format basis is necessary

R1-166003 **Way Forward on managing UE blind decoding for LAA SCells in Rel-14 eLAA** **Qualcomm**
Decision: The document is noted.

Agreement:
- A single UL grant scheduling multiple subframes can only schedule consecutive subframes for PUSCH transmission

Agreement:
- The following scheduling information in the existing DCI format 0/4 are not included in DCI 0A/4A/0B/4B for LAA when an interlace structure is used
  - frequency hopping, resource allocation type

Possible agreement:
- RRC signalling can configure whether resource allocation is based on an interlace structure or on legacy structures
- RAN1 recommends that the support of resource allocation based on an interlace resource allocation structure for DCI 0A/4A/0B/4B is mandatory.
- RAN1 recommends that the support of resource allocation based on the legacy resource allocation structure for DCI 0A/4A/0B/4B is optional

Agreement:
- There is only one SRS transmission request per DCI 0A/4A/0B/4B

R1-165822 **Second WF on Multi-subframe scheduling in LAA,** **LGE, ZTE**
Decision: The document is noted.

Agreements:
- DCI format 0B/4B indicates number of scheduled subframes
- DCI format 0B/4B indicates HARQ process IDs for the scheduled subframes by indicating HARQ process ID for a single subframe, and HARQp_ids for other subframes are derived by a given rule
  - the HARQp_ids for other subframes are consecutive with the indicated HARQ process IDs, modulo max number of HARQ processes
- DCI format 0B/4B indicates RVs for the scheduled subframes by indicating a 1-bit RV value per scheduled subframe (regardless of the number of scheduled transport blocks)
  - Can indicate RV 0 or 2

Agreements:
- For MSF DCI format 4B, utilise the current 2-bit SRS triggering field; include SRS subframe indication in the SRS parameter set configuration
- For MSF DCI format 0B, existing SRS triggering bit and 1 additional bit are used for SRS triggering and subframe indication
  - The 4 states are defined in specs as no triggering, first, second or last subframe
- Ending PUSCH DFT-S-OFDM symbol in a DCI format 0B/4B applies only to the last scheduled subframe
- CSI request in DCI format 0B/4B applies to 2nd scheduled subframe if Nmax=2, and otherwise to the penultimate scheduled subframe
- CSI reference subframe is defined according to the existing rules in 36.213 s.7.2.3.
- In case the subframe in which CSI would be transmitted is not transmitted because LBT does not succeed, CSI shall not be transmitted
- MCS for each codeword in DCI format 4B is indicated separately
- Timing offset is counted from subframe N+4+k, and k is signalled with (working assumption) 3bits ([0….7] SFs) (FFS in case of 2-step scheduling)
- Working assumption (automatically confirmed if no problem identified by the end of the meeting): Common MCS value in DCI format 0B/4B applies to the PUSCH containing UCI and/or SRS and/or blanked symbol(s) without special handling

Discuss separately:
- RRC configures the max number of HARQ processes, up to 16

Agreement:

- eNB signals LBT type at least including 25us single slot LBT and Cat4 LBT to the UE at least for PUSCH

R1-165647 **WF on eLAA UL/DL scheduling combinations Nokia, Alcatel-Lucent Shanghai Bell, CATT, LG Electronics, NTT DOCOMO, Qualcomm, Intel, Ericsson, ZTE, Fujitsu, ETRI, ITL, Huawei, HiSilicon, Samsung, Kyocera, Panasonic**
Decision: The document is noted.

Agreements:
- Support UL/DL Scheduling Combination 2: Self-scheduling on DL and cross-carrier scheduling on UL
  - The UE to monitor for DCI formats scheduling PUSCH of a single eLAA Scell on one UL licensed-band scheduling cell
    - i.e. DCI formats 0A/0B, Formats 4A/4B if configured for TM2
  - The UE to monitor for DCI formats scheduling LAA PDSCH on the LAA SCell
    - i.e. DCI formats 1A/1B/1D/1/2A/2/2B/2C/2D
  - Configuration details of enabling self-scheduling on DL and cross-carrier scheduling on UL are up to RAN2
  - FFS: If UCI cell groups concept is agreed, then whether scheduling is allowed from outside the UCI cell group
  - FFS: Whether cross-carrier transmissions of DCI scheduling on the UL is only applicable to PUSCH scheduling or whether it may be applicable to all the UL DCIs for the UL (e.g. if agreed, DCI for SRS triggering etc).
  - FFS: How to manage the number of blind decodes at the UE side in general (equally applicable for other scheduling combinations)?

PUSCH structure

R1-165963 **CR to 36.211 on Introduction of NB-IoT**
Decision: The document is for further discussion.

R1-165883 **WF on initial signal transmission in LAA, LGE Huawei, HiSilicon, ZTE**
Decision: The document is noted.
R1-165717 **WF on PUSCH transmissions on an LAA Scell and PUCCH transmissions Ericsson**
Decision: The document is noted.

Agreement: Timing of 25 us gap immediately before transmission of PUSCH and SRS for 25 us LBT is decided by the eNB and is indicated to the UE

Agreement:
- Transmission time for PUSCH and SRS after a Cat. 4 LBT at the UE is decided by the eNB and is indicated to the UE.
  - Note: There is no restriction on when the UE starts cat. 4 LBT
  - Note: If the UE fails to complete Cat. 4 LBT for the first subframe in a multi-subframe UL grant, it can continue the Cat. 4 LBT procedure and attempt transmission for subsequent subframes.

Possible offline agreement:
Transmission on UL is allowed to start at the following times in a UL subframe
- Start of DFTS-OFDM symbol 0
- Start of DFTS-OFDM symbol 1
- 25 us + TA value after start of DFTS-OFDM symbol 0
- 25 us after start of last DFTS-OFDM symbol of previous subframe
- FFS: 16 us + TA after start of DFTS-OFDM symbol 0
- Note: Gaps may be created by UE subframe timing adjustment instead of using a partial OFDM symbol if a TA offset is dynamically signaled

Other
R1-165145 **On Power Spectral Density Regulations for Enhanced LAA Transmissions Ericsson**
Decision: The document is noted.

Not treated.
R1-164055 Resource allocation for RB interleaved PUSCH for eLAA Huawei, HiSilicon

R1-164075 Multi-subframe scheduling design for eLAA Huawei, HiSilicon
R1-164127 On the DCI design for multi-subframe scheduling Intel Corporation
R1-164128 Remaining details on resource allocation for eLAA PUSCH transmission Intel Corporation
R1-164197 PUSCH scheduling for Rel-14 eLAA CATT
R1-164287 Power headroom report enhancement for eLAA Sony
R1-164319 eLAA PUSCH transmission Fujitsu
R1-164406 PUSCH design details Qualcomm Incorporated
R1-164407 PUSCH and SRS multiplexing Qualcomm Incorporated
R1-164408 PUSCH resource allocation granularity Qualcomm Incorporated
R1-164409 Control details for UL scheduling Qualcomm Incorporated
R1-164410 DCI design for PUSCH scheduling in eLAA Qualcomm Incorporated
R1-164479 Remaining issues on PUSCH resource allocation NEC
R1-164480 Remaining details on multiple-subframe scheduling for LAA NEC
R1-164495 PUSCH resource allocation in LAALG Electronics
R1-164496 Multi-subframe scheduling in LAA LG Electronics
R1-164497 Summary of email discussion on multi-subframe scheduling LG Electronics
R1-164572 HARQ for UL LAA ZTE
R1-164573 Consideration of LBT failure in LAA UL HARQ operation ZTE
R1-164574 On UL Resource Allocation for PUSCH ZTE
R1-164575 Discussion on UL scheduling for LAA ZTE
R1-164576 TPC and PHR for UL LAA ZTE
R1-164578 Discussion on UL Grant Transmission for eLAA Spreadtrum Communications
R1-164595 WF on UL scheduling and transmission for LAA ZTE
R1-164717 Multi-subframe scheduling for eLAA Kyocera Corporation
R1-164740 UL Waveform for PUSCHSamsung
R1-164741 Multi-subframe scheduling for PUSCH Samsung
R1-164742 Discussion on UL power issues for eLAA Samsung
R1-164743 Discussion on scheduling options for eLAA Samsung
R1-164744 Remaining issues on PUSCH design for eLAA Samsung
R1-164745 Further Discussion on PUSCH DTX Handling for eLAA Samsung
R1-164828 Discussion on PUSCH transmission starting within symbol #0 Huawei, HiSilicon
R1-164829 PHY signaling design for eLAA Huawei, HiSilicon
R1-164831 Discussion on equal and non-equal multi-interlace based PUSCH structure Huawei, HiSilicon
R1-164918 On PUSCH Transmit Power on LAA SCells Nokia, Alcatel-Lucent Shanghai Bell
R1-164919 PUSCH Resource Allocation Details Nokia, Alcatel-Lucent Shanghai Bell
R1-164928 Discussion on scheduling combinations for eLAA ITRI
R1-164940 On LAA UL/DL Scheduling Combinations Nokia, Alcatel-Lucent Shanghai Bell
R1-164941 eLAA UL scheduling / UL grant details Nokia, Alcatel-Lucent Shanghai Bell
R1-164942 On Two-Stage UL scheduling for eLAA Nokia, Alcatel-Lucent Shanghai Bell
R1-164992 DCI design for multiple-subframe scheduling for LAA UL Sharp
R1-164993 Resource allocation of PUSCH for eLAA Sharp
R1-165033 Uplink Subframe Structure Panasonic
R1-165115 Considerations on eLAA PUSCH design Mediatek
R1-165116 Control channel design for eLAA Mediatek
R1-165141 Uplink Resource Allocation Design for Enhanced LAA Ericsson
R1-165142 Multi-subframe scheduling design for Enhanced LAA Ericsson
R1-165143 Performance impact of UL short LBT periods in symbol #0 Ericsson
R1-165144 Solutions supporting UL short LBT period in Symbol #0 Ericsson
R1-165185 Discussion on PUSCH subframe structure and resource allocation for eLAA UL NTT DOCOMO, INC.
R1-165186 Discussion on UL scheduling design for eLAA NTT DOCOMO, INC.
R1-165247 Remaining details of multi-subframe scheduling for eLAA ETRI
R1-165556 WF on Multi-subframe scheduling in LAA LG Electronics, Nokia, Alcatel-Lucent Shanghai Bell, Huawei, HiSilicon, ZTE
R1-165649 WF on eLAA PUSCH retransmission with synchronous HARQ Huawei
R1-165783 WF on handling PUSCH errors after 25us LBT in eLAA Broadcom
R1-165893 WF on power headroom report for eLAA Sony
R1-165900 Way-Forward on DL+UL Traffic multiplexing for eLAA Broadcomm
R1-165901 Way-Forward on the No LBT option for UL transmissions in eLAA Broadcomm
R1-165921 WF on UL resource allocation for eLAA Qualcomm Incorporated
R1-165923 WF on supporting trigger based transmission for UL in eLAA Qualcomm Incorporated

6.2.1.2 SRS design

R1-165565 WF on LBT scheme for SRS transmission on LAA SCell LGE, ITL, Sharp

- DL grant triggering aperiodic SRS that is not multiplexed with PUSCH signals LBT type for SRS transmission
  - LBT type includes at least 25 usec one-shot LBT or Cat 4 LBT.
  - FFS: If aperiodic SRS is followed by PUSCH without gap between SRS and PUSCH, UE performs LBT indicated for the following PUSCH.
- If Cat 3 or Cat 4 LBT is performed for aperiodic SRS that is not multiplexed with PUSCH and without PUSCH in following subframe, the highest LBT priority class with only the minimum contention window size [3] can be considered for LBT purposes.

R1-165572 **WF on general SRS aspects** **Huawei, HiSilicon**
Decision: The document is noted.

Agreement:
- Periodic SRS is NOT supported in Rel-14 eLAA WI
- Cell-specific and UE-specific SRS subframe configuration in RRC signaling for both periodic and aperiodic SRS is not applicable in the current scope of Rel-14 eLAA

Agreement: SRS uses the legacy comb structure

Agreement:
- Keep the existing max # SRS RBs for a given system bandwidth
  - No shifting of SRS is used on an LAA SCell

R1-165573 WF on transmission and triggering SRS without PUSCH, Huawei, HiSilicon, Qualcomm, Samsung, ZTE, Intel, ITL, Nokia, ALU, Ericsson
Decision: The document is noted.

Agreement: When SRS without PUSCH is transmitted in DL ending partial subframes, UE transmits SRS in symbol 13

Options for triggering of SRS transmissions:
1) SRS without PUSCH is transmitted in subframe n+4 if the DL grant triggering the SRS transmission is received in subframe n (default if no other options are agreed)
2) SRS is transmitted according to one of the two options
   a. in a DL ending partial subframe n+4 if a DL grant triggering SRS transmission is received in subframe <= n
   b. in a subframe n+4 immediately following a DL subframe, if a DL grant triggering SRS transmission is received in subframe <= n and no DL ending partial subframe is present between the DL grant and subframe n+4
3) SRS without PUSCH is transmitted in subframe n+k if the DL grant triggering the SRS transmission is received in subframe n.
   a. The parameter k is indicated in the DL grant

Proposal:
- Common/Group DCI can be used to trigger a-SRS without PUSCH for a group of UEs on the LAA Scell
- The triggering signaling includes the following fields
  - Subframe timing k. This field will be omitted if subframe timing is predefined.
  - FFS SRS LBT type, e.g., cat.2/cat.4
    - Depends on whether or not the UE knows of the MCOT
  - CIF, if cross carrier indication from PCell is supported
  - UE-specific field: trigger or not
- The group ID/RNTI is configured to the UE via RRC signaling

Not treated.
R1-164074 SRS configurations for eLAA Huawei, HiSilicon
R1-164129 Remaining details of SRS transmission for eLAA Intel Corporation
R1-164288 LBT operation for SRS in eLAA Sony
R1-164411 SRS procedures for eLAA Qualcomm Incorporated
R1-164498 SRS transmission in LAA LG Electronics

R1-164579 Discussion on the remaining issues for SRS transmission in eLAA Spreadtrum Communications
R1-164596 Discussion on SRS design for eLAA UL ZTE
R1-164719 SRS design for eLAA Kyocera Corporation
R1-164746 Remaining issues of SRS transmission Samsung
R1-164814 SRS waveform Huawei, HiSilicon
R1-164986 Remaining issues on aperiodic SRS transmission without PUSCH Nokia, Alcatel-Lucent Shanghai Bell
R1-164987 Remaining issues on LAA SRS with PUSCH allocation Nokia, Alcatel-Lucent Shanghai Bell
R1-165117 SRS design for LAA Mediatek
R1-165146 On SRS Design for Enhanced LAAEricsson
R1-165187 Discussion on SRS design for eLAA UL NTT DOCOMO, INC.
R1-165239 SRS design in Rel-14 eLAA Innovative Technology Lab Co.
R1-165248 Remaining details of SRS transmission on eLAA ETRI

6.2.1.3 Uplink control information on an LAA SCell

R1-164747 UCI Transmission on LAA Scell Samsung
Decision: The document is noted.
R1-164198 UCI transmission for Rel-14 eLAACATT
Decision: The document is noted.
R1-165188 Discussion on UCI transmission for eLAA UL NTT DOCOMO, INC.
Decision: The document is noted.

Agreement:

- A UE may be configured with simultaneous PUSCH/PUCCH in licensed spectrum or without simultaneous PUSCH/PUCCH in licensed spectrum independently from the configuration of an LAA Scell for the UE

Agreement:

- An LAA SCell for UL is configured to the UE only if simultaneous PUCCH in licensed spectrum and LAA SCell PUSCH transmission is supported by the UE

Not treated.

R1-164076 UCI transmission for eLAA Huawei, HiSilicon
R1-164130 UCI transmission for eLAA Scells Intel Corporation
R1-164412 UCI reporting on unlicensed carriers Qualcomm Incorporated
R1-164499 UCI transmission in LAA LG Electronics
R1-164598 Discussion on UCI transmission on LAA SCell ZTE
R1-164647 UCI transmission on LAA Scell Lenovo (Beijing) Ltd
R1-164920 UCI Transmission on LAA SCells Nokia, Alcatel-Lucent Shanghai Bell
R1-164994 UCI transmission on LAA carrier Sharp
R1-165118 UCI transmission in LAA Mediatek
R1-165147 Summary of Email Discussion [84b-05] on UCI Transmission for Enhanced LAA Ericsson
R1-165148 On the Transmission of Uplink Control Information for Enhanced LAA Ericsson
R1-165149 Performance impact of large HARQ-ACK payloads multiplexed with PUSCH Ericsson
R1-165150 Solutions supporting large HARQ-ACK payloads multiplexed with PUSCH Ericsson
R1-165251 HARQ-ACK transmission on LAA SCell PUSCH for eLAA WILUS Inc.
R1-165922 WF on UCI transmission for eLAA Scells Qualcomm Incorporated

6.2.1.4 PRACH design

R1-165498 **WF on PRACH Ericsson**
Decision: The document is noted.

Conclusion:

- Several possible approaches have been identified for the PRACH
- PRACH is useful in some use cases
- Enhanced LAA can operate without PRACH at least in scenarios with limited separation between base stations on licensed and unlicensed carriers, if the initial values of timing advance and power control are defined, e.g. if the licensed and unlicensed carriers are in the same TAG

Not treated.

R1-164077	PRACH waveform for eLAA	Huawei, HiSilicon
R1-164078	PRACH configurations for eLAA	Huawei, HiSilicon
R1-164131	PRACH transmission for eLAA	Intel Corporation
R1-164199	PRACH design for Rel-14 eLAA	CATT
R1-164413	PRACH waveforms for eLAA	Qualcomm Incorporated
R1-164414	PRACH procedures for eLAA	Qualcomm Incorporated
R1-164500	Random access preamble in LAA	LG Electronics
R1-164501	Random access procedure in LAA	LG Electronics
R1-164600	PRACH Design for LAA	ZTE
R1-164748	PRACH Transmission for UL LAA	Samsung
R1-164749	Discussion on random access procedure for eLAA	Samsung
R1-164830	Evaluation for PRACH waveform for eLAA	Huawei, HiSilicon
R1-164904	Discussion on PRACH design for LAA	HTC
R1-164988	Discussion on PRACH design for eLAA	Nokia, Alcatel-Lucent Shanghai Bell
R1-164989	Performance Evaluation of PRACH for eLAA	Nokia, Alcatel-Lucent Shanghai Bell
R1-165034	PRACH Bandwidth on Unlicensed Carriers	Panasonic
R1-165070	Performance Evaluation for PRACH for eLAA	Intel Corporation
R1-165119	Considerations on PRACH desgin in eLAA	Mediatek
R1-165151	PRACH Design for Enhanced LAA	Ericsson
R1-165152	On Performance of PRACH for Enhanced LAA	Ericsson
R1-165169	Discussion on PRACH for eLAA	Shenzhen Coolpad Technologies
R1-165189	Discussion on PRACH for eLAA UL	NTT DOCOMO, INC.
R1-165558	WF on PRACH procedure in LAA	LG Electronics, Intel

6.2.1.5 Channel access framework

R1-164990 Channel Access for LAA UL Nokia, Alcatel-Lucent Shanghai Bell
Decision: The document is noted.

R1-164073 Contention window size adjustment for UL category 4 LBT for eLAA Huawei, HiSilicon
Decision: The document is noted.

Possible agreement:
Contention window maintenance for UL Category 4 LBT is done per UE

Options for LBT priority class handling when UE performs Category 4 LBT:
Option 1: Signalling of LBT priority class from eNB to UE determines for its Cat. 4 LBT

- Buffer status report from UE allows eNB to determine what LBT priority class the UE intends to use for its category 4 LBT
- eNB schedules subframes and gaps according to its determination and signals priority class or contention window size (FFS between the two) to the UE
- UE follows the signalled LBT parameters for UL LBT for Category 4 LBT
- UE is allowed to use LCP for the allocated subframes regardless of LBT priority class that was used for UL LBT

Don't like this approach: Mediatek, Broadcom, Intel, Marvell, Cablelabs

Option 2: No signalling of LBT parameters for category 4 LBT at the UE from eNB and UE determines all Cat. 4 LBT parameters

- Buffer status report from UE allows eNB to determine what LBT priority class the UE intends to use for its category 4 LBT
- eNB schedules subframes and gaps according to its determination
- UE determines all category 4 LBT parameters for UL LBT for the allocated UL subframes based on traffic type of the data sent in the allocated subframes and the number of subframes it has been allocated

Don't like this approach: Qualcomm, LG, ZTE, Samsung, ETRI, Sharp

R1-165812 **WF on ED threshold** **Ericsson**

- Align the requirement on the energy detection threshold for UL transmission with the corresponding Rel-13 LAA requirements for PDSCH transmission.
    - The maximum transmit power per carrier configured to the UE is used to set the ED threshold

Decision: The document is noted.

R1-165890 **Way Forward on determining UL LBT priority class** **Mediatek**

Decision: The document is noted.

WF on DL+UL Traffic Multiplexing for eLAA Broadcom, BlackBerry, CableLabs, Orange, Marvell

- *For a ~~DL~~ transmission burst with PDSCH(s) and/or PUSCH(s) scheduled by the eNB for which channel access has been obtained using Channel Access Priority Class P (1…4), E-UTRAN shall ensure the following where ~~a DL~~ transmission burst refers to ~~the continuous~~ DL transmissions from the eNB and all scheduled UL transmissions from the UEs starting after a successful LBT:*
    - *the transmission duration of the ~~DL~~ transmission burst shall not exceed the minimum duration needed to transmit all available buffered traffic corresponding to Channel Access Priority Class(es) ≤ P;*
      NOTE: the buffered traffic includes all ~~the~~ available traffic in DL at the eNB and all traffic available for transmission at all scheduled UEs as per the latest buffer status information from each UE (see [ref 13 in 36.300])
    - *the transmission duration of the ~~DL~~ transmission burst shall not exceed the Maximum Channel Occupancy Time (as defined in Table 15.1.1-1 of [ref 6 in 36.300]) for Channel Access Priority Class P;*
        - *additional traffic corresponding to Channel Access Priority Class(es) > P may only be included in the ~~DL~~ transmission burst once no more ~~data~~ buffered traffic corresponding to Channel Access Priority Class(es) ≤ P is available for transmission and the transmission duration of the transmission burst as defined above has not yet expired. In such cases, E-UTRAN should maximise occupancy of the remaining transmission resources in the ~~DL~~ transmission burst with this additional traffic.*

Note: Additions to the agreements made in Rel 13 LAA are marked in Green while deletions are marked in Red with strikethrough.

R1-165838 **LS to RAN1 on RAN2 agreement on eLAA** **RAN2**

Decision: The document is noted.

R1-165897 **WF on the determination of LBT priority class at the UE** **Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

Agreement:

- When the UE performs Cat. 4 LBT, it uses the priority class signaled by the eNB
    - There is no additional restriction at the UE (other than the multiplexing rules defined in RAN2) on the type of the traffic that can be carried in the scheduled subframes.
    - eNB shall not schedule the UE more subframes than what is needed to transmit all the traffic corresponding to the same LBT priority class or lower (i.e., with a lower number in the LBT priority class table) than the signaled LBT priority class based on the latest BSR and received UL traffic from the UE.
    - The eNB is responsible for making sure that the mapping between QCI and LBT priority class is consistent with section 5.7.1 in TS 36.300.
        - The eNB is expected to take the QCI with the lowest priority in the logical channel group into account when defining the LBT priority class for a logical channel group

R1-165948 **WF on the CWS adjustment at the UE for Cat-4 LBT** **Nokia, Alcatel-Lucent Shanghai Bell, Ericsson, Broadcom**

Decision: The document is noted.

R1-165752 **WF on CWS adjustment for category 4 UL LBT in eLAA** **LG Electronics, Sharp**

Decision: The document is noted.

Possible offline agreement:

- For category 4 LBT for PUSCH transmission on LAA SCell,
  - CWS is managed by eNB and indicated by UL grant.
  - CWS is adjusted per UE based on whether or not reference subframe is successfully decoded.
    - Reference subframe is the starting subframe of the most recent UL transmission burst for which a Cat. 4 LBT was expected to be used, for which DM-RS or SRS transmission from the UE is detected and PUSCH decoding is completed.
  - If at least one of the TBs in the reference subframe is successfully decoded, the CWS is reset for all priority classes; otherwise, it is increased to the next higher value for all priority classes.
  - The CWS is reset to the minimum value if the maximum CWS is used for K consecutive LBT attempts for transmission only for the priority class for which maximum CWS is used for K consecutive LBT attempts.
    - K is selected by eNB implementation from the set of values from (1, …,8).

Possible offline agreement:

- For category 4 LBT for PUSCH transmission on LAA SCell
  - **The reference scheduled burst** is the most recent set of **contiguous** (i.e. without any gap in between) scheduled UL subframe(s) for the UE that is expected to start after a category 4 LBT and is expected to end at least 4 subframes earlier than the subframe in which the following contention window size adjustment is transmitted
  - **The reference subframe** is the first subframe in the reference scheduled burst where the eNB successfully **decodes** at least one transport block from the UE.
  - The position of the reference subframe within the reference scheduled burst is signaled to the UE in the UL grant in which Cat. 4 LBT is signaled as the LBT type to the UE
    - The eNB can also signal that no reference subframe was detected
  - If the UE first transmitted in the reference scheduled burst earlier than the signaled reference subframe, the CWSs for all the priority classes are increased.
  - If the UE first transmitted in the reference scheduled burst later than the signaled reference subframe, the CWSs for all the priority classes are left unchanged.
  - If the UE first transmitted in the reference scheduled burst in the signaled reference subframe, the CWSs for all the priority classes are reset.
  - The CWS is reset to the minimum value if the maximum CWS is used for K consecutive LBT attempts only for the priority class for which maximum CWS is used for K consecutive LBT attempts.
    - K is selected by eNB and RRC configured to the UE from the set of values from (1, …,8).

Not treated.

R1-164071	Discussion on the applications of LBT options in eLAA	Huawei, HiSilicon
R1-164072	UL category 4 LBT with eNB assistance	Huawei, HiSilicon
R1-164132	Remaining details for UL LBT	Intel Corporation
R1-164133	UL grant transmission	Intel Corporation
R1-164200	UL channel access for Rel-14 eLAA	CATT
R1-164318	Considerations for UL LBT	Sequans Communications
R1-164415	UL channel access for eLAA	Qualcomm Incorporated
R1-164416	Discussion on ED threshold for UEs in eLAA	Qualcomm Incorporated
R1-164502	LBT schemes in LAA UL	LG Electronics
R1-164503	Further details on channel access in LAA UL	LG Electronics
R1-164504	Impact of UE-to-UE interference on LAA performance	LG Electronics
R1-164505	Initial signal in LAA uplink	LG Electronics
R1-164601	Frame design and signalling for LAA UL based on FS3	ZTE
R1-164603	Discussion on the UL LBT for LAA	ZTE
R1-164604	LBT for Frequency and reuse and Multiplexing in Uplink	ZTE
R1-164605	WF on UE initiated TxOP/MCOT shared by the eNB	ZTE
R1-164648	LBT mechanism for LAA uplink	Lenovo (Beijing) Ltd
R1-164720	Channel Access Scheme for UE multiplexing	Kyocera Corporation
R1-164750	Discussion of LAA-LAA coexistence	Samsung
R1-164751	Discussion on UL LBT alignment	Samsung
R1-164752	Discussion on shared MCOT and LBT procedure	Samsung

R1-164753 Remaining issues on Cat 4 LBT for eLAA Samsung
R1-164815 On the need of reservation signal Huawei, HiSilicon
R1-164827 Other issues related to LBT for eLAA Huawei, HiSilicon
R1-164905 Dynamic carrier selection for LAA HTC
R1-164995 Methods of UL LAA channel access Sharp
R1-165032 Error Cases due to Failed Clear Channel Assessment for UL Transmissions Panasonic
R1-165071 Defer period for UL LBT Intel Corporation
R1-165120 eLAA Uplink channel access Mediatek
R1-165121 On priority classes for uplink LBT Mediatek
R1-165140 PUSCH DTX Detection for LAA UL Nokia, Alcatel-Lucent Shanghai Bell
R1-165154 On Channel Access Procedures for PRACH and SRS Ericsson
R1-165155 On Channel Access Procedures for Transmissions with Only UL Grants Ericsson
R1-165156 On Support of Conditional UL Transmissions without LBT Ericsson
R1-165157 On UL Channel Access Procedures Ericsson
R1-165158 On Performance of UL Channel Access Procedures Ericsson
R1-165159 On Signaling of UL Channel Access Parameters Ericsson
R1-165190 Discussion on channel access framework for eLAA UL NTT DOCOMO, INC.
R1-165235 Uplink Channel Access Mechanisms in eLAA III
R1-165250 On channel access mechanism for eLAA ETRI
R1-165252 Consideration on UL LBT Type Switching for eLAA WILUS Inc.
R1-165253 CWS adjustment for UL PUSCH in eLAA WILUS Inc.
R1-165318 Discussion on LAA paused COT and UL traffic multiplexing BROADCOM LIMITED
R1-165323 Discussion on LAA UL no LBT BROADCOM LIMITED
R1-165713 WF on CW adjustment for UL LBT based on Cat. 4 Ericsson
R1-165714 WF on Selection of LBT Priority Class for UL Transmission Ericsson
R1-165715 WF on LBT Priority Class for UL Transmission Ericsson
R1-165716 WF on MCOT limit Signaling and Modifying LBT type Ericsson
R1-165924 WF on determining maximum UE TX power on a LAA SCell for ED threshold computation Qualcomm Incorporated
R1-165927 WF on CCA Detection Threshold for eLAA CableLabs, Broadcom, Orange, Marvell, Microsoft
R1-165962 WF on ED Threshold for UL LBT Ericsson, Huawei, HiSilicon
R1-166014 Way-Forward on UL PSD limit in eLAA Broadcom, Marvell, CableLabs
R1-166021 [Draft]LS on Mapping of QCI to LBT Priority Classes in UL CableLabs

6.2.1.6 Others

Not treated.
R1-164106 Discussion on synchronous and asynchronous HARQ method for eLAA Huawei, HiSilicon
R1-164506 Power control in LAA uplink LG Electronics
R1-164921 On the Support for UL Operation in FS3 and C-PDCCH Nokia, Alcatel-Lucent Shanghai Bell
R1-165566 WF on ending partial TTI with duration of 3 symbols for eLAA LG Electronics, ITL, Sharp
R1-165567 WF on PDCCH reception in ending partial subframe for eLAA LG Electronics, Intel, Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Sharp, Huawei, HiSilicon, ITL

6.2.2 Support for V2V services based on LTE sidelink - WID in RP-160649

R1-165935 Chairman's Notes of Agenda Item 6.2.2 on V2V Ad-hoc chair (Nokia, LGE)
The document was presented by Matthew Baker from Nokia and provides the outcomes of the eLAA session.
Decision: The document is endorsed. Contents incorporated below.

Friday
LS to RAN2/4 for email approval regarding the agreements and WAs until June 2nd – (LGE)

Editors will submit draft CRs (36.201, 36.211, 36.212, 36.213, 36.214 (if needed)) until August 18th.
Rapporteur shall submit agreement and WA lists until June 30th.

R1-165608 Summary of Tuesday offline discussions on V2V LG Electronics

Decision: The document is noted.

Agreement:

- For PSSCH resource (re)selection when all the PSCCH/PSSCH transmissions have the same priority (FFS whether the initial resource selection needs to be designed differently from the procedure below)
  - Step 1: All the resources are considered available.
  - Step 2: UE excludes resources at least based on SA decoding and additional conditions. Down select one between the following options.
    - Option 2-1: A resource is excluded if it is indicated or reserved by a decoded SA and the received DM RS power in the associated data resource is above a threshold.
    - Option 2-2: A resource is excluded if it is indicated or reserved by a decoded SA and the energy in the associated data resource estimated from the measurement in the SA resource is above a threshold. Additional estimation of energy caused by in-band emission is not precluded.
      - FFS the estimation of the energy in the associated data resource.
      - Measuring energy of SA transmitted from a particular UE may not be accurate enough.
    - The precise definition of "if it is indicated or reserved by a decoded SA" to be discussed later.
    - FFS the details of the thresholds above
  - Step 3: UE selects its transmission resource from the resources not excluded by (Down select one among the following options)
    - Option 3-1:
      - Step 3-1: UE measures and ranks the remaining PSSCH resources based on total received energy and selects a subset
      - Step 3-2: UE compares the energy on the currently selected resource with the energy of the resources the subset. If the energy of the current resource is a threshold above the energy of all the resources in the subset, then UE selects one among the subset of resources.
        - A semi-persistent period before reselection is triggered, UE transmits PSSCH on another resource in the subset identified in step 3-1 and measures the energy of the currently selected resource for step 3-2.
      - Step 3-3: UE randomly selects one resource from the subset
    - Option 3-2:
      - Step 3-1: UE measures and ranks the remaining PSSCH resources based on total received energy and selects a subset
      - Step 3-2: UE randomly selects one resource from the subset
    - Option 3-3:
      - Step 3-1: UE measures and ranks the remaining PSSCH resources based on total received energy and selects a subset
      - Step 3-2: UE selects the resource that minimizes the frequency resource fragmentation from the subset.
    - Option 3-4:
      - Step 3-1: UE measures RX power of PSSCH resource indicated in the decoded SA, sum them as the total RX power of a subframe, and sorts the subframes according to the total RX power.
      - Step 3-2: A set of available subframes consists of X subframes with the highest total RX power and Y subframes of the lowest total RX power. UE randomly selects transmission subframe(s) from this set.
      - Step 3-3: UE randomly selects frequency from transmission subframe(s).
  - FFS how to select resources for a wideband transmission based on the energy/power measurement above.

Proposed agreement:
After resolving the FFS points relevant to RAN1, send LS to RAN2 to ask them to define the following UE behavior for resource reselection triggering.

Agreements:

- Reselection is triggered if any of the following conditions are met
  - A counter meets an expiration condition
    - The counter decrements
  - Working assumption: every TB transmission (can be revisited if a problem is identified with TBs other than every 100 ms)
    - The counter is reset to a value when reselection is triggered for all the semi-persistently selected resources.
    - The value is uniformly randomly selected within a range (which is independent of the TB arrivals) between 5 and 15

- UE identifies that the TB does not fit within the current resource allocation using the maximum allowed MCS,
- FFS other triggers that may be defined by RAN2,

For further discussion:

- Working assumption: UE detects resource allocation (including the indication of the intention of reusing the frequency resource as per the existing agreement) of another UE which potentially overlaps with its current resource allocation (including the indication of the intention of reusing the frequency resource as per the existing agreement) and the detected situation meets an FFS condition
  - different conditions for different priorities are not precluded (if any relevant case happens in priority handling from RAN1 point of view).
- eNB implicitly triggers reselection whenever the resource pool configuration is changed
  - Dedicated signalling is used for RRC_Connected UEs and broadcast signalling is used for RRC_Idle UEs
  - FFS whether some information needs to reported from UE to eNB
- FFS additional condition(s), e.g.,
  - If it is supported that a UE can notify later that it no longer intends to use the resource at a future TTI, reselection triggering condition related to this notification.
  - Reselection triggered by notification on resource collision from another UE
  - Reselection triggered by sensing of resources utilization above a threshold
  - Reselection triggered by higher layer
  - Other conditions are not precluded

Continue discussion during this week

R1-165898 **Summary of Thursday offline discussions on V2V LGE**
Decision: The document is noted.

Agreement:

- For all the PSCCH/PSSCH/SLSS/PSBCH transmissions for V2V in all the resource allocation modes, $N_{\mathrm{TA,SL}} = 0$
- FFS in RAN1 on the receiver UE assumption on the reception timing, e.g., whether it can assume that all the transmissions in a single subframe use the same synchronization reference.

R1-165991 **Summary of Friday offline discussions on V2V LGE**
Decision: The document is noted.

6.2.2.1 Enhancement to sidelink physical layer structure

Not treated.

R1-165072	Enhancements of sidelink physical layer structure for PC5 V2V communication	Intel Corporation
R1-165277	L1 Format for V2V Transmissions using Sidelink	Ericsson

6.2.2.1.1 DM-RS for PSCCH and PSSCH

Agreement: Confirm the working assumption that legacy PUSCH RS is used for PSCCH and PSSCH in the four RS symbols.

Agreement:

- Alt 1 + Adapt MCS, the number of RBs, and number of transmission subframes depending on the UE absolute speed and UE synchronization source (e.g. GNSS or eNB)
  - Options for details of PSCCH
    - Working assumption which will be automatically confirmed if no problem is identified during this week
      - DMRS within a TTI for a transmission by a UE are not identical
        - No blind detection of DMRS is introduced
        - Details FFS
  - Working assumption: 2 consecutive PRB pairs in a subframe are used for each PSCCH if the number of SA bits is less than 64 including CRC. The exact size of SA is FFS including the CRC size and could be larger than 64 bits.
  - Options for details of PSSCH
    - Network configuration or preconfiguration can be used to associate the ranges of MCS, RB number for PSSCH, number of retransmission with the condition of the UE absolute speed. Different (pre)configuration and threshold is given for the different type (e.g., eNB, GNSS, UE) of the transmission synchronization reference.
    - RAN1 will study the proper range of these parameters.

R1-165676 **WF on PSSCH DMRS and SA ID** **LG Electronics, ZTE, Qualcomm, Nokia, ASB, Samsung, CATT**
Decision: The document is noted.

Proposed agreements:
- Source ID is used for PSSCH DM RS sequence generation.
- 8-bit destination ID in SA is replaced by 8-bit source ID.
  - Send LS to RAN2 to inform this agreement.
  - FFS whether source ID is changed in time (up to RAN2).

Continue discussion during this week.

R1-165604 **WF on Multi-Cluster PSSCH Transmissions** **Qualcomm, Samsung**
Decision: The document is noted.

Proposed agreements:
- Multi-cluster PSSCH transmissions by a UE are supported
  - Details FFS

Continue discussion until Thursday (Qualcomm).

Not treated.

R1-164094	DMRS for PSCCH and PSSCH	Huawei, HiSilicon
R1-164134	On DMRS physical structure enhancements for PSCCH and PSSCH	Intel Corporation
R1-164417	DM-RS Enhancements for V2V PSCCH and PSSCH	Qualcomm Incorporated
R1-164507	Discussion on DMRS for PSCCH and PSSCH	LG Electronics
R1-164754	DMRS configuration for PSSCH and PSCCH	Samsung
R1-164902	Link performance of DMRS Enhancement for PSCCH and PSSCH	Beijing Xinwei Telecom Techn.
R1-164932	Enhancement to sidelink physical layer structure in supper high Doppler case for V2V	ITRI
R1-164949	DMRS Enhancements for PSSCH and PSCCH	ZTE
R1-165041	Evaluations of DMRS Enhancement for PSCCH and PSSCH	Nokia, Alcatel-Lucent Shanghai Bell
R1-165255	Construction of DMRS sequences	Ericsson
R1-165412	Link level performance of DM RS for V2V	CATR
R1-165535	DMRS enhancement in PC5-based V2V	CATT
R1-165592	WF on Supporting 500kmph for SA	Qualcomm, LGE
R1-165658	WF on L1 Format for V2V Communication	Intel, ITRI

6.2.2.1.2 DM-RS for PSBCH

R1-165677 **WF on PSBCH DMRS** **LG Electronics, ZTE, Qualcomm, ITL, KRRI**
Decision: The document is noted.
Proposed agreements:
- For PSBCH DM RS symbol location, Option 3 (i.e., symbol #4, #6, #9 for normal CP) is supported.

Continue discussion until Thursday (Hyukjin – LGE).

Agreements:

- For PSBCH DM RS symbol location, Option 3 (i.e., symbol #4, #6, #9 for normal CP) is supported.
- Working assumption: PSBCH content size is the same as Rel-12.
- Working assumption: V2V SLSS/PSBCH periodicity is 200 ms.
- If it is agreed that SLSS/PSBCH is used for the purpose of detecting LTE ITS transmissions, this working assumption needs to be revisited.
- Rel-13 D2D synchronization resource configuration principle is reused.

Not treated.

R1-164095	DMRS for PSBCH	Huawei, HiSilicon
R1-164135	On DMRS physical structure enhancements for PSBCH	Intel Corporation
R1-164320	Discussion on DM-RS for PSBCH for sidelink-based V2V communication	Fujitsu
R1-164418	DM-RS Enhancements for V2V PSBCH	Qualcomm Incorporated
R1-164958	DMRS for PSBCH	ZTE
R1-165307	DMRS design for PSBCH	Samsung
R1-165419	Discussion on DMRS for PSBCH	LG Electronics

6.2.2.1.3 Other

Including adaptation of MCS, the number of RBs, and number of transmission subframes depending on the UE absolute speed and UE synchronization source (e.g, GNSS or eNB)

Not treated.

R1-164509 Discussion on adaptation of MCS depending on UE speed LG Electronics
R1-164756 Supporting 500 km/h relative speed requirement for V2V Samsung
R1-164864 Discussion on inband emission suppression for V2V communications Huawei, HiSilicon
R1-165268 Radio measurements for congestion control for V2X Ericsson
R1-165678 WF on transmission parameter adaptation LG Electronics, Ericsson, ITL, KRRI, NTT DOCOMO

6.2.2.2 Sensing with semi-persistent transmission in UE autonomous resource selection mode

Not treated.
R1-165073 Discussion on sensing aspects to support V2V communication with different traffic periodicity Intel Corporation
R1-165555 Sensing and autonomous resource selection Ericsson
R1-165957 WF on semi-persistent transmission for mode 2 Ericsson, Qualcomm

6.2.2.2.1 Details of using SA decoding and energy measurement for sensing

R1-165679 WF on sub-channelization LG Electronics, Ericsson, CATT, Intel
Decision: The document is noted. Also supported by Lenovo.
Proposed agreements:

- Sub-channelization is supported for PSSCH.
  - A sub-channel consists of a group of RBs in a same subframe.
  - The sub-channel size in a resource pool can be configured by eNB or preconfigured.
    - Candidate sub-channel sizes are FFS.
  - Sub-channel size is the same in a resource pool.
  - Different sub-channels have disjoint group of adjacent RBs.
    - FFS whether different formation of sub-channels is needed if multi-cluster transmission is supported.
- Energy sensing granularity of PSSCH is based on the size of sub-channel.
- The UE always (re)selects an integer number of subchannels for transmission.
- The UE always transmits on an integer number of subchannels.

Continue discussion.

Not treated.
R1-164136 Utilization of PSCCH decoding and energy measurements for sensing based V2V communication Intel Corporation
R1-164203 Discussion on sensing mechanism in PC5-based V2V CATT
R1-164467 UE sensing based congestion control for mode-2 Guangdong OPPO Mobile Telecom.
R1-164510 Discussion on details of sensing operation for PC5 based V2V LG Electronics
R1-164757 Sensing procedure for UE autonomous resource selection Samsung
R1-164758 RSRP measurement on decoded SA for sensing Samsung
R1-164959 SA decoding and energy measurement ZTE
R1-164984 Discussion on SA Decoding and Energy Measurement Beijing Xinwei Telecom Techn.
R1-165039 On sensing with SA decoding and energy measurement for V2V INTERDIGITAL COMMUNICATIONS
R1-165042 On sensing with semi-persistent transmission Nokia, Alcatel-Lucent Shanghai Bell
R1-165191 Discussion on SA decoding and energy measurement for sensing NTT DOCOMO, INC.
R1-165306 Discussion on SA decoding and energy measurement for sensing Sony
R1-165499 Updated WF on sub-channelisation LGE

6.2.2.2.2 Details of the transmitter UE behaviour in resource selection/reselection

Including the time duration in which UE performs sensing, the transmission timing of SA and the associated data, and the indication of the intention to reuse the frequency resource for another TB

R1-165698 Way forward on timeline for sensing based UE autonomous resource selection NTT DOCOMO, NEC, Samsung
Decision: The document is noted. Also supported by Huawei, HiSilicon, Intel

Agreement:

- The values of a and b are fixed
  - b > 0
  - Confirm the working assumption "The values a and b are common for V2V UEs"
    - a = 1000 + b
  - All the decoded SA transmissions in TTI [n-a, n-b) are taken into account.
  - A decoded SA which is associated with data transmissions in data resource(s) at any TTI [n-a, n-b) and transmitted earlier than TTI n-a is taken into account.
- FFS: If UE skips sensing on sub-frame m, for e.g.: due to its own transmission in sub-frame m, it excludes resources in subframes at m+100*k in the resource (re)selection (if triggered), until it is able to perform sensing in those sub-frames.
- FFS on the following:
  - c > 0
  - c, d <= 100
  - FFS how to further restrict the selection of c and d, e.g., to fulfill the latency requirement
- FFS during this week on the details of e, e.g., the receiver UE assumption on the transmitter UE behavior in reusing the same resource.

Friday: Email approval regarding above FFSs until June 9th – (LGE)

Not treated.

R1-164102	Discussion on sensing details for measurement and reservation	Huawei, HiSilicon
R1-164137	Transmitter behavior for sidelink resource re-selection	Intel Corporation
R1-164204	Discussion on resource selection mechanism in PC5-based V2V	CATT
R1-164205	Discussion on time duration of sensing in PC5-based V2V	CATT
R1-164206	Further consideration on UE autonomous resource allocation in PC5-based V2V	CATT
R1-164468	Discussion on the SPS configuration for mode-2	Guangdong OPPO Mobile Telecom.
R1-164473	Schedule Assignment for SPS	NEC
R1-164511	Discussion on details of resource selection for PC5 based V2V	LG Electronics
R1-164645	UE autonomous resource selection for semi-persistent transmission	Lenovo (Beijing) Ltd
R1-164670	Discussion on the transmitter UE behavior in resource selection/reselection	Sony
R1-164759	UE operation after sensing in UE autonomous resource selection	Samsung
R1-164855	Power control for V2V	Huawei, HiSilicon
R1-164933	Discussion on explicit and implicit approaches for enhanced random resource selection	ITRI
R1-164960	Transmitter UE behavior in V2V	ZTE
R1-164961	Geo Based Resource Allocation for V2V	ZTE
R1-165043	On resource selection with sensing	Nokia, Alcatel-Lucent Shanghai Bell
R1-165192	Transmitter UE behaviour for sensing-based resource allocation	NTT DOCOMO, INC.
R1-165240	Considerations on UE autonomous resource selection for V2V	Innovative Technology Lab Co.
R1-165244	Adaptation of MCS, RB allocation, and number of retransmissions	Ericsson
R1-165271	How Should PC5 Autonomous Resource Allocation be Specified?	Ericsson
R1-165276	Discussion on V2X PC5 Scheduling, Resource Pools and Resource Patterns	Ericsson
R1-165315	Sensing and SPS for UE Autonomous Mode	PANASONIC
R1-165904	WF on resource usage indication	LGE
R1-165909	WF on Timing Relationship for V2V Sensing and Resource Selection	Intel
R1-165910	Details of sensing for V2V	Qualcomm Incorporated

6.2.2.2.3 Details of triggering resource reselection

Agreement:
Send LS to RAN2 to ask them to define the following UE behavior for resource reselection triggering with the following additional agreements:

- eNB implicitly triggers reselection whenever the resource pool configuration is changed
  - Dedicated signalling is used for RRC_Connected UEs and broadcast signalling is used for RRC_Idle UEs
  - FFS whether some information needs to reported from UE to eNB

Not treated.

R1-164096	Resource (re)selection triggering mechanisms	Huawei, HiSilicon
R1-164138	Discussion on resource reselection triggers for V2V communication	Intel Corporation
R1-164474	Triggering resource reselection based on collision detection	NEC

R1-164512 Discussion on details of resource reselection for PC5 based V2V LG Electronics
R1-164760 Triggering conditions for resource reselection Samsung
R1-164962 Discussion on V2V resource reselection ZTE
R1-165263 Resource reselection Ericsson
R1-165692 WF on UE measurement and reporting Huawei, HiSilicon, NEC

6.2.2.2.4 Priority handling

R1-165561 Way Forward on priority information in SCI Huawei, HiSilicon, Intel, Ericsson, Sharp, LG Electronics, NTT DoCoMo, OPPO , ITRI, Kyocera, Nokia, ASB, Potevio
Decision: The document is noted. Also suppoted by Sony, ZTE, III, CATT

Agreements:

- Working assumption: PPPP is used to identify which PDCP PDU has which priority level. RAN1 will not use any additional notion of priority.
- Send LS to RAN2 (CC: SA2) to confirm this working assumption. (Shailesh – Qualcomm)

R1-165750 [DRAFT] LS on Priority for V2V Qualcomm
Decision: The document is noted and final LS is agreed in R1-165814 with adding SA2 in "CC" and reflecting the changes in the working assumption.

Proposed agreement:

- Priority information is explicitly indicated by SA
  - The number of bits is FFS.
  - SCI decoding is used to identify associated data transmissions priority
- If UE with lower priority transmission decodes a SCI with priority information higher than itself, UE doesn't transmit on that resource and (re)select other resource.
  - FFS if additional criteria is needed

Continue discussion

Working assumption:

- SCI explicitly includes priority information.
  - FFS how this priority information is exactly transmitted in SCI.
  - Priority information in a decoded SCI is used in resource (re)selection.
  - Priority information in a decoded SCI is not used as a condition to trigger resource reselection
  - Priority information in a decoded SCI is not used as a condition to drop transmission.
- A measurement metric is specified to reflect the congestion level of a PC5 carrier, e.g., similarly to the channel busy ratio defined in ETSI.
  - This measurement is available to higher layers in the UE.
  - FFS whether the measurement can be reported to eNB.
  - FFS the details of the measurement and the UE behavior, for example:
    - The principle to drop PC5 transmissions as a function of this measurement and priority is supported.
    - The radio adjusts radio parameters (max tx power, nr of retx restriction, MCS range restriction, nr of PRBs restriction) as a function of priority and this measurement.
    - Packets with different priorities are transmitted on the same resource pool
- Revoke the existing working assumption on the resource reselection triggering condition: UE detects resource allocation (including the indication of the intention of reusing the frequency resource as per the existing agreement) of another UE which potentially overlaps with its current resource allocation (including the indication of the intention of reusing the frequency resource as per the existing agreement) and the detected situation meets an FFS condition
  - different conditions for different priorities are not precluded (if any relevant case happens in priority handling from RAN1 point of view).
  - Note that applies to resource reselection triggering only.

Not treated.

R1-164104 Discussion on the priority handling Huawei, HiSilicon
R1-164139 Design options to support priority for V2V communication Intel Corporation
R1-164207 Considerations on V2V priority handling CATT
R1-164322 Discussion on resource allocation for V2V based on LTE sidelink Fujitsu
R1-164420 Priority handling for autonomous resource selection Qualcomm Incorporated
R1-164513 Discussion on details of priority handling for PC5 based V2V LG Electronics
R1-164671 Discussion on the priority handling for UE-autonomous resource (re)selection Sony
R1-164761 Priority handling for UE autonomous resource selection Samsung

R1-164901 Discussion on V2V Priority Handling Beijing Xinwei Telecom Techn.
R1-165040 On priority handling for V2V INTERDIGITAL COMMUNICATIONS
R1-165044 Priority considerations for autonomous V2V communication Nokia, Alcatel-Lucent Shanghai Bell
R1-165260 Priority handling for V2V over PC5 Ericsson
R1-165952 WF on priority handling for V2V Huawei, HiSilicon, Intel, Ericsson, Sharp, LG Electronics, NTT DoCoMo, OPPO , ITRI, Kyocera, Nokia, ASB, Potevio, Sony, ZTE, III, CATT, Samsung

6.2.2.2.5 Other

R1-164466 Discussion on the mode-2 resource allocation for V2V Guangdong OPPO Mobile Telecom.

6.2.2.3 Semi-persistent scheduling for sidelink resource in eNB scheduling mode

Agreements:

- Support cross carrier scheduling for sidelink SPS and dynamic scheduling for V2V with mode-1
  - PC5-based V2V design will support the multiple-operator scenario but not be optimized for it.
  - Details FFS, e.g.,
    - How to handle timing difference between eNB timing and PC5 timing, when it exists
    - PC5 resource partitioning among multiple operators
      - Resource coordination across operators is out of 3GPP scope.

Not treated.
R1-164818 SPS enhancement for V2V Huawei, HiSilicon
R1-165309 Details on PC5 SPS enhancement PANASONIC

6.2.2.3.1 Details of (E)PDCCH used for SPS

Including details of resource indication and how to trigger/release different SPS configurations

R1-164421 eNodeB signaling for SPS resource allocation Qualcomm Incorporated
R1-164514 Discussion on details of (E)PDCCH used for sidelink SPS LG Electronics
R1-164762 Multiple SPS configuration support for SL Samsung
R1-164878 Discussion on SPS configurations CMCC
R1-164906 Signaling design to support SPS activation/release in V2V Panasonic
R1-164963 Trigger and release of V2V SPS ZTE
R1-165193 (E)PDCCH for sidelink SPS configuration switching NTT DOCOMO, INC.
R1-165246 Contents of Downlink Control Information for V2V over PC5 Ericsson
R1-165699 WF on ePDCCH used for multiple SPS configuration NTT DOCOMO
R1-165728 WF on DCI for SL SPS LGE
R1-165907 WF on cross carrier scheduling in PC5-based V2V CMCC

6.2.2.3.2 Details of UE reporting

Including details of UE indication to eNB on the transmission intention and the need of eNB acknowledgement

R1-164321 Discussion on the resource allocation enhancement for sidelink-based V2V communication Fujitsu
R1-164422 UE reporting for eNodeB resource allocation Qualcomm Incorporated
R1-164475 Reporting of radio-level measurements of sidelink NEC
R1-164515 Discussion on details of UE reporting LG Electronics
R1-164763 UE reporting procedure for SL SPS transmissions Samsung
R1-164964 Discussion on UE reporting ZTE
R1-165258 Geo-Info reporting to eNB Ericsson
R1-165272 Mode-1 SPS for V2V over PC5 Ericsson

6.2.2.4 Details of resource pool design

Including how to configure SA and data resources FDMed from system perspective and how a data pool is associated with an SA pool

R1-165591 WF on Same Subframe SA and Data transmission Qualcomm, Ericsson, LGE
Decision: The document is noted.

Agreements:

- Allow resource pool definition where SA and associated Data transmitted on the same subframe are always adjacent in frequency
  - All the PRBs used for the SA and associated data transmissions should be contiguous in frequency.
  - Details FFS
- For a SA and associated data resource pool it should be (pre)configured whether the SA and associated data transmission by all the UEs using this pool either occur on the same subframe in an adjacent manner, or occur on different subframes, (FFS or occur on the same subframe in a potentially non-adjacent manner).
  - If the FFS part is not supported, this reverts the existing agreement "When SA and the associated data are transmitted in the same TTI, they can be transmitted in non-adjacent RBs."
  - Strive for not increasing the number of SA blind decoding to enable this.

Continue discussion on the FFS part during this week (Qualcomm)

R1-165755 **WF on resource pool configuration** **Huawei, HiSilicon, ZTE, NTT DoCoMo**
Decision: The document is noted.
Proposed agreement:
- For PC5-based V2V, time domain resource pool can be (pre)configured.
- For PC5-based V2V, frequency domain resource pool can be (pre)configured.
- At least for the case of transmitting SA and the associated data in the same subframe, UE can perform resource selection when a TB arrives (mode-2) or transmit when instructed by the eNB (mode-1).

Continue discussion during this week.

Not treated.

R1-164056	Resource pool design and multiplexing of SA and its associated data	Huawei, HiSilicon
R1-164140	Details of resource pool design for sidelink V2V communication	Intel Corporation
R1-164208	Resource pool enhancement in PC5-based V2V	CATT
R1-164323	Discussion on Resource Pool for PC5 based V2V	Fujitsu
R1-164423	Resource pool design for V2V	Qualcomm Incorporated
R1-164424	MPR for same subframe control and data transmission for V2V	Qualcomm Incorporated
R1-164476	Resource pool design for collision detection and handling	NEC
R1-164516	Discussion on remaining issues on resource pool design for PC5 based V2V	LG Electronics
R1-164646	Resource pool for V2V	Lenovo (Beijing) Ltd
R1-164764	Details on resource pool design	Samsung
R1-164903	Enhancement on V2V geo-based resource pool	Beijing Xinwei Telecom Techn.
R1-164965	Discussion on resource pools and SA resource pattern	ZTE
R1-165066	Details of V2V resource pool design	Potevio
R1-165195	Discussion on resource pool for PC5 based V2V communications	NTT DOCOMO, INC.
R1-165273	Subbands and measurements for sensing for V2V over PC5	Ericsson

6.2.2.5 Scheduling assignment

Including the content of SCI

R1-164103	Discussion on SCI contents for V2V	Huawei, HiSilicon
R1-164141	Scheduling assignment for sidelink V2V communication	Intel Corporation
R1-164209	Discussion on contents of scheduling assignment	CATT
R1-164425	Scheduling Assignments for V2V	Qualcomm Incorporated
R1-164517	Discussion on details of scheduling assignment for PC5 based V2V	LG Electronics
R1-164636	SA contents for V2V	Lenovo (Beijing) Ltd
R1-164765	Discussion on SCI contents	Samsung
R1-164817	Variable number of transmissions for V2V	Huawei, HiSilicon
R1-164907	Repetition and relationship between SA and associated data	Panasonic
R1-164966	Discussion on SA content	ZTE
R1-165046	On SCI Contents	Nokia, Alcatel-Lucent Shanghai Bell
R1-165067	Contents of SCI for V2V communication	Potevio
R1-165196	Discussion on enahancement of scheduling assignement in V2V communications	NTT DOCOMO, INC.
R1-165262	Relation between SA and data for V2V over PC5	Ericsson
R1-165264	Contents of PSCCH for V2V over PC5	Ericsson

6.2.2.6 Details of coexistence of PC5-based V2V operation and legacy Uu operation

R1-164967	Coexistence of PC5-based V2V operation and legacy Uu operation	ZTE
R1-165259	On the Need for V2V Gaps	Ericsson

6.2.2.6.1 Details of prioritizing sidelink transmissions over UL transmissions

R1-164112 Coexistence of cellular and V2V services on the same carrier Huawei, HiSilicon
R1-164518 Discussion on details of prioritizing sidelink transmissions over UL transmissions LG Electronics
R1-164766 Prioritization of sidelink transmissions over Uplink transmissions Samsung
R1-165197 Details of prioritizing sidelink transmissions over UL transmissions NTT DOCOMO, INC.
R1-165733 WF on V2V TX gap NTT DOCOMO

6.2.2.6.2 Other

Including reusing sidelink open loop power control and the need of RSRP-based resource selection
R1-164392 Discussion on intra-UE coexistence between 5.9GHz PC5 chain and 2GHz Uu chain for V-UE CATT
R1-164519 Discussion on remaining issues on coexistence of PC5-based V2V and legacy Uu LG Electronics

6.2.2.7 Enhancement to sidelink synchronization procedure

Low priority is given to enhancements to Rel-12/13 SLSS-based synchronization.

Agreements:

- Rel-12 DFN definition is reused.
  - When GNSS is the synchronization reference, DFN is derived from GNSS.
    - Details are up to RAN2.
  - For the other cases, DFN is derived according to Rel-12 behavior.

Working assumption:

Working assumption for the V2V PC5 SLSS:

- At least one value is reserved for SLSS ID used for SLSS transmissions from UEs having GNSS as the synchronization reference.
  - FFS whether multiple values need to be reserved.
- The reserved value(s) of the SLSS IDs is(are) pre-defined.
- If it is agreed that SLSS/PSBCH is used for the purpose of detecting LTE ITS transmissions, this working assumption needs to be revisited.

Conclusion:

- Companies are encouraged to consider whether having GNSS as the highest sync priority for OOC UEs have significant impact on in-coverage UE operations.

Working assumption:

- SSSS for V2V uses sequences of subframe-5 SSS
  - If it is agreed that SLSS/PSBCH is used for the purpose of detecting LTE ITS transmissions, this working assumption may need to be revisited.

R1-164113 Timing alignment of different synchronization sources for V2V Huawei, HiSilicon
R1-164426 Synchronization Procedure for V2V Qualcomm Incorporated
R1-165317 Distributed Synchronization Procedure for V2X over PC5 Ericsson
R1-165743 Way Forward on differentiate the GNSS timing and eNB timing Huawei, HiSilicon, Qualcomm, Samsung, NTT DOCOMO , LG Electronics, Panasonic, Xinwei, ZTE, ITRI, CATR

6.2.2.7.1 Priority order of synchronization references

R1-164101 The remaining issues for V2V PC5 synchronization priority Huawei, HiSilicon
R1-164105 Sidelink synchronization enhancement in V2V communication Huawei, HiSilicon
R1-164210 Synchronization enhancements in PC5-based V2V CATT
R1-164469 Discussion on the GNSS based synchronization Guangdong OPPO Mobile Telecom.
R1-164520 Discussion on details of synchronization enhancements LG Electronics
R1-164767 Priority order for synchronization references Samsung
R1-164934 Discussion multiple synchronization references on sidelink synchronization procedure for PC5-basde V2V communication ITRI
R1-164968 Priority order of synchronization references ZTE
R1-165045 Prioritization of sidelink synchronization sources Nokia, Alcatel-Lucent Shanghai Bell
R1-165074 Priority order of synchronization references for sidelink V2V communication Intel Corporation
R1-165198 SLSS enhancements for GNSS based synchronization NTT DOCOMO, INC.

R1-165241 Considerations on priority order of synchronization references for V2V Innovative Technology Lab Co.
R1-165308 V2V synchronization remaining issues PANASONIC
R1-165744 Way Forward on Sync Priority for OOC Huawei, HiSilicon, Samsung, Panasonic, NEC, Xinwei, ITRI, ZTE

6.2.2.7.2 Other

Including how sidelink TTI/subframe number and frame number are derived

R1-164211 Discussion on synchronization issues of physical design CATT
R1-164212 Discussion on PSBCH issues CATT
R1-164213 Timing alignment for V2V CATT
R1-164477 Determining the radio frame and subframe for V2X synchronisation signals NEC
R1-164521 Discussion on sidelink subframe timing and number determination LG Electronics
R1-164768 Differentiation on synchronization references Samsung
R1-164866 SLSS and PSBCH design for V2V PC5 Huawei, HiSilicon
R1-164969 Enhancement to the sidelink synchronization ZTE
R1-164996 Remaining Issue Discussions on V2X Synchronization Sharp
R1-165680 WF on V2V timing LG Electronics
R1-165745 Way Forward on timing offset between eNB timing and PC5 based V2V Huawei, HiSilicon, Qualcomm, Intel, ZTE , Xinwei
R1-165749 Way Forward on V2V PC5 SLSS/PSBCH transmission Huawei, HiSilicon, ITRI, ZTE, OPPO
R1-165908 WF on V2V and D2D SLSS differentiation Samsung

6.2.2.8 Other

R1-164908 MCS report in mode 1 resource allocation Panasonic
R1-165245 Observations on CAM Message Periodicity and Payload Ericsson

6.2.3 Enhancements on Full-Dimension (FD) MIMO for LTE - *WID in RP-160623*

R1-165936 Chairman's Notes of Agenda Item 6.2.3 on FDMIMO Ad-hoc chair (Qualcomm, Samsung)
The document was presented by Wanchi Chen from Qualcomm and provides the outcomes of the FDMIMO session.
Decision: The document is endorsed. Contents incorporated below.

R1-165447 Proposed work plan for RAN1#85 Samsung, Nokia, CATT
Decision: The document is noted.

Conclusion:

- RAN1 to aim to conclude on the three "*evaluate and, if needed, specify*" items
- Decide for each of the three items:
  - whether to specify or not to specify
  - if RAN1 decides to specify, decide the scope of specification work
- Based on the decisions, recommend to refine scoping of the WI to RAN plenary

6.2.3.1 Reference Signals

6.2.3.1.1 Non-precoded CSI-RS

For {20, 24, 28, 32} ports with mechanism for overhead reduction

R1-164142 Discussion on CSI-RS for Class A FD-MIMO with overhead reduction Intel Corporation
R1-164214 CSI-RS enhancement for {20,24,28,32} ports CATT
R1-164771 Discussions on CSI-RS enhancements for Class A CSI reporting Samsung
R1-165047 On non-precoded CSI-RS overhead reduction InterDigital
R1-165199 Discussion on CSI-RS Port Extension NTT DOCOMO, INC.

R1-165593 WF on enhancements for non-precoded CSI-RS LG Electronics, Samsung, NEC
R1-165589 WF on NP CSI-RS Aggregation ZTE, Qualcomm, Beijing Xinwei Tech.

Agreement:

- For {20, 24, 28, 32} ports, a CSI-RS resource for class A CSI reporting is aggregated as follows (where M_k is the # of CSI-RS ports in a CSI-RS configuration)
  - For {24, 32} ports, $\sum_k M_k \in \{24, 32\}$, M_k is either 4 or 8, where the same $M_k = M$ used for all k
    - Possible down-selection till RAN1#86 regarding M_k=4 vs. 8
  - For {20, 28} ports, FFS till RAN1#86 (including possible down-selection)
    - Alt 1: $\sum_k M_k \in \{20, 28\}$, M_k is either 4 or 8, where the same $M_k = M$ used for all k
      - Possible down-selection till RAN1#86 regarding M_k=4 vs. 8.
      - If M_k=8 is supported, FFS the details
    - Alt 2: $\sum_k M_k \in \{20, 28\}$, $M_k \in \{4, 8\}$, where M_k may be different for different k
  - FFS port numbering
  - FFS N vs. M

R1-165613 **WF on non-precoded CSI-RS Samsung, LGE, NEC**

Proposal:

- For {20, 24, 28, 32} ports, CSI-RS RE density can be lower than 1RE/RB/port
  - The chosen scheme(s) will be down-selected/merged among following alternatives
    - FDM
    - Partial port

Continue discussion offline till RAN1#86

R1-165616 **Way-forward on CDM-8 for Non-Precoded CSI-RS CATT, Intel, NEC**

Proposal:

- At least OCC- 8 is supported for more than 16 ports non-precoded CSI-RS
  - other OCC value not precluded

Conclusion:

- Further discussion till RAN1#86, especially regarding evaluating different alternatives, e.g., using OCC 2/4/8, high reuse of CSI-RS, etc.

Not treated.

R1-164215	Discussion on CSI-RS overhead reduction	CATT
R1-164216	Discussion on backward compatiblity of Rel.12 and Rel.13 CSI-RS	CATT
R1-164308	Views on non-precoded CSI-RS design for eFD-MIMO	ZTE
R1-164309	Aperiodic CSI-RS for non-precoded CSI-RS	ZTE
R1-164335	CSI-RS Design Supporting up to 32 Antenna Ports	Nokia, Alcatel-Lucent Shanghai Bell
R1-164427	Non-precoded CSI-RS design for up to 32 ports	Qualcomm Incorporated
R1-164481	Design for Non-precoded CSI-RS for overhead reduction	NEC
R1-164483	Discussion on CSI-RS with CDM8	NEC
R1-164522	Discussion on CSI-RS designs for eFD-MIMO	LG Electronics
R1-164772	Evaluation results on CSI-RS RE densities	Samsung
R1-164822	CSI-RS pattern design for up to 32 ports	Huawei, HiSilicon
R1-164879	Discussion on non-precoded CSI-RS enhancement	CMCC
R1-165094	CSI-RS Design for Class A eFD-MIMO	Ericsson
R1-165397	Discussion on Non-precodes CSI-RS for eFD-MIMO	Beijing Xinwei Telecom Techn.

6.2.3.1.2 Beamformed CSI-RS

More efficient resource utilization for UE-specific BF CSI-RS, including aperiodic CSI-RS

R1-164428	**Enhancements on Beamformed CSI-RS for eFD-MIMO**	**Qualcomm Incorporated**
R1-164523	**Beamformed CSI-RS enhancements including aperiodic CSI-RS**	**LG Electronics**
R1-164773	**On aperiodic CSI-RS design**	**Samsung**
R1-164845	**PDSCH rate matching enhancement for aperiodic NZP and ZP CSI-RS**	**Huawei, HiSilicon**
R1-165406	**Dynamic CSI-RS Design and Overhead Reduction**	**Ericsson (R1-165095)**

R1-165585 **WF on beamformed CSI-RS enhancements LG Electronics, Samsung, Qualcomm**

Agreement:

- Scheme 1: Aperiodic NZP CSI-RS resource is supported in Rel-14 for Class B eMIMO-Type, where
  - Only PUSCH based A-CSI reporting is supported.
  - A new aperiodic CSI-RS resource allocation/configuration is defined
    - Without *Subframe_config*
  - Aperiodic CSI-RS transmission instance is indicated by UL-related DCI transmitted on a control channel with a CSI request field:
    - Aperiodic CSI-RS transmission is in the same DL subframe as the associated UL-related DCI
    - FFS whether or not the UE may not assume more than one aperiodic NZP CSI-RS resource. If more than one resource is allowed, FFS the signaling details
    - FFS the number of bits for the CSI request field
    - The control channel can be PDCCH or EPDCCH. FFS whether or not the case of EPDCCH can be precluded or with some restrictions/relaxations
  - FFS whether or not periodic CSI-RS can be additionally configured
- Scheme 2: For Class B eMIMO-Type, the following CSI-RS resource configuration mechanism is supported
  - A UE receives an activation/release trigger containing a choice from multiple higher-layer-configured NZP CSI-RS resources for a given CSI process
    - Each NZP CSI-RS resource can be either periodic or, aperiodic CSI-RS resource (if scheme 1 is supported)
    - Details of the activation/release trigger (including the set of NZP CSI-RS resource configuration parameters) are FFS
  - For an activation trigger received in subframe n, the transmission of the associated NZP CSI-RS resource will start no earlier than subframe n+X where X>0
  - For a release trigger received in subframe n, the transmission of the associated NZP CSI-RS resource will stop after subframe n+Y where Y>0
    - FFS the impact of multi-shot configuration, if supported
  - FFS whether or not there are any significant issues regarding the potential misalignment about activation and/or release between eNB and UE, and if so, how to address them
- FFS whether or not to further enhance rate matching for PDSCH, particularly whether or not aperiodic NZP CSI-RS will not have impact on PDSCH RE mapping
- FFS the QCL details
- Down-selection between scheme 1 and scheme 2 (if any) to be discussed in RAN1#86

R1-165642 **WF on Beamformed CSI-RS Huawei, HiSilicon, CATT**

R1-164336 **CSI-RS Overhead Reduction for Beamformed CSI-RS Transmission Schemes Nokia, Alcatel-Lucent Shanghai Bell**
R1-164143 **Discussion on CSI-RS overhead reduction schemes for Class B FD-MIMO Intel Corporation**

Conclusion:

- Candidate schemes for CSI-RS overhead reduction for Class B eMIMO-Type (2, 4, and 8 ports):
  - Scheme 1: Configurable CSI-RS frequency-domain density
  - Scheme 2: Localized CSI-RS in frequency domain
  - Scheme 3: Configurable RPF pattern
  - Scheme 4: Frequency domain MR
- Companies are encouraged to study the following issues in the next meeting:
  - Backward compatibility
  - UE implementation restriction (for, e.g. channel estimation)
  - Impact on eNB scheduling
  - Impact on CSI reporting
  - PDSCH rate matching

Not treated.
R1-164217 On aperiodic CSI-RS transmission CATT
R1-164218 Enhancements on beamformed CSI-RS CATT
R1-164310 Enhancements on Beamformed CSI-RS ZTE
R1-164858 Discussion on efficient utilization of BF CSI-RS Huawei, HiSilicon

R1-164930 Discussion on beamformed CSI-RS ITRI
R1-165200 Aperiodic CSI-RS with Semi-static Resource Reservation NTT DOCOMO, INC.

6.2.3.1.3 Uplink DM-RS

Evaluate and, if needed, specify more orthogonal ports with partially overlapping BW allocations

R1-164144 Discussion on UL DMRS Enhancement for FD-MIMO Intel Corporation
R1-164429 Performance evaluation of uplink DMRS enhancements for MU-MIMO Qualcomm Incorporated

R1-164099 Discussion on more orthogonal DMRS ports with partial overlapping Huawei, HiSilicon
R1-164311 Discussion on UL DMRS enhancement for eFD-MIMO ZTE

Not treated.
R1-164219 Discussion on UL DMRS enhancement CATT
R1-164348 General views on DM-RS enhancements in uplink for FD-MIMO Fiberhome Technologies Group
R1-164484 Proposals for uplink DM-RS enhancement NEC
R1-164524 Uplink DMRS enhancements for eFD-MIMO LG Electronics
R1-164774 Discussion on uplink DMRS for partially overlapping bandwidth allocations Samsung
R1-165096 Discussion on UL DMRS Enhancements Ericsson
R1-165432 UL DMRS Enhancement and Evaluations for FD-MIMO Nokia, Alcatel-Lucent Shanghai Bell

6.2.3.2 CSI Reporting

R1-164775 Discussions on periodic CSI reporting for class A in eFD-MIMO Samsung

6.2.3.2.1 Non-precoded CSI-RS codebooks

For newly defined number of ports for NP CSI-RS for a subset of possible port layouts,both 1D and 2D

R1-164857 Discussion on codebook design to support up to 32 ports CSI-RS Huawei, HiSilicon
R1-164430 Non-precoded CSI-RS Codebooks for eFD-MIMO Qualcomm Incorporated
R1-164145 Discussion on Class A codebook extension Intel Corporation
R1-164146 Performance evaluation of Class A codebooks with 32 ports Intel Corporation
R1-164312 Discussion on rank 1-2 codebook design for eFD-MIMO ZTE
R1-165097 Class A Codebook Design for up to 32 Ports in Rel-14 Ericsson

R1-165594 WF on enhancements on codebook for Rel-14 LG Electronics, ZTE, Qualcomm

Conclusion:
- Class A codebook enhancement:
  - Starting from Rel-13 Class A codebook design structure by enabling different N1 and N2 combinations
- Reduce the number of combinations of codebook parameters (N1, N2, O1, and/or O2)
  - To be concluded in RAN1#86
  - Examples:
    - Down select from 19 (N1,N2) combinations; and/or
    - Reduce the number of (O1,O2) combinations
    - Other possibilities are not excluded

Not treated.
R1-164220 Antenna port layouts for Rel-14 FD-MIMO CATT
R1-164221 Codebook design for {20,24,28,32} ports CATT
R1-164324 Discussion on non-precoded CSI-RS Fujitsu
R1-164338 Codebook Design Supporting Antenna Configurations Up to 32 Ports Nokia, Alcatel-Lucent Shanghai Bell
R1-164525 Discussion on codebook design for eFD-MIMO LG Electronics
R1-164776 View on class A codebook extension Samsung
R1-164929 Discussions of codebook enhancement for up to 32 ports ITRI
R1-165201 Codebook Enhancement for Non-precoded CSI-RS NTT DOCOMO, INC.

6.2.3.2.2 CSI reporting for hybrid CSI-RS

Hybrid between NP and BF CSI-RS or different types of BF CSI-RS

R1-164222 CSI reporting for hybrid CSI-RS CATT
R1-164339 Hybrid CSI measurement and reporting schemes Nokia, Alcatel-Lucent Shanghai Bell
R1-164431 Discussion on Hybrid CSI-RS Operation for eFD-MIMO Qualcomm Incorporated
R1-164526 Discussion on CSI reporting enhancements for hybrid CSI-RS LG Electronics
R1-165048 On Hybrid CSI-RS reporting scheme InterDigital

R1-165606 WF on Hybrid CSI Samsung, CATT, Interdigital, LG Electronics, Nokia, ALU Shanghai Bell, Qualcomm, Huawei, HiSilicon
R1-165617 Way Forward on Hybrid CSI Reporting ZTE, NTT DOCOMO, Beijing Xinwei Tech., NEC

Working assumption:

- Mechanism 1: Hybrid CSI is realized by with one CSI process, support at least CLASS A for the 1st eMIMO-Type and CLASS B with K=1 CSI-RS resource for the 2nd eMIMO-Type
  - i_1 is reported while CQI and i_2 are not reported for the 1st eMIMO-Type (CLASS A)
    - FFS: whether RI is reported for CLASS A
  - CQI/PMI/RI are reported for the 2nd eMIMO-Type (CLASS B K=1)
- At least one more mechanism is supported, to be discussed in RAN1#86

R1-164860 Discussion on Joint utilization of different types of CSI-RS Huawei, HiSilicon
R1-164770 Port-based CSI-RS overhead reduction Samsung
R1-164777 Hybrid PMI codebook based CSI reporting and simulation results Samsung
R1-165202 CSI Reporting for Hybrid CSI-RS NTT DOCOMO, INC.

R1-165920 WF on additional hybrid CSI mechanism NTT DOCOMO, LG Electronics, NEC, Qualcomm, Samsung

Conclusion:

- Candidate mechanisms to consider in RAN1#86
- Mechanism 2A: for hybrid CSI with one CSI process, support CLASS B with K≥1 CSI-RS resources for the 1st eMIMO-Type and CLASS B with K=1 CSI-RS resources for the 2nd eMIMO-Type
  - For the 1st eMIMO-Type, depending on the value of K
    - K=1: CQI/RI are reported. In addition, i_1 is reported for Rel.12 dual-stage codebooks
    - K>1: two options
      - Option 1: CRI is reported
      - Option 2: PMI/RI for each CSI-RS resource are reported
  - For the 2nd eMIMO-Type
    - CQI/PMI/RI are reported
- Mechanism 2B: for hybrid CSI with one CSI process, support CLASS B with K≥1 CSI-RS resources for the 1st eMIMO-Type and CLASS B with K=1 CSI-RS resources for the 2nd eMIMO-Type
  - For the 1st eMIMO-Type, depending on the value of K
    - K=1:
      - Option 1: i_1 is reported for Rel.12 codebooks (when applicable) or i_2 for Rel.13 CLASS B codebooks
      - Option 2: CQI/RI are reported. In addition, PMI is reported for Rel.13 CLASS B codebooks
    - K>1: two options
      - Option 1: CRI is reported
      - Option 2: PMI/RI for each CSI-RS resource are reported
  - For the 2nd eMIMO-Type
    - CQI/PMI/RI are reported
- Mechanism 3: for hybrid CSI with one CSI process, CLASS A or CLASS B K=1 for the 1st eMIMO-Type and CLASS B K>1 for the 2nd eMIMO-Type
  - For the 1st eMIMO-Type: i_1 is reported
  - For the 2nd eMIMO-Type: two options

        - Option 1: CRI and CQI/PMI/RI for the recommended CSI-RS resource are reported
        - Option 2: CQI/PMI/RI for a CSI-RS resource
- Mechanism 4: Hybrid CSI reporting with CSI process pair
    - UE calculates CSI for only one CSI process at a time
- Mechanism 5: the proposal in R1-165617
- Other mechanisms are not precluded
- Down select from the above mechanisms and/or options in RAN1#86
- Each proposal should include clear description on use case(s) and specification impact
    - For CLASS B K=1, proponent needs to clarify whether both codebook options are applicable for not.

R1-164880 Considerations on hybrid non-precoded CSI-RS and beamformed CSI-RS CMCC

Not treated.

R1-164147 Evaluation of beam selection in Class B for hybrid FD-MIMO Intel Corporation
R1-164313 Discussion on CSI reporting for hybrid CSI-RS ZTE
R1-164778 CSI reporting for hybrid CSI-RS Samsung
R1-164895 Discussion on CSI reporting for hybird CSI-RS Beijing Xinwei Telecom Techn.
R1-165098 Hybrid CSI Reporting with One and Two CSI Processes Ericsson

6.2.3.2.3 Advanced CSI reporting and interference measurement

(Second priority) Evaluate and, if needed, specify enhancements on CSI reporting to improve eNB precoding and interference measurement for MU transmissions

R1-164781 LC based explicit CSI feedback and simulation results Samsung
R1-165100 High Resolution CSI feedback Ericsson
R1-164150 Explicit CSI reporting for FD-MIMO Intel Corporation
R1-165789 Initial performance evaluation on advanced implicit CSI LG Electronics (R1-164527)
R1-164098 Enhancement on CQI measurement and feedback for MU-MIMO Huawei, HiSilicon
R1-165203 Advanced Interference Measurement and CSI Reporting NTT DOCOMO, INC.

R1-165801 WF on advanced CSI feedback Huawei, Hisilicon, China Unicom, China Telecom, Deutsche Telekom
Proposal:

- Specify at least Analog CSI feedback in Rel-14 with the following restrictions
    - CQI is quantized and CQI derivation is based on associated unquantized CSI (i.e. implicit feedback)
    - Only support Aperiodic feedback in Rel-14;
    - Only support {2, 4} ports per CSI-RS resource in Rel-14

Not treated.

R1-164090 CSI feedback for beam space MIMO Huawei, HiSilicon
R1-164097 Discussion and evaluation of analog CSI feedback Huawei, HiSilicon
R1-164148 Beam combining codebook enhancements for Class B FD-MIMO Intel Corporation
R1-164223 On Interference enhancement for multi-user MIMO operation CATT
R1-164315 Discussion on interference measurement for MU-CSI ZTE
R1-164432 Discussion on advanced CSI reporting and initial evaluation results Qualcomm Incorporated
R1-164659 Considerations on MU-CQI Transmission Sony
R1-164779 Advanced CSI reporting paradigm Samsung
R1-164780 Linear combination (LC) codebook based CSI reporting and simulation results Samsung
R1-164782 Discussions on auxiliary CSI for MU transmission Samsung
R1-164783 Discussions on interference measurement enhancement in eFD-MIMO Samsung
R1-164856 Advanced CSI feedback framework for LTE Huawei, HiSilicon
R1-164881 Enhancing interference measurement for MU transmissions CMCC
R1-164897 Discussion on Advanced CSI Reporting Beijing Xinwei Telecom Techn.
R1-165099 Discussion on Interference Measurement Enhancements Ericsson
R1-165408 Explicit CSI reporting for FD-MIMO Intel Corporation
R1-165444 Discussion on CSI reporting of linear combination codebookZTE

R1-165597 Discussion on the performance of CQI reporting based on the NZP CSI-RS Intel CorporationR1-164090 CSI feedback for beam space MIMO Huawei, HiSilicon

6.2.3.3 DMRS-based Open-Loop and Semi-Open-LoopTransmission

Evaluate and, if needed, specify necessary CSI reporting scheme and open-loop (without PMI feedback) as well as semi-open-loop (with reduced PMI feedback) transmission scheme

R1-165102 Email Summary: Use of 3D RMa Channel Model in Semi-Open Loop Evaluations Ericsson

Conclusion:

- No consensus to change RMa channel model assumptions for (semi-)open loop evaluations at present. Implications:
  - 2D RMa currently supported in evaluations is suitable for 1D horizontal arrays.
  - Companies bringing in preliminary results for FD-MIMO (2D) arrays will need to explain how they approximated a 3D model from the 2D ITU model
- Use of 3D RMa may be further discussed in evaluations during specification phase.
- Clarify that 2D RMa can be simulated with 30, 60, 120 kmph, as shown below.
- Amend slide 3 of R1-163832 as follows, leaving the 'UE Speed' row unchanged.

Parameters	Value
Scenarios	3D-UMa ISD 500m ~~(at 30km/h, 60kmph, and/or 120km/h)~~ RMa ISD 1732m~~(120km/h)~~ in ITU-R model [note: this is a 2D model]

R1-165407 DMRS-based Open-loop MIMO Ericsson (R1-165101)
R1-164433 Discussion on DMRS based OL and Semi-OL Transmission Qualcomm Incorporated
R1-164859 Discussion on DMRS based open and semi open loop transmission Huawei, HiSilicon
R1-164341 Evaluation Results of DMRS-based open-loop transmission schemes Nokia, Alcatel-Lucent Shanghai Bell
R1-164225 Evaluation of DMRS-based open-loop and semi-open-loop MIMO CATT

R1-165790 WF on the three "evaluate and, if needed, specify" Items Nokia, Alcatel-Lucent Shanghai Bell, Samsung, CATT

Agreements:

- UL DMRS Enhancement
  - Specify enhancement on uplink DMRS to support (more than 2) orthogonal DMRS for MU-MIMO with partially overlapping BWs allocation, i.e. one of IFDMA with OCC2 or new DMRS sequence design
- Advanced CSI
  - Specify enhancement on CSI reporting to improve eNB precoding. The specified enhancement is to be selected from the following categories:
    - Enhancements to Rel-13 feedback codebooks (FFS which numbers of antenna ports from the set {8, 12, 16, 20, 24, 28, 32}) that increase CSI resolution through improved beam selection / construction in W1 and/or improved beam/port selection / combining / weighting mechanisms in W2
    - Parameters representing channel coefficients, or some reduced space representation thereof including beam combining / weighting with coefficient quantisation or channel quantisation or channel covariance matrix quantisation
      - Uplink physical channel enhancements to carry the representation of channel coefficients can be included if selected
  - Also, interference measurement enhancement can be considered
- DMRS-based semi-open-loop
  - Specify enhancement to support DMRS-based semi-open-loop transmission with the existing numbers of CSI-RS ports as well as the newly supported number of CSI-RS ports, in the following areas
    - CSI reporting scheme with partial PMI feedback, and/or
    - Transmission method with transmit diversity and/or precoder cycling, with possible enhancements to precoder bundling
    - Associated enhancements to DMRS if required
  - Further system level simulations (e.g. considering wideband scheduling and BLER targets at high speed) will be conducted in order to identify the exact scheme to be specified.

Send LS to RAN plenary reflecting the above, with update to WID - R1-165493.

Friday

R1-165493 **LS on Rel.14 eFD-MIMO WID update** **Nokia**
Decision: The document is noted and final LS is agreed in R1-166029

R1-165860 **Draft LS on Rel.14 eFD-MIMO WID update** **Samsung**

Agreement:
Change "RAN1 has agreed to request RAN to amend the WID as follows" to "RAN1 has agreed on the following"
The agreed LS is to be prepared in R1-165493.

Not treated.

R1-164151	Evaluation of open loop schemes	Intel Corporation
R1-164224	Discussion on DMRS based open-loop MIMO	CATT
R1-164528	Initial performance evaluation on semi-OL MIMO	LG Electronics
R1-164784	Discussions on open and semi-open loop transmission in eFD-MIMO	Samsung
R1-164898	Discussion on Semi-Open-loop Transmission	Beijing Xinwei Telecom Techn.
R1-165341	Discussions on DMRS based Open/Semi-open loop MIMO schemes	CEWiT
R1-165411	Initial simulation results of DMRS based semi-open-loop MIMO	CATR
R1-165433	Evaluation Results of DMRS-based open-loop transmission schemes	Nokia, Alcatel-Lucent Shanghai Bell
R1-165445	Discussion on DMRS-based Open-Loop and Semi-Open-Loop Transmission	ZTE

6.2.4 Downlink Multiuser Superposition Transmission for LTE - WID in RP-160680

R1-165937 **Chairman's Notes of Agenda Item 6.2.4 on MUST** **Ad-hoc chair (Qualcomm)**
The document was presented by Wanchi Chen from Qualcomm and provides the outcomes of the MUST session.
Decision: The document is endorsed. Contents incorporated below.

R1-165888 **Draft LS on RAN1 Agreements in MUST** **MediaTek**
The draft LS is approved in R1-165984, with the following updates:

- Remove the yellow parts
- Last paragraph is updated to:
  - For exact values of power ratios, although RAN1 concludes that R1-165763 and R1-165797 can be used as examples for further evaluation, RAN1 has not achieved consensus yet and further evaluations are to be performed in RAN1.

6.2.4.1 Superposition transmissions

Down select between single and multiple power ratios, potential power ratios, modulation, etc.

R1-164079	**Discussion on power ratios for MUST**	**Huawei, HiSilicon**
R1-164282	**Performance evaluation of MUST for selection of potential power ratios**	**ZTE**
R1-164435	**Power ratio set considerations for MUST**	**Qualcomm Incorporated**
R1-164529	**Discussion on power ratio and modulation order**	**LG Electronics**
R1-164977	**Selection of Power Ratios and Modulation for MUST PDSCH**	**MediaTek Inc.**
R1-164997	**On transmission power ratios for MUST**	**Sharp**
R1-165831	**Discussion on power ratios optimization for MUST scheme**	**NTT DOCOMO, INC.** (R1-165204)

R1-165764 **WF on modulation order** **LG Electronics, Intel, MediaTek, NTT DOCOMO, ZTE, Nokia**
Agreement:

- For Case 1 and 2 described in MUST WID, Far UE's modulation order is limited to QPSK when it is co-scheduled with near UE in a given subframe.

R1-165796 **Way Forward on MUST Power Ratio** **MediaTek, China Unicom, CHTTL, Huawei, HiSilicon, HTC, III, Intel, ITRI, LG, NTU, Sharp, Sony, ZTE**
Also supported by CMCC

Agreement:
- For MUST Case 1 and Case 2, multiple power ratios are supported at least for some combinations of MUST-near UE and MUST-far UE modulation orders
  - For case 3, FFS

R1-165763 **Way Forward on MUST Power Ratio Set** **Qualcomm**
R1-565765 **WF on power ratios** **LG Electronics, ZTE, Nokia**

Agreement:
- For Case 1 and 2, and for each combination of modulation order,
  - The number of power ratios generating non-uniform composite constellation should be chosen from 0 (for some combinations, if any), 1, 2 or 3.
    - The details are FFS.
  - Power ratios generating non-uniform composite constellation should be selected from the range [0.7, 0.95].
    - The values of power ratio is FFS.
    - 0.7 should be excluded in case of 64QAM (for near UE) + QPSK (for far UE).

R1-165797 **Way Forward on MUST Transmission** **MediaTek, ASUSTEK COMPUTER (SHANGHAI), CHTTL, Huawei, HiSilicon, HTC, III, ITRI, NTT DOCOMO INC., NTU, Sharp, ZTE**
R1-165798 **Way Forward on MUST Transmission when MUST-Far UE Has 16QAM** **MediaTek, CHTTL, Huawei, HiSilicon, HTC, III, ITRI, NTU, Sharp**

Conclusion:
- Companies are encouraged to perform more evaluations especially regarding the detailed set of power ratio(s) for each combination (**e.g.**, refer to the WFs in R1-165763, R1-165797 as an example)

Not treated.
R1-164152 Discussion on superposition transmission Intel Corporation
R1-164226 Selection of superposition transmission scheme and parameterizationCATT
R1-164281 Multiuser superposition transmission scheme for LTE ZTE
R1-164434 Superposition transmissions Qualcomm Incorporated
R1-164530 Discussion on Gray mapping for superposed constellation LG Electronics
R1-164593 down-selection for superposition scheme Sequans Communications
R1-164816 Constellation combinations in MUST with legacy composite constellations Huawei, HiSilicon
R1-164978 Discussion on the EVM requirement for MUST MediaTek Inc.
R1-165136 MUST Case 1 and 2 schemes Nokia, Alcatel-Lucent Shanghai Bell

6.2.4.2 Mechanisms for efficient operation

Related to RRC signaling, DCI, UE blind detection, etc.

R1-165135 **On network assistance and operation of MUST** **Nokia, Alcatel-Lucent Shanghai Bell**
R1-164979 **Blind detection evaluation on interference existence for Case 1** **MediaTek Inc.**

R1-165799 **Way Forward on Mechanism for MUST operation** **MediaTek, China Telecom, CHTTL, CMCC, Huawei, HiSilicon, HTC, III, ITRI, NTT DOCOMO INC., NTU, Sharp, Sony, ZTE**

Agreement:
- No new TM for MUST
- MUST Case 1 and Case 2 using up to 2Tx is supported in the following TMs
  - TM 2/3/4
  - FFS TM 8/9/10
- A UE is signalled by RRC if it is to be configured for potential MUST operation
- FFS MUST Case 3 using up to 8Tx is supported in the following TMs
  - TM 4/8/9/10
  - Companies are encouraged to perform more evaluations especially using the agreed FTP model

- At least one new DCI is to be monitored by a UE once configured into MUST operation
  - FFS on details
- FFS MUST-near UE may assume MUST interference presence/absence is consistent among all of its scheduled PRBs for CRS-based TM and DMRS-based TM

R1-165793 Way forward on transmission mode for MUST ZTE, NEC, MediaTek, Sequans
Also supported by Sharp

Agreement:
- For MUST case 1/case 2/case 3, dynamic switching between MUST and non-MUST operation is supported
- Maximum number of spatial layers for MUST
  - For MUST case 1 and case 2, up to 2 spatial layers for each UE are used.
  - For MUST case 3, the maximum number of spatial layers for a UE should be limited, with details FFS.

R1-165794 Way forward on DCI transmission for MUST ZTE, MediaTek, Qualcomm
Revised in R1-165956
R1-165803 Way Forward on MUST codewords multiplexing Huawei, HiSilicon, MediaTek, ZTE
R1-165881 WF on far UE spec impact LG Electronics, Intel, ASUSTeK, ZTE

Not treated.
R1-164080 Signaling mechanisms for MUST Huawei, HiSilicon
R1-164153 On downlink control signalling for MUST Intel Corporation
R1-164227 Support of downlink superposition transmission CATT
R1-164283 Method to provide assistance information to a UE ZTE
R1-164284 Potential mechanisms for MUST operation ZTE
R1-164345 Discussion on control signalling of MUST Fiberhome Technologies Group
R1-164436 Mechanisms for efficient operation Qualcomm Incorporated
R1-164478 Discussion on candidate assistance information for signalling or blind detection NEC
R1-164531 Discussion on Signaling Assistance Information LG Electronics
R1-164594 initial configuration and dynamic indication Sequans Communications
R1-164669 Considerations of Efficient Control Signaling for MUST Sony
R1-164980 Mechanisms for Operation of MUST MediaTek Inc.
R1-164981 Downlink power allocation for MUST MediaTek Inc.
R1-165068 Operation mechanism for MUST case 1 and case 2 China Telecommunications
R1-165137 On the specification approach of MUST Nokia, Alcatel-Lucent Shanghai Bell
R1-165205 Discussion on remaining issues and signaling design for DL MUST NTT DOCOMO, INC.
R1-165265 Discussion on Downlink Control Signaling for MUST ASUSTEK COMPUTER (SHANGHAI)
R1-165736 Feasibility of interference presence blind detection in case 1 MUST Nokia
R1-165956 WF on DCI transmission for MUST ZTE, MediaTek, Qualcomm

6.2.4.3 Evaluation for MUST using up to 8Tx
R1-164285 Evaluation for MUST using up to 8Tx antennas ZTE
R1-164882 Updated Evaluation results for MUST using 8Tx with different precoders CMCC
R1-164982 Preliminary evaluation results for MUST Case 3 MediaTek Inc.
R1-165138 System-level Evaluation of Case 1 and 3 MUST Nokia, Alcatel-Lucent Shanghai Bell
R1-165206 Evaluation for CRS-based MUST with 4 Tx antennas NTT DOCOMO, INC.

6.2.4.4 Other
R1-164437 MUST UE pairing with existing CQI feedback Qualcomm Incorporated
R1-164832 Consideration on implementation for MUST transmitter Huawei, HiSilicon

6.2.5 eMBMS enhancements for LTE - WID in RP-160675
R1-165938 Chairman's Notes of Agenda Item 6.2.5 on eMBMS Rapporteur (Ericsson)
The document was presented by Joerg Huschke from Ericsson and provides the outcomes of the eMBMS session.

Decision: The document is endorsed. Contents incorporated below

6.2.5.1 Longer cyclic prefix for MBSFN subframe

R1-164082 Evaluations of different numerologies for eMBMS Huawei, HiSilicon
R1-164438 Evaluation results for longer cyclic prefixQualcomm Incorporated
R1-165437 System simulation results for longer CP in MBSFN subframes Ericsson (R1-165219)
R1-165342 MBSFN Measurements Alcatel-Lucent Shanghai Bell

R1-164154 On the support of longer cyclic prefix for MBSFN subframes Intel Corporation
R1-164439 Design options for longer cyclic prefix for MBSFN subframes Qualcomm Incorporated

R1-165220 Link level simulation assumptions for evaluation of longer CP for MBSFN subframes Ericsson

Offline discussion to develop simulation assumptions – Joerg Huschke (Ericsson) - R1-165438 (email approval until June 30th)

6.2.5.2 Increased number of MBSFN subframes per radio frame

R1-164440 Increased number of MBSFN subframes per radio frame Qualcomm Incorporated
R1-164155 On the support of increased number of MBSFN subframes per radio frame Intel Corporation
R1-165221 Radio frame design for extended MBSFN subframe allocation Ericsson

R1-164083 Radio frame design for increased number of MBSFN subframes Huawei, HiSilicon
R1-164306 Consideration on increasing number of MBSFN subframes ZTE
R1-165222 DRS design for carrier with extended MBSFN subframe allocation Ericsson

6.2.5.3 MBSFN subframes without a unicast control region and cell-specific reference signals

R1-164156 On the support of MBSFN subframes without a unicast control region and cell-specific reference signals Intel Corporation
R1-164307 Consideration on support of MBSFN subframes without a unicast region ZTE
R1-164441 MBSFN subframes without a unicast control region and cell-specific reference signals Qualcomm Incorporated

R1-164849 On MBSFN subframes without a unicast control region and cell-specific reference signals Huawei, HiSilicon
R1-165223 Unicast control region configuration for eMBMS enhancements Ericsson

6.2.5.4 Other

R1-164442 Standalone eMBMS carrier Qualcomm Incorporated
R1-164443 Simultaneous reception of broadcast and unicast Qualcomm Incorporated
R1-165340 Considerations for eMBMS Nokia, Alcatel-Lucent Shanghai Bell

Way Forwards

R1-165609 eMBMS WF unicast control region, incl. CRS Ericsson, Qualcomm, BBC, EBU
R1-165611 eMBMS WF link level simulations and RS design Ericsson, Qualcomm, BBC, EBU
R1-165615 WF on system information and idle mode reception for eMBMS enhancements Qualcomm, EBU, BBC, Ericsson

R1-165610 Way Forward on longer CP for MBSFN Ericsson, Qualcomm, BBC, EBU
R1-165614 WF on numerology supported in MBSFN subframes Huawei, HiSilicon, Orange, Intel, ZTE

R1-165846 Way Forward on eMBMS enhancements Ericsson, Qualcomm, BBC, EBU, Nokia, ASB, Dish, AT&T, Telstra, Fraunhofer IIS

Proposed agreement

- If a carrier is operated with 100% MBSFN subframe allocation, a single CP longer than or equal to X is supported
  - It is understood 100% MBSFN subframe allocation allows for non-MBSFN subframes set aside for e.g. cell search, SI
  - 100% MBSFN subframe allocation applies to objective b), and objective d) if specified
  - This carrier does not have unicast control in the MBSFN subframes
    - FFS: Where to indicate MCCH change notifaction
- For a carrier that is operated with 100% MBSFN subframe allocation, legacy CPs are supported
  - FFS whether it is needed to have unicast control on this carrier
- FFS whether the longer CP numerology can be supported in carriers with less than 100% MBSFN subframe allocation
- If a carrier supports mixed unicast and MBMS, at least 2 subframes separated by 5ms are non-MBSFN subframes
- eMBMS enhancements do not require changes to any channels and signals needed for MBMS operation except PMCH and MBSFN-RS
  - FFS whether use of more REs, TTI extension and/or change in payload are needed for PBCH coverage enhancements.

Proposed working assumption: x=100us, need for more evaluation

Huawei: is first proposal for standalone only? If so it is for study only.
Qualcomm: also applies to objective b), not only for standalone
ZTE, Huawei believe should be only for standalone operation
Telstra emphasizes need for support of large ISD not only for standalone but in existing spectrum
Huawei: What is standalone?
Ericsson: a carrier operating on its own. Currently MBMS on SCell does not work for Telstra because their ISDs are too large.
Huawei: So this is for mixed ISD? Has not been evaluated.
Telstra: Has taken it as given that CP for 15km will be specified, reading from WI
Ericsson: Mixed unicast/MBMS does not have to be evaluated separately. Addressing real operator problem.
Huawei: Can 15km ISD really provide contiguous PCell coverage.
Huawei: Proposes to have more time to evaluate longer CP scenario

Pro: Nokia, ASB, Qualcomm, Ericsson, BBC, EBU, Dish, Fraunhofer, KT, Telstra
Con: Huawei, HiSilicon, ZTE, Orange

This should be revisited on Friday
Friday: Email approval regarding the above proposed agreement and proposed working assumptions until June 30th – (Qualcomm)

6.2.6 SRS switching between LTE component carriers - *WID in RP-160676*

R1-165939 **Chairman's Notes of Agenda Item 6.2.6 on SRS** **Ad-hoc chair (Qualcomm)**
The document was presented by Wanshi Chen from Ericsson and provides the outcomes of the SRS session.
Decision: The document is endorsed. Contents incorporated below.

R1-165054 **An additional requirement on SRS switching** **SoftBank Corp.**
Conclusion:

- Companies are encouraged to check R1-165054, especially considering input from RAN4
- Revisit in RAN1#86

6.2.6.1 SRS Transmission on TDD CCs without PUSCH

Including power control, timing advance, and possible new symbol positions

R1-164107 **SRS subframe design for SRS carrier based switching** **Huawei, HiSilicon**
R1-164228 **Considerations on SRS carrier based switching** **CATT**
R1-164444 **SRS Transmission on TDD CCs without PUSCH** **Qualcomm Incorporated**
R1-164786 **SRS Transmission without PUSCH** **Samsung**
R1-164936 **On SRS transmission on TDD CCs without PUSCH** **Ericsson**

R1-165760 **Way Forward on SRS Transmission on TDD CCs without PUSCH** **Huawei, HiSilicon**

Agreement:

- Support non-contention based PRACH transmission over SRS Scell without PUSCH
  - Re-using existing procedure
- Timing advance commands are supported for SRS Scell without PUSCH
  - Re-using existing procedure
- Support power control mechanism for SRS transmission in cells without configured PUSCH transmission
  - Specify power control parameters for SRS transmission without PUSCH.
    - Aim for re-using existing parameters. Details FFS
  - Specify closed-loop power control signaling. Details FFS
  - Specify power headroom reports. Details FFS
  - FFS specify dropping/power scaling rules. Details FFS

Agreement:

- As defined in Rel-13, for SRS carrier based switching, the SRS transmission opportunities include:
  - In at least one symbol out of up to 6 symbols in a special subframe
  - In the last symbol of a UL subframe
  - Note: from UE perspective, there may be impact on SRS transmission opportunities due to switching time depending on RAN4 input
- FFS whether or not to further allow more symbol positions for SRS transmissions on a switching-to carrier in special subframes, UL subframes and/or after the control region in MBSFN subframes

Not treated.

R1-164108	Power control for SRS on TDD CCs without PUSCH	Huawei, HiSilicon
R1-164109	Timing advance for SRS on TDD CCs without PUSCH	Huawei, HiSilicon
R1-164157	Consideration on Support SRS Carrier based Switching	Intel Corporation
R1-165281	UL transmission on DL-only carrier for SRS carrier based switching	Nokia, Alcatel-Lucent Shanghai Bell

6.2.6.2 Support of Periodic and/or aperiodic SRS

R1-164110	**Support of periodic and/or aperiodic SRS**	**Huawei, HiSilicon**
R1-164937	**On Periodic and aperiodic SRS switching**	**Ericsson**
R1-165075	**Support of SRS transmission switching**	**Intel Corporation**
R1-165282	**Discussion on SRS transmission triggering**	**Nokia, Alcatel-Lucent Shanghai Bell**

R1-165761	**Way Forward on Support of Periodic and/or Aperiodic SRS**	**Huawei, HiSilicon, Softbank**

Agreement:

- Aperiodic SRS on a CC without PUSCH is supported for SRS carrier-based switching
  - Details FFS
- Periodic SRS on a CC without PUSCH is supported for SRS carrier-based switching
  - Details FFS
  - Strive for minimizing additional complexity (w.r.t. A-SRS), if any, and additional specification impact for supporting P-SRS

Not treated.

R1-164445	Support of Periodic and/or aperiodic SRS	Qualcomm Incorporated
R1-164787	P-SRS and A-SRS Transmission with Carrier Switching	Samsung

6.2.6.3 Collision Handling

R1-164446	**Collision Handling**	**Qualcomm Incorporated**
R1-164788	**SRS Collisions due to Carrier Switching**	**Samsung**
R1-165283	**Collision handling for SRS carrier based switching**	**Nokia, Alcatel-Lucent Shanghai Bell**

R1-165762	**Way Forward on Collision Handling**	**Huawei, HiSilicon, Qualcomm**

Agreement:

- To handle collision due to SRS carrier-based switching
  - Define priority/dropping rules by taking into account the factors including periodic/aperiodic SRS type, channel/UCI type, and PCell/SCell type
    - Rel-13 collision handling rules between SRS and other UL transmissions as baseline, taking into account switching time based on input from RAN4
    - Details FFS
  - FFS shortened PUSCH format and possible mechanisms to mitigate the effect of puncturing (e.g. power control, different beta value for UCI).
  - FFS approaches to help avoid collision, e.g.,
    - Introduction of different HARQ timing (e.g. by introduction of HARQ reference subframes)
    - Introduction of flexible A-SRS transmission timing
    - Group DCI for A-SRS triggering

Not treated.

R1-164111 Collision handling for SRS carrier based switching Huawei, HiSilicon
R1-164938 On collision handling of SRS and channels on other carriers Ericsson

6.2.6.4 Other

R1-164081 SRS carrier based switching for UEs with multiple antennas Huawei, HiSilicon

Conclusion:

- Discuss further for the case when UEs have more than one receiving antenna but only one transmitting antenna at one time, how to handle the transmit antenna for SRS
  - Note: this may be related to UE capability

6.2.7 Further Indoor Positioning enhancements for UTRA and LTE - *WID in RP-160538*

R1-165940 Chairman's Notes of Agenda Item 6.2.7 on enh_Ind_Pos Ad-hoc chair (Qualcomm)

The document was presented by Wanshi Chen from Qualcomm and provides the outcomes of the IndPos_enh session.
Decision: The document is endorsed. Contents incorporated below.

6.2.7.1 OTDOA Enhancements

R1-165553 WF on OTDOA for the same PCIHuawei, HiSilicon, Intel, ZTE

Agreement:

- For OTDOA same PCI, RAN1 decides to:
  - Define $N_{\mathrm{ID}}^{\mathrm{PRS}}$ for PRS sequence/vshift generation per TP
    - With $N_{\mathrm{ID}}^{\mathrm{PRS}}$ values ranging FFS
- Send LS to RAN2 and RAN3 for signaling design (including agreements from last meeting) – Xue Jiantao (HW)
  - Draft LS is in R1-165835, approved in R1-165853 with the following update:
    - CC RAN4

Not treated.

R1-163976 TP-specific PRS sequence generation for indoor positioning Ericsson
R1-163977 PRS pattern enhancements for indoor positioning Ericsson
R1-163978 Richer RSTD reporting for indoor positioning Ericsson
R1-164447 Introduction of OTDOA enhancements for the shared Cell-ID scenario Qualcomm Incorporated
R1-164448 Draft CR Introduction of OTDOA enhancements for the shared Cell-ID scenario Qualcomm Incorporated
R1-164449 Introduction of UE inter-frequency RSTD calibration accuracy reporting Qualcomm Incorporated
R1-164661 Adaptive RSTD reporting for indoor positioning Ericsson
R1-164668 OTDOA Enhancement for Same PCI Issue Nokia, Alcatel-Lucent Shanghai Bell
R1-164852 VCID PRS sequence generation Huawei, HiSilicon
R1-165232 OTDOA enhancement Intel Corporation
R1-165526 Summary of PRS sequence generation proposals for indoor positioning Ericsson

6.2.7.2 PRS-based Beacons

R1-164451 **Way Forward on PRS-based Beacons** **Qualcomm Incorporated**
R1-165825 **Way Forward on PRS-based Beacons** **Qualcomm Incorporated**

Agreement:

- For PRS-based TBS, as a starting point for Rel-14 WI, RAN1 decides to prioritize the following:
  - Support PRS-based TBS where the TPs transmit positioning reference signals with the same general design as defined for eNBs in Rel-14.
  - The PRS for the TBS TPs can be configured in up to all 10 subframes within a radio frame.
  - The PRS for the TBS TPs can be configured in up to all radio frames of a DL carrier.

Not treated.

R1-164450 Introduction of PRS based Terrestrial Beacon Systems Qualcomm Incorporated

6.2.7.3 E-CID Enhancements

R1-165552 **WF on E-CID for the same PCI** **Huawei, HiSilicon**
R1-165834 **WF on E-CID for the same PCI** **Huawei, HiSilicon**

Proposal:

- RAN1 decides to prioritize the following for the same PCI E-CID enhancement
  - Support CSI-RSRP reporting to E-SMLC
    - Note: this is only supported when the UE is configured with CSI-RS based DRS
    - Detailed reporting is up to RAN2/RAN3
  - Send LS to RAN2 and RAN3 for signaling design - Xue Jiantao (HW)
- Note: Other E-CID enhancements are not precluded

Further discussion offline.
Conclusion: No consensus to approve above proposal – draft LS in R1-165839 is irrelevant and not pursued.

Not treated.

R1-163980 E-CID enhancements for indoor positioning Ericsson
R1-164853 Discussion on the same PCI case for E-CID enhancements Huawei, HiSilicon
R1-164854 Discussion on the UE Rx-Tx measurement over multiple serving cells Huawei, HiSilicon

6.2.7.4 Other

R1-163981 Indoor/outdoor classification for indoor positioning Ericsson

6.2.8 Uplink Capacity Enhancements for LTE - *WID in RP-160664*

Finalize the design of MCS table and the remaining details to support UL 256QAM.

R1-165951 **Chairman's Notes of Agenda Item 6.2.8 on UL_Cap_enh** **Ad-hoc chair (Nokia)**
The document was presented by Matthew Baker from Nokia and provides the outcomes of the UL_Cap_enh session.
Decision: The document is endorsed. Contents incorporated below.

MCS & TBS Tables

R1-164850 **Evaluation results for UL 256QAM** **Huawei, HiSilicon**
R1-164091 **TBS table design for UL 256QAM** **Huawei, HiSilicon**
R1-164092 MCS table design for UL 256QAM Huawei, HiSilicon
R1-164453 **MCS table design considerations for UL 256QAM** **Qualcomm Incorporated**
R1-164883 **Discussion on UL 256QAM design** **CMCC**
R1-165320 **Further Discussion on MCS Table Design for UL 256QAM** **Ericsson**
R1-165321 **Design Principles for New UL 256 QAM MCS Entries** **Ericsson**
R1-165322 **New TBS Designs Supporting UL 256QAM** **Ericsson**

R1-165880 **WF on UL 256QAM TBS table** **Huawei, HiSilicon, CMCC, CATR, China Unicom, China Telecom, ZTE, Deutsche Telekom, Sprint, AT&T**

Agreements:

- Introduce at least a new TBS index for 256QAM supporting a code rate of around 948/1024
- Principles for design of new TBS entries:
  - Reuse Rel-8-12 design principles, including:
    - Use of same code block sizes for a given entry
    - Max TBS given by 100PRB size
    - Aligned with QPP principle
  - The following MCS/TBS entries are removed:

MCS	MO	TBS
1	2	1
3	2	3
5	2	5
7	2	7
9	2	9
11	4	10
16	4	15
21	6	19
28	6	26

- Introduce 6 MCS values for 256QAM:
  - TBS indices 30, 31, 32, 32A (new), 33, 34 (new)

MCS	Modulation Order	TBS
23	8	30
24	8	31
25	8	32
26	8	32A
27	8	33
28	8	34

r x 1024	SE
700.8333	5.4753
as in spec	as in spec
763.7500	5.9668
829.5417	6.4808
895.3333	6.9948
948.0000	7.4063

I_{TBS}	N_{PRB}									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
32A	904	1864	2792	3752	4584	5544	6456	7480	8248	9144
34	1032	2088	3112	4264	5160	6200	7224	8504	9528	10296

I_{TBS}	N_{PRB}									
	11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
32A	10296	11064	12216	12960	14112	14688	15840	16416	17568	18336
34	11448	12576	13536	14688	15840	16992	17568	19080	19848	20616

I_{TBS}	N_{PRB}									
	21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
32A	19848	20616	21384	22152	22920	24496	25456	26416	27376	27376
34	22152	22920	24496	25456	26416	27376	28336	29296	30576	31704

I_{TBS}	N_{PRB}									
	31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
32A	28336	29296	30576	31704	32856	32856	34008	35160	36696	36696
34	32856	34008	35160	35160	36696	37888	39232	39232	40576	42368

I_{TBS}	N_{PRB}									
	41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
32A	37888	39232	40576	40576	42368	42368	43816	43816	45352	46888
34	42368	43816	45352	46888	46888	48936	48936	51024	51024	52752

I_{TBS}	N_{PRB}									
	51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
32A	46888	48936	48936	51024	51024	52752	52752	52752	55056	55056
34	52752	55056	55056	57336	57336	59256	59256	61664	61664	63776

I_{TBS}	N_{PRB}									
	61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
32A	57336	57336	59256	59256	59256	61664	61664	63776	63776	63776
34	63776	63776	66592	66592	68808	68808	71112	71112	71112	73712

I_{TBS}	N_{PRB}									
	71	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
32A	66592	66592	68808	68808	68808	71112	71112	73712	73712	73712
34	75376	76208	76208	78704	78704	78704	81176	81176	81176	84760

I_{TBS}	N_{PRB}									
	81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
32A	75376	76208	76208	78704	78704	78704	81176	81176	81176	84760
34	84760	84760	87936	87936	87936	90816	90816	93800	93800	93800

I_{TBS}	N_{PRB}									
	91	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
32A	84760	84760	87936	87936	87936	87936	90816	90816	90816	93800
34	93800	97896	97896	97896	97896	101840	101840	101840	105528	105528

I_{TBS}	N_{PRB}									
	101	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
32A	93800	93800	93800	97896	97896	97896	97896	101840	101840	101840
34	105528	105528	105528	105528	105528	105528	105528	105528	105528	105528

- 2-layer mapping:

TBS_L1	TBS_L2
101840	203704
105528	211936

Signalling and UE cats

R1-165319 **Remaining Physical Layer Design Aspects of UL 256QAM Ericsson**
R1-164093 **Physical layer aspects for UL 256QAM Huawei, HiSilicon**
R1-164944 **On 256QAM to 64QAM MCS table fall-back Nokia, Alcatel-Lucent Shanghai Bell**
R1-164452 **Discussion of UL 256QAM Qualcomm Incorporated**

Agreement:
- Signalling of 256QAM MCS table:
  - Separately for DCI formats 0 & 4

R1-165495 **On 256QAM UL UE categories & related capabilities Nokia, Alcatel-Lucent Shanghai Bell**
(R1-164943)

Agreement:
- Introduce the 256QAM extension also for UL UE category 8 (in addition to the already agreed extensions of UL Categories 5, 13 and 14).
- The following 2 tables are agreed:

UE UL Category	Maximum number of UL-SCH transport block bits transmitted within a TTI	Maximum number of bits of an UL-SCH transport block transmitted within a TTI	Support for 64QAM in UL	Support for 256QAM in UL
UL Category 0	1000	1000	No	No
UL Category 3	51024	51024	No	No
UL Category 5	75376	75376	Yes	No
UL Category 7	102048	51024	No	No
UL Category 8	1497760	149776	Yes	No
UL Category 13	150752	75376	Yes	No
UL Category 14	9585664	149776	Yes	No
UL Category 15	105528	105528	Yes	Yes
UL Category 16	2119360	211936	Yes	Yes
UL Category 17	211056	105528	Yes	Yes
UL Category 18	13563904	211936	Yes	Yes

UE DL Category	UE UL Category	UE categories
DL Category 0	UL Category 0	N/A
DL Category 6	UL Category 5	Category 6, 4
DL Category 6	UL Category 15	Category 6, 4 DL Category 6 and UL Category 5
DL Category 7	UL Category 13	Category 7, 4
DL Category 7	UL Category 17	Category 7, 4 DL Category 7 and UL Category 13
DL Category 9	UL Category 5	Category 9, 6, 4
DL Category 9	UL Category 15	Category 9, 6, 4 DL Category 9 and UL Category 5
DL Category 10	UL Category 13	Category 10, 7, 4
DL Category 10	UL Category 17	Category 10, 7, 4 DL Category 10 and UL Category 13
DL Category 11	UL Category 5	Category 11, 9, 6, 4
DL Category 11	UL Category 15	Category 11, 9, 6, 4 DL Category 11 and UL Category 5
DL Category 12	UL Category 13	Category 12, 10, 7, 4
DL Category 12	UL Category 15	Category 12, 10, 7, 4 DL Category 12 and UL Category 13
DL Category 13	UL Category 3	Category 6, 4
DL Category 13	UL Category 5	Category 6, 4
DL Category 13	UL Category 7	Category 7, 4
DL Category 13	UL Category 13	Category 7, 4
DL Category 13	UL Category 15	Category 6, 4 DL Category 13 and UL Category 5
DL Category 13	UL Category 17	Category 7, 4 DL Category 13 and UL Category 13
DL Category 14	UL Category 8	Category 8, 5
DL Category 14	UL Category 16	Category 8, 5 DL Category 14 and UL Category 8
DL Category 15	UL Category 3	Category 11, 9, 6, 4
DL Category 15	UL Category 5	Category 11, 9, 6, 4 DL Category 11 and UL Category 5
DL Category 15	UL Category 7	Category 12, 10, 7, 4
DL Category 15	UL Category 13	Category 12, 10, 7, 4 DL Category 12 and UL Category 13
DL Category 15	UL Category 15	Category 11, 9, 6, 4 DL Category 11 and UL Category 5 DL Category 15 and UL Category 5
DL Category 15	UL Category 17	Category 12, 10, 7, 4 DL Category 12 and UL Category 13 DL Category 15 and UL Category 13
DL Category 16	UL Category 3	Category 11, 9, 6, 4
DL Category 16	UL Category 5	Category 11, 9, 6, 4 DL Category 11 and UL Category 5
DL Category 16	UL Category 7	Category 12, 10, 7, 4
DL Category 16	UL Category 13	Category 12, 10, 7, 4 DL Category 12 and UL Category 13
DL Category 16	UL Category 15	Category 11, 9, 6, 4 DL Category 11 and UL Category 5 DL Category 16 and UL Category 5
DL Category 16	UL Category 17	Category 12, 10, 7, 4 DL Category 12 and UL Category 13 DL Category 16 and UL Category 13
DL Category 17	UL Category 14	Category 8, 5 DL Category 14 and UL Category 8
DL Category 17	UL Category 18	Category 8, 5 DL Category 14 and UL Category 8 DL Category 17 and UL Category 14

Send these UE cat and RRC signalling related agreements to RAN2 in an LS - R1-165496 – (Ericsson)

Friday:

R1-165496 **[DRAFT] LS on Uplink Capacity Enhancements for LTE** **Ericsson**

R1-166017 **[DRAFT] LS on Uplink Capacity Enhancements for LTE** **Ericsson**

Decision: The document is noted and final LS is agreed in R1-166034.

PUSCH in UpPTS
For information preparatory to starting detailed work at RAN1#86:
R1-164884 Discussion on PUSCH transmission for UpPTS CMCC
R1-164851 Initial discussion on UL PUSCH in TDD special subframes Huawei, HiSilicon

6.2.9 Study on LTE-based V2X Services - *SID in RP-160657*

R1-165941 Chairman's Notes of Agenda Item 6.2.9 on V2X Ad-hoc chair (Nokia, Huawei)
The document was presented by Matthew Baker from Nokia and provides the outcomes of the V2X session.
Decision: The document is endorsed.

R1-164532 3GPP TR 36.885 v.1.1.0 Study on LTE-based V2X Services LG Electronics
Revisit this Friday

6.2.9.1 Evaluation results

To collect the evaluation results to be included in TR36.885

R1-165795 Discussion on collecting V2X evaluation results in TR36.885 LG Electronics (R1-164533)
Companies provide results according to R1-165795 by this Friday.
Friday: Email approval of TP and updated simulation results by June 2nd – (LGE)
Email approval of the next version of TR June 2nd – (LGE)

6.2.9.1.1 Uu transport for V2V, V2P, and V2I/N

Including evaluation of the feasibility in terms of meeting latency requirements, network coordination required, resource efficiency, and energy efficiency of UE

Simulation results
R1-164158 Performance analysis of Uu broadcast transmission schemes for V2V communication Intel Corporation
R1-164454 System level performance using SC-PTM and eMBMS Qualcomm Incorporated
R1-165403 Evaluation results on the enhancement of Uu transport for V2V, V2P and V2I/N LG Electronics (R1-164534)

R1-165527 Text proposal for Uu-V2P power consumption analysis in TR36.885 LGE

6.2.9.1.2 PC5 transport for V2P and V2I/N

Including potential V2V performance degradation

Simulation results
R1-164230 Evaluation results on PC5-based V2P CATT
R1-164231 Evaluation results on PC5-based V2I CATT
R1-164535 Evaluation results on PC5 transport for V2P and V2I/N LG Electronics
R1-164790 Evaluation results for PC5 based V2P and V2I/N Samsung
R1-164861 Evaluation results for PC5-based V2X Huawei, HiSilicon
R1-165207 Evaluation of PC5 transport for V2P/V2I/I2V communications NTT DOCOMO, INC.

V2P enhancement (under agenda 6.2.9.2.3)
R1-165275 Discussion on P2x-x2P Ericsson
R1-164229 Discussion on resource allocation for PC5-based P2V CATT
R1-164455 PC5 for V2P Qualcomm Incorporated

6.2.9.2 Support of Uu transport for V2V, and PC5/Uu transport for V2I/N and V2P

6.2.9.2.1 Enhancement to DL multicast/broadcast transmissions

Including details of how to enable the enhancements identified in RAN1#84bis

Overview on all the aspects
R1-164456 Downlink Enhancements for Uu based V2V Qualcomm Incorporated

R1-165254 **Downlink Enhancements for V2X** **Ericsson**

R1-165815 **WF on DL broadcast enhancement for V2X** **LG Electronics, Deutsche Telekom, III, ITL, KRRI, KT Corporation, LG Uplus, Samsung, SK Telecom, Xinwei**

Proposal:

- A set of enhancements concluded as beneficial in RAN1#84bis can be implemented by supporting the following feature:
  - V2X messages are broadcast ~~via TM 10 DM RS based PDSCH scheduled by (E)PDCCH~~, e.g. by:~~:~~
    - ~~The current SC-PTM is extended to support TM 10 for broadcast from a single eNB.~~
  - A CP length shorter than extended CP ~~PMCH~~ in the current MBSFN architecture ~~is replaced by this PDSCH~~ for broadcast from multiple eNBs.
  - Issues to be considered to support this include
    - DCI format/content and the search space
    - Quasi-colocation, rate matching, RS sequence generation
    - OL precoding and CSI feedback

Continue offline discussion until Friday.

Friday:

R1-165960 **Way forward on DL and PC5 for V2X** **LG Electronics, Huawei, HiSilicon, Ericsson, NTT DOCOMO, Samsung, Panasonic, Nokia, ASB**

Decision: The way forward is agreed.

Multicast/broadcast area decision according to Geo-info

R1-164325 **Discussion on enhancement to DL multicast/broadcast transmissions** **Fujitsu**
R1-164970 Enhancement to DL multicast/broadcast transmissions ZTE

R1-164159 **Discussion on multi-cell multicast/broadcast enhancements for V2V communication** **Intel Corporation**
R1-164326 Multicast/Broadcast enhancements for V2X Fujitsu

CoMP and MIMO enhancement

R1-164536 **Further details on enhancements for multi-cell multicast/broadcast** **LG Electronics**
R1-164791 **MIMO support for V2X multicasting** **Samsung**

UE feedback

R1-164057 **Uu DL enhancements for V2X** **Huawei, HiSilicon**
R1-164537 Discussion on UE feedback for DL multicast/broadcast LG Electronics

R1-165729 **WF on HARQ Feedback LG Electronics, Huawei, ITRI**

Conclusion to be captured in the technical part of the TR:

- In the event that HARQ feedback for DL multicast/broadcast transmissions were to be introduced, at least in a single cell, two options are identified for HARQ feedback resource allocation:
  - UE-common resource: Multiple UEs receiving the same DL multicast/broadcast transmission transmit HARQ feedback on the same resource.
  - UE-specific resource: Different UEs receiving the same DL multicast/broadcast transmission transmit HARQ feedback on different resources.

6.2.9.2.2 Enhancements to unicast

Including UL enhancement (e.g., SPS enhancement, SR enhancement)

R1-164538 Discussion on UL SPS for V2X LG Electronics
R1-164580 Discussion on SR Enhancements for V2X Spreadtrum Communications
R1-164971 Uu transport enhance for V2X ZTE
R1-165274 UL SPS and reporting to eNB for V2X Ericsson

6.2.9.2.3 Enhancements to sidelink

Including details of resource selection in pedestrian UEs

Whether to support P UE transmit only

R1-164819 **Power consumption analysis of PC5 V2P Huawei, HiSilicon**
R1-165275 **Discussion on P2x-x2P Ericsson**

Observation: the motivation to support random resource selection/partial sensing is at least for power saving purpose.
Note: RAN1 has not evaluated potential cost reduction.
Continue offline discussion.

Resource allocation and sensing for P UE

R1-165208 Further detail of partial sensing for P2V operation NTT DOCOMO, INC.
R1-164972 Discussion on V2P design aspects ZTE
R1-164229 Discussion on resource allocation for PC5-based P2V CATT
R1-164455 PC5 for V2P Qualcomm Incorporated
R1-164935 Zone based dynamic resource management in V2X service ITRI

6.2.9.3 Identification of high level coexistence approaches (long-term basis) between PC5 transport for V2V services and DSRC/IEEE 802.11p services in the same channel

R1-164089 **Co-channel of PC5 V2V with other techniques Huawei, HiSilicon**
R1-164457 **Co-channel coexistence between V2V and DSRC Qualcomm Incorporated**
R1-164540 **Discussion on coexisting LTE-V2V and IEEE802.11p on the same carrier LG Electronics**
R1-164792 **Interlaced transmissions for co-existence with DSRC Samsung**
R1-165243 **Detection Sequence in LTE-ITS Sidelink for Coexistence with IEEE 802.11p Ericsson**

R1-165826 **Way Forward on DSRC co-existence Samsung, ZTE, LG Electronics, Sony**
R1-165830 **WF on DSRC/LTE-based ITS Coexistence Ericsson, Huawei, HiSilicon**

R1-165844 **WF on DL broadcast enhancement for V2X Huawei, HiSilicon, Ericsson**

Agreements:

- RAN1 believes that other radio access technologies and LTE-based ITS transmissions on sidelink can co-exist; some standardization and/or regulatory actions need to be taken in other bodies in order to enable this.
- The possible solutions identified by RAN1 for high level coexistence approaches (long-term basis) between PC5 transport for V2V services and DSRC/IEEE 802.11p services in the same channel are as follows:
  - Geo-location and database.
  - Time sharing between systems based on GNSS timing; this would require some modifications to DSRC.
  - Sensing-based vacate/switching approaches with or without transmission of a predetermined signal(s) (e.g. LTE-ITS preamble, SLSS)
  - Sensing with a predetermined signal(s) would require some modifications to DSRC.
  - RAN1 has not conducted any system-level evaluations for these solutions, although some link-level results have been provided for some solutions.
- RAN1 respectfully asks RAN to provide RAN1 findings to other relevant bodies.

LS containing the above to be sent to RAN plenary – Stefano (Ericsson) - R1-165494 - revisit on Friday.

Friday:

R1-165494 **[DRAFT] LS on high level coexistence approaches between PC5 transport for V2V services and DSRC/IEEE 802.11p services in the same channel Ericsson**

Decision: The document is noted and final LS is agreed in R1-166033.

6.2.9.4 Other

R1-165270 **Proposed TP for 36.885 Conclusions Ericsson**
R1-165870 **Proposal for SI conclusions LG**

Proposed conclusion for TR:

The RAN WGs concluded that it is feasible to support transport for V2V, V2I/N and V2P services over Uu. The RAN WGs identified solutions to improve the latency, capacity, and reliability performance of LTE Uu interface and observed that UL enhancements to the SPS protocol [and DL enhancements to multicast/broadcast] are beneficial from performance perspective. It is recommended to specify [TBD after the discussion on the detailed technical solutions] for Uu-based V2X. The RAN WGs concluded that it is feasible to support V2I and V2P services (the latter by means of P2V transmissions) over PC5. The RAN WGs identified that some changes to the PC5 interface would be beneficial in terms of power consumption and UE complexity in case of P2V transmissions. It is recommended to specify [TBD after the discussion on the detailed technical solutions] for PC5-based V2X.

Way forward:

- Discuss offline until Friday:
  - What can be put in the two TBD parts.
  - How to handle conclusions from RAN2/3 – check with RAN2/3 chairmen
  - Whether the TR can be further clarified to indicate clearly which statements are for further study and which are conclusions of RAN1
  - Check throughout the TR whether the terms V2P services and V2P/P2V/etc transmissions are correctly used
- If on Friday there is consensus on text to replace the TBDs, then the conclusions above can be agreed with the new text replacing the TBDs
- If on Friday there is no consensus, either
  - Delete the two recommendation sentences and agree the rest of the conclusion anway
  - Postpone the conclusion and do further evaluation until RAN1#86 with a view to closing the TBD items

Friday:

R1-165899 **Way forward on V2X study conclusion LG Electronics, Huawei, HiSilicon, Samsung, Panasonic, Nokia, ASB, NTT DOCOMO, Ericsson**

Agreements: The following text is agreed as

- the conclusion on the feasibility of LTE-based V2X, and
- the recommendation from RAN1.

Email discussion is triggered to discuss how to recommend the solutions identified in other WGs.

Text:

The RAN WGs concluded that it is feasible to support transport for V2V, V2I/N and V2P services over Uu. The RAN WGs identified solutions to improve the latency, capacity, and reliability performance of LTE Uu interface and observed that UL enhancements to the SPS protocol and DL enhancement to multicast/broadcast are beneficial from performance perspective. It is recommended to support the following solutions identified in this TR for Uu-based V2X:

- Transmission using a single CP shorter than extended CP, with normal CP as the baseline, with necessary additional study
- HARQ feedback and retransmissions for SC-PTM and MBSFN, with necessary additional study
- Geo-information report from RRC_Connected UEs
  - No additional specification work is needed.
- [TBD on the solutions from other WGs]

The RAN WGs concluded that it is feasible to support V2I and V2P servicesover PC5. It is concluded that V2P services where P-UE sends V2X messages but not receives V2X messages is substantially more power efficient than V2P services where P-UE receives V2X messages from V-UEs. The RAN WGs identified that some changes to the PC5 interface would be beneficial in terms of power consumption and UE complexity in case of P2V transmissions. It is recommended to support following solutions identified in this TR for PC5-based V2X:

- Random resource selection for P-UEs potentially on the resource pool shared with V-UE transmissions, with additional study on sensing operation during a limited time for P-UEs
- [TBD on the solutions from other WGs]

6.2.10 Study on Latency reduction techniques - *SID in RP-150465*

Focus on this SI in 2Q 2016 will follow approved WF (RP-160650)

R1-165942 **Chairman's Notes of Agenda Item 6.2.10 on Latency** **Ad-hoc chair (Qualcomm)**
The document was presented by Wanshi Chen from Qualcomm and provides the outcomes of the Latency session.
Decision: The document is endorsed. Contents incorporated below.

R1-165827 **Offline session notes** **Ericsson**
R1-165855 **TP for conclusion of latency reduction SI** **Ericsson**
R1-165856 **TP for latency reduction** **Ericsson**
R1-165828 **[Draft] LS on TR update for latency reduction** **Ericsson**
Decision: The document is noted and final LS is agreed in R1-165913.

6.2.10.1 Channel design for shortened TTI

Provide channel design including reference signals for s(E)PDCCH, sPDSCH, sPUSCH, sPUCCH. Provide recommendations on supported sTTI length(s).

R1-164160 **Downink control singaling design for shorten TTI** **Intel Corporation**
R1-164233 **Design of sPUCCH for shortened TTI** **CATT**
R1-164459 **UL channel design for shortened TTI** **Qualcomm Incorporated**
R1-164544 **Discussion on sPUSCH design with TTI shortening** **LG Electronics**
R1-164867 **CQI feedback overhead reduction in short TTI** **Huawei, HiSilicon**
R1-164923 **Simultaneous Transmissions of UL Signals for Shortened TTI Operation** **Nokia, Alcatel-Lucent Shanghai Bell**

R1-165549 **Way forward on sTTI length** **Huawei, HiSilicon, Ericsson**
Decision: The document is noted.

Working assumption:

- It is recommended to support a design that is based on 2-symbol sTTI and 1-slot sTTI for sPDSCH/sPDCCH
- It is recommended to support a design that is based on 2-symbol sTTI, 4-symbol sTTI, and 1-slot sTTI for sPUCCH/sPUSCH
  - During the WI phase, down-selection is not precluded
- The working assumption is automatically confirmed by the end of Thursday if no significant issues are found
- Note: the supported sTTI lengths are not intended to impact discussion on additional subframe types in TDD.

Note: the above working assumption is already confirmed for FDD, and updated for TDD
Friday: Huawei Above WA should be turned into an agreement for both FDD and TDD

R1-165544 **Way Forward on sPUCCH design** **LG Electronics, Ericsson , Panasonic, NTT DOCOMO, Sharp, KDDI**

Agreement:

- The following sPUCCH formats are recommended to be supported
  - One sPUCCH format for HARQ-ACK and/or SR feedback for a serving cell
  - sPUCCH format(s) for multiple HARQ-ACK bits, e.g. as in CA and frame structure type 2
    - The amount of sPUCCH formats to support is depending on the maximum identified payload size to support
    - sPUCCH format allows for multiplexing of HARQ-ACK and SR
    - FFS: sPUCCH format supports CSI feedback

R1-165550 **WF on UL DMRS for sTTI** **Huawei, HiSilicon, Ericsson,Qualcomm**
R1-165545 **WF on DM-RS for sPUSCH** **LG Electronics, CATT, NTT DOCOMO, Samsung**

Agreement:

- For DM-RS of sPUSCH, the followings are recommended to be supported:
  - For the case of 1-slot TTI length, reuse the current DM-RS
  - For the case of less than 1-slot TTI length, support DM-RS sharing/multiplexing of consecutive TTIs from one or multiple UEs

- At least 2 contiguous TTIs can be shared/multiplexed. FFS on sharing /multiplexing of more than 2 contiguous TTIs
- FFS on how to share/multiplex DM-RS (e.g., CDM, FDM, different BW between RS & data, and hybrid thereof)
- FFS the DMRS position and whether it is indicated by eNB

R1-165631 **Way forward on sPDCCH Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Mediatek, Sharp, Huawei, HiSilicon, CATT, CATR, Motorola Mobility, ZTE**

Agreement:

- Confirm the working assumption
  - Working Assumption:
  - CRS-based sPDCCH is recommended to be supported
  - FFS whether CRS-based sPDCCH can be transmitted in the legacy PDCCH region
  - DMRS-based sPDCCH is recommended to be supported
  - Design of both CRS-based sPDCCH and DMRS-based sPDCCH will be studied further.
- From resource utilization perspective, sPDSCH assigned by a sPDCCH can be mapped to resources that are left unused by any sPDCCH
  - Details are for further study, e.g., FFS whether unused resources is RB or RE level

R1-165548 **Way Forward on sPDCCH transmitted in sTTI and legacy PDCCH region ZTE, ZTE Microelectronic**

R1-165522 **Way forward on sPDSCH Ericsson, Huawei, HiSilicon, Panasonic**

Agreement:

- For sPDSCH based on a CRS based transmission scheme the maximum number of supported layers is 4
- For sPDSCH based on a DM-RS based transmission scheme shall be down-selected among the following options
  - the maximum number of supported layers is 2
  - the maximum number of supported layers is 4
  - the maximum number of supported layers is 8
- FFS for sPDSCH based on a DM-RS based transmission scheme it is recommended to increased PRB bundling size compared to PDSCH for at least sTTI lengths shorter than 1-slot

R1-165551 **Way Forward on TDD FS2 for latency reduction Huawei, HiSilicon, Panasonic, CATT, Qualcomm, Nokia, Alcatel-Lucent Shanghai Bell**

R1-165892 **WF on TDD latency reduction Huawei, HiSilicon, CMCC, Nokia, ASB, Panasonic, Ericsson, ZTE**

Agreement:

- Regarding sTTI length:
  - Confirm the working assumption for FS1 FDD
  - Take the following agreement for FS2 TDD
    - It is recommended to support a design that is based on 1-slot sTTI for sPDSCH/sPDCCH/sPUSCH/sPUCCH for FS2 TDD in Rel-14
    - It is recommended to consider enhancements including other shorter sTTI duration(s), and additional DL-UL switching points/ additional subframe types for FS2 TDD latency reduction in Rel-15

R1-165546 **WF on UCI transmission on sPUSCH LG Electronics, Ericsson, Intel, Nokia, Alcatel-Lucent Shanghai Bell, NTT DOCOMO, Sharp**

Agreement:

- The following principles on sPUSCH are recommended to be supported:
  - UCI transmission on sPUSCH is supported
  - FFS UCI mapping rule, especially considering the impact of DM-RS design
  - FFS on which carrier to multiplex UCI on in case different sTTI lengths are used on different UL CA

- Note:
  - The UCI herein refers to at least the ones for sTTI operations
  - FFS whether or not the UCI also includes the ones for legacy TTI operations

R1-164232 Design of sPDCCH for shortened TTI CATT
R1-164793 sPDCCH and sDCI design Samsung
R1-165237 On two-level DL control channel design for shorter TTI operation Nokia, Alcatel-Lucent Shanghai Bell
R1-164060 DCI design for short TTI Huawei, HiSilicon

Conclusion:

- Further discussion during the WI phase (if WI is approved) regarding the single-level DCI vs. two-level DCI considering aspects such as overhead, complexity, potential scheduling restriction, search space design, the corresponding performance, impact of different TTI lengths (if any), etc.
  - Note: this conclusion is not be included in the TR

Not treated.

R1-164058 Views on TTI length Huawei, HiSilicon
R1-164059 sPDCCH design for short TTI Huawei, HiSilicon
R1-164061 PUCCH design for short TTI Huawei, HiSilicon
R1-164062 Discussion on DL RS for short TTI Huawei, HiSilicon
R1-164063 Discussion on UL RS for short TTI Huawei, HiSilicon
R1-164065 Discussion on CSI feedback for short TTI Huawei, HiSilicon
R1-164068 The co-existence consideration of legacy TTI and sTTI in one carrier Huawei, HiSilicon
R1-164115 Reducing UL RS overhead for sPUSCH Mitsubishi Electric
R1-164161 Consideration on S-PDCCH design for latency reduction Intel Corporation
R1-164162 UL design aspects of TTI shortening Intel Corporation Intel Corporation
R1-164234 Design of sPUSCH DMRSCATT
R1-164235 Discussion on the simultaneous transmissions of normal TTI and sTTI CATT
R1-164458 DL channel design for shortened TTI Qualcomm Incorporated
R1-164487 Details of Two-stage downlink control channel NEC
R1-164541 Discussion on candidate length for sTTI LG Electronics
R1-164542 Discussions on DCI and sPDCCH for latency reduction LG Electronics
R1-164543 Discussions on sPDSCH for latency reduction LG Electronics
R1-164545 Discussion on sPUCCH for HARQ-ACK in latency reduction LG Electronics
R1-164546 Discussion on sPUCCH for CSI in latency reduction LG Electronics
R1-164581 Discussion on DL control for shortened TTI Spreadtrum Communications
R1-164582 Considerations on shortened TTI transmission within MBSFN subframe Spreadtrum Communications
R1-164583 sTTI schedule impact due to MBSFN or ABS subframe Spreadtrum Communications
R1-164639 Discussion on sPDCCH for shortened TTI ZTE
R1-164640 PUCCH design and evaluation for shortened TTI ZTE
R1-164642 Study on PDSCH transmission in shortened TTI ZTE
R1-164643 Study on PUSCH transmission in shortened TTI ZTE
R1-164649 Design of DL channels for shortened TTI Lenovo (Beijing) Ltd
R1-164650 Design of UL channels for shortened TTI Lenovo (Beijing) Ltd
R1-164663 Discussion on control signaling design for reduced TTI HTC
R1-164794 sPUCCH design Samsung
R1-164795 Discussion on sPDSCH Samsung
R1-164796 Discussion on sPUSCH Samsung
R1-164820 PUSCH design for short TTI Huawei, HiSilicon
R1-164821 PDSCH design for short TTI Huawei, HiSilicon
R1-164886 Discussion on low latency control channel design CMCC
R1-164909 Discussion on reference signal design for shortened TTI Panasonic
R1-164910 Discussion on multiplexing between sTTI and TTI in the same subframe Panasonic

R1-164911	Discussion on single level DCI and two-level DCI	Panasonic
R1-164914	UL aspect of shortened TTI	Panasonic
R1-164922	sPUCCH Design for Shortened TTI	Nokia, Alcatel-Lucent Shanghai Bell
R1-164945	On supported Shorter TTI lengths and its configurability	Nokia, Alcatel-Lucent Shanghai Bell
R1-164946	On simultaneous unicast PDSCH and sPDSCH operation	Nokia, Alcatel-Lucent Shanghai Bell
R1-164999	Shortened TTI for DL transmissions	Sharp, MTI
R1-165001	Channel design of shortened PUCCH	Sharp
R1-165049	Consideration on sPDCCH Design	InterDigital
R1-165050	Consideration on sPDSCH Design	InterDigital
R1-165051	Consideration on sPUCCH Design	InterDigital
R1-165052	Consideration on sPUSCH Design	InterDigital
R1-165069	Discussion on length of shortened TTI	China Telecommunications
R1-165109	Shortened TTI Design	Motorola Mobility
R1-165110	Multiplexing of Regular TTI and shortened TTI	Motorola Mobility
R1-165123	Control channel design for latency reduction	Mediatek
R1-165209	sPDCCH for shortened TTI	NTT DOCOMO, INC.
R1-165210	sPDSCH for shortened TTI	NTT DOCOMO, INC.
R1-165211	sPUSCH for shortened TTI	NTT DOCOMO, INC.
R1-165212	sPUCCH for shortened TTI	NTT DOCOMO, INC.
R1-165213	Views on sTTI length	NTT DOCOMO, INC.
R1-165236	On DL control channel design for shorter TTI operation	Nokia, Alcatel-Lucent Shanghai Bell
R1-165249	Impact of shortened TTI on uplink transmission	ASUSTEK COMPUTER (SHANGHAI)
R1-165267	Discussion on PUCCH design for shortened TTI	KDDI Corporation
R1-165290	Discussions on the channel design for latency reduction	CATR
R1-165292	Physical design aspects of sPDCCH	Ericsson
R1-165293	sPDCCH search space design	Ericsson
R1-165294	DCI for sTTI scheduling	Ericsson
R1-165295	Physical design aspects of sPDSCH	Ericsson
R1-165296	Physical design aspects of sPUSCH	Ericsson
R1-165297	Physical design aspects of sPUCCH	Ericsson
R1-165298	Short TTI operation in FS2	Ericsson
R1-165299	On the operation with different TTI lengths	Ericsson
R1-165310	Discussion on short PUSCH design	KT Corp.
R1-165547	Way forward on latency reduction for TDD	ZTE, CMCC, Ericsson, CATT, Sharp, NTT DOCOMO

6.2.10.2 Processing time reduction and related procedures

Provide targets on how much the processing time/maximum TA can be reduced

Agreement:

- It is recommended to reduce the maximum TA for short TTI operation with processing time reduction compared to Rel-13
  - Details are FFS
- A single minimum delay between UL grant and UL data and between DL data and DL HARQ feedback is recommended to be supported for a given sTTI length

R1-165854 **Way forward on processing timing reduction for sTTI** **Ericsson**

Agreements:

- The minimum timing for UL grant to UL data and for DL data to DL HARQ is n + k sTTI for short TTI operation;
  - Processing time >= the legacy processing time linearly downscaled with TTI length
    - 4 <= k <= 8
  - FFS whether or not to support processing time is lower than the legacy processing time linearly downscaled with TTI length for at least slot based TTI
    - k < 4 for slot based TTI.
  - Note that sTTI refers to

        - sPUSCH sTTI for the UL grant to UL data timing
        - sPDSCH sTTI for the DL data to DL HARQ feedback timing
    - FFS how to the handle the minimum timing for the case when DL sTTI and UL sTTI have different lengths
- Further study whether or not the eNB would indicate an additional parameter m (Note: the value may be dependent on the discussion on the max TA), resulting in a timing of n + k + m sTTI
    - FFS: semi-static or dynamic configuration of m, if introduced
- The minimum timing for UL grant to UL data and for DL data to DL HARQ is n + k TTI for subframe-long TTI operation and short TTI capable UEs.
    - k = 4 is supported
    - Further study whether a reduced minimum timing is possible, e.g. k = 2, k = 3, and if a reduced maximum TBS is needed to achieve this
- Note: CQI feedback enhancements for short TTI and legacy TTI are not precluded

R1-164236 **TDD system design for shortened TTI and related procedures for latency reductionCATT**

Not treated.

R1-164064 Discussion on UL scheduling timing for short TTI Huawei, HiSilicon
R1-164066 Discussion on DL HARQ timing for short TTI Huawei, HiSilicon
R1-164067 Processing time reduction for short TTI Huawei, HiSilicon
R1-164163 On the processing time reduction and maximum TA limitations Intel Corporation
R1-164460 Processing time reduction and related procedures for DL Qualcomm Incorporated
R1-164461 Processing time reduction and related procedures for UL Qualcomm Incorporated
R1-164462 TDD-specific processing time reduction and related procedures Qualcomm Incorporated
R1-164470 Discussion on TTI shortening Guangdong OPPO Mobile Telecom.
R1-164638 Latency reduction solutions for TDD ZTE
R1-164641 Processing time reduction and related procedures ZTE
R1-164797 Discussion on processing time for TTI shortening Samsung
R1-164885 Discussion on latency reduction for TDD CMCC
R1-164912 Evaluation results on processing time reduction in physical layer Panasonic
R1-164947 Legacy TTI processing time considerations for supporting latency reduction Nokia, Alcatel-Lucent Shanghai Bell
R1-164948 sTTI processing time considerations for supporting latency reductionNokia, Alcatel-Lucent Shanghai Bell
R1-165214 Views on processing time reduction and related procedures NTT DOCOMO, INC.
R1-165269 Discussion on HARQ Process for Slot-based TTI ASUSTEK COMPUTER (SHANGHAI)
R1-165300 On reduced processing time for short TTI Ericsson
R1-165429 Processing time reduction for latency reduction LG Electronics

6.2.10.3 Remaining evaluation results

Remaining aspects of system and link evaluation results, e.g. FS2 related aspects

R1-165518 **Updates to Link Level results Ericsson**

Conclusion:

- The TP is endorsed, but without the parts concerning the puncturing performance

R1-165519 **Updates to Link Level observations Ericsson**

Conclusion:

- The TP is endorsed, except the following:
    - Removing the following:

> One source showed that puncturing of an PDSCH within a subframe long TTI by an short TTI significantly degrades the BLER performance and at ~~16QAM or~~ higher modulation orders makes the PDSCH undecodable. Whether there are any enhancements to PDSCH reception in this case that would allow better reception performance has not been studied.

- Update the last sentence in the sPUCCH section with the following:
  - For larger payload sizes e.g. 5 to 40 bits, can achieve tolerable performance with a longer sTTI length. Note that there is some coverage impact with shorter TTI lengths with large payload sizes.

R1-165520 **Updates to System level results Ericsson**

Conclusion:

- The TP is endorsed
  - Note: further update is necessary based on the new results available till midnight Tuesday

R1-165521 **Updates to System level observations Ericsson**

Conclusion:

- The TP is endorsed, with the following updates in the last paragraph
  - Updating:
    - At least shown by two sources, under a given TDD UL/DL subframe configuration, introducing additional subframe types for a new UE can further reduce the U-plane latency for TDD compared to the case without introducing additional subframe types in the evaluated scenarios.
  - Including the impact analysis not limited to additional subframes types – Laetitia (Ericsson)
    - Detailed wording to be worked on offline
  - Further discussion offline whether or not to further update the following sentences:
    - Two sources show that the performance of 14OS TTI length with reduced processing time (i.e. with reduced HARQ RTT and UL access delay) comes close to the one of slot based TTI length. However, source 4 shows that if 14OS TTI follows the same TBS assumption as 7OS TTI length, gains of 14OS TTI length with reduced processing time are smaller than the ones of other short TTI lengths.
    - Three sources (R1-16454830, R1-164637, R1-164823) show that in the most favourable~~ite~~ situation for TTI shortening, introducing short TTI in existing TDD UL/DL configuration without additional subframe type can lead to large user perceived throughput~~performance~~ improvement. ~~and gains are larger with shorter TTI lengths.~~ Four sources (R1-164823, R1-164237, R1-164637, R1-164548) show that in the most favourable~~ite~~ situation for TTI shortening , introducing short TTI with additional subframe type within existing UL/DL configuration can lead to ~~much~~ improved user perceived throughput compared to introducing short TTI without additional subframe type within existing UL/DL configurations, especially for short TTI length as 2OS. One source (R1-164548) shows that significant performance loss in 5th percentile user throughput with shorter TTI length like 2OS both with and without additional subframe type.

R1-165632 **TP for inclusion of evaluation assumptions for FS2 Ericsson**

Conclusion:

- The TP in R1-165632 is endorsed

R1-165705 **Updates to System level results Ericsson**

Conclusion:

- The TP in R1-165705 is endorsed

R1-165706 **Updates to System level observations Ericsson**

Conclusion:

- The TP is endorsed, except the following update:
  - From "There is difficulty to schedule legacy UEs in the additional subframes and therefore the performance of legacy UEs is degraded. How much the degradation for legacy UEs is has not been evaluated in the study item. "
  - To "The performance of legacy UEs is degraded with the introduction of additional subframe type. It has not been evaluated during the SI on how much degradation for legacy UEs. "

Not treated.

R1-164164 Link level evaluation for PDSCH in a short TTI Intel Corporation
R1-164237 TDD system performance evaluation of latency reduction CATT

R1-164464 Updated link-level evaluation of TTI shortening in UL Qualcomm Incorporated
R1-164549 Further link level evaluation of sPUSCH for shortened TTI LG Electronics
R1-164637 System-level performance evaluation for TDD ZTE
R1-164823 Summary of performance evaluation for latency reduction in TDD Huawei, HiSilicon
R1-164824 Performance evaluation for latency reduction based on frame structure set 3 Huawei, HiSilicon
R1-164825 Performance evaluation for latency reduction based on enhanced frame structure set 1 Huawei, HiSilicon
R1-164826 Performance evaluation for latency reduction based on enhanced frame structure set 2 Huawei, HiSilicon
R1-165076 Link level simulation results for S-PDCCH Intel Corporation
R1-165238 System level study on processing time reduction and TCP parametrization impact Nokia, Alcatel-Lucent Shanghai Bell
R1-165301 Additional system level results for short TTI and downlink traffic Ericsson
R1-165302 Additional system level results for short TTI and uplink traffic Ericsson
R1-165303 Additional system level results for short TTI with different processing times Ericsson
R1-165304 Additional link results for sPDSCH Ericsson
R1-165418 System level simulations with FTP model 3 Intel Corporation
R1-165421 Additional link results for sPUCCH Ericsson
R1-165430 System-level simulation results for TDD scenario with latency reduction LG Electronics
R1-165446 System performance evaluation for dynamic control channel overhead CATT
R1-165455 Updated system level evaluations Qualcomm Incorporated
R1-165571 Way forward on scheduling mechanism for sTTI Ericsson, Intel, Nokia, Alcatel-Lucent Shanghai Bell
R1-165928 System level study on processing time reduction of 2OS and 7OS TTINokia, Alcatel-Lucent Shanghai Bell

6.2.10.4 Other

R1-164069 Discussion on enhanced frame structure type 2 for latency reduction Huawei, HiSilicon
R1-164070 Discussion on U-plane latency for TDD Huawei, HiSilicon
R1-164584 HARQ feedback for sTTI scheduling Spreadtrum Communications
R1-164798 TDD-specific issues on TTI shortening Samsung
R1-164913 Additional subframe type for TDD Panasonic
R1-164924 Considerations on shorter TTI for TDD duplex mode Nokia, Alcatel-Lucent Shanghai Bell
R1-165003 Short TTI and processing time reduction for TDD Sharp, MTI
R1-165215 Further Discussion about TDD Frame Structure for Latency Reduction NTT DOCOMO, INC.
R1-165256 Latency Reduction for FS2 with 1-ms TTI Nokia, Alcatel-Lucent Shanghai Bell

6.2.11 Study on Further enhancements to Coordinated Multi-Point Operation

SID in RP-160665

R1-165943 Chairman's Notes of Agenda Item 6.2.11 on eCOMP Ad-hoc chair (Qualcomm)
The document was presented by Wanshi Chen from Qualcomm and provides the outcomes of the Latency session.
Decision: The document is endorsed. Contents incorporated below.

R1-164165 Work plan for FeCoMP study item Intel Corporation, ZTE
Decision: The document is noted.
R1-164298 TR Skeleton for Study on FeCoMP ZTE
Decision: The document is noted.
Conclusion:

- The TR skeleton in R1-164298 is endorsed, with the following updates:
  - Section 5.1: Evaluation Scenarios for Non-coherent Joint Transmission
  - Section 6.1: Potential Enhancements for Non-coherent Joint Transmission

Not treated.
R1-164084 Overview on further enhancements to Coordinated Multi-Point Operation Huawei, HiSilicon
R1-164299 Overview on FeCoMP ZTE

6.2.11.1 Deployment scenarios and system-level evaluation assumptions

Consider the existing dense deployment scenarios and evaluation assumptions as starting point. The priority at RAN1#85 will be given to the scenarios and evaluation assumptions.

R1-164167 **Evaluation assumptions for FeCoMP evaluations Intel Corporation**
Decision: The document is noted.
R1-164300 **Deployment scenarios and evaluation assumptions for JT ZTE**
Decision: The document is noted.
R1-164974 **Scenarios for feCoMP SoftBank Corp.**
Decision: The document is noted.

R1-165845 **Way Forward on scenarios for FeCoMP evaluations Intel, ZTE, ZTE Microelectornic, Softbank, KT Corporation, Huawei, HiSilicon, LGE, CATT, Xinwei, Ericsson, Samsung, Nokia, ASB**
Decision: The document is agreed.

R1-165852 **Way Forward on Evaluation Assumptions for FeCoMP ZTE, ZTE Microelectronics, Intel, Ericsson, Nokia, ASB, Huawei, LGE, CATT, ASTRI, Samsung**
Decision: The document is noted.

Agreement:
- The WF in R1-165852 is agreed, with the following updates:
  - Macro cell layer TP:
    (8,4,2), (8,8,2) optional, (8,1,2) ~~optional~~
  - Small cell layer TP:
    M=1 (FFS whether or not additionally have M=4 as optional), N=1, 2 or 4 (optional), P = 2
  - Baseline 3TPs~~, other values are not precluded and if used should be reported.~~ If a different value is used, it should be indicated.
  - Non full buffer FTP traffic model 1, S = 0.1Mbytes (optional) or 0.5Mbytes
  - 2Rx, 4Rx (only for non-coherent JT), $0^0/90^0$ polarization slants, 0.5 wavelength spacing
  - CS/CB for FD-MIMO: 2 or more ports per NZP CSI-RS resource ~~(total number of CSI-RS ports up to 16)~~
  - Baseline scheme:
    - ~~Option 1: DPS/DPB for JT, Single point for CS/CB~~
    - ~~Option 2: Rel-11 CoMP and non-CoMP Rel-13 FD-MIMO~~
    - ~~Option 3:~~ Provided by each company for now. Further discussion to finalize a baseline scheme till RAN1#86

R1-165851 **Way Forward on Prioritization of Scenarios for FeCoMP ZTE, ZTE Microelectronics, Intel, ASTRI**
Decision: The document is noted.

Not treated.
R1-164085 Discussion on simulation scenarios and methodology for FeCoMP Huawei, HiSilicon
R1-164166 Scenarios for FeCoMP evaluations Intel Corporation
R1-164239 Discussion on scenarios and evaluation assumptions for CoMP enhancement CATT
R1-164301 Deployment scenarios and evaluation assumptions for CS/CB ZTE
R1-164342 Considerations of FeCoMP deployment scenarios Nokia, Alcatel-Lucent Shanghai Bell
R1-164799 Deployment scenarios and system-level evaluation assumptions Samsung
R1-165103 feCoMP Scenarios and Evaluation Ericsson

6.2.11.2 Potential enhancements for non-coherent joint transmission

R1-165876 **WF on non-coherent JT schemes for FeCoMP Huawei, HiSilicon, Intel, SoftBank Corp, ZTE, CATT**
Decision: The document is noted.

Not treated.
R1-164086 Potential enhancement for FeCoMP with ideal backhaul links Huawei, HiSilicon
R1-164087 Discussion on FeCoMP with non-ideal backhaul links Huawei, HiSilicon

R1-164168 CSI feedback enhancements for non coherent JT Intel Corporation
R1-164169 Control signalling enhancements for non coherent JT Intel Corporation
R1-164170 Initial evaluation results for non coherent JT Intel Corporation
R1-164240 Enhancement for non-coherent joint transmission CATT
R1-164302 Potential Enhancements for Joint Transmission ZTE
R1-164303 QCL Issues of Joint Transmission ZTE, ASTRI
R1-164343 Overview of non-coherent joint transmission for FeCoMP Nokia, Alcatel-Lucent Shanghai Bell
R1-164550 Discussion on enhancements for non-coherent JT LG Electronics
R1-164800 Discussion on non-coherent joint transmission for FeCoMP Samsung

6.2.11.3 Potential enhancements for coordinated scheduling/beamforming with FD-MIMO

Not treated.
R1-164088 Discussion on CSI measurement and feedback for FeCoMP Huawei, HiSilicon
R1-164171 Enhancements for CS/CB CoMP Intel Corporation
R1-164241 Coordinated beamforming with FD-MIMO CATT
R1-164304 Using FD-MIMO framework for CS/CB ZTE
R1-164344 Overview of FD-MIMO based CSCB transmission Nokia, Alcatel-Lucent Shanghai Bell
R1-164551 Discussion on enhancements for CS/CB with FD-MIMO LG Electronics
R1-164801 Potential enhancement for coordinated beamforming with FD-MIMO Samsung
R1-165104 feCoMP Motivations and Techniques Ericsson

6.2.11.4 Other

Not treated.
R1-164489 Enhancements to Coordinated Multi-point Operation: Impact of interference averaging NEC

7 NR

7.1 *Study on New Radio Access Technology - SID in* RP-160671

R1-165216 Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects NTT DOCOMO, INC.
The document was presented by Kazuaki Takeda from NTT DOCOMO.
Decision: The document is endorsed as v0.0.2.

Wednesday
R1-165804 Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects NTT DOCOMO
The document was presented by Kazuaki Takeda from NTT DOCOMO.
Discussion: Huawei, Qualcomm requested more time for detailed review.
Decision: The document is noted. Continue offline discussion until Thursday –(NTT DOCOMO)

R1-165720 Draft Reply LS on Parameters for WP5D sharing and compatibility studies NTT DOCOMO
Decision: The document is noted. Continue offline discussion about the notes – (NTT DOCOMO)
R1-165805 Draft Reply LS on Parameters for WP5D sharing and compatibility studies NTT DOCOMO
Decision: The document is noted and final LS is agreed in R1-165820.

Thursday
R1-165804 Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects NTT DOCOMO
Decision: The document is noted. Further revised in:
R1-165882 Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects NTT DOCOMO
Discussion: Huawei → can the meaning of "baseline" used in multiple instances through the TR be clarified? Replaced by "is supported" may be better
DOCOMO: agreed – Terminology "baseline" will be updated in a later version
Decision: The document is noted and endorsed as v0.0.3 in R1-165889, with following update in Section 6.1:
The downlink transmission scheme is based on OFDM ~~using a cyclic prefix~~.

Not treated.

R1-165170 Workplan for Study on Study on New Radio Access Technology NTT DOCOMO, INC.

7.1.1 Forward compatibility for new radio interface

Solutions how to achieve forward compatibility with Phase II specification and beyond.

R1-164046 Forward compatibility consideration on reference signals and control information/channels Huawei, HiSilicon

The document was presented by Zukang Shen from Huawei.

- *Proposal 1: The reference signal for cell identification and coarse time/frequency synchronization in NR is not in a fixed frequency location within a carrier.*
- *Proposal 2: A minimum bandwidth shall be defined for the reference signal for RRM measurement in NR. Consider to derive the time/frequency location of the reference signal for RRM measurement based on the reference signal for cell identification and coarse time/frequency synchronization.*
- *Proposal 3: NR shall support orthogonal reference signals among different links (such as downlink, uplink, sidelink, backhaul link).*

Decision: The document is noted.

R1-164242 NR system design for forward compatibility CATT

The document was presented by Fang Chen Cheng from CATT.

- *Proposal 1: For forward compatibility of support low cost mMTC, the NR system needs to support the operations of narrowband carrier standalone or embedded in a wideband carrier, single transceiver chain and communication with passive devices.*
- *Proposal 2: For forward compatibility of massive MTC power efficiency, the NR system should support on-demand wakeup for the sleeping device and communication with passive devices.*
- *Proposal 3: The channel coding scheme with extremely high coding gain should be supported for URLLC applications.*
- *Proposal 4: The NR system design should target common design of control channels and reference signals in the frame structure for downlink, uplink and sidelink. The control channel design should support both central and distributed resource allocation and coordination.*
- *Proposal 5: The NR system should support opportunistic access for the operation on dedicated and shared spectrum.*

Decision: The document is noted.

R1-164633 On forward compatibility Ericsson

The document was presented by Stefan Parkvall from Ericsson and proposes the following to improve future compatibility:

- Avoid fixed timing relations across subframe borders
- Self-contained transmission where data (and control) transmissions have, e.g., their own reference signals.
- Avoid tying multiple quantities to a single underlying quantity unless there is a clear motivation.

Decision: The document is noted.

R1-165367 On forward compatibility for NRChina Unicom

The document was presented by Xiao Han from China Unicom.

Observation 1: the blank resources design should enable the Phase 1 UEs successfully receive and decode the UE-specific channels transmitted on adjacent time and frequency resources.

Observation 2: the cell-specific RS should be minimized on resources and configurable for usage scenarios and numerologies and necessary cell-specific RS should be supported.

Observation 3: single TDM and FDM solutions for multiplexing may not sufficient satisfy NR requirements.

Decision: The document is noted.

R1-164552 Forward compatibility support design of NR LG Electronics

The document was presented by Yunjung Yi from LGE.

- *Proposal 1: NR design should minimize (semi-)statically configured signal/channels but synchronization signals and system information in the very initial access state may be (semi-) statically and periodically transmitted.*
- *Proposal 2: Flexible and dynamic TDD operation should be enabled in consideration of ICI in NR.*
- *Proposal 3: Flexible HARQ timing for both DL and UL should be designed in consideration of UE processing capability and latency requirements of NR.*

Decision: The document is noted.

R1-164292 **On forward compatibility for new radio interface ZTE**

The document was presented by Ruyue Li from ZTE.

- *Proposal 1: The number of symbols per 1 ms is 2m, where m is an integer, since it allows smooth multiplexing of future services and use cases.*
- *Proposal 2：The design of NR numerology and frame structure should prioritize forward compatibility, in order to ensure smooth evolution to accommodate future services and use cases. Within one carrier of a network, numerology adaptation based on changing the number of symbols per subframe is preferred to scaling of subcarrier spacing, since it ensures better forward compatibility and reduces overhead.*
- *Proposal 3：Regarding reference signal design, we propose the following design principles:*
  - *Avoid always-on reference signals*
  - *Avoid periodic reference signals in a non-standalone system*
  - *Use aperiodic reference signals or configurable multi-shot reference signals*
  - *Granularity and overhead of reference signals should be flexibly configured depending on the different requirements of CSI measurement*
  - *Support multi-level CSI-RS with different configurable granularities*
- *Proposal 4：Avoid unnecessary periodic system information. Identify the fundamental system information for UE to access network. The fundamental system information should adapt to different use cases/scenarios.*
- *Proposal 5：Regarding control channel design, we propose the following design principles:*
  - Design of downlink control channel should be flexible to adapt to different application.
  - Multi-level downlink control channel structure should be considered in NR.
- *Proposal 6：Support multi-component and multi-level design in MIMO CSI feedback framework in NR*

Decision: The document is noted.

R1-165603 **WF on NR forward compatibility** **Huawei, HiSilicon**

The document was presented by Zukang Shen from Huawei.

- Forward compatibility of NR shall ensure smooth introduction of future services and features with no impact on the access of earlier services and UEs
  - Multiplexing different numerologies within a same NR carrier is supported
  - Reference signal for synchronization is not in a fixed frequency location within a carrier.
  - Transmission of system information is not in a fixed frequency location within a carrier
  - Avoid tying multiple parameters to a same parameter and rely more UE specific parameters as much as possible
  - Common design (e.g. waveform) shall be aimed for various link directions in NR, e.g. downlink, uplink, sidelink, backhaul link

Decision: The document is noted, further revised in R1-165628 as follows:

- Forward compatibility of NR shall ensure smooth introduction of future services and features with no impact on the access of earlier services and UEs
  - Multiplexing different numerologies within a same NR carrier bandwidth (from the network perspective) is supported
  - Reference signal for synchronization and transmission of MIB is not in a fixed frequency location within a NR carrier bandwidth (from the network perspective).
    - The frequency location of MIB is derived from the reference signal for synchronization (e.g. the same frequency location)
  - Avoid tying multiple parameters to a same parameter and rely more UE specific parameters as much as possible
  - Common design should be aimed for various link directions in NR, e.g. downlink, uplink, sidelink, backhaul link

Agreements:

- Forward compatibility of NR shall ensure smooth introduction of future services and features with no impact on the access of earlier services and UEs
  - Multiplexing different numerologies within a same NR carrier bandwidth (from the network perspective) is supported
    - FDM and/or TDM multiplexing can be considered

Possible agreements:

- Reference signal for synchronization and transmission of MIB is not in a fixed frequency location within a NR carrier bandwidth (from the network perspective).
  - The frequency location of MIB is derived from the reference signal for synchronization (e.g. the same frequency location)

- Avoid tying multiple parameters to a same parameter and rely more UE specific parameters as much as possible
- Common design should be aimed for various link directions in NR, e.g. downlink, uplink, sidelink, backhaul link

R1-165607 **WF on implicit dependencies assumptions** **InterDigital, Ericsson, Huawei, HiSilicon**

The document was presented by Paul Marinier from InterDigital.

- Implicit (i.e. non-configurable) dependencies between transmissions that exist in LTE design are not by default assumed to be introduced in NR design.
- An identity parameter may tie signals for search/synchronization (e.g. PSS/SSS) to the broadcast transmission of essential system information (e.g. MIB)
  - Name of identity parameter TBD (e.g. cell ID, hypercell ID, system ID)
  - Other dependencies to this identity parameter can be introduced if considered beneficial taking into account forward compatibility, signalling overhead and complexity

Decision: The document is noted.

Possible agreements:

- For NR design, implicit (i.e. non-configurable) dependencies can be introduced if considered beneficial taking into account forward compatibility, signalling overhead and complexity
  - It is not assumed by default that implicit dependencies that exist in LTE design are introduced in NR design

Possible agreements:

- An identity parameter ties signals for search/synchronization to the broadcast transmission of essential system information
  - Name of identity parameter TBD (e.g. cell ID, hypercell ID, system ID)
  - Other dependencies to this identity parameter can be introduced if considered beneficial taking into account forward compatibility, signalling overhead and complexity

Agreements:

- Timing between data transmission and corresponding HARQ A/N is indicated explicitly
  - FFS if implicit indication is supported in some cases
- Essential system information (MIB) should be decodable based on an identity parameter used for generation of search/synchronization signal (e.g. PSS/SSS)
  - Name of identity parameter TBD (e.g. cell ID, hypercell ID, system ID)
  - Other dependencies to this identity parameter are FFS

Wednesday

R1-164674 **Channel bandwidth consideration for forward compatibility** **Qualcomm Incorporated**

The document was presented by Tingfang Ji from Qualcomm.

- Proposal 1: NR UE should be allowed to support a subset of NR channel bandwidth.
- Proposal 2: NR channel bandwidth should be defined to allow efficient unlicensed spectrum access.
- Proposal 3: NR UEs should be tested for a limited set of channel bandwidth. Additional Tx/Rx requirements for service multiplexing in frequency domain should be studied for baseband filtering.

Decision: The document is noted.

R1-165806 **WF on Supporting different Numerologies in a NR carrier** **LG Electronics, Huawei, HiSilicon**

- It is supported that a NR carrier can be divided into multiple Frequency Resource Groups (FRGs) in frequency domain
  - Different FRGs can have different numerologies
  - Each FRG may have independent synchronization signal(s)
  - Multiple FRGs may share the same synchronization signal(s)
  - Further consider DC subcarrier aspects in a NR carrier comprising multiple FRGs

Decision: The document is noted. Continue offline.

Thursday

R1-165837 **WF on Supporting different Numerologies in a NR carrier** **LG Electronics, Huawei, HiSilicon, Panasonic**

Decision: The document is noted.

Possible agreements:

- Contiguous frequency resources using one numerology in a NR carrier is called frequency resource group (FRG)
  - A numerology is defined at least by CP duration and subcarrier spacing
  - One numerology is applied in FRG over T time duration
    - FFS on details of T
  - Multiple FRGs in a NR carrier with different numerologies is supported
  - Multiple FRGs in discontinuous frequency resources in a NR carrier can use the same or different numerology
  - FFS
    - sizes of FRG
    - whether FRG (e.g., size of FRG and T) can change dynamically or semi-statically.
    - whether different FRGs can overlap or not
    - whether/how to handle DC subcarrier aspects in a NR carrier comprising multiple FRGs
  - FFS: NR supports the following
    - Each FRG has its own synchronization signal(s)
    - Multiple FRGs share the same synchronization signal(s)

Continue offline discussion until Friday –(LGE)

Friday

R1-166008 **WF on Supporting different Numerologies in a NR carrier LG Electronics, Huawei, HiSilicon, Panasonic, Ericsson**

Decision: The document is noted and modified as follows:

Agreements:

- For a NR carrier (from network perspective) using multiple numerologies, at least the following is for further study
  - multiple frequency/time portions using different numerologies share a synchronization signal
    - Note: The synchronization signal refers to the signal itself and the time-frequency resource used to transmit the synchronization signal

---

R1-165873 **Way Forward on fixed DL physical resource for dynamic operation in NR LG Electronics, Qualcomm, Panasonic, NTT Docomo**

- A UE may assume NR has downlink reference signal(s) with a certain periodicity/duration in time at least for the purpose of synchronization.
  - FFS: necessary frequency domain resource for the reference signal(s)
  - FFS: necessary time domain periodicity/duration for the reference signal(s)
  - FFS: whether the UE may assume the reference signal(s) is transmitted with the periodicity irrespective of the UE condition (e.g., already/yet synchronized with LTE/NR)
  - FFS: whether UE may assume a common numerology for this signal
- Downlink physical resources that composes the above downlink reference signal(s) may also comprise downlink reference signal(s) for the purpose of RRM measurement.
  - FFS : the downlink physical resources are contiguous in time
  - FFS : the downlink physical resources are contiguous in frequency
- FFS: other signal(s)/channel(s) necessary in the downlink physical resource.
- Physical resources except for the above downlink physical resources are flexibly utilized either as DL or UL or SL

Decision: The document is noted. Continue offline discussion until Friday – (LGE)

Friday: no progress.

R1-165674 **Way forward on forward compatibility for waveform evolution Spreadtrum, CATR, CMCC, Cohere, Deutsche Telekom, InterDigital, Orange, Sony, Telstra, Telefonica, ZTE**

- Forward compatibility for waveform evolution should be ensured in system framework design.
  - Downlink, uplink and sidelink share the same framework of physical layer processing.

Discussion: Also supported by Fraunhofer HHI, NTU, Panasonic

Concern from a number of companies

Spreadtrum stressed how forward compatibility can be ensured?
Spreadtrum would like to see it included in the TR
Chair: TP to TR will come at a later stage, let's discuss technical solutions before trying to capture anything
Decision: The document is noted.

Not treated.

R1-163982	Forward compatibility for NR	Samsung
R1-164047	General consideration on forward compatibility for new radio interface	Huawei, HiSilicon
R1-164172	Forward compatible and low overhead structure for NR	Intel Corporation
R1-164387	Forward compatibility considerations on physical layer procedures	Huawei, HiSilicon
R1-164471	On forward compatibility of NR	Guangdong OPPO Mobile Telecom.
R1-164585	Forward compatibility for waveform evolution	Spreadtrum Communications
R1-164651	Forward compatibility for new radio interface	Lenovo (Beijing) Ltd
R1-164654	Consideration on forward compatibility for NR	Sony
R1-164664	Framework for forward compatible NR design	INTERDIGITAL COMMUNICATIONS
R1-164931	Discussion on Reference Signal Design	ITRI
R1-165160	Discussion on Forward Compatible System Design for NR	MediaTek Inc.
R1-165171	Forward compatibility for NR	NTT DOCOMO, INC.
R1-165172	Forward compatibility related to mMTC and URLLC	NTT DOCOMO, INC.
R1-165356	On the forward compatibility of new radio	Nokia, Alcatel-Lucent Shanghai Bell
R1-166002	WF on synchronization for NR forward compatibility	LG Electronics, Panasonic

7.1.2 Remaining issues on evaluation assumptions for new radio interface

R1-163984 Discussion on phase noise modeling Samsung

- *Proposal 1: Use multi-pole/zero model with configurable parameters such as PSD0 and multiple pole/zero frequencies for practical phase noise performance evaluations.*
- *Proposal 2: Study how to decide the model parameters.*
- *Observation 1: Discussion on the relationship between OFDM subcarrier spacing and phase noise is effective only when the CPE of phase noise is compensated properly.*
- *Observation 2: Considering phase noise, large subcarrier spacing can help to enhance EVM performance when large bandwidth up to a few GHz needs to be supported in higher frequencies.*
- *Observation 3: For higher frequencies, the $f_0 * 2^n$ subcarrier spacing set shows too big EVM performance gap between adjacent subcarrier spacing values considering phase noise. On the other hand, the $f_0 * 2^n * 5^m$ subcarrier spacing set with finite integers such that n=0,1,2,3,4,5,6,7,8 and m=0,1,2 seems to be good enough to support large bandwidth up to a few GHz in viewpoint of phase noise impacts.*

Decision: The document is noted.

R1-165944 Chairman's Notes of Agenda Item 7.1.2 on NR eval_assumptions Session Chairman (Nokia, Qualcomm Inc.)
The document was presented by Matthew Baker from Nokia and provides the outcomes of the session.
Decision: The document is endorsed. Contents incorporated below.

R1-165482 Remaining issues on evaluation assumptions NTT Docomo
Decision: The document is noted.

Indoor hotspot
R1-164383 Further discussion on evaluation assumption for eMBB deployment scenarios Huawei, HiSilicon
Decision: The document (Section 2.1) is noted.

R1-165483 Discussion on System-Level Evaluations for NR Samsung (R1-164718)
Decision: The document (Section 2) is noted.
Proposal for indoor open office: optional additional ISD of 40m -- ~~R1-165489~~
Friday
R1-165850 WF on antenna placement in Indoor scenarios Intel, NTT DoCoMo, Samsung, Ericsson
Decision: The document is agreed.

R1-165950 **WF on Remaining Evaluation Assumptions** **NTT DOCOMO, Intel**
Decision: The document is noted. Further revised and agreed in:
R1-166007 **WF on Remaining Evaluation Assumptions** **NTT DOCOMO, Intel**

R1-165994 WF on the antenna model for outdoor TRP Intel, NTT DOCMO
Decision: The document is noted. Further revised and agreed in:
R1-166026 **WF on the antenna model for outdoor TRP** **Intel, NTT DOCOMO, ZTE, Samsung, Xinwei, CATT, Ericsson, Nokia, ASB, Huawei**
Email approval about brackets in R1-166026 until June 9th - (Intel)

R1-165982 **WF on UE antenna number** **Huawei, HiSilicon**
Decision: The document is noted.
R1-166011 **WF on UE antenna number** **Huawei, HiSilicon**

- For UE at 70GHz, companies are also allowed to investigate the case with 64 total number of antenna elements
  - The number of TXRUs remains the same as 30GHz

R1-164677 **mmW related simulation assumption parameters** **Qualcomm Incorporated**
Decision: The document is noted.

Agreements:

Attributes	Values or assumptions
Maximum Tx power	BS: Above 6GHz: 23 dBm for system bandwidth ≥ 100MHz. EIRP should not exceed [51] dBm (NOTE1). UE: 30GHz: 23dBm 70GHz: 21dBm EIRP should not exceed 43 dBm (NOTE1).
UE receiver noise figure	Below 6GHz: 9dB Above 6GHz: 13dB (baseline performance), 10dB (high performance)
Traffic model	Alt. 1: Full buffer Alt. 2: FTP Proposal: Consider full buffer and FTP model 1/2/3 with packet size 0.5 Mbytes, 0.1 Mbytes (other value is not precluded). Other traffic models are not precluded.
Traffic load (Resource utilization)	For baseline scheme: 25%, 50%, 80% (other value is not precluded)
NOTE1: See Appendix in R1-164383 for the derivation of maximum allowed EIRP	

R1-165693 **Way Forward on UE Noise Figure** **Straight Path, Samsung, Intel, Nokia, KT**
Decision: The document is noted.
R1-165742 **WF on UE Receiver Noise Figures** **Samsung, Ericsson, Intel, Nokia, ZTE, MediaTek, Straight Path, KT Corp., Verizon, ETRI, IITH, CeWiT, Reliance-jio, Tejas Networks, Fiberhome, Sony, Coolpad, InterDigital, Potevio, Mitsubishi Electric, SK Telecom, OPPO, Lenovo, Skyworks, Xiaomi, AT&T**
Decision: The document is noted.

Dense urban
R1-164383 **Further discussion on evaluation assumption for eMBB deployment scenarios** **Huawei, HiSilicon**
Decision: The document (Section 2.2) is noted.

Agreements:

Attributes	Values or assumptions

Carrier frequency	Micro layer: Around 30GHz, 4 GHz; optional: 70GHz
Aggregated system bandwidth	Around 30GHz and 70GHz: Up to1GHz (DL+UL)
Tx power	Micro BS: Proposal: 4 GHz: 33dBm for 20MHz system bandwidth– check on Wed Above 6GHz: 33 dBm for system bandwidth ≥100MHz. EIRP should not exceed [69] dBm (NOTE1). UE: 30GHz: 23dBm 70GHz: 21dBm EIRP should not exceed 43 dBm (NOTE1).
UE receiver noise figure	Below 6GHz: 9dB Above 6GHz: 13dB
Traffic model	Alt. 1: Full buffer Alt. 2: FTP Proposal: Consider full buffer and FTP model 1/2/3 with packet size 0.5 Mbytes, 0.1 Mbytes (other value is not precluded). Other traffic models are not precluded.
Traffic load (Resource utilization)	For baseline scheme: 25%, 50%, 80% (other value is not precluded)
NOTE1: See Appendix in R1-164383 for the derivation of maximum allowed EIRP	

R1-164243 Remaining issues on deployment scenarios CATT
Decision: The document is noted.

Agreement: Capture the following in 38.802:

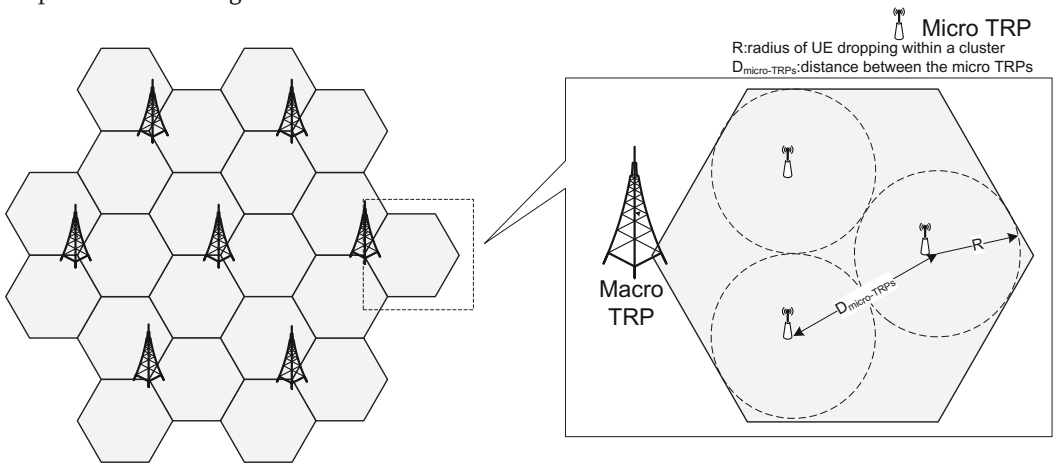


Figure: Layout illustration of deployment scenario of "Dense Urban": 3 Micro TRPs per Macro TRP

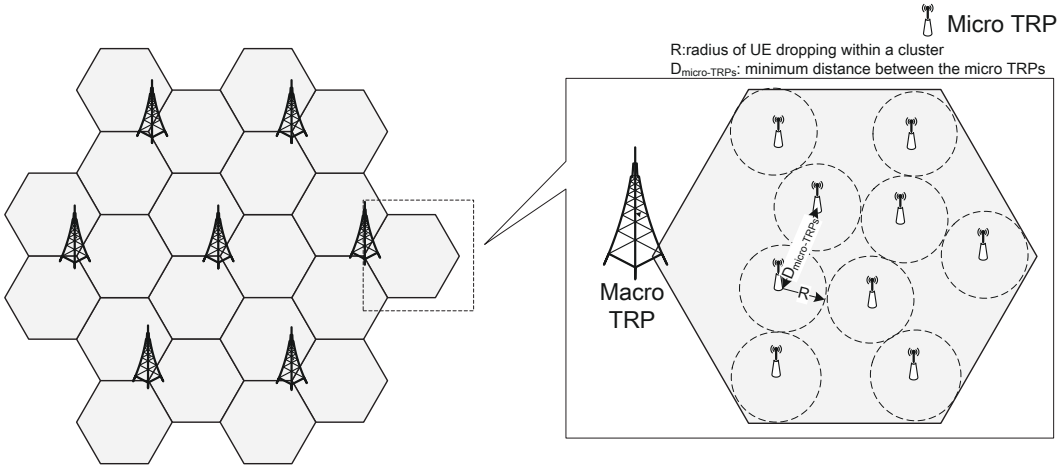


Figure: Layout illustration of deployment scenario of "Dense Urban": 9 Micro TRPs per Macro TRP

Table: Number of Micro TPP per Macro TRP vs. minimum distance between TRPs and UE cluster radius

Number of the micro TRPs per macro TRP	Minimum distance between Micro TRPs (m)	Radius of UE dropping within a cluster: R (m)
3	57.9	<28.9
6	42.4	<21.2
9	32	<16

Rural

R1-164383 **Further discussion on evaluation assumption for eMBB deployment scenarios** **Huawei, HiSilicon**

Decision: The document (Section 2.3) is noted.

Agreement:

Traffic model	Alt. 1: Full buffer Alt. 2: FTP Proposal: Consider full buffer and FTP model 1/2/3 with packet size 0.5 Mbytes, 0.1 Mbytes (other value is not precluded). Other traffic models are not precluded.
Traffic load (Resource utilization)	For baseline scheme: 25%, 50%, 80% (other value is not precluded)

Urban macro

R1-164383 **Further discussion on evaluation assumption for eMBB deployment scenarios** **Huawei, HiSilicon**

Decision: The document (Section 2.4) is noted.

Agreements:

Attributes	**Values or assumptions**
Tx power	BS: ~~Above 6~~30GHz: 43 dBm for system bandwidth ≥100MHz. EIRP should not exceed [78] dBm (NOTE1).. UE: 30GHz: 23dBm EIRP should not exceed 43 dBm (NOTE1).
UE receiver noise figure	Below 6GHz: 9dB Above 6GHz: 13dB
Traffic model	Alt. 1: Full buffer Alt. 2: FTP Proposal: Consider full buffer and FTP model 1/2/3 with packet size 0.5 Mbytes, 0.1 Mbytes (other value is not precluded). Other traffic models are not precluded.
Traffic load (Resource utilization)	For baseline scheme: 25%, 50%, 80% (other value is not precluded)
NOTE1: See Appendix in R1-164383 for the derivation of maximum allowed EIRP	

High-speed

R1-164887 **Remaining Evaluation Assumptions for High Speed Train Scenario** **CMCC**

Decision: The document is noted.

R1-165576 **WF on evaluaton assumptions for high speed train scenario** **CMCC, CATT, Huawei, CATR, China Unicom, ZTE**

Decision: The document is noted. Also supported by Qualcomm.

Agreements:

- All proposals in R1-165576, with removal of "same cell ID" on slide 5.
- Other scenarios can be further discussed, e.g.:
  - 30GHz (see below)
  - Unidirectional beams

R1-164029 **Clarification and proposals on parameters for high speed train scenarios** **Mitsubishi Electric Co.**

Decision: The document is noted.

R1-165484 **WF for high speed train scenario at 30GHz** **Mitsubishi, ETRI (Also supported by E///)**

Decision: The document is agreed.

Notes:

- Focus is on evaluation of the base station to relay link.
- 1 relay node per train is assumed.

R1-164383 **Further discussion on evaluation assumption for eMBB deployment scenarios** **Huawei, HiSilicon**
Decision: The document (Section 2.5) is noted.

Agreements:

Attributes	Values or assumptions
UE receiver noise figure	Below 6GHz: 9dB Above 6GHz: 13dB
Traffic model	Alt. 1: Full buffer Alt. 2: FTP Proposal: Consider full buffer and FTP model 1/2/3 with packet size 0.5 Mbytes, 0.1 Mbytes (other value is not precluded). Other traffic models are not precluded.
Traffic load (Resource utilization)	For baseline scheme: 25%, 50%, 80% (other value is not precluded)

Extreme rural
R1-164680 **Other KPI evaluation assumptions** **Qualcomm Incorporated**
Decision: The document is noted.

Agreement:

- For the evaluation of Long Range (single cell SLS), consider a single cell radius target (e.g. 100km), and identify the data rate with which the edge users can be served; then observe how many users such a cell site can serve.

FFS: detailed parameters for long range scenarios – (Qualcomm) - R1-165485
R1-165485 **WF on Extreme Long Range KPI Evaluation** **Qualcomm**
Decision: The document is agreed.

Friday
R1-165917 **Way forward on High Speed Link Level evaluation** **Cohere, AT&T, CMCC, Deutsche Telekom, InterDigital, Orange, Spreadtrum, Telefonica, Telstra**
Decision: The document is noted. Revised in:
R1-166020 **Way Forward on High Speed link level evaluation** **Cohere, AT&T, CMCC, Deutsche Telekom, InterDigital, National Taiwan University, Orange, Spreadtrum, Telefonica, Telstra**
Decision: The document is noted. Further revised and agreed in R1-166031.

R1-165926 **WF on additional evaluation assumptions for high speed train scenario: Macro + relay around 30GHz** **Mitsubishi Electric, ETRI, Ericsson**
Decision: The document is noted.

Agreements:

- On additional evaluation assumptions for high speed train scenario: Macro + relay around 30GHz
  - Number of antenna elements of relay
    - Relay Tx: up to 256
    - Relay Rx: up to 256
    - Note: The antenna of the relay for RRH-to-Relay is located outside of a train
  - Number of antenna elements of RRH
    - RRH Tx: up to 256
    - RRH Rx: up to 256
    - Note: The above values are shown in TR 38.913

Continue discussion other proposals in R1-165926 offline
Friday
R1-166001 **Proposal for email discussion on evaluation assumptions for high speed train scenario: Macro + relay around 30GHz** **Mitsubishi Electric, ETRI**

Decision: The document is noted.
Conclusion: Agreed R1-166001 except for brackets and FFS parts
Email approval until June 8th about brackets and FFS parts – (Mitsubishi)

Urban coverage for massive connectivity
R1-164044 **Evaluation assumption for non-eMBB deployment scenarios** **Huawei, HiSilicon**
Decision: The document (Section 2.1) is noted.

Highway
R1-164044 **Evaluation assumption for non-eMBB deployment scenarios** **Huawei, HiSilicon**
Decision: The document (Section 2.2) is noted.

R1-164679 **Highway and urban grid evaluation scenarios** **Qualcomm Incorporated**
Decision: The document is noted.

R1-165612 **WF on SLS evaluation assumptions for eV2X** **LG Electronics, Deutsche Telekom**
Decision: The document is noted.

Offline discussion on evaluation assumptions for Highway / Urban Grid scenarios / eV2X – (LGE) - revisit on Wed.
R1-165704 **WF on SLS evaluation assumptions for eV2X** **LG Electronics, Deutsche Telekom**
Decision: The document is noted.

Agreements: (including below add-on from Friday online session)

Parameters	Urban grid for eV2X	Highway for eV2X
Layout	Option 1: Macro only (with the road configuration in Figure 6.1.10-1 in TR38.913) Option 2: Macro + RSUs (with the road configuration in Figure 6.1.10-1 in TR38.913) Note: An RSU can be a BS type RSU or UE type RSU Out of coverage can be evaluated assuming eNB or RSU to be disabled. Sidelink evaluation with partly out of coverage Ues and partly in coverage Ues are FFS.	Option 1: Macro only (straigntline eNB placement with Road configuration in TR36.885) Option 2: Macro + RSUs (straightline eNB with Road configuration in TR36.885) Note: An RSU can be a BS type RSU or UE type RSU Out of coverage can be evaluated assuming eNB or RSU to be disabled. Sidelink evaluation with partly out of coverage Ues and partly in coverage Ues are FFS.
Inter-BS distance	Inter Macro: 500m Inter RSU: RSU is dropped at each intersection	Inter Macro: 1732m, 500m (optional) Inter RSU: Uniform allocation with 100m spacing in the middle of the highway
Carrier frequency	Macro to/from vehicle/pedestrian UE : 4 GHz Between vehicle/pedestrian UE: 6 GHz BS-type-RSU to/from vehicle/pedestrian UE : 4 GHz UE-type-RSU to/from vehicle/pedestrian UE: 6 GHz Note: Agreed value does not mean non-ITS band is precluded for real deployment for sidelink	Macro to/from vehicle/pedestrian UE : 2 GHz or 4GHz Between vehicle/pedestrian UE: 6 GHz BS-type-RSU to/from vehicle/pedestrian UE : 4 GHz UE-type-RSU to/from vehicle/pedestrian UE: 6 GHz Note: Agreed value does not mean non-ITS band is precluded for real deployment for sidelink
Aggregated system bandwidth	Up to 200 MHz (DL+UL) Up to 100 MHz (SL)	Up to 200 MHz (DL+UL) Up to 100 MHz (SL)
Simulation bandwidth	20 or 40 MHz (DL+UL) 10 or 20 MHz (SL)	20 or 40 MHz (DL+UL) 10 or 20 MHz (SL)
Channel model	Macro to/from vehicle/pedestrian UE : 3D UMa Between vehicle/pedestrian UE: V2X Channel model in TR36.885 RSU to/from vehicle/pedestrian UE : V2X Channel model in TR36.885 FFS whether V2V channel model enhancements are needed	Macro to/from vehicle/pedestrian UE: 3D UMa for 500m ISD 3D RMa for 1732m ISD (2D RMa may be used until 3D RMa is complete) Between vehicle/pedestrian UE: V2X Channel model in TR36.885 RSU to/from vehicle/pedestrian UE : V2X Channel model in TR36.885

		FFS whether V2V channel model enhancements are needed
Tx power	Macro BS: 49dBm PA scaled with simulation BW when system BW is higher than simulation BW. Otherwise, 49dBm [TBD for TDD] BS-type-RSU: 24dBm PA scaled with simulation BW when system BW is higher than simulation BW. Otherwise, 24dBm Vehicle/pedestrian UE or UE type RSU: 23dBm Note: 33dBM for RSU or UE is not precluded	Macro BS: 49dBm PA scaled with simulation BW when system BW is higher than simulation BW. Otherwise, 49dBm [TBD for TDD] BS-type-RSU: 24dBm PA scaled with simulation BW when system BW is higher than simulation BW. Otherwise, 24dBm Vehicle/pedestrian UE or UE type RSU: 23dBm Note: 33dBM for RSU or UE is not precluded
BS antenna configuration	Macro BS: Up to 256 TX/RX antenna elements BS-type-RSU: Up to 8 TX/RX antenna elements	Macro BS: Up to 256 TX/RX antenna elements BS-type-RSU: Up to 8 TX/RX antenna elements
BS antenna pattern	Macro BS: Follow the modeling of TR 36.873 BS-type RSU: Follow the modeling of TR 36.873 Note: Further study if needed, e.g., vertical beamforming, vehicle-to-vehicle channel.	Macro BS: Follow the modeling of TR 36.873 BS-type RSU: Follow the modeling of TR 36.873 Note: Further study if needed, e.g., vertical beamforming effect, vehicle-to-vehicle channel.
BS antenna height	Macro BS: 25m BS-type-RSU: 5m	Macro BS: 35m for ISD 1732m 25m for ISD 500m BS-type-RSU: 5m
BS antenna element gain + connector loss	Macro BS: 8 dBi BS-type-RSU: 8dBi	Macro BS: 8 dBi BS-type-RSU: 8dBi
BS receiver noise figure	Macro BS:5dB BS-type-RSU: 5dB	Macro:5dB BS-type-RSU: 5dB
UE antenna elements	Vehicle/pedestrian UE: Up to 8 TX/RX antenna elements UE-type RSU: Up to 8 TX/RX antenna elements	Vehicle/pedestrian UE: Up to 8 TX/RX antenna elements. UE-type RSU: Up to 8 TX/RX antenna elements
UE antenna pattern	Vehicle/pedestrian UE: Half spherically uniform distribution with upper direction UE-type-RSU: Half spherically uniform distribution with bottom direction Note: directional antenna pattern is not precluded Note: uniform antenna models should be used for 2-D channel models	Vehicle/pedestrian UE: Half spherically uniform distribution with upper direction UE-type-RSU: Half spherically uniform distribution with bottom direction Note: directional antenna pattern is not precluded Note: uniform antenna models should be used for 2-D channel models
UE antenna height	Vehicle/pedestrian UE: 1.5m UE-type-RSU: 5 m	Vehicle/pedestrian UE: 1.5m UE-type-RSU: 5 m
UE antenna gain	Vehicle UE: 3dBi Pedestrian UE: 0dBi UE-type RSU: 3dBi	Vehicle UE: 3dBi Pedestrian UE: 0dBi UE-type RSU: 3dBi
UE receiver noise figure	Vehicle UE: 9dB UE-type RSU: 9dB	Vehicle UE: 9dB UE-type RSU: 9dB
Traffic model	[50 messages] per 1 second with [60km/h], [10 messages] per 1 second with [15km/h] in TR38.913 Note: This value is tentative. After SA1 input, it can be modified.	[50 messages] per 1 second with absolute average speed of [100-250 km/h] (relative speed: 200 – 500km/h) in TR38.913 Note: This value is tentative. After SA1 input, it can be modified.
Traffic load (Resource utilization)	FFS	FFS
UE distribution	Urban grid model (car lanes and pedestrian/bicycle sidewalks are placed around a road block. 2 lanes in each direction, 4 lanes in total, 1 sidewalk, one block size: 433m x 250m) in TR38.913 Average inter-vehicle distance (between two vehicles' center) in the same lane is [1sec * average vehicle speed] (average speed [15 – 120km/h]) in TR38.913 Vehicle UE location update in TR36.885 should be used for the evaluation of PRR in sidelink or	Average inter-vehicle distance (between two vehicles' center) in the same lane is [0.5 sec or 1sec * average vehicle speed] (average speed: [100-250 km/h]) in TR38.913 Vehicle UE location update in TR36.885 should be used for the evaluation of PRR in sidelink or communication interruption in uplink/downlink. Vehicle UE location update may not be assumed for the evaluation of PRR in uplink/downlink Note: Inter-vehicle distance is tentative.

	communication interruption in uplink/downlink. Vehicle UE location update may not be assumed for the evaluation of PRR in uplink/downlink Note: Inter-vehicle distance is tentative. After SA1 input, it can be modified. Pedestrian UE distribution: Inter-pedestrian distance 20m, which is tentative. After SA1 input, it can be modified.	* After SA1 input, only one value will be selected.
Feedback assumption	FFS	FFS
Channel estimation	Realistic	Realistic
Performance metric	FFS	FFS

Friday: Email discussion on performance metrics, starting from the ones in R1-165612, till August 6th .

Urban Grid

R1-164044 **Evaluation assumption for non-eMBB deployment scenarios** **Huawei, HiSilicon**

Decision: The document (Section 2.3) is noted.

Other mMTC assumptions

R1-165008 **UE battery life evaluation for mMTC use cases** **Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

Conclusion:

- Discuss until RAN1#86 to define simple UE energy modelling approach for NR mMTC radio access energy efficiency analysis which is not specific to any particular radio access solution (contact: Karri Ranta-aho)

R1-165696 **WF on evaluation methodologies for mMTC** **LG Electronics, Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

Agreements:

- Evaluation methods and relevant evaluation metrics per KPIs for mMTC in RAN1 are as follows:
  - Coverage is evaluated by link budget
  - Connection density is evaluated by SLS and analysis
  - UE battery life is evaluated by analysis
    - Statistics of wake-up time duration of UE in consideration of the number of (re)transmissions
  - Battery life is evaluated in consideration of RAN2 procedure

Other URLLC assumptions

R1-164681 URLLC KPI evaluation assumptions Qualcomm Incorporated

Decision: The document is noted. Discuss these proposals offline, including:

- the exact definition to be used for latency evaluation
- reliability KPI:

Revisit on Tuesday evening - R1-165487

R1-165487 **WF on URLLC KPIs and Evaluation** **Qualcomm**

Decision: The document is noted.

Proposed Working Assumption for URLLC KPIs:

- URLLC latency and reliability KPIs are defined in conjunction
  - (Latency, Reliability) of (L, R) is met if packet of X bytes is delivered within L ms latency from radio protocol ingress point to egress point with packet error rate < R.
  - E.g., (1ms, 1e-5)

Revisit later in the week.

Friday: To be revisited at next meeting.

Agreements:

The following performance metrics are defined for evaluation and feature selection in RAN1 (FFS the method of evaluation, including whether SLS are required):

- URLLC capacity is defined as delivered traffic given the (L, R) constraint
  - Denoted as C(L,R)
- URLLC/ eMBB multiplexing capacity is defined as the simultaneously delivered URLLC capacity *C(L,R)* and eMBB capacity *T*

FFS until RAN1#86:

- Proposal 1: Single URLLC traffic model should be used evaluate URLLC KPIs
  - Example: Fixed packet size of 32 Bytes, Poisson arrival rate of λ,
  - Example: single directional and bi-directional traffic could be considered
- Proposal 2: Latency metric should capture transmission latency, processing latency, retransmission latency and queuing/scheduling latency
- Proposal 3: Link level BLER evaluation should include control and data channels
  - With and without other cell interference
- Proposal 4: System level evaluation should capture other cell interferences

R1-163988 **Evaluation methodology and KPI for URLLC** **Samsung**
Decision: The document is noted.

V2X
R1-164173 **Discussion on URLLC evaluation assumptions and scenarios** **Intel Corporation**
Decision: The document is noted.

Conclusion: Aim for a single set of assumptions for evaluations of URLLC.

MIMO & antenna modelling
R1-164950 **On new antenna model for NR basestation** **Ericsson**
Decision: The document is noted.

Agreements:

- TXRUs within a panel can be assumed to be synchronized and phase-calibrated (at least to the same level as in LTE).
- It should be possible as one option to assume QCL between ports of two different panels of the same transmission points
- Distances ($d_{g,H}$, $d_{g,V}$) between panels should be limited to at most [FFS] metres.
- NR evaluations may consider both cases of phase-calibration and no phase-calibration between panels

R1-163986 **Remaining details of TRP antenna modeling and TXRU mapping/virtualization** **Samsung**
Discussion: Telecom Italia insists on realistic numbers of antenna elements at lower frequencies.
Decision: The document is noted.

R1-165488 **WF on TRP antenna model** **Samsung, Intel, Ericsson**
Decision: The document is noted. Revisit on Wednesday.

R1-164554 **Proposal for UE antenna model for new RAT** **LG Electronics**
Decision: The document is noted.
R1-165712 **WF on hybrid UE antenna modelling** **Intel, Samsung, LG**
Decision: The document is noted.

Companies are requested to check both R1-165488 (->R1-165490) and R1-165712 (->R1-165491) by the end of the morning coffee break; WF owners to provide editable versions (in Word).
R1-165490 **Way-forward for TRP antenna modeling Samsung, Intel, Ericson, Qualcomm, Xinwei**
Decision: The document is noted.

Agreements on TRP antenna modelling:

- For evaluation, consider the following antenna configurations:
  - Baselines are at least for MIMO-related calibration (and can also be used for other features unless a different baseline is defined for evaluation of a particular feature). Companies are encouraged to evaluate other configurations as well.
  - **At 4GHz:**
    - Dense urban and Urban macro:
      - Baseline: (M,N,P,Mg,Ng) = (8,8,2,1,1), (d_V,d_H) = (0.8, 0.5)λ.
      - Note that for Urban macro, companies are also encouraged optionally to investigate larger panels, e.g. (8,16,2,1,1)
    - Indoor hotspot:
      - FFS
  - **At 30GHz:**
    - Dense urban and Urban macro:
      - Baseline: (M,N,P,Mg,Ng) = (4,8,2,2,2). (d_V,d_H) = (0.5, 0.5)λ. ($d_{g,V}$,$d_{g,H}$) = (2.0, 4.0)λ.
      - Note that companies are also encouraged to investigate a larger panel spacing, e.g. ($d_{g,V}$,$d_{g,H}$) = (4,8) λ
    - Indoor hotspot:
      - FFS
  - **At 70GHz:**
    - Dense urban:
      - Baseline: (M,N,P,Mg,Ng) = (8,16,2,2,2). (d_V,d_H) = (0.5, 0.5)λ. ($d_{g,V}$,$d_{g,H}$) = (4.0, 8.0) λ.
      - Note that companies are also encouraged to investigate a larger panel spacing, e.g. ($d_{g,V}$,$d_{g,H}$) = (8,16) λ
    - Indoor hotspot:
      - FFS

- Consider the following a TXRU to antenna elements mapping as examples
  - **At 4GHz:** the same as TR36.897
  - **At 30GHz and 70GHz:**
    - **Option 1:** a single TXRU is mapped per panel per polarization.
    - **Option 2**: a single TXRU is mapped per panel per subarray per polarization,
      - E.g., where a subarray consists of consecutive M/2 vertical antennas and N/2 horizontal antennas with the same polarization.
      - Other subarray configurations are not precluded.
    - **Option 3**: Fully connected TXRU mapping within a panel per polarization.
      - Other Fully connected TXRU mapping is not precluded.
- For evaluating multi beam based approaches at 30GHz and 70GHz, consider the following:
  - TXRU to antenna mapping weights are adjustable and used to steer the panel beam direction in multi beam based approaches in time domain.
  - Companies should describe TXRU mapping weights for the panel beams

R1-165640 **WF on antenna placement in Indoor scenarios** **Intel, NTT DOCOMO** (R1-165587)

Decision: The document is noted. Companies are invited to review this – revisit on Friday.

Agreements on UE antenna modelling:

- For UE with (M_g, N_g) directional antenna panels.
  - Introduce ($\Omega_{mg,ng}$, $\Theta_{mg,ng}$) for orientation of the panel (m_g, n_g), $0 \le m_g < M_g$, $0 \le n_g < N_g$, where the orientation of the first panel ($\Omega_{0,0}$, $\Theta_{0,0}$) is the same as UE orientation, $\Omega_{mg,ng}$ is the array bearing angle and $\Theta_{mg,ng}$ is the array downtilt angle defined in [TR 36.873].
  - For NR MIMO evaluation:
    - Config 1: (M_g, N_g) = (1, 2); $\Theta_{mg,ng}$=90; $\Omega_{0,1}=\Omega_{0,0}+180$; ($d_{gH}$, d_{gV})=(0,0)
    - Config 2: (M_g, N_g) = (1, 4); $\Theta_{mg,ng}$=90; $\Omega_{0,1}=\Omega_{0,0}+90$; $\Omega_{0,2}=\Omega_{0,0}+180$; $\Omega_{0,3}=\Omega_{0,0}+270$; ($d_{gH}$, d_{gV})=(0,0)
    - Other configurations can have panel specific position offset ($d_{gH,\,mg,\,ng}$, $d_{gV,\,mg,\,ng}$). Note in this case the notation of (M_g, N_g) does not leads to rectangular shape.
  - UE orientation for mobile device ($\Omega_{0,0}$, $\Theta_{0,0}$)=(U(0,360), 90); UE orientation for customer premise equipment (CPE) can be optimized
  - Each antenna array has shape $d_H=d_V=0.5\lambda$
    - Config 1 can be used with config a/b; Config 2 can be used with config c/d/e
    - Config a: (M, N, P) = (2, 4, 2), the polarization angles are 0 and 90
    - Config b: (M, N, P) = (4, 4, 1) , the polarization angle for even panel is 0 and for odd panel is 90
    - Config c: (M, N, P) = (2, 2, 2), the polarization angles are 0 and 90

        - Config d: (M, N, P) = (2, 4, 1) , the polarization angle for even panel is 0 and for odd panel is 90
        - Config e: (M, N, P) = (1, 4, 2), the polarization angles are 0 and 90
        - FFS: Other configurations, e.g. (M, N, P) = (4, 4, 2) or (M, N, P) = (4, 8, 1) can be considered for 70GHz band, without exceeding the limit on the maximum number of UE antenna elements
    - The antenna elements of the same polarization of the same panel is virtualized into one TXRU
    - FFS: one TXRU can connect to different subarrays dynamically
    - Note: The channel coefficients for each UE panel can be generated using spatial channel model
- Companies should describe the method used for TRP association with UE-side beamforming

UE PA model

R1-165006 **On the evaluation of PA model Nokia, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

R1-164721 **On justification of the parameter selection for PA models in link level evaluation Huawei, HiSilicon**

Decision: The document is noted.

Conclusion: Discuss further when LS reply is received from RAN4.

Waveform

R1-164586 **LLS assumptions for waveform evaluation in mMTC UL transmissions Spreadtrum Communications**

Decision: The document is noted.

R1-165675 **Way forward on Case 5 for waveform LLS evaluation Spreadtrum, Orange, ZTE**

Decision: The document is noted.

R1-164034 **Further evaluation assumptions for waveform Huawei, HiSilicon**

Decision: The document is noted. To be revised in R1-165759 – revisit later

R1-165859 **Way forward on further evaluation assumptions for NR waveform Huawei, HiSilicon, InterDigital, NTT DOCOMO, LGE**

Decision: The document is agreed.

R1-165914 **WF on further evaluation assumptions for NR waveform 30GHz and beyond Nokia, Intel**

Decision: The document is noted. Continue discussion offline

Friday

R1-165989 **Way forward on calibration assumptions for NR waveform Huawei, HiSilicon, NTT DOCOMO, Nokia**

- Use an email discussion to collect the calibration results for all agreed simulation cases before RAN1#86 meeting.
  - OFDM/DFT-S-OFDM with CP as baseline for performance reference. (LMMSE receiver assumed)
  - At least BLER vs SNR should be reported for calibration

  Note: This calibration is not for down-select purpose.

  Note: The selection of the parameters on page 3 is only for calibration purpose

Decision: The document is agreed. Email discussion on calibration for NR waveform until June 30th - (Huawei)

R1-166016 **Way forward on email discussion for waveforms Huawei, HiSilicon, National Taiwan University, NTT DOCOMO, Nokia**

- Use an email discussion to collect information from each company on the details of their proposed/simulated waveform(s), including
  - used parameters
  - Tx/Rx structure
  - Corresponding performance
- Companies are encouraged to provide inputs to this email discussion as early as possible
- The purpose of this email discussion is to facilitate waveform discussion in future meetings. No conclusion is expected out of this email discussion

Decision: The document is agreed. Email discussion to collect information for NR waveform until August 4th - (Huawei)

R1-166000 **WF on further evaluation assumptions for NR waveform 30GHz and beyond Nokia, Alcatel-Lucent Shanghai Bell, Intel, Samsung, Huawei, HiSilicon**

Decision: The document is noted. Revised in:

R1-166028 **WF on further evaluation assumptions for NR waveform 30GHz and beyond Nokia, Alcatel-Lucent Shanghai Bell, Intel, Samsung, Huawei, HiSilicon,Qualcomm**

Decision: The document is agreed.

Multiple Access

R1-163983 **Evaluation assumptions for NR multiple access** **Samsung**
Decision: The document is noted.
R1-164045 **SLS parameters for evaluation scenarios for multiple access evaluation** **Huawei, HiSilicon**
Decision: The document is noted.
R1-165691 **Way forward on remaining issues on multiple access evaluation assumption** **Huawei, HiSilicon**
Decision: The document is noted.

Agreements for SLS parameters for UL mMTC scenario – urban coverage for massive connection:

Attributes	Values or assumptions
Layout	Single layer - Macro layer: Hex. Grid
Inter-BS distance	1732m
Carrier frequency	700MHz
Simulation bandwidth	Companies report simulation bandwidth used in evaluation
Channel model	3D UMa Take 5GCM output into account if applicable.
Tx power	UE: Max 23dBm or optional 10dBm
BS antenna configuration	Rx: 2 and 4 ports (8 as optional)
BS antenna pattern	Follow the modeling of TR36.873
BS antenna height	25m
BS antenna tilt	Companies report tilt
BS antenna element gain + connector loss	8 dBi, including 3dB cable loss
BS receiver noise figure	5 dB
UE antenna elements	1Tx
UE antenna height	1.5m
UE antenna gain	-4dBi
Traffic model	Non-full buffer small packet. Consider future trend of mMTC traffic
UE distribution	20% of users are outdoor in cars (100km/h) or 20% of users are outdoors (3km/h) 80% of users are indoor (3km/h) Users dropped uniformly in entire cell
BS receiver	MMSE-IRC as baseline, Advanced receiver is not precluded
UL power control	Companies report power control scheme
Channel estimation	Realistic

- Notes:
  - The same table is also agreed to be used for general assumption for mMTC for UL
  - Additionally, it was agreed to additionally define the minimum packet size is [20] bytes

Discuss offline remaining slides in R1-165691, including LLS assumptions.
R1-165759 **Way forward on further evaluation assumptions for NR waveform** **Huawei, HiSilicon, InterDigital**
Decision: The document is noted.
R1-165848 **Way forward on mMTC evaluation assumptions**
Decision: The document is noted.
R1-165875 **Way forward on remaining issues on multiple access evaluation assumptions** **Huawei, HiSilicon**
Decision: The document is noted.

Agreement:
- PHY abstraction (L2S mapping) of LLS is encouraged to be provided for calibration purpose
- LLS evaluation with ideal and realistic channel estimation

Proposal:
- Slide 4 in R1-165875 is agreed, with the following updates:
  - BS: 49dBm / 10MHz for FDD and 20MHz for TDD
  - (eNB) 2/4/8 Tx/Rx ports as start point -> more than 2 ports
  - (UE) 1 Tx/2Tx and 2 Rx/4Rx as starting point

- ~~25%~~, 50%, 80% (other value is not precluded
- For TRP spectrum efficiency: full buffer or ftp?
- Uniform distribution, 10, ~~20 users~~ per TRP or more ~~for full buffer traffic~~
- UE receiver and/or TRP receiver: Updated to Advanced receiver is not precluded?
- Scheduler?

Continue offline discussion

Friday

R1-166006 **WF on remaining issues on SLS parameters for multiple access** **Huawei, HiSilicon, CATT, Orange, NTT DOCOMO, Vodafone**

Decision: The document is noted.

Agreements:

- For multiple access evaluations for eMBB scenarios, both subband and wideband scheduler can be considered
- For multiple access evaluations for eMBB rural scenario:
  - Carrier frequency: 700MHz;
  - ISD: 1732m;
  - BS antenna configuration: 2/4/8 ports
  - UE antenna configuration: 2Tx/1Tx port, 2Rx/4Rx ports;
  - Traffic model:
    - For spectral efficiency: full buffer (NOTE)
    - For user experienced data rate: FTP model 1/3
  - UE density:
    - Full buffer: 10 UE per TRP, other values are not precluded;
  - Traffic load (FTP)
    - 50%, 80%, 25% (optional)
  - NOTE: full buffer evaluation is not used for technical scheme down selection.
- For multiple access evaluations for eMBB dense urban scenario:
  - Layout: Signal layer; Two layers not precluded
  - Carrier frequency: 4 GHz for the single layer
  - BS antenna TXRUs: 4, 8, 16, 32 TXRUs
  - UE antenna TXUs and RXUs: 2/1 TXUs, 2/4 RXUs
  - Traffic model:
    - For spectral efficiency: full buffer (NOTE)
    - For user experienced data rate: FTP model 1/3
  - UE density:
    - Full buffer: 10 UE per TRP, 20 or other values are not precluded;
  - Traffic load (FTP)
    - 50%, 80%, 25% (optional)
  - NOTE: full buffer evaluation is not used for technical scheme down selection
  - Note: Other parameters refer to general assumptions

R1-165916 WF on DL Multiple Access for eMBB MediaTek, Spreadtrum

Decision: The document is noted.

Initial evaluations

R1-166004 **Response LS on realistic power amplifier model for NR waveform evaluation** **RAN4, Nokia**

Decision: The document is noted.

R1-166010 **WF on power amplifier assumptions for NR wavwform evaluations** **Nokia, Alcatel Lucent Shanghai Bell**

Decision: The document is noted.

Working assumption:

- RAN1 adopts the models provided in RAN4 LS (R1-166004) to the NR UL waveform evaluations

Email discussion and approval about power amplifier assumptions for NR DL waveform evaluations by utilizing R1-166004 and R1-166010 and also email approval to confirm above WA until 9th June – Mihai (Nokia)

R1-165675 **Way forward on Case 5 for waveform LLS evaluation** **Spreadtrum, Orange, ZTE**
Decision: The document is noted.

Not treated.
R1-163985 Discussion on achieving data rate and spectral efficiency KPIs for NR Samsung
R1-163987 Remaining details of UE antenna modeling and TXRU mapping/virtualization Samsung
R1-164041 Phase noise model for above 6GHz Huawei, HiSilicon
R1-164174 Discussion on channel modeling framework for UE-UE and eNB-eNB interference Intel Corporation
R1-164175 Traffic model for small packet size Intel Corporation
R1-164244 Remaining issues on link/system-level evaluation assumptions for MA CATT
R1-164245 Discussion on link-level evaluation assumptions for channel coding CATT
R1-164262 Remaining issue with link level simulation for multiple access ZTE
R1-164263 Remaining issue with system level simulation for multiple access ZTE
R1-164264 Requirement KPIs and system performance targets for multiple access ZTE
R1-164373 Evaluation methodology for Massive MIMO in New Radio Huawei, HiSilicon
R1-164391 Overview of remaining issues of evaluation assumption Huawei, HiSilicon
R1-164553 Evaluation assumptions for eV2X LG Electronics
R1-164555 Remaining Issues on Evaluation Assumptions for New Radio Interface LG Electronics
R1-164587 Further consideration on the evaluation assumption of multiple access Spreadtrum Communications
R1-164675 Initial DL KPI evaluation for eMBB Qualcomm Incorporated
R1-164676 Initial UL KPI evaluation for eMBB Qualcomm Incorporated
R1-164678 High speed train scenario clarification Qualcomm Incorporated
R1-164683 Multiple access evaluation assumption Qualcomm Incorporated
R1-164868 Evaluation assumptions for high speed scenario ETRI
R1-164888 Phase Noise in High Frequency Bands for New Radio SystemsCMCC
R1-164951 Scenarios and Evaluation methodology for NR Ericsson
R1-165005 On the evaluation of PN model Nokia, Alcatel-Lucent Shanghai Bell
R1-165009 System level simulation assumptions for mMTC use cases Nokia, Alcatel-Lucent Shanghai Bell
R1-165010 Waveform comparison simulation assumptions for 30 GHz and beyond Nokia, Alcatel-Lucent Shanghai Bell
R1-165078 Remaining details of NR evaluation assumptions Intel Corporation
R1-165424 On baseline UE receiver for NR ORANGE, Vodafone
R1-165443 Evaluation Assumptions for NR MIMO ZTE
R1-165491 WF on hybrid UE antenna modelling Intel, Samsung, LGE
R1-165633 Way Forward on SLS evaluation assumptions LG Electronics
R1-165690 WF on eMTC evaluation assumptions Huawei, HiSilicon
R1-165697 Way Forward on KPIs discussion for RAN1 evaluation LG Electronics
R1-165735 WF on assumption details for case 5 in waveform LLS evaluation Spreadtrum, Fraunhofer IIS, National Taiwan University, Orange, ZTE
R1-165930 WF on evaluation assumptions for eMBB LGE
R1-166005 WF on Channel coding selection Qualcomm Incorporated, ZTE

7.1.3 Waveform and multiple access schemes for new radio interface

7.1.3.1 Waveform

R1-164265 **Discussion on FB-OFDM of new waveform for new radio interface ZTE**
The document was presented by Yifei Yuan from ZTE.

- *Observation 1: FB-OFDM shares the same baseband signal formulation with some other OFDM-based multi-carrier waveforms including CP-OFDM, CP-OFDM with WOLA, FBMC, FBMC-OQAM and GFDM.*
- *Observation 2: Due to use of polyphase filter, FB-OFDM has the simple implementation in both transmitter and receiver.*
- *Observation 3: FB-OFDM has good flexibility and adaptability in choosing pulse functions and symbol intervals.*
- *Observation 4: Polyphase filter can be used with various OFDM-based multi-carrier waveforms. It is beneficial to make the NR waveform compatible with polyphase filter for the NR forward compatibility.*
- *Observation 5: FB-OFDM has much better OOB performance than CP-OFDM, particularly in the region closing to the edge of transmission band.*
- *Observation 6: FB-OFDM performs better than CP-OFDM when adjacent subbands have different numerologies.*
- *Proposal: To include FB-OFDM with polyphase filter as a waveform scheme in the further NR study.*

Decision: The document is noted.

R1-164619 **Flexibly configured OFDM (FC-OFDM) waveform** **ORANGE**

The document was presented by Hao Lin from Orange.

- Proposal 1: Study FC-OFDM as a solution to enable multiple configuration modes' 'multiplexing in frequency domain, allowing necessary flexibility for the NR to support different use cases.
- Proposal 2: Study FC-OFDM as a solution for window design in time domain bringing advantages in terms of support of flexible numerology, coexistence of sync/non-sync transmission, spectral confinement.

Decision: The document is noted.

R1-165011 **OFDM based Waveform for 5G new radio interface** **Nokia, Alcatel-Lucent Shanghai Bell**

The document was presented by Karri Ranta-aho from Nokia.

- *Proposal 1: Zero prefix with short sub-band wise filter should be considered when multiplexing different numerologies at low bands.*
- *Proposal 2: PA model needs to be considered into final evaluation of sub-band wise filtered waveforms.*
- *Proposal 3: UL/DL symmetric CP-OFDMA should be used for eMBB optimized frequency band 3-40 Ghz.*
- *Proposal 4: Single carrier without carrier aggregation should be considered for frequency bands over 40 Ghz*
- *Proposal 5: Replacement of CP by zero value which are part of the symbol itself needs to be considered.*

Decision: The document is noted.

R1-164355 **Circularly Pulse Shaped OFDM-based Waveform Idaho National Laboratory**

The document was presented by Ramon Khalona from INL.

- *Proposal: DFT-S-OFDM should be considered as the baseline waveform for the uplink due its PAPR performance.*
- *Proposal: Filtering/windowing techniques must be added to the DFT-S-OFDM to improve its OOBE characteristics.*
- *Observation: To meet the NR requirements such as improving battery life of the mMTC and D2D devices new functionalities must be added to improve the existing OFDM-based DFT-S-OFDM waveform.*
- *Observation: Circular Pulse Shaping provides significant gain of at least 1.2dB and at least 3.2dB over DFT-S-OFDM and OFDM respectively.*
- *Proposal: RAN1 should consider SC-CPS-FDMA because of its improved PAPR performance over SC-FDMA while still providing all the benefits of SC-FDMA.*
- *Observation: SC-CPS-OFDM is amicable to MIMO technologies and provides greater flexibility for CFO compensation.*

Decision: The document is noted.

R1-165035 **[NR] 5G waveforms PAPR and out of channel emissions measurements** **Skyworks Solutions Inc.**

The document was presented by Dominique Brunel from Skyworks.

- Proposal 1: Refocus efforts on reduced PAPR for the 5G NR UL, whether
  - Retaining the present PAPR performance of single-carrier SC-FDMA as in LTE-A,
  - Revisiting encoding and multiple access schemes that enable PAPR reduction, and
  - Explore alternative means to guarantee out-of-channel emissions than simply to rely on native PA linearity at significant DC current consumption penalty for the UE.
- Proposal 2
  - LTE and Wi-Fi PA measurements results with candidate waveforms shall serve as the benchmark for modelling.
  - Impact of memory effect for higher frequencies and wider bandwidths as intended by NR/5G shall be assessed for power amplifier modelling.
- Observation 1
  - For a fully allocated channel, at the output of the PA, initial waveform localization properties are lost and out-of-channel spectral emissions are degraded to the same values limited by the PA nonlinearity.
  - For a fully allocated channel, higher PAPR waveforms result in lower transmitted power and reduced DC efficiency
- Observation 2
  - For a partially allocated channel, at the output of the PA initial waveform localization properties are lost and out-of-channel emissions are degraded to the same values limited by the PA nonlinearity
  - For a partially allocated channel, higher PAPR waveforms result in lower transmitted power and reduced DC efficiency
- Observation 3: Both LTE high band and Wi-Fi 5GHz high performance PAs are good candidates for modelling and testing NR waveforms at less than 6GHz frequencies for channel bandwidths at least equal to 200MHz.
- Observation 4: Simple AM/AM + AM/PM model is not representative of power amplifier non linear behaviour for wide bandwitdth and/or frequencies higher than 6GHz. Models accounting for memory effects, bias network bandwidth

limitations, etc. should be studied in order to refine the accuracy and predictability of such models. Application of PA models for mm Wave will also need to be inclusive of additional parasitics and test method limitations.

Decision: The document is noted.

R1-165113 **OFDM-Based Waveform With Precoding Techniques** **National Taiwan University**

The document was presented by … from NTU.

- Proposal: For any OFDM-based waveform, both frequency-domain precoding and time-domain filtering techniques for low OOBE shall be considered.
- Observation: GFDM can be regarded as a precoded-OFDMA waveform that meets the objective of this study item [1]:
  - Fundamental physical layer signal structure for new RAT
    - Waveform based on OFDM, with potential support of non-orthogonal waveform and multiple access

Decision: The document is noted.

R1-165257 **Link level evaluation of waveforms for open-loop synchronized Uplink** **KDDI Corporation**

The document was presented by … from KDDI.

- *Observation 1: In an open-loop synchronized Uplink scenario, ZT-OFDM presents performance close to the case with zero delay for moderate SNR and reaches an error floor (below BLER = 1e-2 for 16-QAM) at high SNR.*
- *Observation 2: In an open-loop synchronized Uplink scenario, the use of low power tail truncation, in addition to providing potential energy saving gains, appears beneficial to the performance when performed at a local minimum of the low power tail of the time-domain waveform.*
- *Proposal: We suggest that in future evaluations, the case in which the ratio of IDFT and DFT sizes at the transmitter is an integer may be considered, as it results in specific time-domain characteristics of the ZT-OFDM waveform with the potential to increase the performance gain obtained by truncation of the low power tail.*

Decision: The document is noted.

R1-164028 **Link-level evaluation results for UW-DFT-s-OFDM** **Mitsubishi Electric Co.**

The document was presented by Cristina Ciochina-Duchesne from Mitsubishi.

- Observation 1: UW DFT-s-OFDM has superior OoB suppression performance with respect to SC-FDMA.
- Observation 2: UW-DFT-s-OFDM and SC-FDMA have the same PAPR performance.
- Observation 3: DFT-FDE-IDFT modules in LTE-SC-FDMA can be used for UW-DFT-s-OFDM and CP removal module is not needed
- Observation 4: UW serves as CP and sufficient FER performance can be obtained by controlling length of UW
- Observation 5: At the OOBE target 26.3dB, UW DFT-s-OFDM outperforms SC-FDMA at SNR below 30dB in the ETU channel. In the EPA channel, UW DFT-s-OFDM outperforms SC-FDMA.
- Observation 6: UW-DFT-s-OFDM is robust against interference from adjacent channels
- Observation 7: UW-DFT-s-OFDM is a waveform with suppressed OOBE, robust performance in multipath fading and tolerance against adjacent channel interference.
- Proposal 1: Investigate UW-DFT-s-OFDM as a potential waveform candidate
- Proposal 2: Investigate location and length of UW for UW-DFT-s-OFDM to achieve the best tradeoff

Decision: The document is noted.

R1-165620 **Performance Results for OTFS Modulation** **Cohere Technologies**

The document was presented by … from Cohere and provides performance comparisons showing the superior performance of OTFS especially in the high mobility (high speed train) use case; 6 dB improvement or more is seen at vehicle speeds of 500 Km/h. This kind of improvement can allow high throughput operation in high mobility cases without requiring increasing the subcarrier spacing and incurring the increased CP overhead associated with a larger subcarrier spacing.

Decision: The document is noted.

R1-165108 **Waveform candidates for NR** **Motorola Mobility**

The document was presented by … from MotM.

- RAN1 should consider additional criteria/metrics for evaluation of waveforms for downlink and uplink, such as complexity/efficiency of pilot signal generation/channel estimation, integration/pairing with MIMO, latency/efficiency of short-packets transmission / reception, time/frequency synchronization robustness.
  - A metric may have a different degree of importance for sub-6Hz and >6GHz frequency bands.
- The criteria/metrics should be used to study benefits of new waveforms over LTE OFDM/SC-FDM waveform with improved (e.g., 95%) bandwidth occupancy.

Decision: The document is noted.

R1-165648 **WF on OFDM based waveform in NR** **Samsung**

- The following OFDM-based waveform variants should be evaluated for RAN1 NR waveform candidates
  - OFDM with guard interval (e.g., CP, ZP, …)
  - DFT-s-OFDM with guard interval
    - SC-FDE with guard interval can be considered as a special case of DFT-s-OFDM
  - Note: Each company should provide details on the DFT-spreading, filtering/windowing applied to OFDM waveform for evaluation
    - RAN1 strives for minimization of the number of waveform(s) supported in NR considering performance, specification impact, and UE/eNB complexity

Discussion: Huawei → no real progress compared to what has been already agreed.
Decision: The document is noted.

Possible agreements:

- The following OFDM-based waveform variants should be evaluated for RAN1 NR waveform candidates
  - OFDM with guard interval (e.g., CP, ZP, …)
  - DFT-s-OFDM with guard interval
    - SC-FDE with guard interval can be considered as a special case of DFT-s-OFDM
  - Filtering and/or windowing on OFDM/DFT-s-OFDM with guard interval
  - Note: Each company should provide details on the DFT-spreading, filtering/windowing applied to OFDM waveform for evaluation
    - RAN1 strives for minimization of the number of waveform(s) supported in NR considering performance, specification impact, and UE/eNB complexity

Wednesday:

Agreements:

- The following OFDM-based waveforms should be used as RAN1 NR waveform performance reference:
  - OFDM with CP
  - DFT-s-OFDM with CP
- All waveform in RAN1 #84bis/#85 meeting can be evaluated based on agreed assumptions
  - Note: Each company should provide details on the DFT-spreading, guard interval, Tx/Rx filtering and/or windowing applied to OFDM waveform for evaluation

R1-165665 **WF on definition of OFDM based waveform** **Spreadtrum, Orange, Sony, Cohere, NTU**

The document was presented by Jinhui Chen from Spreadtrum.

- Definition: An OFDM-based waveform is a waveform based on IDFT(IFFT) operation.
  - Includes at least CP-OFDM, OFDM-WOLA, f-OFDM, FB-OFDM, UFMC, GFDM, W-OFDM, FBMC-OQAM, FC-OFDM, UW DFT-S-OFDM, GI DFT-S-OFDM, DFT-S-OFDM, variants of DFT-S-OFDM, OTFS, etc.

Discussion: Spreadtrum very upset and stressed for targetting to select/narrow-down options without much evaluation results been presented yet.
Decision: The document is noted.

R1-165666 **Way forward on categorization of IFFT-based waveform candidates** **Orange, Spreadtrum, InterDigital, ZTE, Cohere, Telstra**

Categorization of IFFT-based waveform candidates can be summarized as:

	time domain windowing	**time domain filtering**	**w.o. windowing/filte**
multi-carrier (MC)	FBMC-OQAM FB-OFDM FC-OFDM GFDM W-OFDM OTFS*	f-OFDM FCP-OFDM UF-OFDM OTFS*	CP-OFDM OTFS
single-carrier (SC)	DFT spreading + TDW MC candidates	DFT spreading + TDF MC candidates	

* Application of time domain windowing or filtering to OTFS is FFS
Decision: The document is noted.

Thursday

R1-165857 **Summary and observations on simulation results in Cases 1a, 1b and 2** **Spreadtrum, Orange, National Taiwan University, ZTE**

- Observation: Under the given simulation assumptions, most new waveforms discussed so far outperform CP-OFDM/DFT-S-OFDM(SC-FDMA) for Case 1a, 1b, 2.

Decision: The document is noted.

Not treated.

R1-163989 Waveform for NR Samsung
R1-163990 Preliminary evaluation results for OFDMA-based waveforms Samsung
R1-163991 Orthogonal vs. non-orthogonal waveforms for NR Samsung
R1-164176 Discussion on waveform for high frequency bands Intel Corporation
R1-164177 Link-level evaluation of filtered/windowed OFDM Intel Corporation
R1-164266 Simulation results of new waveform in case 1a and 1b ZTE
R1-164267 Simulation results of new waveform in case 2 ZTE
R1-164327 On coexistence of new waveforms for NR Fujitsu
R1-164369 Discussion on waveform for high frequencies Huawei, HiSilicon
R1-164588 Initial LLS evaluation results of NR waveforms under case 1a/1b/2 Spreadtrum Communications
R1-164629 On OFDM in NR Ericsson
R1-164655 Discussion on filtered waveform for NR Sony
R1-164684 Single carrier waveform evaluation Qualcomm Incorporated
R1-164687 mmW waveform selection considerations Qualcomm Incorporated
R1-165012 New radio waveforms for the Multi-Service Air Interface below 6 GHz Nokia, Alcatel-Lucent Shanghai Bell
R1-165013 Initial uplink performance results for new radio waveform for below 6GHz Nokia, Alcatel-Lucent Shanghai Bell
R1-165014 Subband-wise filtered OFDM for New Radio below 6 GHz Nokia, Alcatel-Lucent Shanghai Bell
R1-165015 Waveform proposal for carrier frequencies beyond 40 GHz Nokia, Alcatel-Lucent Shanghai Bell
R1-165016 Potential for system level gains for low-PAPR waveforms Nokia, Alcatel-Lucent Shanghai Bell
R1-165057 Performance Evaluation of UW DFT-S-OFDM for UL INTERDIGITAL COMMUNICATIONS
R1-165065 Discussion on Unique Word DFT-S-OFDM Waveform for New Radio INTERDIGITAL COMMUNICATIONS, Mitsubishi Electric
R1-165114 Evaluation of OFDM-Based Waveforms National Taiwan University
R1-165161 Initial link level evaluation result for NR waveform MediaTek Inc.
R1-165173 Comparison of candidate waveforms NTT DOCOMO, INC.
R1-165401 Initial downlink performance results for new radio waveform for below 6GHz Nokia, Alcatel-Lucent Shanghai Bell
R1-165422 Performance of GPO and OFDM with PA model and windowing IITH, CEWiT, Reliance-jio, Tejas Networks
R1-165423 Performance evaluation of FC-OFDM ORANGE
R1-165425 f-OFDM scheme and filter design Huawei, HiSilicon
R1-165426 Link level evaluation results of waveform proposals Huawei, HiSilicon
R1-165434 Initial Evaluation Result for waveform LG Electronics
R1-165580 OFDM based waveform single user evaluation Qualcomm Incorporated
R1-165581 OFDM based waveform multi-user evaluation Qualcomm Incorporated
R1-165584 Design target and initial evaluation results on waveform for NR Panasonic Corporation

7.1.3.2 Multiple access scheme

R1-163992 **Non-orthogonal multiple access candidate for NR** **Samsung**

The document was presented by … from Samsung.

- *Observation 1: The aforementioned NoMA schemes have potential to accommodate more users with limited resource, which is subject to the availability of well-designed codebooks or code sequences. It may be challenging to provide well-designed code resources for multiplexing large number of UEs in one dimension with a view to future proof.*
- *Observation 2: To bring NoMA supporting large number of UEs into reality, multi-user detection (MUD) with practically feasible complexity MUST be viable, which needs further careful verification.*

- *Observation 3: IGMA provides flexibility to choose bit level interleavers and/or grid mapping pattern to separate users. With the abundant source generated by bit-level interleavers and grid mapping patterns, the scalability to support different connection densities could be easily supported.*
- *Observation 4: The symbol-level interleaving randomizes the symbol sequence order, which may further bring benefit in terms of combating frequency selective fading and inter-cell interference.*
- *Observation 5: The IGMA scheme could apply relatively low-complexity multi-user detector and sparse grid mapping pattern could further reduce detection complexity.*
- *Proposal 1: the interleaver-based multiple access scheme (IGMA) should be evaluated as a candidate multiple access scheme for NR.*
- *Proposal 2: The proposed NoMA schemes should be evaluated taking into account their performance improvements, impact on receiver complexity, and feasibility of required specification support.*

Decision: The document is noted.

R1-164329 **Initial LLS results for UL non-orthogonal multiple access Fujitsu**

The document was presented by … from Fujitsu.

- *Observation 1: LDS CDMA seems to be a simple and effective multiple access scheme.*
- *Observation 2: RE mapping across RBs has the potential to save reference signals and gain from diversity.*
- *Observation 3: User signature vector extension by transforming two signature vectors into a larger vector has a potential to further exploit diversity gain.*
- *Proposal 1: Consider RE mapping across RBs for LDS (low density spreading) types of multiple access.*
- *Proposal 2: User signature vector extension can be considered for performance enhancement.*
- *Proposal 3: Consider LDS CDMA as a candidate multiple access scheme.*

Decision: The document is noted.

R1-164656 **Consideration on the Non-Orthogonal Multiple Access for NR Sony**

The document was presented by … from Sony.

- Proposal 1: The power domain NOMA and the code domain NOMA, which includes the “Spreading”, “Scrambling” and/or “Interleaving” functions, should be considered.
- Proposal 2: RAN1 should consider new specific information which all superposed UEs can know without assistance information to ease the use of NOMA technologies.

Decision: The document is noted.

R1-165019 **Non-orthogonal multiple access for New Radio Nokia, Alcatel-Lucent Shanghai Bell**

The document was presented by … from Nokia.

- Proposal 1: Both spreading and non-spreading based non-orthogonal multiple access shall be considered, targeting for diversified NR usage scenarios and use cases.
- Proposal 2: The design of the non-orthogonal multiple access needs to joint consider: the supported number of connections, the receiver complexity, the flexibility of resource allocation, the PAPR impact, the standard impact.
- Proposal 3: Non-orthogonal coded access (NOCA) using LTE defined low correlation sequences is taken as the baseline for spreading based non-orthogonal multiple access.

Decision: The document is noted.

R1-165021 **Performance of Interleave Division Multiple Access (IDMA) in combination with OFDM family waveforms Nokia, Alcatel-Lucent Shanghai Bell**

Proposal: Investigate IDMA and its combination with OFDM family waveforms w.r.t. frequency diversity gain, complexity and its potential in uplink in conjunction with service requirements (such as suitability for machine type communication with relaxed timing alignment).

Decision: The document is noted.

R1-165004 **Contention based multiple access for NR uplink Sharp**

The document was presented by … from Sharp.

- Multiple access scheme candidates should be categorized based on the principle of access scheme, e.g., code, or power.
- Multiple access scheme candidates should be studied considering their pros and cons, their ability to maximize KPIs for the NR RAT, and whether KPIs can be enhanced by combining aspects of these schemes.

Proposals:

- Each company is encouraged to report the receiver assumption and whether time-domain partial contention occurs or not in the evaluation.
- RAN1 should clarify not only system bandwidth but also transmission bandwidth of mMTC UEs for evaluations.

Decision: The document is noted.

R1-164869 **Low code rate and signature based multiple access scheme for New Radio ETRI**

The document was presented by … from ETRI.

- *Proposal 1: Non-orthogonal multiple access with asynchronous transmission should be investigated/evaluated for the uplink of mMTC.*
- *Proposal 2: At least for mMTC, LSSA can be considered as a candidate for non-orthogonal multiple access scheme, supporting massive connectivity and low power consumption.*

Decision: The document is noted.

R1-165653 **WF on scenarios for non-orthogonal multiple access CATT**

The document was presented by Yanping Xing from CATT.

- Besides the study of DL transmission from single TP, study multiple data streams from different TPs transmitting to a UE with non-orthogonal multiple access scheme for eMBB
- Evaluate the above scheme in the following scenarios
  - dense urban with two-layers
  - Indoor hotspot

Decision: The document is noted. Continue offline discussion.

Wednesday: CATT suggested continuing until next meeting.

R1-165618 **WF on categorizing candidate multiple access schemes for NR CMCC, Huawei, HiSilion, CATT**

The document was presented by … from CMCC.

- The Non-orthogonal MA can be categorized based on their way to superpose users:
- Category 1: Spreading based (e.g., MUSA, PDMA, SCMA etc)
  - Subcategories for the above categories are FFS.
- Category 2: Non-spreading based (e.g., NOMA etc)
- NR MA should support flexible selection and / or adjustment between orthogonal MA and non-orthogonal MA depending on specific conditions.

Discussion: Purpose for categorizing unclear (Ericsson)

ZTE→ purpose is to assess performances for each categories

Decision: The document is noted.

Possible observations:

- More than 10 non-orthogonal MA schemes are proposed in the contribution of RAN-1 #85.
- Most proposed non-orthogonal MA schemes are Spreading based schemes.

Possible agreements:

- From preliminary LLS results presented in the extensive contributions of RAN-1 #85, non-orthogonal MA has been proved to have gain over orthogonal MA, especially in overloaded transmission scenarios.
  - The Non-orthogonal MA can be categorized based on their way to superpose users:
    - Category 1: Spreading based (e.g., MUSA, PDMA, SCMA etc)
      - Subcategories for the above categories are FFS.
    - Category 2: Non-spreading based (e.g., NOMA etc)
  - NR MA should support flexible selection and / or adjustment between orthogonal MA and non-orthogonal MA depending on specific conditions.

R1-165596 **WF on categorization for multiple access schemes ZTE, ZTE Microelectronics, Qualcomm Inc.**

The document was presented by Yifei Yuan from ZTE.

- For uplink mMTC scenario, the scheme categorization can be based on the way UEs' data are separated
  - Category 1: Spreading using random-like sequences or patterns
    - Examples as MUSA, RSMA, NCMA, NOCA, low code rate spreading
  - Category 2: Structured-codebook based
    - Examples as SCMA, PDMA
  - Category 3: Interleaving based
    - Examples as IGMA, IDMA

Decision: The document is noted.

R1-165702 **WF on categorizing candidate multiple access schemes for NR CMCC, ZTE, Huawei, HiSilicon, CATT, Intel, INTERDIGITAL**

- Non-orthogonal multiple access schemes can be categorized based on the ways to separate different users:
  - Category 1: Code domain based
  - Category 2: Interleaver based
  - Category 3: Power domain based
  - Schemes that have features of combined categories are not precluded.

Discussion: Intel withdrew their support.
Also supported by Qualcomm, Spreadtrum.
LGE: at least an answer regarding their concern should be provided – what are the motivations of these categorizations?
DOCOMO: concern how the simulation results can/will be exploited?
Decision: The document is noted. Continue offline discussion.

R1-165595 **WF on scenarios for multiple access ZTE, ZTE Microelectronics, InterDigital, Qualcomm Inc., Spreadtrum**

The document was presented by Yifei Yuan from ZTE.

- Autonomous/grant-free/contention based UL non-orthogonal multiple access has the following characteristics
  - A transmission from UE does not need the dynamic and explicit scheduling grant from eNB
  - Each time in transmission, a UE randomly chooses a code/sequence or a pattern of interleaver from a pool known to eNB and UE before hand
  - Multiple UEs can share the same time and frequency resources
- For autonomous/grant-free/contention based UL non-orthogonal multiple access, the following should be studied
  - Collision of code/sequence/interleaver pattern from different UEs but on the same resource
  - Potentially relaxed requirement for UL synchronization (DL synchronization assumed)
    - Case 1: Timing offsets between UEs are within a cyclic prefix
    - Case 2: Timing offsets between UEs can be greater than a cyclic prefix, FFS the exact model of timing offsets
  - Potentially relaxed requirement for power control, i.e., no closed-loop
    - Case 1: Perfect open-loop power control, i.e., equal average SNR between UEs
    - Case 2: Realistic open-loop power control with certain alpha and P0 values
    - Case 3: no power control

Discussion: Also supported by ETRI.
Decision: The document is noted, modified and agreed as follows:

Agreements:

- Autonomous/grant-free/contention based UL non-orthogonal multiple access has the following characteristics
  - A transmission from UE does not need the dynamic and explicit scheduling grant from eNB
  - Multiple UEs can share the same time and frequency resources
- For autonomous/grant-free/contention based UL non-orthogonal multiple access, the following should be studied
  - Collision of time/frequency resources from different UEs, solutions potentially including
    - E.g., code, sequence, interleaver pattern
  - UL synchronization (DL synchronization assumed)
    - Case 1: Timing offsets between UEs are within a cyclic prefix
    - Case 2: Timing offsets between UEs can be greater than a cyclic prefix, FFS the exact model of timing offsets
  - Requirement for power control
    - Case 1: Perfect open-loop power control, i.e., equal average SNR between UEs for potentially link level calibration
    - Case 2: Realistic open-loop power control with certain alpha and P0 values
    - Case 3: Close-loop power control
  - Receiver impact

R1-165656 **WF on multltiplke access scheme for NR Uplink NTT DOCOMO, Panasonic, LG**

The document was presented by Ryosuke Osawa from NTT DOCOMO.

- Synchronous/UL grant-based orthogonal multiple access should be considered as the baseline UL transmission scheme at least for eMBB
  - Note: Synchronous means that timing offset between UEs is within cyclic prefix by e.g. timing alignment

Decision: The document is noted and agreed as follows:

Agreements:

- NR supports at least synchronous/scheduling-based orthogonal multiple access for DL/UL transmission schemes, at least targeting for eMBB
    - Note: Synchronous means that timing offset between UEs is within cyclic prefix by e.g. timing alignment

Wednesday

R1-165816 WF on considerations for multiple access LG Electronics, Ericsson

- For the study on multiple access,
    - Benefits of multiple access schemes should be assessed in considerations of other features especially MIMO aspect with larger number of antenna ports as below:
        - at least 8 at eNB side
        - at least 4 at UE side for eMBB usage scenario

Decision: The document is noted.

Not treated.

R1-163993 Non-Orthogonal Multiple Access Considerations for NR Samsung
R1-164036 Multiple access for UL small packets transmission Huawei, HiSilicon
R1-164037 LLS results for uplink multiple access Huawei, HiSilicon
R1-164178 Uplink non-orthogonal multiple access for NR access technology Intel Corporation
R1-164246 Discussion on scenarios and use cases for MA CATT
R1-164247 Performance on LLS of PDMA CATT
R1-164268 Grant-based and grant-free multiple access for mMTC ZTE
R1-164269 Contention-based non-orthogonal multiple access for UL mMTC ZTE
R1-164270 Receiver implementation for MUSA ZTE
R1-164346 MA for eMBB in mmWave spectrum Fiberhome Technologies Group
R1-164354 Underlay Common Control Channel for Unlicensed Spectrum Access and Underlay Low-Rate Data Channel for Licensed Spectrum Idaho National Laboratory
R1-164370 SLS evaluation methodology for grant-free based multiple access Huawei, HiSilicon
R1-164557 Initial LLS Evaluation Result for NoMA LG Electronics
R1-164558 Multiple Access scheme for eMBB LG Electronics
R1-164634 Instant uplink access Ericsson
R1-164672 NR multiple access Ericsson
R1-164688 RSMA Qualcomm Incorporated
R1-164689 RSMA and SCMA comparison Qualcomm Incorporated
R1-164876 Design target on multiple access schemes for NR Panasonic Corporation
R1-164889 Analytical Evaluation of Multiple Access and Preliminary Results CMCC
R1-165017 Scheduled TDMA-OFDMA for NR Nokia, Alcatel-Lucent Shanghai Bell
R1-165020 Contention-based non-orthogonal multiple access with frequency hopping for mMTC uplink Nokia, Alcatel-Lucent Shanghai Bell
R1-165022 Uplink contention-based access in 5G New Radio Nokia, Alcatel-Lucent Shanghai Bell
R1-165023 Scheduling framework and related requirements Nokia, Alcatel-Lucent Shanghai Bell
R1-165058 Performance Evaluation of Asynchronous UL NOMA INTERDIGITAL COMMUNICATIONS
R1-165174 Uplink multiple access schemes for NR NTT DOCOMO, INC.
R1-165175 Initial views and evaluation results on non-orthogonal multiple access for NR NTT DOCOMO, INC.
R1-165410 Initial link level simulation results of new multiple access scheme CATR
R1-165416 Overview of the proposed non-orthogonal MA schemes Nokia, Alcatel-Lucent Shanghai Bell
R1-165435 Initial LLS evaluation results on multiple access schemes Spreadtrum Communications
R1-165554 Proposed TR structure for Multiple Access Studies Huawei, HiSilicon
R1-165619 Transceiver implementation and complexity analysis for SCMA Huawei, HiSilicon

7.1.4 Numerology and frame structure for new radio interface

R1-165112 NR Numerology Design Principles Qualcomm Incorporated

The document was presented by Jing Jiang from Qualcomm and proposes the following Way Forward:

- In RAN1 #85, RAN1 could agree on the scaling methodology in frequency:
    - The subcarrier spacing for the NR scalable numerology should scale as
        - $f_{sc} = f_0 * 2^m$
        - where

    - f_0 is FFS
    - m is an integer chosen from a set of possible values
- In RAN1 #86, RAN1 could agree on the specific values of
    - f_0 and m

Decision: The document is noted.

R1-164692 **Numerology and TTI multiplexing for NR Forward Compatibility AnalysisQualcomm Incorporated**

- Proposal 1: NR should support multiplexing of services of different numerologies in the same carrier.
- Proposal 2: NR should support short subframes by scaling the number of symbols.
- Proposal 3: NR should support low latency services with short subframes by scaling up SCS (i.e., scaling down symbol duration).
- Proposal 4: scaled numerology should have multi-symbol unit aligned with the symbol boundary of the original numerology for efficient numerology multiplexing.
- Proposal 5: subframe interval and boundary should aligned irrespective of the underlying PHY numerology for efficiency and simplicity.
- Proposal 6: power of 2 symbols numerology should be considered jointly with NR frame structure, URLLC forward compatibility design.

Decision: The document is noted.

R1-164271 **Overview of numerology candidates ZTE**

The document was presented by Thorsten Schier from ZTE.

- Observation 1: Alt 1 (NCP) 15 kHz and Alt 3 17.07 kHz have similar performance, also for very long DS. Alt 3 outperforms Alt 1 when achieving low-latency subframes (0.125 ms) at very long DS.
- Observation 2: Mixed-radix DFT complexity is not more than 28% higher than FFT. Mixed-radix DFT provides additional flexibility.
- Observation 3: Alt 2-4 have better forward compatibility for a smooth evolution to fewer symbols per subframe.
- Proposal 1: A mixed-radix DFT approach should be adopted, so that a smooth introduction of future features and services that may require new unscaled CP durations is ensured, without changing the unscaled symbol durations or the frame structure.
- Observation 4: All numerology candidates offer co-existence with LTE and NB-IoT.
- Proposal 2: A numerology with 2^m symbols (m is an integer) per subframe is adopted in NR.
- Proposal 3: NR adopts numerologies based on Alt 3.

Decision: The document is noted.

R1-164031 **Analysis and comparison on numerology candidates Huawei, HiSilicon**

The document was presented by David Mazzarese from Huawei and provides the comparison of 15kHz family and 17.5kHz family summarized in Table4, and considering the performance in **Error! Reference source not found.**R1-164030] which shows 15kHz outperforms 17.5kHz family, 15kHz family subcarrier spacing is proposed for NR.

Discussion: Qualcomm does not agree with "For NR using 15kHz, there is no interference between NR and NB-IOT"

Decision: The document is noted.

Qualcomm suggested more offline discussion on:
How to achieve reduced latency?
How to achieve multiplexing efficiency?
How to align TTI/ symbol boundary
How to fix overhead for normal CP?

R1-164622 **NR numerology Ericsson**

The document was presented by Stefan Parkvall from Ericsson.

- RAN1 concludes on alternative 1 (Subcarrier-spacing values include 15 kHz subcarrier-spacing (i.e., "LTE-based" numerology)) as the baseline for the NR numerology
- RAN1 concludes on scale factors $N = 2^n$ as the baseline for the NR numerology.

Decision: The document is noted.

R1-165439 **Views on numerology for NR NTT DOCOMO, INC.**

The document was presented by Fred Takeda from NTT DOCOMO.

- Observation 1: Possible subcarrier spacing is determined by $f_0 * 2^m$ where m is an integer.
    - f_0=15kHz and m is an integer.

- Observation 2: Fixed CP overhead ratio for different subcarrier-spacing would be sufficient as normal CP operation.

The following table is proposed as a starting point.

	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7	Set z
SC-spacing (kHz)	15	30	60	120	240	480	960	…
CC BW (MHz)	X	2X	4X	8X	16X	32X	64X	…
Symbol length (us)	66.67	33.33	16.67	8.33	4.17	2.08	1.04	…
CP-length (us)	4.69	2.34	1.17	0.59	0.29	0.15	0.07	…
SF length (ms)	TBD after identifying detailed scheduling operations in NR							
Frame length (ms)	Periodicity of fixed DL resources can be a starting value							
Note	At least it is necessary to cover X = 20, and it is beneficial to cover X=40 FFS further wider bandwidth							

Decision: The document is noted.

R1-165525 **Discussion on NR numerology KT Corp., Verizon Wireless**

The document was presented by Hyojin Lee from KT.

Proposal 1:

- *LTE based numerology including 15 kHz subcarrier-spacing should be the baseline for NR design*
- *Alternative proposals have to be justified based on concrete use cases and significant benefits in performance or implementation perspective*

Observation 1: Taking into account available BW for NR, there are some deployment cases that cannot be efficiently supported only with 2^m scaling values for subcarrier spacing

Observation 2:

- *The scalable way as agreed in RAN1#84bis would be beneficial for different carrier frequencies since a basic frame structure and design can be easily re-used*
- *However, it is quite difficult to find any reason why the scaling to support different carrier frequencies should be restricted in 2^m values.*

Observation 3:

- *Since the basic NR system operation would be for eMBB services in most cases, it would be a sufficient design requirement that subcarrier spacing values for URLLC and mMTC should be multiplies or divisors of the one for eMBB rather than 2^m scaling relationship*
- *More important design factors should be the requirements derived for different use cases in [TR 22.891] and [*TR 38.913*]*

Proposal 2: The scalable numerologies should be designed under the assumption of linear scaling values rather than being restricted in 2^m scaling values taking into account the following three aspects:

- *To efficiently utilize available 5G bandwidths*
- *To cover wide range of target frequency up to 100GHz*
- *To support multiple use cases in the same carrier frequency*

Decision: The document is noted.

R1-165517 **WF on scaling of subcarrier spacing in NR Samsung, Intel, KT Corp., Verizon Wireless, Fiberhome**

- *$f_{sc} = f_0 * M$ (Alt. 2)* should be taken into account as the scaling method of subcarrier spacing in NR SI where *$f_0 = 15$ kHz.*
- Subcarrier spacing values to be studied in NR SI include at least
  - *{15, 30, 60, 75, 120, 150, 240, 300} kHz*

Decision: The document is noted.

Working assumption

- RAN1 concludes on alternative 1 (15 kHz) as the baseline design assumption for the NR numerology
- RAN1 concludes on scale factors N =2^n for subcarrier spacing as the baseline design assumption for the NR numerology.

Supported by Ericsson, MediaTek, Fujitsu, Panasonic, Nokia, ASB, LGE, Huawei, HiSilicon, NTT DOCOMO, Sharp, CATT, ETRI, ITRI

CMCC: object to the working assumption
Qualcomm: does not agree with 1st bullet
KT: this represents a majority's view, no consensus - should not be taken as a working assumption
Ericsson: it can always be revisited at next meeting if deemed necessary
NTT DOCOMO: if WA is to be rediscussed, should be wise to define a deadline for bringing any critical issues up – otherwise we enter in an endless discussion

Possible working assumption (CMCC, Qualcomm, KT)

- RAN1 concludes on scale factors N =2^n as the baseline design assumption for the number of OFDM symbols per 1ms

Continue offline: CMCC

Possible conclusions:

- If RAN1 finds issues about above WA including the following criteria, RAN1 should compare WA and "scale factors N = 2^n as the baseline design assumption for the number of OFDM symbols per 1 msec" by Wednesday
  - Design complexity
  - Compatibility of different numerology from time domain and frequency domain
  - Latency
  - Multiplexing efficiency
  - TTI/symbol boundary alignment
  - Overhead of Normal CP
  - Coexistence with NB-IoT and LTE
  - Scalable set of supportable CC BW

R1-165583 **WF on Scalable Numerology Symbol Boundary Alignment** **Qualcomm, ZTE, ETRI, NEC, OPPO , Panasonic, DoCoMo, Deutsch Telecom, Convida Wireless,**
Decision: The document is noted. Continue offline discussion until Wednesday

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Wednesday
R1-165821 **WF on Scalable Numerology Symbol Boundary Alignment** **Panasonic, InterDigital, Ericsson, Fujitsu, NTT DOCOMO**
Decision: The document is noted.

Possible agreements:

- In case of F0=15 kHz, with Fs=15 kHz symbol boundary of normal CP is aligned with LTE.
- For scaled numerology Fs = F0*M, in the case where Base numerology contains N symbols per ms and scaled numerology contains N*M symbols per ms
  - Each symbol length (including CP) of base numerology (w/ SCS = F0) equals the sum of the corresponding M symbols of scaled numerology (w/ SCS = Fs)
  - Each symbol may not necessarily be of the same length (e.g. in LTE numerology, symbol0 is long than symbol 1, 2, … 6)
  - Multiple CP durations per each numerology is not precluded:
    - For each CP family (NCP or ECP), each symbol length (including CP) of base numerology (w/ SCS = F0) equals the sum of the corresponding M symbols of scaled numerology (w/ SCS = Fs)
- Above is not related to synchronization among multiple transmitters like network synchronization, synchronization among UEs, different NR carrier bandwidth and so on.

Continue offline discussion until Thursday – Suzuki (Panasonic)

Thursday
R1-165886 **WF on Scalable Numerology Symbol Boundary Alignment** **Panasonic, Intel, Samsung, NTT DOCOMO, Qualcomm, Huawei, Mediatek**
Decision: The document is noted.

Working assumption:

- In the case of subcarrier spacing 15 kHz and 14 symbols per 1ms, the following applies:
  - Baseline: Symbol boundary is aligned with LTE of normal CP

Agreement: For the numerology with 15 kHz and larger subcarrier spacing ,1 msec alignment is supported

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R1-165841 **WF on NR CP type** **Huawei, HiSilicon, Intel, LGE, CATT, IITH, CEWiT, Reliance-jio, Tejas Networks, Samsung, NEC, Sony, Fujitsu, Vodafone**

- Multiple CP types should be allowed for each NR subcarrier spacing

Discussion: Qualcomm → concern on complexity – why not start with 1CP, optimize it and then decide
Nokia: clearly RAN1 should concentrate on normal CP, should take design decisions that do not prevent using any future extended CP.
Erricsson: Agree with Nokia – should not preclude having multiple CPs
Huawei: believes the need for multiple CP is already there
Decision: The document is noted.

Possible agreement: Multiple CP types/lengths without having scaling subcarrier spacing should be allowed
Continue offline discussion until Thursday – David (Huawei)

Thursday

R1-165878 **WF on further step on numerology study** **Huawei, CMCC, National Instruments, Ericsson, Orange, Vodafone, Panasonic**

- RAN1 should investigate the impact of supporting the following non-mutually exclusive options:
  - Multiple CP lengths by scaling subcarrier spacing using a single CP type/option, and enabling OFDM symbol alignment among scaled numerologies (R1-165821)
  - Multiple CP types/options without scaling subcarrier spacing (R1-165841)
  - Multiple network configuration options where the system can operate with different CP overheads (R1-165719)

Decision: The document is noted.

R1-164674 **see 7.1.1**
R1-164632 **Flexible bandwidth in NR** **Ericsson**
Decision: The document is noted.

Agreements:

- NR should support of flexible NW and UE channel bandwidth
- FFS: NR carrier bandwidth should consider to allow efficient unlicensed spectrum access
- The NR physical-layer design should allow for fine granularity in terms of NR carrier bandwidth
- The NR physical-layer design should be such that devices with different bandwidth capabilities can efficiently access the same NR carrier regardless of the NR carrier bandwidth
  - FFS: minimum bandwidth
- FFS: There should not be an assumption that devices necessarily support the same set of bandwidths for transmission and reception
- FFS: There should not be an assumption that the network carrier bandwidth is necessarily the same for downlink and uplink

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Wednesday

R1-165731 **Way forward on Numerology** **LG Electronics, NTT DOCOMO, Sprints, LGU+**
Decision: The document is noted.
R1-165660 **WF on Scalable NCP** **Qualcomm Incorporated, ZTE**
Decision: The document is noted.
R1-165719 **Discussion on frequency-domain initiated numerology and time-domain initiated numerology** **CMCC**
Decision: The document is noted.

Possible conclusions:

- RAN1 will evaluate CP length(s) for different deployments scenarios and different services
- RAN1 should carefully make decision on such kind of key parameters and design principle than dependent on more studies and evaluation. Especially full comparison from different aspects should be done to guarantee we are on the right way. Based on above observation. we propose to do some comparison from following aspects(not limited to):
  - Design complexity and future design effort
  - Overall performance

- Compatibility of different numerology from time domain and frequency domain
- Multiplexing efficiency
- Latency
- Coexistence with NB-IoT and LTE
- Scalable set of supportable CC BW

Continue offline discussion.

Thursday

R1-165842 **Proposals for evaluation of CP requirements in NR** **CMCC**

- To evaluate what is the minimal CP length in NR considering existed knowledge on delay spread
  - Scaled CP and Scaled numerologies Vs Unscaled CP and Scaled numerologies
  - Unscale CP assumes two values for comparison
    - Comparable NCP used in LTE, e.g., for 2^N SCS scheme, 4.71us, for 2^N OS scheme 5.36us
    - Half of Comparable NCP used in LTE, e.g., for 2^N SCS scheme, about 2.36us, for 2^N OS scheme about 2.68us

Decision: The document is noted.

Conclusion: For CP based scheme, companies are encouraged to evaluate/investigate necessary CP lengths for different numerologies

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R1-165734 **WF on subcarrier spacing in NR Verizon Wireless, KT Corp., Reliance-jio, CHTTL, Samsung, Intel, Potevio, Fiberhome, IITH, CEWiT, Tejas Neworks**

- Working Assumption discussed on Monday should be revisited to resolve the issues identified with 2^n scaling
- Take the following as the revised working assumption on subcarrier spacing:
  - *Working assumptions*
    - *RAN1 concludes on alternative 1 (15 kHz) as the baseline design assumption for the NR numerology*
    - *RAN1 concludes on scale factors N =2^n for subcarrier spacing as the baseline design assumption for the NR numerology*
    - *RAN1 should include the subcarrier spacing {75} kHz for different CC BW support*

Discussion: Objection from Qualcomm, Nokia, ASB, Huawei, HiSilicon, Fujitsu adding the third bullet in the WA

Decision: The document is noted.

Thursday

R1-165891 **WF on subcarrier spacing in NR Verizon Wireless, KT Corp., Reliance-jio, CHTTL, China Telecom, Samsung, Intel, Potevio, Fiberhome, IITH, CEWiT, Tejas Neworks, Straight Path, ITL, WILUS**

- *Working assumptions*
  - *RAN1 concludes on alternative 1 (15 kHz) as the baseline design assumption for the NR numerology*
  - *RAN1 concludes on scale factors N =2^n for subcarrier spacing as the baseline design assumption for the NR numerology*
  - *RAN1 include 75 kHz for subcarrier spacing as the additional baseline design assumption for the NR numerology*

Decision: The document is noted.

Conclusion: RAN1 will continue investigations on how to achieve effective use for variable bandwidths until the next meeting

Observations: Some companies proposed followings

- introducing a complementary scale factor leading to subcarrier spacing of 75 kHz for support of 100 MHz (in R1-165891)
- f0 = 17.5 kHz subcarrier spacing (R1-165112)
- f0 = 17.07 kHz subcarrier spacing (R1-164271)

R1-165807 **Way forward on timing relations for NR Frame Structure CMCC, CATT, OPPO, MediaTek, Lenovo**

Decision: The document is noted. Revised in:

R1-165871 **Way forward on timing relations for NR Frame Structure CMCC, CATT, OPPO, MediaTek, Lenovo, Huawei, HiSilicon**

- NR should at least support common design of timing relation for TDD and FDD (i.e., duplex agnostic timing relation design) in the following aspects,
  - Timing relations between DL assignment and the corresponding DL data transmission
  - Timing relations between DL data and the corresponding DL data acknowledgement
  - Timing relations between UL grant and the corresponding UL data transmission
  - Timing relations between UL data and the corresponding UL data transmission
- The common design shall consider, e.g.,
  - The indication of the timing relation, e.g., DCI and/or RRC and/or others, shall be duplex agnostic.
- Note: this does not preclude any optimization for either TDD only or FDD only

Decision: The document is noted.

Agreements:

- RAN1 strives for maximizing commonality between TDD and FDD
  - It is preferable that mechanisms to indicate the timing relation are duplex agnostic
  - Note: This does not preclude any optimization either for FDD only or TDD only

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R1-165456 **Summary of email discussion on frame structure Qualcomm Incorporated**

The document was presented by Joseph Soriaga from Qualcomm.

- Potential Agreement 1: NR frame structure should defined using two basic types of time intervals: time interval A which would be expressed as multiple of symbols, and time interval B which is expressed as absolute time (nominally 1ms). An integer scaling relationship between these two time intervals may follow from the numerology for subcarrier spacing.
- Observation 1: When the time interval A is shortened/extended, the frequency granularity is also scaled to wider/narrower. One atomic block size is defined dimensioned by one time interval A and one frequency granularity.
- Potential Agreement 2: An atomic block size is basically common between paired and unpaired spectrum. Specific optimization for paired and unpaired spectrum is not precluded.
- Observation 2: There was commonality in defining time interval A to have up to one switch between DL and UL.
- Potential Agreement 3: Consideration of baseline frame structures in Table 1, but FFS multiple gaps within time interval A with respect to forward compatibility.
- Potential Agreement 4: The RS used to demodulate a data transmission is located FFS near before and/or within a time interval A. FFS whether a time interval A always has the RS used to demodulate a data transmission.
- Potential Agreement 5: The NR design should strive to reduce the time between the assignment to the corresponding data and the time between the data to the corresponding acknowledgement. FFS whether the time can be short enough so that the exchange is confined within time interval A.
- Potential Agreement 6: The scaling of time interval A is realized by the changing the number of the symbols without changing the numerology, or by the keeping the number of the symbols with changing the numerology.

Decision: The document is noted.

R1-165685 **WF on Phase Noise Modeling Nokia, Alcatel-Lucent Shanghai Bell, NTT DoCoMo, Samsung, Qualcomm, Ericsson, Intel, InterDigital**

PN model should be developed for evaluation of NR systems for above 6GHz with the following principles

- Proposal #1:
  - Phase noise model for UE should be considered for the evaluation by default.
  - Implementation cost, complexity and power consumption at the UE should be taken into account.
  - The PN modelling in eNB is FFS.
- Proposal #2:
  - Realistic PN model should consider total oscillator PSD including the impact of reference clock, loop filter noise and VCO sub-components. (e.g. PLL-based model, multi-pole/zero model)
  - Each company should provide the model and the parameters used for the evaluation.
- Proposal #3:
  - The oscillator PSD level increases by 20dBc/Hz per decade of increase of the carrier frequency. (Baseline)
  - A different parameter set of phase noise model can be defined for specific target frequency.
- Proposal #4:
  - Companies are encouraged to provide link level evaluation result with the phase noise model. Following phase noise models are provided as examples.

    - UE model in R1-164041
    - Proposed WF in R1-165005
    - Model A in R1-163984
    - mmMagic high and low model
  - Other phase noise model is not precluded.
  - Companies should provide which phase noise model is applied for the evaluation.

Decision: The document is noted and modified as follows:

Agreements:

- Companies should use following PN model principles for evaluation of NR for above 6GHz
  - Phase noise model for UE should be considered for the evaluation by default.
  - Implementation cost, complexity and power consumption at the UE should be taken into account.
  - The PN modelling in TRP is FFS.
  - Realistic PN model should consider total oscillator PSD including the impact of reference clock, loop filter noise and VCO sub-components. (e.g. PLL-based model, multi-pole/zero model)
  - Each company should provide the model and the parameters used for the evaluation.
  - The oscillator PSD level increases by 20dB per decade of increase of the carrier frequency as a baseline to scale PSD level
  - A different parameter set of phase noise model can be defined for specific target frequency.
  - Companies are encouraged to provide link level evaluation result with the phase noise model. Following phase noise models are provided as examples which are captured in R1-165685 (in page 5 – 8)
    - UE model in R1-164041
    - Proposed WF in R1-165005
    - Model A in R1-163984
    - mmMAGIC high and low model
  - Other phase noise model is not precluded.
  - Companies should provide which phase noise model is applied for the evaluation.

R1-165575 **Way Forward On Frame Structure** **Qualcomm, Ericsson, Panasonic, NTT Docomo, ZTE, Convida, Nokia, ASB, Sony, Intel**

The document was presented by Joseph Soriaga from Qualcomm.

- At least the following is studied in NR in order to reduce decoding latency
  - RS used to demodulate a data transmission is located at the beginning of the time interval to which the data and associated RS for demodulation is physically mapped

Discussion: Also supported by InterDigital.

Decision: The document is noted, agreed as follows:

Agreements:

- At least the following is studied for NR in order to reduce decoding latency
  - RS used to start to demodulate a data transmission is located at the beginning of the time interval to which the data and associated RS for demodulation is physically mapped
- Other additional RS design associated with data demodulation is not precluded

R1-165669 **Way Forward On Frame Structure** **Qualcomm, OPPO, MediaTek, Intel, CATT, DOCOMO, InterDigital, Samsung, Sony, ZTE, Ericsson, Panasonic, ITRI, ETRI**

- At least the following should be supported for NR
  - A time interval X which can contain one or more of the following
    - DL transmission part
    - Guard
    - UL transmission part
  - Dynamic and Semi-static operations are studied
  - Furthermore, the following is supported
    - The DL transmission part of time interval X to contain downlink control information and/or downlink data transmissions and/or reference signals
    - The UL transmission part of time interval X to contain uplink control information and/or uplink data transmissions and/or reference signals
  - FFS length(s) of time interval X
  - Note: The usage of DL and UL does not preclude other deployment scenarios e.g., sidelink, backhaul, relay

Decision: The document is noted and modified as follows:

Agreements:

- At least the following should be supported for NR in a frequency portion
  - A time interval X which can contain one or more of the following
    - DL transmission part
    - Guard
    - UL transmission part
  - FFS which combinations are supported and whether they are indicated dynamically and/or semi-statically
  - Furthermore, the following is supported
    - The DL transmission part of time interval X to contain downlink control information and/or downlink data transmissions and/or reference signals
    - The UL transmission part of time interval X to contain uplink control information and/or uplink data transmissions and/or reference signals
  - FFS length(s) of time interval X
  - FFS: other characteristics of time interval X
  - Note: The usage of DL and UL does not preclude other deployment scenarios e.g., sidelink, backhaul, relay

R1-165662 **WF on NR frame structure** **Samsung, Mediatek, Intel, NTT DOCOMO, CMCC, Panasonic, Sony, ITRI, Interdigital, LG Electronics**

- At least the following is supported for NR frame structure
  - Following timing relationships are indicated to a UE dynamically and/or semi-statically
    - Timing relationship between DL data reception and corresponding acknowledgement
    - Timing relationship between UL assignment and corresponding UL data transmission
  - Following timing relationship is FFS whether fixed and/or dynamically and/or semi-statically indicated
    - Timing relationship between DL assignment and corresponding DL data reception
  - For above two sub-bullets
    - Potential values for each timing relationship has to be studied further considering e.g., UE processing capability, gap overhead, UL coverage, and etc.
    - Default value, if any, for each timing relationship is FFS.

Decision: The document is noted and the WF is agreed.

R1-165700 **Way Forward on Frame Structure Timing Relations** **Ericsson, Qualcomm, ZTE, NTT DOCOMO**
Decision: The document is noted.
R1-165739 **NR Frame Structure Timing Relations** **Ericsson**
Decision: The document is noted.

Agreements:

- NR design should strive at least to enable the possibility for
  - Corresponding acknowledgement reporting shortly (in the order of X μs) after the end of the DL data transmission
  - Corresponding uplink data transmission shortly (in the order of Y μs) after reception of UL assignment
  - Note: may depend on e.g. UE capability/category, payload size, etc
  - FFS: X and Y in the order of a few tens of or hundreds of micro sec is feasible
- Other mechanisms/configurations in addition to fast/short corresponding acknowledgement are needed
  - For example to provide coverage or enable TD-LTE coexistence
- Note: RAN1 will continue investigations about UE complexity, implementation processing time, interleaving applicability

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Thursday
R1-165818 **Way Forward on frame structure for NR** **LG Electronics, CATT, ETRI, Lenovo**
Decision: The document is noted. Revised in:
R1-165896 **Way Forward on frame structure for NR** **LG Electronics, CATT, ETRI, Lenovo**
Decision: The document is noted.
R1-165931 **Way Forward on time interval for NR** **LG Electronics, CATT**

- Following type of time interval is needed in NR
  - UE-common time interval

- This is to be known by the UE for access to network for a given numerology
- FFS on the length of this time interval
- FFS on the relationship between this time interval and the time interval X, in terms of the length

Decision: The document is noted.

R1-165840 **Way Forward on NR frame structure with asynchronous UL HARQ ZTE, Qualcomm, Ericsson, DOCOMO, ETRI**

- NR should at least support asynchronous hybrid ARQ in the UL to avoid fixed timing relationship between initial transmission and re-transmission

Decision: The document is noted and modified as follows:

Agreement: NR should support at least asynchronous hybrid ARQ in the DL and UL to avoid fixed timing relationship between initial transmission and re-transmission

R1-165872 **WF on minimum HARQ Timing LG Electronics, Panasonic**
Decision: The document is noted. Revised in:
R1-165887 **WF on minimum HARQ Timing LG Electronics, Panasonic, Qualcomm, NTT DOCOMO**
Decision: The document is noted, modified as follows:

Agreements:

- NR design should strive to enable the possibility for
  - Corresponding retransmission shortly (in the order of Z μs) after the end of acknowledgement reporting
  - FFS: Z in the order of a few tens of or hundreds of micro sec is feasible

R1-165955 **WF on time interval X Huawei, HiSilicon, Qualcomm, Nokia, ASB**

- At least the following combinations with time order for time interval X should be supported
  - Combination 1: DL transmission part, a possible guard
  - Combination 2: A possible guard, uplink transmission part
  - Combination 3: A DL transmission part, a guard, and an UL transmission part

Decision: The document is noted and modified as follows:

Possible agreements:

- At least the following combinations for time interval X should be supported
  - Combination 1: DL transmission part, possible guard(s)
  - Combination 2: Possible guard(s), uplink transmission part
  - FFS: Combination 3: A DL transmission part, a guard, and an UL transmission part

Continue offline discussion until Friday – (Huawei)

Friday
R1-166013 **WF on time interval X Huawei, HiSilicon, Qualcomm, Nokia, ASB**
Decision: The document is noted.

R1-165877 **WF on wireless relay/backhaul for NR Samsung, AT&T, Ericsson**
Decision: The document is noted.
R1-165902 **WF on wireless backhaul for NR Samsung, AT&T, Ericsson, Intel, IITH, CEWiT, Tejas Networks, Reliance-jio, Straight Path**

- NR should allow for efficient same frequency operation between the access link and backhaul link.
- NR should also allow for efficient operation when the backhaul link and access link are on different frequencies. This includes:
  - Operation of backhaul link and access link on different frequencies in the same band
  - Operation of backhaul link and access link in different bands
- Note: The term 'backhaul link' does not make any assumption on NR RAN architecture design options

Decision: The document is agreed.

Friday
R1-165990 **WF on Frame Structure and Evaluation Qualcomm, Huawei, HiSilicon, NTT DOCOMO, Ericsson**
Decision: The document is noted. Also supported by ZTE, Panasonic. Revised in:

R1-166027 **WF on Frame Structure and Evaluation Qualcomm, Panasonic, NTT DOCOMO, KT Corp, MediaTek, Intel**

Decision: The document is noted and modified as follows:

Agreements:

- At least the following time domain structures should be studied/evaluated for NR
  - DL transmission region (containing data assignments and data), guard region, UL transmission region (containing UCI)
  - DL transmission region (containing data assignments), guard region, UL transmission region (containing data, UCI)
  - Other structures not precluded
  - Note: there is no assumption between the relationship of assignments and data in the above
  - FFS: there can be guard region after the uplink transmission region.
- FFS: Study candidate solutions where 1 structure spans at most a time interval of 1 ms
- FFS: Metrics for study/evaluation
- Note: This does not preclude the same structure could span multiple 1 msecs

Not treated.

R1-163994 Discussions on control signaling for NR Samsung
R1-163995 Discussions on reference signal design for NR Samsung
R1-163996 Discussion on the base subcarrier spacing for NR Samsung
R1-163997 Cell search for NR: design consideration Samsung
R1-163998 Proposed set of numerologies for NR Samsung
R1-163999 Discussion on different scaling methods for NR subcarrier spacing Samsung
R1-164000 Unified framework for NR physical layer Samsung
R1-164001 Framework for multiplexing verticals in NR Samsung
R1-164002 Design aspects of URLLC for NR Samsung
R1-164003 Dynamic TDD for NR Samsung
R1-164004 Discussion on TTI, subframe and signaling timing for NR Samsung
R1-164005 Support of wireless relay for NR Samsung
R1-164006 Design aspects of mMTC for NR Samsung
R1-164030 Evaluation of scalable numerology proposals Huawei, HiSilicon
R1-164032 Discussion on frame structure for NR Huawei, HiSilicon
R1-164179 Subcarrier spacing and scaling for new RAT Intel Corporation
R1-164180 Low Latency Frame Structure Design for NR Intel Corporation
R1-164181 NR Operation in Unlicensed Spectrum Intel Corporation
R1-164248 NR frame structure design CATT
R1-164249 Discussion of NR numerology CATT
R1-164261 Forward compatibility of numerology and frame structure design ZTE
R1-164272 Performance evaluation of numerology candidates ZTE
R1-164273 Frequency multiplexing of different numerologies ZTE
R1-164274 Frame structure for NR ZTE
R1-164275 NR frame structure for unlicensed spectrum ZTE
R1-164276 Discussions on HARQ operation for NR ZTE
R1-164330 NR sub-carrier spacing Fujitsu
R1-164331 TDD frame structure with mixed numerology Fujitsu
R1-164332 NR Frame structure considerations for low latency TDD operation Fujitsu
R1-164333 Discussion on flexible/dynamic TDD Fujitsu
R1-164347 Numerology for 5G NR Fiberhome Technologies Group
R1-164380 Frame Structure Design Considerations for Bands above 6 GHz Huawei, HiSilicon
R1-164381 Impact of directional transmission on NR numerology for high frequency bands Huawei, HiSilicon
R1-164472 Frame structure supporting flexible parameter allocations Guangdong OPPO Mobile Telecom.
R1-164482 Considerations on the design of frame structure for NR NEC
R1-164486 Subcarrier spacing and other parameters for numerology NEC
R1-164560 Discussion on frame structure for NR LG Electronics

R1-164561	Support different numerology and different usage scenarios	LG Electronics
R1-164562	Consideration of Flexible and Full duplex operation in NR design	LG Electronics
R1-164590	Discussion on numerology sets	Spreadtrum Communications
R1-164591	Discussion on frame structure	Spreadtrum Communications
R1-164621	On a 30kHz subcarrier spacing option for NR	Ericsson
R1-164627	Hybrid-ARQ acknowledgements for NR	Ericsson
R1-164628	Frame structure for NR	Ericsson
R1-164630	Performance difference between 60 and 75 kHz subcarrier spacing	Ericsson
R1-164631	Duplex schemes for NR	Ericsson
R1-164652	Frame structure design for new radio interface	Lenovo (Beijing) Ltd
R1-164657	Discussion on frame structure design for NR	Sony
R1-164658	Discussion on numerology design for NR	Sony
R1-164665	Frame structure for New Radio	INTERDIGITAL COMMUNICATIONS
R1-164666	Numerology for New Radio	INTERDIGITAL COMMUNICATIONS
R1-164690	NB-IOT Coexistence Analysis for NR Numerology	Qualcomm Incorporated
R1-164691	NR numerology design and evaluation for long delay spread channels	Qualcomm Incorporated
R1-164693	NR sampling rate related numerology considerations for eMBB and mMTC	Qualcomm Incorporated
R1-164694	Frame structure requirements	Qualcomm Incorporated
R1-164695	Candidate frame structures	Qualcomm Incorporated
R1-164723	Numerology and Frame Structure for NR-Unlicensed	Huawei, HiSilicon
R1-164870	Discussion on numerology for NR	ETRI
R1-164871	Frame structure for new radio interface	ETRI
R1-164890	Discussion on the frame structure design for new radio	CMCC
R1-164915	Transient period on NR uplink frame structure design	Panasonic Corporation
R1-164973	NR frame structure considering coexistence with TDD LTE	SoftBank Corp.
R1-164985	Discussion on the multiplexing of different numerologies	Panasonic
R1-165024	Flexible numerology for 5G	Nokia, Alcatel-Lucent Shanghai Bell
R1-165025	Comparison of different numerology scaling principles	Nokia, Alcatel-Lucent Shanghai Bell
R1-165026	Comparison of different subcarrier spacings	Nokia, Alcatel-Lucent Shanghai Bell
R1-165027	Basic frame structure principles for 5G	Nokia, Alcatel-Lucent Shanghai Bell
R1-165028	URLLC U-plane latency analysis	Nokia, Alcatel-Lucent Shanghai Bell
R1-165029	Main components for forward compatible frame structure design in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-165030	On the unlicensed band operation in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-165031	On the wireless relay operation in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-165055	Discussion on Frame Structure for NR	Cohere Technologies
R1-165083	Consideration on URLLC in NR frame structure	ZTE
R1-165107	Numerology and Frame Structure for NR	Motorola Mobility
R1-165162	On Numerology for New Radio Access Technology	MediaTek Inc.
R1-165163	Flexible Frame Structure for New Radio Access Technology	MediaTek Inc.
R1-165176	Discussion on frame structure for NR	NTT DOCOMO, INC.
R1-165178	Views on domodulation RS design for NR access technology	NTT DOCOMO, INC.
R1-165217	Consideration on frame structure for NR	Beijing Xiaomi Mobile Software
R1-165242	On Frame Structure for NR	Innovative Technology Lab Co.
R1-165285	Bidirectional frame structure for imparity CCFD scheme	III
R1-165291	Discussions on the numerology and frame structure design for NR	CATR
R1-165311	Considerations on frame structure for NR	KT Corp.
R1-165316	Scalable numerology for New RAT	Sharp
R1-165371	Discussion of Numerology for NR	Convida Wireless LLC
R1-165431	Initial Evaluation Result for NR Numerology	LG Electronics
R1-165436	Discussions on reference signal design for NR	Samsung
R1-165811	WF on Frame Structure and Control Interference	Qualcomm
R1-165833	Mixed Numerology in an OFDM System	Ericsson
R1-165925	WF on frame structure for NR	LG Electronics, CATT

R1-166032 Way Forward on Ack/Nack feedback of DL HARQ for NR ZTE, ZTE Microelectronics, Ericsson, Qualcomm, NTT DOCOMO

7.1.5 Channel coding and modulation for new radio interface

R1-165945 Chairman's Notes of Agenda Item 7.1.5 on Ch_Coding Ad-hoc chair (Nokia)
The document was presented by Matthew Baker from Nokia and provides the outcomes of the session.
Decision: The document is endorsed. Contents incorporated below.

7.1.5.1 Channel coding

Comparisons
General
R1-165641 Comparison of coding schemes for NR Intel Corporation (R1-164182)
R1-164277 Evaluation on performance and complexity of channel coding for NR ZTE
R1-164704 Channel coding evaluation assumptions - performance and complexity Qualcomm Incorporated
R1-164564 Performance and complexity comparison of existing Turbo and LDPC codes LG Electronics

eMBB
R1-164812 Preliminary evaluation results on new channel coding scheme for NR - LDPC code for high throughput Samsung
R1-164360 Analysis of Candidate Code Types for Long Block Length Ericsson
R1-164377 Performance of channel coding schemes for eMBB scenario Huawei, HiSilicon
R1-165060 Performance Evaluation of Channel Coding for eMBB INTERDIGITAL COMMUNICATIONS
R1-165357 Performance of eMBB channel coding candidates Nokia, Alcatel-Lucent Shanghai Bell
R1-165360 Selection of the eMBB channel coding scheme Nokia, Alcatel-Lucent Shanghai Bell

R1-165657 WF on channel coding for eMBB Nokia, ASB

Proposal:
- Conclusion:
  - At least LDPC and Polar can support the high code rate and high throughput scenarios
- Further study:
  - Study further whether modified Turbo or Polar codes can satisfy the high code rate and high throughput scenarios; working assumption may be revisited if so
  - Implementation details should be provided for the decoding algorithms used in the simulation results for other eMBB coding candidates, i.e. Turbo and Polar
    - E.g. : Survey on the existing implementation efforts

R1-165637 Way Forward on Channel Coding Scheme for New Radio Samsung, Nokia, Qualcomm, Intel, ZTE
Also supported by Sharp
Proposed conclusions:
– All candidate channel coding schemes for eMBB application show comparable link performance in most cases
– Observations on LTE turbo code for high code rates
  – LTE turbo code requires higher decoder computational complexity compared to LDPC code
  – LDPC code is superior to LTE turbo code in terms of latency and high data throughput
  – ~~LTE turbo code starts generating error floor between BLER=10^{-2} and 10^{-3} for high code rates and for some large information block lengths (e.g. some sizes ≥1000 bits)~~
– ~~LDPC code can be designed to meet the flexibility required for application scenarios in NR systems~~

Observations:
- At least in AWGN channels:
  - For large information block sizes, all candidate channel coding schemes show comparable link performance
- Further study is required on all potential coding schemes in order to determine which coding scheme(s) should be supported, including:
  - Implementation details should be provided for the decoding algorithms used in the simulation results, e.g. survey on the existing implementation efforts

FFS:

- At least in AWGN channels:
  - [For small information block sizes, performance of Polar codes is comparable to or better than other candidate schemes depending on the Polar decoding technique and code rate]
- [At least LDPC can support the high code rate and high throughput scenarios]
- [At least Polar codes can support the high code rate and high throughput scenarios]
- Compared to LTE turbo code:
  - [At high code rates and high throughputs, LTE turbo code requires higher decoder computational complexity compared to LDPC code]
  - [Considering all code rates and all information block sizes and HARQ requirements, LTE turbo code has comparable decoder computational complexity compared to LDPC code]
- [Flexibility requirements and feasibility]

R1-165598 **WF on small block length** **Huawei, HiSilicon, Interdigital, Mediatek, Qualcomm**

Proposal:

- Observation - From the evaluation results
  - TBCC and polar codes show best performance for (K=20,40)
  - For K larger than 100 and lower than 1000, polar outperforms TBCC for all choices of code rate and list-size
- Proposal
  - At least for mMTC and URLLC, For small information block lengths ~~(e.g. 200 bits)~~, at least Polar codes and TBCC Codes are considered as candidate schemes.
    - FFS what is meant by "small"
  - Further evaluation of performance and complexity/latency needs to be done

R1-165726 **Code type for small info block length in NR** **Ericsson, Nokia, ASB**

Proposal:

- Observation
  - For short info block lengths and low code rate, TBCC and Turbo code perform well compared to LDPC and Polar codes
- Proposal
  - Baseline ~~C~~channel code type for short info block lengths (including at least: DL control channel and mMTC DL) in NR is tail-biting convolutional code (TBCC)
    - Can be revisited if problems are identified

R1-165741 **WF on further study of complexity of channel code** **LG, Ericsson, Orange**

Agreement: As one potential input to the decisions on channel coding:

- Companies are encouraged to bring evaluations of the complexity of channel coding / HARQ schemes including at least:
  - Energy efficiency (J/bit)
  - Area efficiency (Gbps/mm^2)
- FEC complexity supporting the full range of info block lengths and code rates with reasonable (details FFS) granularity should be compared instead of single info block length with some code rate
  - Companies should provide details of the range of info block lengths and code rates for which their complexity evaluations are conducted

R1-165959 **WF on channel coding simulation data sharing** **Qualcomm**

Agreement:

- Include file format of results with contribution
  - Use excel file template provided in ExampleResults.xlsx
  - Multiple columns for
    - QAM, Rate, Info. Blocklength, Es/N0, Eb/N0, BLER
  - Separate tab to provide context
    - Contribution#, name of code, decoder implementation, #iterations or list size, brief details of code construction, brief details of rate matching algorithm, #CRC bits, and other parameters

    - The referenced accompanying contribution should provide enough details to enable other companies to repeat the simulations
- Companies encouraged to submit with their contribution for RAN1 #86

mMTC, URLLC

R1-164359 **Performance Evaluation of Turbo Codes and LDPC Codes at Higher Code Rates** **Ericsson**

LDPC Details and Performance

R1-164697 **LDPC design overview** **Qualcomm Incorporated**
R1-165409 **Consideration on LDPC codes for NR** **ZTE** (R1-164278)

R1-165643 **WF on LDPC schemes for NR** **ZTE, ZTE Microelectronics, Nokia, Qualcomm, InterDigital, MediaTek, Intel, Samsung**
Also supported by Sharp

Agreement:

- For the purpose of study and comparisons, quasi-cyclic like LDPC codes are defined as follows:
    - The Parity check matrix of Quasi-cyclic like LDPC Codes is defined at least by a matrix H of size (mb×z)×(nb×z), which consists of sub-block matrices of size z×z, where each sub-block matrix is composed by circularly shifted matrices or zero matrices. Wherein, mb, nb and z are integers larger than 1.
        - The values of mb, nb and z are FFS.
- Companies providing evaluations or proposals for LDPC codes are encouraged to show how:
    - Multiple code rates and multiple code sizes would be supported,
    - Suitable granularity of information block size and code rate would be supported,
    - How to support HARQ with/without IR.

Polar Coding Details and Performance

R1-164039 **Polar codes - encoding and decoding** **Huawei, HiSilicon**
R1-164184 **Polar code design for NR** **Intel Corporation**
Note that the curves for L=8 and L=32 are indicated the wrong way round in Fig 2

Turbo coding Details and Performance

R1-164251 **Performance evaluation of binary turbo codes with low complexity decoding algorithm** **CATT**
R1-164635 **Improved LTE turbo codes for NR** **ORANGE**
R1-164361 **Turbo Code Enhancements** **Ericsson**

R1-165792 **WF on turbo coding** **LG, Ericsson, CATT, Orange**
Proposed observation:

- Turbo codes in general ~~provide~~ show potential for full flexibility of all code rates and all information block sizes, e.g. from 40 bits to 8192 bits

Outer coding

R1-165954 **WF on Outer Coding** **ZTE**
Revisit at RAN1#86.

Not treated.

R1-164007 Flexibility of LDPC - Length, Rate and IR-HARQ Samsung
R1-164008 Preliminary evaluation results on new channel coding scheme for NR Samsung
R1-164009 Discussion on throughput, latency for new channel coding scheme for NR Samsung
R1-164040 On latency and complexity Huawei, HiSilicon
R1-164183 LDPC code design for NR Intel Corporation
R1-164185 Polar code constructions for evaluations Intel Corporation
R1-164186 Performance evaluation of coding schemes for NR Intel Corporation
R1-164250 Performance evaluation of non-binary LDPC codes CATT

R1-164252 Performance evaluation of non-binary turbo codes CATT
R1-164279 Throughput and latency analysis on new channel coding candidates for NR ZTE
R1-164280 Consideration on outer code for NR ZTE
R1-164356 Performance Evaluation of TBCC and Polar Codes Ericsson
R1-164357 Analysis of Candidate Code Types for Short Block Length Ericsson
R1-164358 Performance Evaluation of Turbo Codes and LDPC Codes at Lower Code Rates Ericsson
R1-164375 Evaluation of polar codes for eMBB scenario Huawei, HiSilicon
R1-164378 Performance of channel coding schemes for mMTC and URLLC scenarios Huawei, HiSilicon
R1-164563 Discussion on channel coding scheme considering NR KPIs LG Electronics
R1-164565 Discussions on polar code design LG Electronics
R1-164592 Simulation results of Turbo and Polar codes Spreadtrum Communications
R1-164667 Outer erasure code for efficient multiplexing INTERDIGITAL COMMUNICATIONS
R1-164698 LDPC - Performance evaluation Qualcomm Incorporated
R1-164699 Polar code design overview Qualcomm Incorporated
R1-164700 Polar - Performance evaluation Qualcomm Incorporated
R1-164701 TBCC design overview Qualcomm Incorporated
R1-164702 TBCC-Performance evaluation Qualcomm Incorporated
R1-164703 Outer erasure code use cases and evaluation assumptions Qualcomm Incorporated
R1-164813 Design of LDPC code for high throughput Samsung
R1-165036 Impact of Number of Iterations in Decoding Turbo and LDPC codes Ericsson Inc.
R1-165059 Performance Evaluation of Channel Coding for URLLC and mMTC INTERDIGITAL COMMUNICATIONS
R1-165284 Channel Coding for NR NTT DOCOMO, INC.
R1-165358 Performance of mMTC and URLLC channel coding candidates Nokia, Alcatel-Lucent Shanghai Bell
R1-165359 Latency considerations for URLLC channel coding candidates Nokia, Alcatel-Lucent Shanghai Bell
R1-165428 Performance evaluation of binary LDPC codes CATT
R1-165453 Discussion on LDPC Code Design and Performance Evaluation MediaTek Inc.
R1-165454 Discussion on Polar Code Design and Performance MediaTek Inc.
R1-165492 WF on channel coding evaluation Qualcomm
R1-165599 Evaluation of TBCC and polar codes for small block lengths Huawei, HiSilicon
R1-165725 Turbo Code Performance Comparison Ericsson

7.1.5.2 Modulation

Not treated.

R1-164187 Modulation schemes for New RAT Intel Corporation
R1-164566 Maximum Supported Modulation Order for above 6GHz LG Electronics
R1-164626 On modulation schemes for NR Ericsson
R1-164653 Considerations for non-uniform constellations for NR Sony
R1-164705 NR modulation requirements Qualcomm Incorporated
R1-164706 Evaluation assumptions for NR modulation schemes Qualcomm Incorporated
R1-165061 Evaluation of Spatial Modulation for New Radio INTERDIGITAL COMMUNICATIONS
R1-165361 Digital Modulation for 5G New Radio Nokia, Alcatel-Lucent Shanghai Bell
R1-165718 WF on baseline modulation schemes for NR study LG Electronics, Intel, Nokia, ASB
R1-165919 WF on modulation for NR InterDigital

7.1.6 Multi-antenna scheme for new radio interface

Discuss initial views on multi-antenna scheme including enhanced massive MIMO analog/digital/hybrid beam-forming

R1-164013 Framework for beamformed access Samsung

- *Observation 1: Relying solely on digital precoding to compensate for the additional path-loss in higher frequencies will lead to excessive implementation burden.*
- *Proposal 1: Adopt hybrid beamforming as a baseline MIMO/beamforming scheme for higher frequencies in NR.*
- *Proposal 2: For beamformed access, introduce beam sweeping for providing basic coverage in NR.*
  - *Strive for minimizing the overhead related to the beam sweeping.*

- *Proposal 3: Study beam-sweeping based designs for initial access in NR: at least for synchronization signals, broadcast channel and random access channel.*
- *Proposal 4: Study beam-sweeping based designs for RRM measurements in NR.*

Decision: The document is noted.

R1-164372 **Coverage Issues of Massive MIMO in NR Huawei, HiSilicon**

Observation 1: Additional gain is needed for NR to achieve similar coverage as LTE.
Observation 2: Beam based scheme outperforms repetition based scheme in terms of coverage performance.
Proposal 1: Investigate SFN as a complementary solution for coverage improvement in NR.
Proposal 2: Investigate power boosting solution to improve the coverage of NR.
Proposal 3: Investigate beam based access to improve the coverage of NR.
Proposal 4: The following principles need to be considered for the enhancements on coverage limited signals (such as synchronization and broadcast signals):

- *The signal design should take into account the performance, overhead , complexity and reliability.*
  - *Impacts from phase noise should be considered in system design for HF bands.*
- *The signal design should consider the adopted numerology and multiple access schemes.*

Decision: The document is noted.

R1-164925 **Considerations of digital beam forming on multi antenna scheme MTI**

- Observation#1: Clearly, DBF has the high performance, and give best operational flexibility with slightly higher cost. The DBF is put the complexity at the cell side, and minimize the complexity and power constraints at UE.
- Observation#2: The cost of DBF is mainly coming from parallel channels of IFP that convert signals from digital domain to IF domain. The IFP may be expensive when design with discrete components, but would be substantially lower cost when implemented with digital IC and RFIC, and when produced at high quantity.
- Proposal 1: Digital beamforming which adopts digital precoding to adjust the beam direction and operating sub band should be considered as well for NR.
- Proposal 2: RAN1 should discuss the design aspects and architecture for DBF, especially considering the maximization of orthogonality and relative blind decoding.

Decision: The document is noted.

R1-165179 **Discussion on NR MIMO NTT DOCOMO, INC.**

Proposal 1: Following requirements should be considered for NR MIMO design.

- *Feasible overhead for DL/UL RSs and feedback*
- *Versatile technology for different*
  - *Antenna configurations (e.g., number/arrangement of antenna elements and virtualization)*
  - *Frequency bands (e.g., low frequency to mmWave*
  - *Duplex schemes, e.g., FDD/TDD/eTDD*

Proposal 2: Beamforming, SU-MIMO and MU-MIMO should be studied for higher frequency NR together with optimization for massive array and reciprocal systems.
Proposal 3: Following issues should be studied for higher frequency.

- *Impact of blockage effect and possible solutions*
- *Effect of multi-cell association technology*
- *Interference measurement schemes (e.g., flush-light effect and measurement for reciprocal systems)*

Proposal 4: For higher frequency, effect of beamforming on common channels/signals should be studied together with other potential technologies such as repetition, power boosting and SFN transmission.
Proposal 5: Multi-antenna technologies for NR should be applicable for hybrid beamforming (or analogue beamforming).
Proposal 6: For frequencies below 6 GHz, beamforming can be applied both for common and data-plane channels/signals, although details should be discussed together with the design for over 6 GHz.

Decision: The document is noted.

R1-164191 **UL MIMO for new radio interface Intel Corporation**

- Proposal 1:
  - For below 6GHz band, consider both digital and hybrid antennas at eNB and omni-directional antenna at UE in the NR design.

  - For above 6GHz band, consider multiple hybrid antennas at eNB and multiple hybrid antennas at UE, e.g. two and facing opposite direction, in the NR design.
- Proposal 2:
  - For below 6GHz band, both sub-array and fully connected virtualization for TRP can be supported by using LTE FD-MIMO framework.
  - For above 6GHz band, prioritize the 2D sub-array based virtualization for eNB/UE in the NR design.
  - It is worth to clarify whether TXRU can be connected to different antenna arrays dynamically at UE.
- Proposal 3:
  - eNB/UE vendors to state intra-array antenna calibration and inter-array antenna calibration assumption for the NR design.
  - NR system design should be flexible enough for different antenna calibration assumptions.
- Proposal 4:
  - Design UL NR MIMO assuming the listed scenarios in Figure 1. UL NR MIMO should support stand-alone operation for all possible bands, however, optimization of the capacity booster layer at middle/high band assuming a coverage layer using LTE or NR at low band can also be considered.
  - Proposal 5:
  - Strive to have a unified uplink NR MIMO framework for all NR bands.
  - Have a relatively independent uplink beam management procedure to downlink
  - Have a beam management framework which can address various scenarios including inter-TRP and intra-TRP beam mobility scenarios.
  - Design uplink physical channels considering the hybrid antennas at both sides of the link.
  - Apply relevant NR MIMO scenarios for various uplink physical channels/signals.
  - Study uplink power control scheme in a beam centric environment.
  - NR at low band should target the same SU-MIMO dimension and higher MU-MIMO dimension than LTE. SRS and DMRS should be designed to be compatible with other system design aspects and better support reciprocity based operation.

Decision: The document is noted.

R1-164892 **General Views on Reference Signal Design** **CMCC**

- Proposal 1: At least NR_SS, NR_CSI-RS and NR_DMRS should be considered for downlink reference signals of NR.
- Proposal 2: A two-stage CSI feedback and corresponding CSI-RS design could be considered in NR
- Proposal 3: NR_SRS and NR_DMRS, whose functionalities are analogous to SRS and DMRS in LTE, could be considered for uplink reference signals of NR.
- Proposal 4: The design of NR_SRS should try to improve its capacity to ensure the accuracy of channel reciprocity in TDD system.

Decision: The document is noted.

R1-164116 **Consideration on muti-antenna schemes for new radio** **Beijing Xinwei Telecom Techn.**

- *Observation 1: Reduction of broadcast signal is also beneficial from perspective of large scale MIMO.*
- *Observation 2: Channel reciprocity in TDD should be carefully invoked, considering the problem of RS contamination and fewer digital chains than antenna elements.*
- *Proposal 1: A universal MIMO framework should be established in the study item for the compatibility of the two-phase standardization process.*
  - *The universal framework should accommodate requirements for different scenarios, including over-6GHz and sub-6GHz deployment.*
- *Proposal 2: Antenna modelling within the NR MIMO framework should not limit the possibility of applying other types of antennas besides URPA.*
- *Proposal 3: The possibility of multiple TXRUs fully connected to the same subarray should not be precluded.*
- *Proposal 4: Novel access and data transmission procedure should be designed with as few broadcast signal as possible and facilitate the usage of spatial information.*
- *Proposal 5: Spatial sparsity of channels could be leveraged to reduce RS overhead.*
- *Proposal 6: RS for spatial information is also beneficial in TDD system.*
- *Proposal 7: Feedback based on RS measurement should be considered as the baseline for NR. Other form of feedback should compared with the baseline on overhead, complexity and performance.*
- *Proposal 8: For antenna array besides URPA, measurement and feedback framework based on beamformed reference signal should be studied.*
- *Proposal 9: Distributed large scale MIMO should be natively supported and facilitated in the NR MIMO framework.*
- *Proposal 10: For distributed large scale MIMO, distributed MRT based scheme should be considered as the baseline for further study.*

Decision: The document is noted.

R1-164117 **Overview of Massive MIMO for NR National Instruments Corp.**

- Observation 1: Massive MIMO beamforms to a point, conventional beamforming beamforms to a direction.
- Observation 2: Reciprocity based TDD NR MIMO is a scalable solution from CSI estimation overhead perspective, for all antenna sizes.
- Observation 3: Canonical Massive MIMO can work with many flexible antenna configuration and has relaxed antenna calibration requirements.
- Observation 4: The subframe duration of a TDD NR M-MIMO subframe should no longer than the channel coherence time for the given deployment scenario.
- Observation 5: Benefits of Massive MIMO are only apparent with 8-10x the number of transceiver chains at eNB as number of UEs in the cell where each transceiver chain is a digital beamforming element.
- Observation 6: Reciprocity Calibration is necessary. Level of calibration and optional support of over the air signaling for calibration is FFS.
- Observation 7: Reciprocity calibration can be performed within the eNB, with no necessity of signaling between eNB and UE.
- Proposal 1: Use Massive MIMO using channel reciprocity as a framework for TDD NR M-MIMO.
- Proposal 2: Adopt TDD NR M-MIMO as primary MIMO mode for larger number of antenna ports at eNB (especially for >= 64 antenna ports).
- Proposal 3: Study improvements in UL Sounding Pilot signaling to support at least 32 UEs in UL.
- Proposal 4: Support a flexible grant duration for TDD NR M-MIMO subframe to be smaller than the channel coherence time.
- Proposal 5: Support fully digital beamforming for up to at least 64 antenna ports at the eNB.

Decision: The document is noted.

R1-165313 **Need for study on In-Band Full Duplex communication CEWiT**

Proposal 1: To consider in-band full duplex communication in conjunction with massive MIMO systems.

Proposal 2: To consider and study other potential network wide applications and standardization impact of in-band full duplex communication.

Decision: The document is noted.

R1-164955 **Reciprocity based MIMO in NR Ericsson**

- Efficient reciprocity-based transmission schemes need to be standardized as in some use cases they will have significantly better performance compared to normal resolution closed loop schemes (as has been specified for smaller arrays, e.g. LTE)
- Coherent reciprocity allows for efficient acquisition of explicit channel knowledge even for very large arrays, thus enabling frequency-selective precoding and nullforming
- Achieving coherent reciprocity imposes several additional requirements, e.g., on antenna calibration
  - Whether there is standard impact (RAN1 or RAN4) is FFS
- Study proposals to support reciprocity based MIMO in NR:
  - RAN1 should study Sounding Reference Signal design and the necessary quality of the estimates
    - Study SRS sequences and SRS density for enabling high-quality channel estimates, to reduce the effects of channel aging and pilot contamination
  - RAN1 should study Interference acquisition schemes for reciprocity based operation
    - for the purpose of scheduling and link adaptation

Decision: The document is noted.

R1-165559 **WF on Supported NR OperationsSamsung, Nokia, Alcatel Lucent Shanghai Bell**

The document was presented by Young Han Nam from Samsung.

- RAN1 to strive for both beam-centric operation and non-beam-centric operation in a single unified framework
  - Beam-centric operation
    - In beam-centric operation, multiple beams are used for covering a DL/UL coverage area of a TRP/a UE.
    - One example of beam-centric operation is beam sweeping:
      - When beam sweeping is applied for a signal (or a channel), the signal (the channel) is transmitted on multiple beams, which are on multiple time instances in a constant time duration.
  - Non-beam-centric operation
    - In non-beam-centric operation, a single beam can be used for covering a DL/UL coverage area of a TRP/a UE, similarly as for LTE cell-specific channels/RS.
- For beam-centric operation, study the application of beam sweeping at least for:

  - Initial-access signals (synchronization signals and random access channels)
  - System-information delivery (broadcast channels)
  - RRM measurement
  - CSI measurement

Decision: The document is noted.

Possible agreements:

- Following three types of beamforming are to be studied in NR
  - Analog beamforming
  - Digital beamforming
  - Hybrid beamforming
- RAN1 studies both beamforming based approaches and non-beamforming based approaches for these channels/signals/measurement/feedback
  - Initial-access signals (synchronization signals and random access channels)
  - System-information delivery (broadcast channels)
  - RRM measurement/feedback
  - L1 control channel
  - FFS: Note: The physical layer procedure design for NR should be agnostic as much as possible to the beamforming type employed at TRP
- Beamforming based approaches
  - In beamforming based approaches, multiple beams are used for covering a DL coverage area and/or UL coverage distance of a TRP/a UE
  - One example of beamforming based approaches is beam sweeping:
    - When beam sweeping is applied for a signal (or a channel), the signal (the channel) is transmitted/received on multiple beams, which are on multiple time instances in finite time duration
      - Multiple beams can be transmitted/received in a single time instance
  - Others are FFS
- Non-beamforming based approaches
  - In non-beamforming based approaches, each time invariant beam can be used for covering a DL/UL coverage area of a TRP/a UE, similarly as for LTE cell-specific channels/RS
- For both beamforming and non-beamforming based approaches, RAN1 can consider following examples
  - Power boosting
  - SFN
  - Repetition
  - Beam diversity (only for beamforming approach)
  - Antenna diversity
  - Other approaches are not precluded
- Combinations of non-beamforming based and beamforming based approaches are not precluded

Agreements:

- Following three implementations of beamforming are to be studied in NR
  - Analog beamforming
  - Digital beamforming
  - Hybrid beamforming
  - Note: The physical layer procedure design for NR can be agnostic to UE/TRP with respect to the beamforming implementations employed at TRP/UE, but it may pursue beamforming implementation specific optimization not to lose efficiency
- RAN1 studies both multi-beam based approaches and single-beam based approaches for these channels/signals/measurement/feedback
  - Initial-access signals (synchronization signals and random access channels)
  - System-information delivery
  - RRM measurement/feedback
  - L1 control channel
  - Others are FFS
  - Note: The physical layer procedure design for NR can be unified as much as possible whether multi-beam or single-beam based approaches are employed at TRP at least for synchronization signal detection in stand-alone initial access procedure
  - Note: single beam approach can be a special case of multi beam approach
  - Note: Individual optimization of single beam approach and multiple beam approach is possible
- Multi-beam based approaches

- In Multi-beam based approaches, multiple beams are used for covering a DL coverage area and/or UL coverage distance of a TRP/a UE
- One example of multi-beam based approaches is beam sweeping:
  - When beam sweeping is applied for a signal (or a channel), the signal (the channel) is transmitted/received on multiple beams, which are on multiple time instances in finite time duration
    - Single/multiple beam can be transmitted/received in a single time instance
- Others are FFS

- Single-beam based approaches
  - In single-beam based approaches, the single beam can be used for covering a DL coverage area and/or UL coverage distance of a TRP/a UE, similarly as for LTE cell-specific channels/RS
- For both single-beam and multi-beam based approaches, RAN1 can consider followings in addition
  - Power boosting
  - SFN
  - Repetition
  - Beam diversity (only for multi-beam approach)
  - Antenna diversity
  - Other approaches are not precluded
- Combinations of single-beam based and multi-beam based approaches are not precluded

R1-165563 **WF on NR beamforming Huawei, HiSilicon**

The document was presented by … from Huawei.

- Following three types of beamforming are to be studied in NR
  - Analog beamforming
  - Digital beamforming
  - Hybrid beamforming
- Study coverage improvement techniques for control channels / signals for NR
  - Beamforming-based coverage improvement
    - Beam sweeping and beam selection techniques
  - Non-beamforming based approaches such as
    - Power boosting
    - SFN
    - Repetition
  - Combinations of non-beamforming based and beamforming based approaches are not precluded
  - Other methods are not precluded

Note: The physical layer procedure design for NR should be agnostic as much as possible to the beamforming type employed at TRP.

Decision: The document is noted.

Possible agreements:

- For Non-beam-centric operation, RAN1 can consider following examples
  - Power boosting
  - SFN
  - Repetition
  - Combinations of non-beamforming based and beamforming based approaches are not precluded

Note: The physical layer procedure design for NR should be agnostic as much as possible to the beamforming type employed at TRP.

Tuesday

R1-165564 **WF on UE beamforming and beam management Nokia, Samsung, Intel, Interdigital, Alcatel-Lucent Shanghai Bell**

Decision: The document is noted.

Agreements:

- RAN1 to study the beamforming procedures and their system impacts at least for multi beam based approach
  - Physical layer procedures for beamforming optimizing different metrics such as overheads and latencies in multi beam and single beam based approaches
  - Physical layer procedures in multi beam based approach that require beam training, i.e. steering of transmitter and/or receiver beams
    - E.g. Periodic/Aperiodic downlink/uplink TX/RX beam sweeping signals, where periodic signals may be semi-statically or dynamically configured (FFS)

- E.g. UL sounding signals
- Other example is not precluded

R1-165684 **WF on beamforming procedures Nokia**
Decision: The document is noted.

Agreements:
- Both intra-TRP and inter-TRP beamforming procedures are considered.
- Beamforming procedures are considered with/without TRP beamforming/beam sweeping and with/without UE beamforming/beam sweeping, according to the following potential use cases:
  - UE movement, UE rotation, beam blocking:
    - Change of beam at TRP, same beam at UE
    - Same beam at TRP, change of beam at UE
    - Change of beam at TRP, change of beam at UE
  - Other cases are not precluded

R1-165650 WF on the antenna port and QCL assumption study in NR Intel, Ericsson
Decision: The document is noted.
Possible agreements:
As a starting point for NR study RAN1 assumes the following definition of antenna port and corresponding antenna port transmission assumptions:
- The antenna port in NR is used for transmission of a physical channel or signal, where an antenna port is defined such that the channel over which a symbol on the antenna port is conveyed can be inferred from the channel over which another symbol on the same antenna port is conveyed.
- For antenna port transmitted in different time occasions (e.g. different subframes or TTIs) by default assumption the channel on the antenna port in one time occasion can't inferred from the channel on the same antenna port in another time occasion
- For antenna port transmitted in the same time occasion on different frequency resource units (blocks), by default assumption the channel in one frequency resource unit/block on one antenna port can't inferred from the channel on the same antenna port in another frequency resource unit/block in the same time occasion

The assumptions on antenna ports that are different from the above should be studied in RAN1 and if needed recommended for NR specification (e.g. fixed in the specification or signaled by network explicitly or implicitly)
Possible agreements:
As a starting point for NR study RAN1 assumes the following definition of QCL and corresponding QCL assumptions:
- Two antenna ports in NR are said to be quasi co-located if the large-scale properties of the channel over which a symbol on one antenna port is conveyed can be inferred from the channel over which a symbol on the other antenna port is conveyed. The large-scale properties include one or more of delay spread, Doppler spread, Doppler shift, average gain, and average delay.
- For antenna ports corresponding to different RS types (e.g. DM-RS and CSI-RS) or multiple RS of the same type (e.g. two NZP CSI-RS) by default assumption UE can't assume QCL-ion between the antenna ports wrt to delay spread, Doppler spread, Doppler shift, average gain, and average delay.
- For antenna ports corresponding to the same type (e.g. DM-RS antenna ports), by default assumption UE can't assume QCL-ion between antenna ports wrt to delay spread, Doppler spread, Doppler shift, average gain, and average delay.

The assumptions on QCL that are different from the above should be studied in RAN1 and if needed recommended for NR specification (e.g. fixed in the specification or signaled by network explicitly or implicitly)
Continue offline discussion – (Intel)
Thursday
R1-165905 **WF on the antenna port and QCL assumption study in NR** **Intel, Ericsson**
Decision: The document is noted. Revised in:
R1-165947 **WF on the antenna port and QCL assumption study in NR** **Intel, Ericsson, ZTE, LGE, Samsung, Nokia, ASB, CATT**
Decision: The document is noted.

Agreement: Study the necessity of QCL and measurement assumptions for antenna ports in NR

R1-165588 **WF on hybrid UE antenna modelling** **Intel, Samsung**
Decision: The document is noted. Revised in:
R1-165712 **WF on hybrid UE antenna modelling** **Intel, Samsung**
Decision: The document is noted.

R1-165654 **WF on CSI Acquisition Framework in NR** **Huawei, HiSilicon, NTT DOCOMO, Intel, China Telecom, ZTE, China Unicom, Deutsche Telecom, Softbank, ETRI, Ericsson, Nokia**
Decision: The document is noted. Also supported by CATR, ASB.

Agreements:

- In NR multi-antenna schemes, studies on CSI acquisition framework include:
  - CSI reporting schemes
    - Implicit CSI feedback
      - Parameters indicating channel quality based on a set of transmission and receiving hypotheses associated with one particular UE, e.g. CQI, PMI, RI, CRI
    - Explicit CSI feedback: for both quantized and unquantized/analog CSI feedback
      - Parameters representing channel coefficients or some reduced-space representation thereof
    - Reciprocity-based feedback
      - For example, take into account interference and/or receiver hypothesis can be included
    - Note: including aperiodic, periodic and semi-persistent, and single/wide band and sub-band feedback
    - Mixed feedback is not precluded
  - Interference measurement
  - FFS: CSI measurement and/or reporting and/or triggering can be 'self-contained' in at least time domain

Possible agreements:

- In NR multi-antenna schemes, studies on CSI acquisition framework include
  - CSI acquisition
    - based on hybrid RS
      - E.g., hybrid non-precoded and beamformed RS
      - E.g., hybrid different types of beamformed RS
    - based on beamformed/precoded RS (e.g., CSI-RS, Demodulation RS)
    - based on non-precoded RS
    - based on reciprocity (e.g., SRS design, UL SRS Transmission in DL band)
    - Note: including measurement over aperiodic/periodic/semi-persistent RS
    - Note: Subband RS is not precluded

Continue offline discussion until Wednesday – (Huawei)

R1-165541 **WF on CSI reporting framework for NR** **Samsung, Interdigital, Ericsson**
Decision: The document is noted.
R1-165701 **WF on RS design for CSI measurements in NR** **Samsung, ZTE, ZTE Microelectronics, Intel, Ericsson**
Decision: The document is noted. Continue offline discussion until Wednesday – (Samsung)

Wednesday

R1-165843 **WF on CSI Acquisition in NR** **Huawei, HiSilicon, Samsung**

- In NR multi-antenna schemes, studies on CSI acquisition include;
  - based on RS for UE-specific use case
    - Note: mutiple-stage RS is not precluded
    - e.g., beamformed CSI-RS, Demodulation RS
  - based on RS for non-UE-specific use case
    - Note: mutiple-stage RS is not precluded
    - e.g., beamformed CSI-RS, Non-precoded CSI-RS
  - based on hybrid RS
    - E.g., hybrid RS for UE-specific and Non-UE-specific use cases

- based on reciprocity (e.g., SRS design, UL SRS Transmission in DL band)
- Note: including measurement over aperiodic/periodic/semi-persistent RS
- Note: Subband RS is not precluded

Decision: The document is noted, modified as follows:

Agreements:

- In NR multi-antenna schemes, studies on RS design and CSI acquisition considering following use cases
  - Non-UE-specific RS use case for CSI measurement
  - UE-specific RS use case for CSI measurement
    - Note: functionally may be analogous e.g.: to R13/14 UE-specific beamformed CSI-RS (with dynamic beamforming)
    - Note: maybe relevant to UE receiving beam sweeping
  - Use of a joint operation among multiple RS from the same or different use cases
  - RS for interference measurement use cases
  - RS for channel reciprocity use cases
  - Other use cases is not precluded
- Note: including measurement over aperiodic/periodic/semi-persistent RS
- Note: Subband RS is not precluded

R1-165590 **WF on aperiodic CSI for NR ZTE, ZTE Microelectronics, ASTRI, Ericsson, Samsung**

- Study aperiodic CSI reporting in conjunction with aperiodic RS (including multi-shot RS) transmission
  - UE measures/reports CSI and TRP transmits RS for CSI measurement only when needed
  - Study self-contained scheme to support CSI triggering, CSI measurement and CSI feedback in a subframe
  - Study RS design for CSI measurement e.g. CSI-RS, demodulation RS.
    - Others are not precluded

Decision: The document is noted. Also supported by Interdigital. The WF is updated as follows:

Agreements:

- Study aperiodic CSI reporting in conjunction possibly with aperiodic RS (e.g. one-shot, multi-shot RS) transmission
  - Aperiodic RS can be used for CSI measurement including channel measurement (e.g. using CSI-RS) and/or interference measurement (e.g. using IMR)
  - Study on demand UE measurement/reports and TRP RS transmission for CSI measurement only when needed
  - Study aperiodic CSI procedure to support CSI triggering, CSI measurement and CSI feedback in certain time interval(s). These three steps can happen in the same or different time interval.
  - Study aperiodic CSI procedure using RS for CSI measurement e.g. CSI-RS, demodulation RS.
    - Others are not precluded

R1-165808 **WF on NR UL MIMO Intel, NTT DOCOMO, Ericsson**

Decision: The document is noted.

Agreements:

- The following techniques are studied for NR UL MIMO
  - Uplink transmission/reception schemes for data channels
    - Non reciprocity based UL MIMO (e.g. PMI based)
    - Reciprocity based UL MIMO. E.g. UE derives precoder based on downlink RS measurement (including partial reciprocity)
    - Support of MU-MIMO
    - Open-loop/Close-loop single/Multi point spatial multiplexing
      - e.g. for multi point SM, multi layer is received either jointly or independently by different TRPs
      - Note: for multi point SM, multiple point may have coordination
    - Single/Multi panel spatial diversity
    - Uplink antenna/panel switching (UE side)
    - UL beamforming management for analog implementation
    - Combination of above techniques
  - UL RS design considering the below functions
    - Sounding
    - Demodulation
    - Phase noise compensation

- UL transmit power/timing advance control in the context of UL MIMO
- Transmission scheme(s) for carrying UL control information
- Other UL MIMO and related techniques are not precluded

Possible agreements:

- Study beam determination procedure (e.g. TRP beam(s) and/or UE beam(s) determination)
  - Option 1: In the initial access procedure
  - Option 2: Not in the initial access procedure
- For beam change after initial beam determination, study the following two procedures:
  - Procedures different from initial beam determination procedure
    - E.g. L1 or L2 based approach
  - Procedures with the same procedure as initial beam procedure
- Note: A common procedure may be applied to initial beam determination and beam change.
- Note: Different procedures may be applied to different frequency resources
- For multi beam and single beam based approaches at TRP, companies should state the assumptions on UE beamforming for the agreed system aspects
  - E.g. how many UE beams and UE beam patterns

Continue offline discussion until Friday – Yuan (Intel)

Friday

R1-166030 WF on beam management Intel, Ericsson, Nokia, Qualcomm, Samsung, ZTE, NTT DoCoMo, Huawei, Xinwei, CATT, MTK

R1-165915 WF on beam management Intel, Samsung, NTT DOCOMO

R1-165946 WF on DL multi-antenna transmissions for NR LG Electronics, CATT, Intel, Samsung

Decision: The document is noted, modified and agreed as follows:

Agreements:

- The following DL multi-antenna transmissions to be studied for NR
  - Closed-loop/(Semi)Open-loop spatial multiplexing
  - Single/Multi-point transmissions
  - SU/MU-MIMO
  - Transmit diversity,
    - e.g., Single/Multi panel spatial diversity
  - Combination of above techniques
- Other DL multi-antenna transmissions and related techniques are not precluded
- This does not imply that used transmission technique needs to be known to the UE

R1-165929 WF on beamforming for message transmission in NR Qualcomm, Ericsson, Intel, Nokia, CATT, Samsung

Decision: The document is noted.

Possible agreements:

- RAN1 to study beamforming for transmitting control message in the multi-beam based approach for NR
  - Beamforming that is specific to a UE or group of UEs when transmitting control message (i.e. control transmission)
    - Procedures for determining (e.g., through beam training) and changing the beam used for the control transmission
      - Procedures may or may not be same as the procedure for determining/changing the beam for data transmission
    - Control transmissions may be in both UL or DL direction
  - Procedures when transmitting common control message (e.g. beam sweeping, wide beam)

Continue offline discussion until Friday – Sundar (Qualcomm)

Not treated.

R1-164010	Discussions on CSI-RS design for NR	Samsung
R1-164011	Discussions on CSI reporting for NR	Samsung
R1-164012	Discussion on advanced MIMO transceivers for NR	Samsung
R1-164014	Discussion on RS for beamformed access	Samsung
R1-164015	DL MIMO framework for NR	Samsung
R1-164016	UL MIMO framework for NR	Samsung
R1-164017	Advanced CSI feedback for NR	Samsung
R1-164018	Analog/digital/hybrid beamforming for massive MIMO	Samsung
R1-164019	Discussion on CSI acquisition for beamformed access	Samsung
R1-164027	Design of massive MIMO for New Radio	Mitsubishi Electric Co.
R1-164038	Motivations and Considerations on Massive MIMO for New RAT	Huawei, HiSilicon
R1-164188	Overview of multi-antenna schemes for new radio interface	Intel Corporation
R1-164189	On UE side beamforming	Intel Corporation
R1-164190	RSRP modeling with UE side beamforming	Intel Corporation
R1-164192	Evaluation methodology for UL MIMO	Intel Corporation
R1-164254	Views on NR MIMO design	CATT
R1-164255	Discussion on beam-based operation	CATT
R1-164256	NR MIMO based on channel reciprocity	CATT
R1-164294	Overview on NR MIMO for sub-6 GHz	ZTE
R1-164295	Overview on NR MIMO for above-6 GHz	ZTE
R1-164296	Discussion on beamforming architecture for NR MIMO	ZTE
R1-164297	Consideration on CSI measurement and feedback for NR MIMO	ZTE
R1-164334	Discussion on massive MIMO in NR	Fujitsu
R1-164349	Discussion the transmission scheme of M-MIMO for 5G system	Fiberhome Technologies Group
R1-164374	CSI Acquisition Framework for Massive MIMO in New Radio	Huawei, HiSilicon
R1-164485	Discussion on Multi-antenna scheme for NR	NEC
R1-164567	Massive MIMO for New Radio Interface	LG Electronics
R1-164624	Principles for downlink control signaling in NR	Ericsson
R1-164625	Design principles for system access in a beam-centric system	Ericsson
R1-164660	Enhanced multiple antenna transmission for NR	Sony
R1-164707	Massive MIMO architecture	Qualcomm Incorporated
R1-164708	NR Massive MIMO design considerations	Qualcomm Incorporated
R1-164872	Initial views on MIMO/Beamforming in the NR systems	ETRI
R1-164873	Use of polarized MIMO for NR	ETRI
R1-164874	Beam-based design framework for New Radio	INTERDIGITAL COMMUNICATIONS
R1-164891	On Gradual UE-specific (GUS) Beamformed Control Channel	CMCC
R1-164893	Hybrid Beamforming for Massive MIMO	CMCC
R1-164952	On CSI for multi-antenna operation in NR	Ericsson
R1-164953	Multi-antenna transmission principles for data channels in NR	Ericsson
R1-164954	SU-MIMO performance for antenna arrays with a massive number of antennas	Ericsson
R1-164956	Multi-point MIMO connectivity	Ericsson
R1-164957	On UE side beamforming in NR	Ericsson
R1-165037	Discussion on Design of Reference Signals for NR MIMO	ZTE
R1-165038	Discussion on Control Channel Design for NR MIMO	ZTE
R1-165056	Views on antenna configuration for above-6GHz NR	CATT
R1-165062	Views on Beamforming with a Large Number of Antennas	INTERDIGITAL COMMUNICATIONS
R1-165063	Views on Massive MIMO for New Radio	INTERDIGITAL COMMUNICATIONS
R1-165079	Consideration on advanced receivers for NR	Intel Corporation
R1-165166	Support of Multiuser Transmission in 5G New Radio Interface below 6GHz	MediaTek Inc.
R1-165167	Beamforming Considerations for above 6 GHz Deployment Scenarios	MediaTek Inc.
R1-165180	Discussion on Multi-Antenna Transmission of Synchronization and Reference Signals	NTT DOCOMO, INC.
R1-165181	Evaluation Methodologies for NR MIMO	NTT DOCOMO, INC.
R1-165362	Multi-antenna Architectures and Implementation Issues in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-165363	Scalability of MIMO operation across NR carrier frequencies	Nokia, Alcatel-Lucent Shanghai Bell

R1-165364 Support for Beam Based Common Control Plane Nokia, Alcatel-Lucent Shanghai Bell
R1-165365 On the UE beamforming in new radio Nokia, Alcatel-Lucent Shanghai Bell
R1-165366 Channel reciprocity support in NR Nokia, Alcatel-Lucent Shanghai Bell
R1-165586 WF on NR UL MIMO Intel, NTT DOCOMO
R1-165721 WF on TXRU Virtualization for NR MIMO Xinwei, NEC
R1-165832 WF on aperiodic CSI for NR ZTE
R1-165997 WF on beamforming for control message transmission in NR Qualcomm

7.1.7 Other

R1-164020 Co-existence of LTE and NR Samsung

- *Proposal 1: LTE-NR coexistence on the same spectrum should be supported as part of NR.*
- *Proposal 2: Consider both geographically separated and co-located scenarios when designing NR specification support for LTE-NR coexistence.*
- *Proposal 3: Design TDD UL-DL configurations for NR such that at least a subset of the configurations are compatible with those of LTE.*
- *Proposal 4: Consider utilizing LTE features to efficiently support LTE-NR coexistence for co-located scenario.*

Discussion: Huawei→ time domain coexistence issues are relevant to this SI.
Decision: The document is noted.

Not treated.
R1-164021 Network topology and system operation for NR Samsung
R1-164022 Discussion on interference coordination for NR Samsung
R1-164023 Discussion on interference management based on advanced transceivers for NR Samsung
R1-164024 Shared spectrum support for NR Samsung
R1-164042 Wideband support for NR Huawei, HiSilicon
R1-164043 Considerations on vehicular communications for NR Huawei, HiSilicon
R1-164053 Support for flexible backhauling for NR Huawei, HiSilicon
R1-164054 Support for energy efficient NR Huawei, HiSilicon
R1-164371 Considerations on new radio access mechanisms in NR Huawei, HiSilicon
R1-164379 Support for UE Cooperation in NR Huawei, HiSilicon
R1-164382 Advanced Link Adaptation for NR Huawei, HiSilicon
R1-164568 High level view on eV2X LG Electronics
R1-164632 Flexible bandwidth in NR Ericsson
R1-164709 Sidelink design for NR Qualcomm Incorporated
R1-164710 Mobility considerations for NR Qualcomm Incorporated
R1-164714 NR positioning Qualcomm Incorporated
R1-165064 Design considerations on URLLC for New Radio systems INTERDIGITAL COMMUNICATIONS
R1-165182 Discussion on affinity for unlicensed spectrum access in 5G new radio NTT DOCOMO, INC.
R1-165373 On Hybrid ARQ functionality for 5G Nokia, Alcatel-Lucent Shanghai Bell
R1-165374 On the utilization of UE Advanced Receivers in NR Nokia, Alcatel-Lucent Shanghai Bell
R1-165375 On the cross-link interference mitigation Nokia, Alcatel-Lucent Shanghai Bell
R1-165376 Radio resource management in NR Nokia, Alcatel-Lucent Shanghai Bell
R1-165377 Random access principles for New Radio Nokia, Alcatel-Lucent Shanghai Bell
R1-165378 On network energy efficiency requirement and evaluation for the 5G new radio Nokia, Alcatel-Lucent Shanghai Bell
R1-165379 Network-based inter-cell interference coordination Nokia, Alcatel-Lucent Shanghai Bell
R1-165380 Uplink power control for 5G New Radio Nokia, Alcatel-Lucent Shanghai Bell
R1-165381 Punctured Scheduling for Latency Critical Transmissions Nokia, Alcatel-Lucent Shanghai Bell

7.2 Study on channel model for frequency spectrum above 6 GHz - SID in RP-151606

R1-164025 Chairman's Notes of Agenda Item 7.2 on Channel model for >6 GHz Nokia

The document was presented by Tuomo Säynäjäkangas from Nokia and provides the outcomes of AI7.2.
Decision: The document isendorsed. Contents incorporated below.

Remaining issues

R1-164606 **List of open issues for channel modelling SI** **Nokia, Samsung**
Discussion:
Decision: The document is noted

R1-165372 **Notation of log-normal distributed random variables** **Fraunhofer HHI**

Proposal 1: Adopt the following notation for mean ($\mu_{\mathrm{lgX}} = \mathrm{mean}\{\log_{10}(X)\}$) and standard deviation ($\sigma_{\mathrm{lgX}} = \mathrm{std}\{\log_{10}(X)\}$) of logarithmized parameters.

Proposal 2: When presenting mean values of logarithmized parameters in linear scale, clarify whether $10^{\mu_{\mathrm{lgX}}}$ or μ_X is given.

Discussion:
Samsung: Has this been used in previous channel model work or is this a new one?
Fraunhofer: This is an old problem. We should avoid misunderstanding.
Samsung: We could agree in principle and think about the wording for a TR.
Decision: The document is agreed

TR update

R1-164607 **TP for TR38.900 on Section 7.2 Nokia, Samsung**
Discussion:
Ericsson: 38.953 mention indoor car users to be reflected too.
Fraunhofer: Then we need to add more details on that model. 7.2.1 table to be corrected.
Huawei: Table 7.2.2 values are already agreed.
We should agree this TP first. It captures agreement from last meeting. Modifications can be added for the next version.
Decision: The document is agreed

R1-164608 **TP for TR38.900 on Section 7.4 Nokia, Samsung**
Discussion:
Nokia: More clarifications are needed for O2I section in this meeting.
Fraunhofer: We need to decide parameter d. PL equations are modified. It is not clear what frequencies are meant. General note of units and equations needs clarifications.
NTT DOCOMO: Rural macro scenario frequency range is not clear.
Nokia: It is up to 7 GHz.
Decision: The document is agreed

R1-164609 **TP for TR38.900 on Section 7.5 Nokia, Samsung**
Discussion:
LGE: Steps 2 and 3 should be corrected.
Fraunhofer: Some parameters needs further clarifications.
NTT DOCOMO: Table 7.5 unit of distance needs further clarifications.
Decision: The document is agreed

R1-164610 **TP for TR38.900 on Section 7.6 Nokia, Samsung**
Discussion:
Motorola: Equation and impulse response corrections are needed. Why impulse response is a function of f?
Decision: The document is agreed

R1-164611 **TP for TR38.900 on Section 7.7 Nokia, Samsung**
Discussion:
Huawei: There are couple of issues to be corrected.
Samsung: There are some errors not captured but discussed in email discussions.
Ericsson: We agreed also K-factor scaling for LOS.
Decision: The document is agreed

R1-164612 **TP for TR38.900 on Section 7.8 Nokia, Samsung**
Discussion:
Decision: The document is agreed

R1-164613 **TP for TR38.900 on Section 8 Nokia, Samsung**

Discussion:
Decision: The document is agreed

R1-164614 **WF on TR clean up** **Nokia, Samsung, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT DOCOMO, Qualcomm**

- *Proposal-1: For all the parameter values in bracket, remove the brackets (confirm the value in bracket) if no proposals of other value are received in RAN1#85.*
- *Proposal-2: Address all FFS points in the TR in RAN1#85.*
- *Proposal-3: Section 7.2, every scenario has a sentence like: "Other parameters are FFS". Remove the FFS sentences for each scenario with the understanding of "other parameters can be considered"*

Discussion:
Fraunhofer: "Other parameter can be considered" has a different meaning. Missing parameters are FFS.
Nokia: Intention is not to replace the sentence but to remove "*Other parameters are FFS".*
ZTE: We are OK with intention but safer way would be to mention numbers can be revised if problems are found.
Nokia: Every parameters can be revised if issues are found.
Decision: The document is agreed

R1-164615 **Detailed parameters for RMa scenario description** **Nokia, Samsung, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT DOCOMO, Qualcomm**

Use below table in section 7.2 for RMa scenario description

Discussion:
LGE: Is BS-UT distance 2d or 3d?
Nokia: 2d
Fraunhofer: In car users are mentioned but why are we not considering pedestrians at all?
Nokia: This is in line with NR SI
Huawei: Other scenarios mention also UE mobility. Should that be considered also for RMa?
Nokia: 3D CM mention reasonable UE speed. Our proposal is to remove that from all scenarios.
Fraunhofer: How to do simulations then?
Nokia: That can be done in separate WI like FD-MIMO.
Motorola: Range of speed could be add on assumption.
Ericsson: It is not mandated for simulations but meant for calibration purposes.
Huawei: We need to clarify the speed for the in car users.
Decision: The document is agreed

R1-165465 **TP for TR38.900** **Nokia, Samsung**
Discussion:
Decision: The document is agreed

R1-165757 **Applicability of TR38.900 channel models** **Huawei, HiSilicon**
Discussion:
Samsung: Some of these are already understood. There is no confusion to correct.
Fraunhofer: RMa scenario should be applicable to up to 7 GHz.
Nokia: We should not this document. RMa is a new and special scenario.
LGE: No need to approve.
Huawei: Don't we need to evaluate whether the model fulfil the requirements?
Samsung: Additional features are already specified in TR.
Decision: The document is noted

R1-165758 **Discussion on the channel model names and abbreviations** **Huawei, HiSilicon**
Discussion:
Samsung: We don't support HF. E.g. NR could be better.
Ericsson: We support NR
LGE: 5G or NR.
Nokia: NR is OK even it is a technology.
Rapporteur could implement the name change by using some acronym in TR abbreviations. Discuss by Friday lunch time. If no agreement then the current names are used.
Decision: The document is noted.

Friday: Current names are used for >6GHz channel model study (TR38.900)

R1-165478 **Corrections for CIR Equations** **Fraunhofer HHI, Motorola Mobility, Lenovo**
Discussion:
LGE: No strong concerns but clarifications needed for proposals 1 and 2. Why we have to change?
Fraunhofer: To avoid misunderstandings. Sometimes people don't realize if we are in time domain or not.
Samsung: Everybody know these models used in the past so need to change. What is actually proposal 3?
Fraunhofer: Change from + to – sign. Lambda f is not defined anywhere. We want to make clear what is coefficient and what is CIR.
Samsung: Rapporteur can do the editorial changes.
Huawei: This is not only editorial change. Equations are different.
Motorola: Errors has to be corrected.
Decision: The document is revised in 5774

R1-165774 **Corrections for CIR Equations** **Fraunhofer HHI, Motorola Mobility, Lenovo, CATT, Huawei, HiSilicon**
Discussion:
Samsung cannot agree. Equations and been used for long time, also in 3D CM. There is no strong reason to change.
Samsung: As compromise delay correction in Proposal 3 can be agreed in principle
ZTE has concerns on proposal 3. Same should be done also for hybrid model.
Delay correction in Proposal 3 can be agreed
Decision: The document is noted

Friday
R1-165775 **WF for TR clean-up** **Nokia, Samsung, Huawei, Hisilicon, Intel, NTT DOCOMO, Qualcomm, AT&T, KT Corporation, Alcatel-Lucent Shanghai Bell, ZTE, Interdigital**
- Remove all brackets in the TR38.900

Discussion:
Decision: The document is noted as working assumption

Agreement: Use 3D distance in RMa path loss

R1-165768 **TR38.900 v0.4.0** **Samsung, Nokia**
Discussion:
Decision: The document is return.
Friday: The document is agreed in principle, and email approval to check the consistency with the agreements reached in RAN1#84bis and RAN1#85 meetings until June 2nd – (Samsung)

Offline session notes

R1-165457 **Minutes of offline session on Tue** **Nokia**
Discussion:
Decision: The document is noted

R1-165467 **Minutes of offline session on Wed** **Samsung**
Discussion:
Decision: The document is noted

Friday
Email discussions

Email discussion until the next meeting for full calibration – R1-165770

[85-19] Email discussion until June 10th for updating results for large scale calibration (Samsung)

[85-20] Email discussion until June 25th for full calibration results (Samsung)
[85-21] Email discussion until June 25th for additional feature calibration (Samsung)
[85-22] Email discussion until August 10th for approval of the summary related to all the calibration results and updated TP (Samsung)

7.2.1 Remaining details on large scale modelling for >6GHz

Path loss modeling

R1-164729 **WF on Pathloss clean up** **Huawei, HiSilicon, Nokia, Samsung, AT&T, Ericsson, Intel, KT Corporation, NTT DOCOMO, Qualcomm, ETRI**

- *For UMa, UMi Street Canyon, Indoor office and RMa, limit the NLOS pathloss by LOS pathloss. (same as 36.873)*
- *NLOS Pathloss is defined as the Max(PL_LOS, PL_NLOS):*
  where PL_NLOS and PL_LOS are LOS and NLOS PL formula in current TR

Discussion:
ZTE: We are OK but do we need to redo calibration?
Samsung: We don't need to redo calibration as we have good enough match between companies already.
Fraunhofer: What about RMa calibration? It would be important to include also that.
Samsung: That is different scenario discussed in NR session. No need for that calibration.
Nokia: No need to have another calibration campaign but companies can update their results if they want.
ZTE: This propose max for all scenarios.
Decision: The document is agreed

Penetration loss

R1-164569 **Remaining issues on large scale modeling** **LG Electronics**

Proposal 1: Whether to use high or low loss model should be UE-specific.
Proposal 2: The 2D indoor distance, d_in, should be common for sectors of an eNB but differently generated for different (non-collocated) eNBs.
Proposal 3: O-to-I penetration loss deviation should be common for 3 sectors of an eNB but different one for different eNB, and it should replace shadow fading of path loss.
Proposal 4: The clarifications on (1) high vs. low loss model, (2) d_in, and (3) O-to-I penetration loss deviation should be included into large scale modeling section of the TR rather than calibration assumption section.

Discussion:
Decision: The document is not treated

R1-164617 **Clarifications on O-I implementation** **Nokia, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT DOCOMO, Qualcomm, Samsung**

- *Clarify the implementation of O-I in TR38.900 as following:*
  - *The selection of high loss or low loss O-I model is UE specific*
  - *O-I deviation is an add-on term to SF.*
    - *Change the standard deviation to 4.4 and 6.5 for low loss and high loss penetration model separately (see below table from R1-163256)*
    - *O-I deviation is UE specific random variable.*
  - *d_in is an UE specific random variable*

Discussion:
LGE: We have prepared another WF on this issue.
Decision: The document is revised in 5458

R1-165458 **Clarifications on O-I implementation** **Nokia, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT DOCOMO, Qualcomm, Samsung**
Discussion:
Decision: The document is withdrawn.

R1-165451 **WF on O-to-I penetration modeling** **LG Electronics, CATT, CHTTL, Intel, ITRI**
Discussion:
Straight Path: Modeling should be site specific. UE specific is not a good approximation e.g. what comes to correlation. Deviations are depended to angle.
Nokia: Site specific was our original proposal but after discussing with other companies we believe US specific is more close to reality.

Straight Path: There are penetration coming from the 4 side of the UE. Those should be site specific.
Ericsson: Propagation is typically coming from the closest wall. This increases the correlation. Shadow fading is link specific and should be accounted for also.
Samsung: Can we agree Proposal 1 Option 2 and proposal 2.
LGE prefers option 1.
CATT: We prefer option 1.
Straight Path: We prefer option 1.
Decision: The document is revised in 5464

R1-165464 **WF on O-to-I penetration modeling** **LG Electronics, Straight Path, Ericsson, Samsung, Nokia, Alcatel-Lucent Shanghai Bell, ETRI, CHTTL, NTT DOCOMO, Huawei, HiSilicon**
Discussion:
Decision: The document is agreed

R1-165463 **WF on O2I Penetration Loss Model Mix for Urban Scenarios** **Huawei, HiSilicon, CATT**
Discussion:
Decision: The document is agreed

R1-165849 **WF on clarification on O2I penetration modeling for RMa** **LG Electronics, Ericsson, ETRI, Samsung, Straight Path, NTT DOCOMO, Intel, Nokia, Alcatel-Lucent Shanghai Bell, CHTTL**

- *For RMa scenario, the indoor 2D distance ($d_{2D\text{-}in}$) for indoor UE is generated in the same manner agreed in R1-165464.*
  - *$d_{2D\text{-}in}$ is UE-specific and generated as the minimum of two independent uniform RVs between 0 and 25 m.*
  - *Other channel modeling steps that should utilize $d_{2D\text{-}in}$ follow the same calculation for $d_{2D\text{-}in}$.*
- *The correlation distance for cluster/ray specific random variables for RMa O2I scenario is 15m.*
  - *Note that this value is the same as one for UMa/UMi-Street Canyon O2I.*

Discussion:
Intel: Also correlation distance for the indoor-outdoor stage should be added with the value of 50 m.
Agreed with the addition: For the RMa scenario correlation distance for the indoor-outdoor state should be added with the value of 50 m.
Decision: The document is agreed

R1-164804 **Discussion on recommended split of low and high penetration loss for NR** **Samsung**

Proposal: For UMi, the low-loss model is used 80% probability and the high-loss model is used 20% probability; for UMa, the low-loss model is used 90% probability and the high-loss model is used 10% probability.

Discussion:
Ericsson: Having different probabilities in UMa and UMi is not in line with NR work.
Samsung: NR scenario don't have UMa and UMi mix. We should make suggestion to NR delegates.
Ericsson: BS above rooftop is UMa, below rooftop it is UMi.
Huawei: We are confused why we are discussing this. Channel model task is not to decide high or low loss.
Nokia: We sympathize the intention of this proposal but we should not have different probabilities for UMa and UMi.
CATT: We have similar view than Huawei.
Ericsson: We also agree with Huawei and CATT. One way could be to capture the recommendation. In the end this is simulation assumption.
Straight Path: There are reasons for the loss numbers in reality.
Decision: The document is revised in 5459

R1-165459 **Discussion on recommended split of low and high penetration loss for NR** **Samsung**
Discussion:
Decision: The document is withdrawn.

R1-165398 **Additional Considerations on Building Penetration Loss Modeling for 5G System Performance Evaluation** **Straight Path Communications**

Two options to model the mix of high-loss and low-loss building penetration models:

Proposal 1: The low loss model should be used with 80% probability, the high loss model should be used with 10% probability, and a medial loss model (the average of the high-loss and the low-loss model) should be used for 10% of the probability.
Proposal 2: The low loss model should be used with 80% probability and the high loss model should be used with 20% probability for Urban Micro; the low loss model should be used with 90% probability and the high loss model should be used with 10% probability for Urban Macro.
We request RAN1 to select one of these two proposals for New Radio (NR) system performance evaluation purposes.

Discussion:
Decision: The document is not treated

Rural Macro model

R1-164712 **Penetration loss measurements for RMa settings** **Qualcomm Incorporated**

Proposal: Adopt the low-loss model from R1-161636 [4] to capture the shadow fading standard deviation for building penetration in an RMa setting, as suggested in R1-163909 [1].

Discussion:
Decision: The document is not treated

R1-164975 **New measurements at 24 GHz in a rural macro environment** **Telstra Corporation Limited, Ericsson**

Proposal: Extend the applicability of the new RMa path loss model in R1-163909 ***Error! Reference source not found.*** *to 24 GHz*
Proposal: Consider extending the applicability of the new RMa fast fading model in R1-163909 ***Error! Reference source not found.*** *to 24 GHz*

Discussion:
Fraunhofer: Lot of parameters are not investigated for this frequency range. This proposal is based on single measurements only.
Huawei: Scope of RMa is below 7 GHz.
Telstra: We want to challenge that approach.
Straight Path: We agree with Telstra. In the end the channel model does not matter. You need to design your system up to 100 GHz.
Huawei: ITU considered above 24 GHz.
Telstra: We did measurement on 24 GHz but that can be updated also to higher frequencies.
Fraunhofer: We don't have not enough data to conclude this.
Nokia: Figure 2, what is the difference between rural and suburban areas?
Ericsson: This is single measurement campaign but not much less than others like urban macro model.
CMCC: It is good to see results. We should match with practical deployments.
Decision: The document is revised in 5732

R1-165732 **Way Forward for RMa model frequency range** **Telstra Corporation Limited, Ericsson**

Discussion:
CMCC: This is not good way to extend the model based on only one measurement results.
Ericsson: Urban macro has been changed based on 2 measurements. This is more reasonable than UMa.
Huawei: How well the measurement results correlate with the low frequency of the IMT-A?
Ericsson: Parameters are the same than < 7 GHz.
Huawei: IMT-A was defined based on one measurements in Tyrnävä near to Oulu, Finland which is the flat terrain.
Telstra: We are surprised with this discussion.
Ericsson: If IMT-A was based on single measurement could we do the same also for this.
CMCC: There were lot of measurements for IMT-A e.g. in Winner.
Nokia: Do we intend to add a note to PL model?
Ericsson: Model is valid up to 30 GHz. It is only for the PL model.
Decision: The document is revised in 5769

R1-165769 **Way Forward for RMa model frequency range** **Telstra Corporation Limited, Ericsson**

Proposal: Extend the applicability of the RMa model to 30 GHz for pathloss, noting that:
- *All fast fading aspects remain applicable to 7 GHz*
- *Pathloss model validation above 7 GHz is based on a single measurement campaign conducted at 24 GHz*
  - *This sentence will be captured as a footnote to the pathloss table in the TR*

Discussion:
Huawei: This version is better now.

Decision: The document is agreed.

R1-165344 **WF on O2I penetration for the RMa scenario** **Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: Adopt a car penetration loss of 9 dB on average with a 5 dB standard deviation

Note: This model is valid for at least 0.6-60 GHz

Proposal 2: Include an optional car penetration loss model for metallized windows with 20 dB on average with a 5 dB standard deviation

Proposal 3: Adopt the low loss model for building penetration in the RMa scenario

Discussion:
LGE: Proposal 2. When the option would apply?
Ericsson: Optional in the future SI/WIs.
Huawei: Why frequency range upper limit is 60 GHz? Is this frequency dependent?
Ericsson: It mean at least 60 GHz.
Qualcomm: We also have measurement results in our document.
Straight Path: Optional model is a good idea but situation may change with mixed windows.
CMCC: It is good to have optional model.
Fraunhofer: In car penetration model up to 60 GHz are specific to RMa.
Decision: The document is agreed

Correlations

R1-165343 **Clarifications on channel model correlations** **Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: UEs on different floors have uncorrelated LSPs

Proposal 2: LSPs for links from different sites to same UE are uncorrelated

– Clarify this directly in the TR rather than by reference

– Applies also to LOS/NLOS state but not indoor/outdoor state

Proposal 3: LSPs for links from co-sited sectors to same UE are fully correlated

– Clarify this directly in TR rather than by reference

– The outcome of steps 1-9 should be identical for all sectors

Discussion:
Decision: The document is agreed

R1-165350 **Clarifications on frequency correlation** **Ericsson, AT&T, ETRI, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal: Cluster delays and angles are frequency-independent

Discussion:
Huawei: In many cases you can see similar delays but they are not always frequency independent. This is important topic but maybe too simplified approach.
Nokia: We don't have procedure to address this proposal in TR.
Ericsson: This may be simplification but pretty close to reality.
Samsung: We need to see what parameters are meant to be frequency-independent.
LGE: We agree with Samsung. This is too high level.
Fraunhofer: Cluster delay could vary over frequency.
Ericsson: Delay spread is in a way a dispersion of the channel.
Straight Path: We understand the intention but also agree with Samsung.
Decision: The document is noted

R1-165481 **WF on frequency correlation** **Ericsson, ETRI, Telstra Corporation Limited**

- *Proposal 1: Step 1 is identical for all frequencies, except:*
  - *1d Antenna patterns and array geometries*
  - *1g System centre frequency and bandwidth*
- *Proposal 2: Step 2 is identical for all frequencies,*
  - *Note: Soft LOS states may be different due to frequency dependent function*
- *Proposal 3: If blocking is modeled, the positions of blockers are the same for all frequencies*

– *Note: The blocking loss may be different*

› *Proposal 4: Step 4 is identical for all frequencies, except for possibly frequency-dependent scaling of e.g. delay spread and angular spreads according to the LSP tables*
› *Proposal 5: The cluster delays and angles resulting from steps 5-7 are same for all frequency bands*
› *Proposal 6: Per-cluster shadowing (Zn in step 6) is independent for different frequency bands*
› *Proposal 7: Cluster powers in step 6 ~~are derived from the delay and angle spreads and~~ may be frequency-dependent*
› *Proposal 8: Steps 8-11 are independent for different frequency bands*

Discussion:
ZTE: WE are basically fine except with proposal 7.
Ericsson: We could change the wording like shown above in these minutes
Samsung: We need more time to look this late contribution.
Decision: The document is agreed with the modifications by red text above.

7.2.2 Remaining details on fast fading modelling for >6 GHz

Rural macro channel model

R1-164386 **Discussion on Rma channel model** **Huawei, HiSilicon**

The following problems are necessary to be further investigated:

Problem1: the difference on the surrounding may bring difference on the ZSA for RMa.
Problem2: the difference between the RMa and UMa environment may bring disorder on the inside correlation when combine the RMa azimuth and UMa zenith cross-correlation parameters together.
Problem3: the difference on the surrounding may bring difference on the cluster ZSA for RMa.
Problem4: the difference between RMa and UMi and UMa may bring difference on the correlation distance in zenith domain for RMa.

Discussion:
Decision: The document is not treated

Large scale parameters

R1-164049 **Discussion on removal of square bracket for LSP** **Huawei, HiSilicon, Samsung**

Proposal1: the square bracket on the frequency dependent LSP in **Error! Reference source not found.** *except K-factor can be removed.*
Proposal2: Modify the K-factor parameters to reuse the values from M.2135 as in Table 1 and remove the square bracket.

Discussion:
ZTE: K-factor change is not only frequency dependent. This is fundamental change. Motivation is not clear.
Huawei: In some cases K-factor can be negative. Most of the cases the K-factor shall be positive.
Ericsson: We don't agree with having frequency dependent parameters.
Decision: The document is noted

R1-164730 **Cross-correlation on LSP for Indoor office** **Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Alternative 1: the cross-correlation on LSP for indoor office in Table 2 will be adopted.
Alternative 2: the cross-correlation on LSP for indoor office in Table 3 will be adopted.
Proposal 1: Adopt Alternative 1 or Alternative 2 for cross-correlation on LSP for indoor office.

Discussion:
Huawei prefers alternative 1.
LGE prefers alternative 1.
Ericsson prefer alt 2 but also OK with alt 1.
Samsung prefer alt 2 but also OK with alt 1.
Agreement: Alternative 1: the cross-correlation on LSP for indoor office in Table 2 will be adopted.
Decision: The document is noted.

R1-164570 **Remaining issues on fast fading modeling** **LG Electronics**

Proposal 1: Choose either approach 1 or 2 for the cross-correlation matrix in UMa and UMi-Street canyon O-to-I scenarios. In case approach 1 is preferred, the table in Appendix A can be used for revising the current cross-correlation

matrix.
Approach 1: Adjusting cross-correlation values to ensure that the cross-correlation matrix is positive definite.
Approach 2: Reusing the cross-correlation matrix from TR 36.873 [2].
Proposal 2: Reuse the ZSD and ZoD offset parameters from TR 36.873 for necessary parameters above 6 GHz.
Proposal 3: After determination of the ZSD and ZoD offset parameters, the scaling factor should be defined based on the determination.
Proposal 4: Reuse the mean and standard deviation of XPR from TR 36.873 for necessary parameters above 6 GHz.

Discussion:
Decision: The document is not treated

R1-164805 **Remaining issues on UMi/UMa large-scale parameters** **Samsung, AT&T, Ericsson, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, ETRI**

Proposal 1: Reuse the mean and standard deviation of XPR parameters from TR36.873 model
Proposal 2: Adopt the cluster DS as fixed number, 5 for LoS and 11 for O2I
Proposal 3: Modify the per-cluster SF parameters to 3 dB for both UMi LoS and NLoS adopting from TR36.873
Proposal 4: Reuse ZoD spread and ZoD offset for UMi O2I and UMa O2I from UMi O2O and UMa O2O, respectively
Proposal 5: Adopt the revised cross-correlation parameters for O2I scenarios in Table 4
Proposal 6: Remove square brackets in Table 1 UMi channel parameters, if there is no other proposal to update

Discussion:
Ericsson: Proposal 6 means other proposals in this meeting.
Decision: The document is agreed

R1-165345 **WF on RMa LSPs** **Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: For in-car and indoor users, reuse LSPs for outdoor users according to the working assumption
– Note: These parameters are in Appendix A in R1-163909
– Note: Car and building penetration loss should be added for these users
Proposal 2: Adopt the following revised cross-correlation entries for LOS
– ZSD vs DS: 0
– ZSD vs ASA: 0
– ZSA vs ASA: 0

Discussion:
LGE: Parameters for indoor UEs?
Ericsson: We use outdoor parameters.
Decision: The document is agreed

R1-165569 **WF on ZoD offset for Indoor office** **Huawei, HiSilicon, Ericsson, Nokia, NTT DOCOMO, NTT, Samsung**

The ZoD offset for indoor office can be set as 0 for both LOS and NLOS cases

Discussion:
Decision: The document is agreed

Small scale parameters

R1-164388 **Discussion on removal of square bracket for cluster level SSP** **Huawei, HiSilicon, AT&T, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: the square bracket on the cluster level SSP in **Error! Reference source not found.** *can be removed.*
Proposal 2: the scaling factors for AOA, AOD generation in TR 36.837 can be reused for InH.
Proposal 3: the scaling factors for ZOA, ZOD generation in InH can be adopted as in **Error! Reference source not found.**.

Discussion:
Ericsson: 4 clusters are far too low.
Huawei: This value is based on results from different companies.

Samsung: What is alternative?
Ericsson: Clusters as in IMT-A, 15 clusters. We have tdoc 5353.
ZTE: We support Ericsson proposal. Number of 4 do not match with link level simulations.
Huawei: IMT-A values are based on below 6 GHz.
Samsung: We don't have all parameters in place in IMT-A.
Decision: The document is revised in 5460

R1-165460 **Discussion on removal of square bracket for cluster level SSP** **Huawei, HiSilicon**
Discussion:
NTT DOCOMO: We have measurement results supporting this.
Decision: The document is agreed

Frequency dependency

R1-164732 **Discussion on frequency dependent channel characteristics for InH and UMi** **Huawei, HiSilicon, CMCC, ETRI, Intel, Samsung, Nokia**
Proposal: Frequency dependent channel characteristics should be included in the model of this SI, e.g. for delay spread and angular spread.
Discussion:
Decision: The document is revised in 5570

R1-165570 **Discussion on frequency dependent channel characteristics for InH and UMi** **Huawei, HiSilicon, CMCC, ETRI, Intel, Samsung, Nokia**
Proposal: Frequency dependent channel characteristics should be included in the model of this SI, e.g. for delay spread and angular spread.
Discussion:
Ericsson: All measurements are not fully comparable.
Decision: The document is revised in 5461

R1-165351 **Frequency-dependence of LSPs** **Ericsson, Telstra**
Proposal: Use frequency-independent or weakly frequency-dependent functions for modeling LSPs
Discussion:
Huawei: We compared from different data sources independently. Those are comparable.
Ericsson: We and Fraunhofer gave reasoning in last meeting on the comparability of the measurement.
Huawei: Ericsson showed in other contribution that delays and angles are quite similar with different power levels.
Ericsson: There may be some sort of dependency but it is not linear.
Huawei: Even with same measurement campaign seems to lead to different findings.
Decision: The document is revised in 5480

R1-165461 **WF on frequency dependent LSP** **Huawei, HiSilicon, Samsung, NTT DOCOMO**
Discussion:
Ericsson: This is only for indoor. What about other scenarios?
Huawei: In this we address only indoor. We have agreement for other scenarios.
Ericsson: We have brackets in other scenarios. We are fine in principle with this but we should apply the same also for other scenarios.
Huawei: Other scenarios can be modified in other contributions.
Ericsson: We would prefer linear domain instead, not logarithmic. It would be easier to compare plots.
Decision: The document is revised in 5475

R1-165475 **WF on frequency dependent LSP for indoor office** **Huawei, HiSilicon, Samsung, NTT DOCOMO**

Discussion:
Ericsson: It is not only the slope change but also average value change. We do have a solution for this in 5480.
Nokia: We could remove all the brackets from LSP values in TR.
Ericsson don't agree with that approach.
Samsung: We need to solve this issue. Only 2 companies (Ericsson, Telstra) object.

Chair: How many companies can agree on removing the brackets from LSP for indoor and UMi? => Nokia, Samsung, Huawei, KT, LGE, ETRI, Alcatel Lucent Shanghai Bell, NTT DOCOMO (8 companies)

Ericsson could agree to remove brackets from indoor.
Nokia: UMi still in brackets?
Ericsson: Half dependency for UMi
Samsung: Apply Ericsson proposal for indoor and remove brackets from UMi.
Nokia: We can compromise with Samsung proposal.
Ericsson: As compromise we could take half the dependency for all the parameters.
Decision: The document is noted

R1-165480 **WF on frequency-dependent LSPs** **Ericsson, Telstra**

Proposal 1: Use the compromise solution between frequency-dependent and frequency-independent for all scenarios
Proposal 2: Change the frequency-dependent LSPs such that the value at 6 GHz equals the legacy value, and mandate that the LSP value is constant below 6 GHz
Proposal 3: Change frequency-independent LSPs to the legacy values

Discussion:
Nokia: proposal 1 say all the scenario but we already have agreements for UMa. This reopen parameters for some scenarios. We don't support to change agreements at this late phase. We should focus on parameters in brackets now.
Ericsson: We are open to change only some of the parameters. Proposal 3 also apply to all scenarios and parameters, not just one with brackets.
Huawei: We share the Nokia concerns on re-opening the parameters which are based on measurements.
Samsung: We have similar view than Nokia and Huawei.
Ericsson: Huawei have raised concern that models are inconsistent but not willing to change those.
Huawei: We agree there are inconsistencies but we have measurements results for high frequencies what is the focus on this SI. We agree with the problem but not with the solution.
Ericsson: This is only solution propose to this issue. If we don't agree we will stuck with this.
Huawei: This is a new approach making parameters for <6GHz based on higher frequency measurements.
Nokia: We share the Huawei view. Target is to make realistic CM for >6 GHz.
Ericsson: This is not a new feature. It is already included in the white paper and done also earlier.
KT: We agree with Huawei, Nokia and Samsung.
Telstra: This is pragmatic approach to make model consistent.
Decision: The document is noted

Time varying parameters

R1-165218 **Time-Varying Delays and Angles** **Keysight**

Proposal 1: Replace the factor $\exp(j2\pi v_{n,m} \cdot t)$ *with* $\exp\left(j2\pi \sum_{k=0}^{K}\left(v_{n,m}(k\Delta T) \cdot \Delta T\right)\right)$ *in the channel coefficient equation*
- *where* $t = k\Delta T$, ΔT *is the time sampling interval and* k *is a positive integer*

Proposal 2: Proposal 1 needs only to be considered in case the Doppler frequencies are time-varying. This could be due to:
- *Non-linear UE movement*
- *Time-varying angles of arrival due to spatial consistency modeling*

Discussion:
Ericsson: This is almost identical with our proposal. This is more complex. Does it also mean delta T need to be updated?
Decision: The document is noted

R1-165346 **WF on modifying channel coefficient equation for time-varying Doppler frequencies**
Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung

- *Proposal 1: Replace the factor* $exp\ j2\pi vn,m \cdot t$ *with* $exp\ j2\pi vn,m\ t \cdot t - ti\ exp\ j2\pi vn,m\ ti \cdot ti$ *in the channel coefficient equation*
  - *The phase shift at time* ti *is established as an anchor point and an incremental phase shift is applied*
  - *The anchor point should be updated sufficiently often so that* $vn,m\ ti+1 - vn,m\ ti \ll 1$
- *Proposal 2: Proposal 1 needs only to be considered in case the Doppler frequencies are time-varying. This could be due to:*
  - *Non-linear UE movement*
  - *Time-varying angles of arrival due to spatial consistency modeling*

Discussion:
Decision: The document is agreed

Clusters

R1-165352 On number of clusters and paths within clusters Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung

Proposal: The observations in this contribution should be taken into account when deciding on the number of clusters and paths within clusters

Discussion:
Samsung: Do you have a specific proposal for the number? This is high level proposal.
Ericsson: We should have at least 400. For the high resolution maybe 1000 or 10000 would be required.
Samsung: We already agreed numbers for the other cases.
Huawei: Is this proposal for all scenarios?
Ericsson: Yes.
Huawei: Changing the number of clusters now is a major change. Proposed numbers are based on only these measurements. What kind of post processing was used in these measurements? Do you measure 10000 rays at the same time? Is the environment fixed?
Ericsson: 2 GHz BW with large antenna array was used.
Decision: The document is noted

R1-165474 WF on number of MPCs Ericsson, NTT DOCOMO
Discussion:
Huawei: There are many good aspects but we have also concerns. E.g. equation for AoD leads easily less than 1. It should never go below 3GPP 3D CM. Equations may also lead to very high number which means more complicated simulations.
Ericsson: We say the minimum value is 20. It may be good to have maximum value as well.
Huawei: There are 3 dimensions, how to spread those to delay, azimuth and elevation?
Ericsson: This WF is only for the number of paths.
Huawei: Some upper limit should be defined to reduce the simulation complexity.
Decision: The document is noted

R1-165476 WF on number of MPCs Huawei, HiSilicon
Discussion:
Samsung: Regarding the number we need to consider also simulation complexity.
Huawei: We think it is good to add some upper limit to reduce complexity.
Nokia: We could leave the number as simulation parameter. Companies could decide the value they use.
Huawei: No strong opinion on that but we need to remind the complexity.
Ericsson: We could give guideline on simulation parameter.
Decision: The document is revised in 5771

R1-165771 WF on number of MPCs Huawei, HiSilicon
Discussion:
Nokia: Will this be in addition feature section?
Huawei: This is additional text to DCM for large BW and large array.
LGE: How about calibration?
Decision: The document is agreed with the addition: For calibration Nmax is 40.

7.2.3 Remaining details on modelling of additional features for >6GHz channel model

7.2.3.1 Remaining details on blockage modelling

R1-164193 Remaining details for blockage modeling Intel Corporation
Discussion:
Decision: The document is revised in 5405

R1-165405 Remaining details for blockage modeling Intel Corporation

Proposal 1: The additional shadowing of one blocker should consider the link between the transmitter and the blocker for indoor scenario as in equation (2-1).
Proposal 2: When calculating the additional shadowing on the LoS channel cluster, the blocker model including center and span, can still be built in the receiver's polar coordinate system. Then the blocker model in the transmitter's coordinate system can be derived by center ($\boldsymbol{\varphi_{Rx} - \pi, \pi - \theta_{Rx}, r_{Tx}}$), azimuth angular span $\boldsymbol{A_{Rx}r_{Tx}/r_{Rx}}$, zenith angular span $\boldsymbol{Z_{Rx}r_{Tx}/r_{Rx}}$.
Proposal 3: For NLoS channel cluster, a virtual transmitter can be assumed at the extension line of AoA/ZoA.

Proposal 4: The additional shadowing on the NLoS channel cluster can be calculated based on the link between virtual transmitter and receiver in the same way as LoS channel cluster.
Proposal 5: The distance between the virtual transmitter and the blocker can be randomly generated in the range of $[r_{Rx} \quad d_{Tx\to Rx} - r_{Rx}]$.
Proposal 6: The definition of LoS/Shadow region can be clarified, e.g. using figure 3, for knife edge model.
Proposal 7: The existent period of hand-held blockage can be modelled as a random variable with exponential distribution or uniform distribution. Or for simplicity, the existence/absence of hand-held blockage can be modelled as a discrete event for a given UE during the whole traffic transmission of this UE.
Proposal 8: The coherent distance to generate spatially consistent blockers need to be defined. It can be generated as the scenario dependent value, e.g. [5] meter for indoor scenario, and [10] meter for UMi/UMa/RMa.

Discussion:
Qualcomm: Proposal 1 is fine in principle. Simulations support shorter distances.
Samsung: In principle we agree with proposal 1. We have slightly different calculation method.
Ericsson: On proposal 7, how would we parametrise such a model?
Decision: The document is noted

R1-164713 **Advantages of stochastic blockage model Qualcomm Incorporated**

Document highlight the main advantages of the stochastic approach and provide a text proposal

Discussion:
Fraunhofer: Reasoning for K-values is confusing.
Samsung: Step c is FFS in TP. Do you have any specific proposal? This method may require too many parameters.
Qualcomm: We could modify the attenuation loss.
Decision: The document is noted

R1-164808 **Remaining details on blockage modelling for above 6 GHz channel model Samsung**

Proposal 1: Proposal B3 is preferred.
Proposal 2: Azimuth angles of blocking screens should be generated with spatial consistency, i.e. interpolation using correlated random variables. Elevation angles of blocking screens should be computed according to geometry.
Proposal 3: Sizes of angular blocking regions should be determined by Eq. (2)-(6).
Proposal 4: The number of blockage regions is modelled by a Poisson distributed random variable as Eq. (7).
Proposal 5: Proposal B5, i.e., knife edge based model should be used to compute attenuation of blockage.
Proposal 6: Proposal A7 is preferred.
Proposal 7: The blockage attenuation is constant during the blockage period. Linear transition periods of 0.01s are introduced at both sides of the blockage period. The average blocking period should be used in the simulation. The average blocking period is determined by Eq. (9)

Discussion:
Ericsson: We don't agree with the complexity. We can use the same approach for blockers as for users.
Qualcomm: We need to consider also other parameters which increase the complexity.
Decision: The document is noted

R1-165347 **WF on Blockage modeling Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

- Both approaches have their use cases
  - A (stochastic model) when a generic and computationally efficient blocking scenario is needed
  - B (geometric model) when a specific and more realistic blocking scenario is needed
- Proposal: Adopt both A and B as optional blocking models

Discussion:
ZTE: Approach A still has some parameters as FFS.
Nokia: We had to address all FFS points in this meeting so we propose this to be conditionally agreed
Ericsson: What is we can agree points only for one model?
Samsung agrees with Nokia.
Decision: The document is agreed

R1-165462 **WF on dynamic blockage Qualcomm Incorporated, Intel, Samsung, Ericsson**

Discussion:
Ericsson: We can agree but we need to note that parameter values on stochastic approach need further clarifications.
ZTE: We prefer the single solution but also OK with this approach. Companies should provide a TP in this meeting.
Qualcomm: We are working on that.
LGE: You just generate random distance. We are in general fine with option A.
Nokia: It is difficult to find different with already agreed WF. We could go directly for the TPs.
Decision: The document is noted.

7.2.3.2 Remaining details on spatial consistency modelling

Remaining issues

R1-164809 **Remaining details on spatial consistency for above 6 GHz channels** **Samsung**

Proposal 1: Use the proposed channel generation steps for user dropping.
Observation 1: The modelling of spatial consistency in the user mobility case may require recalculation of antenna patterns, which increases the complexity of channel simulation.
Proposal 2: If spatial consistency in mobility is considered, Method 1 or Method 2 should be used. Also, Method 2 is slightly preferred.
Under the working assumption of interpolation with correlated random variables, a method was proposed in [7], which is denoted as Method 1
Propose a new method (denoted as Method 2) to update channel parameters over time.

Discussion:
Ericsson: Proposal 1, companies may implement this differently. Method 2 is problematic approach.
Huawei: How about angle spreads in Method 1? Is it possible to merge these proposals?
Samsung: No
Decision: The document is noted

Time evolution

R1-164050 **Dynamic modeling for time evolution** **Huawei, HiSilicon**

Proposal 1: Adopt the model of time-variant angles given by equations (1)~(5) under the framework of spatial consistency model in [3].

Discussion:
Decision: The document is not treated

R1-164389 **Cluster delay with time evolution** **Huawei, HiSilicon**

Proposal 1: Adopt the correlation matrix method in (1) to slow down the varying rate of cluster delay

Discussion:
Decision: The document is not treated

R1-164726 **Discussion on spatial consistency in 5G channel model in time variant case** **Huawei, HiSilicon**

Proposal 1: Considering these results we may define a maximum distance of movement for the time evolution before a new spatially consistent realization is drawn. The max. movement maybe in the range of a few meters, e.g. 5m. This distance however may depend on the distance $\boldsymbol{d_{2D}}$.
Proposal 2: Consider an asymmetric behaviour for the angular changes to model local cluster angular change rates.

Discussion:
Decision: The document is not treated

Calibration

R1-164194 **Calibration methodology for spatial consistency** **Intel Corporation**

- Proposal 1: Spatial consistency can be calibrated as:
  - For each dropped UE, create one pair of positions according to **Error! Reference source not found.**. The first position is the dropped UE's position. The second position has fixed distance, e.g. 1 meter, from the first position.
  - Collect statistics from channel realization on each pair of positions.
  - For LOS/NLOS state spatial consistency, collect CDF of the LOS/NLOS state delta.
  - For cluster level spatial consistency, collect CDF of the mean channel angle difference using equation (1-2) for AOD/ZOD/AOA/ZOA.
- Proposal 2: For drop based MU-MIMO simulation, use the baseline model for spatial consistency.

- Proposal 3: If improvement of mobility based simulation is needed, use baseline model for initial UE dropping, followed by updating cluster delay using equation (5-1) and updating cluster angle with the limit of equation (5-2).
- Proposal 4: If moving between different channel states is modelled, define soft LOS/NLOS and indoor/outdoor states, and then path loss and fast fading channel are defined as a function of soft LOS/NLOS and indoor/outdoor states as in equation (7-1) and (7-2).

Discussion:
Huawei: The scope of this document is not clear. Only proposal 1 is for calibration. Is mobility also considered?
Intel: This propose also other details than calibration. Mobility relation is not agreed yet.
Nokia: We are OK in principle with dropping part for calibration.
Samsung is also OK with dropping part.
Huawei: WE have joint contribution in different agenda item
Decision: The document is noted

Further enhancements

R1-165233 **WF on correlation distance for spatial consistency in RMa** **Intel, Ericsson, AT&T, ETRI, Huawei, HiSilicon, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

- *The correlation distance for cluster/ray specific random variables for RMa is according to the table below*
- *The correlation distance for LoS state is [60m] for RMa*

	RMa	
	LOS	NLOS
Correlation distance (m) for cluster/ray specific random variables	[50]	[60]

Discussion:
Nokia: We should remove the brackets.
Samsung: Same comment.
Chair: Brackets can be removed when implementing text into TR.
Decision: The document is agreed

R1-165234 **WF on mobility enhancement for spatial consistency** **Intel, Ericsson, AT&T, ETRI, Huawei, HiSilicon, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: Both alternatives are captured in TR 38.900
- *Alternative 1: based on R1-163480, details described in the following slides*
- *Alternative 2: based on R1-163248, details described in the following slides*

Proposal 2: Modify the below text by adding the red text into the current TP
- *The cluster specific random variables include:*
  - *Cluster specific random delay in step 5;*
  - *Cluster specific shadowing in step 6; and*
  - *Cluster specific offset for AoD/AoA/ZoD/ZoA in step 7.*
  - *Cluster specific sign for AoD/AoA/ZoD/ZoA in step 7*
- *The procedure shall apply to each cluster before sorting the delay. Cluster specific sign for AoD/AoA/ZoD/ZoA in step 7 shall be generated once kept unchanged per simulation drop if UE position changes during simulation. The ray specific random variables include:*

Discussion:
Samsung: Alternative 1, would it be possible to update cluster angles?
Ericsson: Alternatives are different in scope. We are fine with capturing both in TR but we need to consider how to do that.
Decision: The document is agreed

R1-165348 **WF on O2I spatial consistency** **Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

- Proposal 1: Determine the "building type" using a spatially consistent random variable with correlation distance [50 m]
  - The building type is determined by comparing the random variable with P1 and P2
- Proposal 2: Determine the indoor distance from a spatially consistent uniform random variable in the interval 0-25 m, with correlation distance [25 m]
- Proposal 3: Make the penetration loss variability sP a spatially consistent random variable with correlation distance [10m]

Discussion:
Fraunhofer: What is the value in proposal 3?

Ericsson: Same as the Shadow fading.
Decision: The document is agreed

R1-165354 **WF on further enhancements for spatial consistency Ericsson, Intel, AT&T, ETRI, Huawei, HiSilicon, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

- Proposal 1: Soft LoS states are modeled in spatial consistency modeling
  - Soft LoS state is a float number between 0 (NLoS) and 1 (LoS)
  - Soft LoS state generating method is according to the appendix
    - dLoS is [20]
  - Define path loss and channel matrix to be a function of soft LoS state
    - $PLLOSsoft=PLLOS\cdot LOSsoft+PLNLOS\cdot(1-LOSsoft)$
    - $HLOSsoft=HLOS\cdot LOSsoft+HNLOS\cdot 1-LOSsoft$
  - Note: Not restricted to mobility simulations only
- Proposal 2: Soft indoor/outdoor states are not modeled in spatial consistency modeling
  - Note: The model thus doesn't support move between indoor/outdoor states in mobility simulation

Discussion:
LGE: Agreement from last meeting was different.
Ericsson: This is a shared view from sourcing companies.
Samsung: We shall remove the brackets when implementing this in TR.
Decision: The document is agreed

R1-165773 **TP for blockage Qualcomm, Intel, Samsung, Ericsson**
Discussion:
Fraunhofer: have you considered if you move the screen and elevation change?
Straight Path: Situation is different in NLOS case.
Decision: The document is noted.

7.2.3.3 Remaining details on large antenna array modelling

R1-164727 **Discussion on remaining details on large antenna array modeling Huawei, HiSilicon**

Proposal 1: The following aspects on large array support should be discussed in the channel model SI: spherical wave, high angular resolution, 3D correlation issue, and non-stationarity.
Proposal 2: The spherical wave modeling introduced in this document should be taken into account in the channel model SI.

Discussion:
Ericsson: What do you mean by 3D correlation issue?
Huawei: Contribution [6] discuss that.
Samsung: Do you have concrete proposals?
Huawei: Spherical way proposal is in this document. Other issues are ongoing except non-stationary. That can be discussed this week further.
Ericsson: Would it be in space domain?
Huawei: Yes.
Ericsson not comfort able with proposal 2.
Decision: The document is noted

R1-165183 **Implementation of cluster delay and angle spread NTT DOCOMO, INC., AT&T, Ericsson, Huawei, HiSilicon, Intel, KT Corporation, Nokia, Qualcomm, Samsung**

Alternative 1: Implementation for narrow BW based on sub-cluster information of 3GPP 3D model
Alternative 2: Implementation for large BW and/or large antenna arrays using generating step of cluster delays and angles in the 3GPP 3D channel model
Alternative 2a: Method using generating step of cluster delays and angles in the 3GPP 3D channel model
Alternative 2b: New method
Proposals 1: Adopt Alternative 1 for low complexity simulations where narrow BW
Proposals 2: Down select from Alternative 2a and Alternative 2b for large BW and/or large arrays

Discussion:
NTT DOCOMO support 2a.
Ericsson support 2b.
ZTE support 2b.

Decision: The document is revised in 5466

R1-165466 **WF on implementation of cluster delay and angle spread NTT DOCOMO, Huawei, HiSilicon, Intel, Nokia, Qualcomm, Samsung**

Proposal 1: Alternative 1 is adopt for low complexity simulations where narrow BW
Proposal 2: Alternative 2a is adopt for large BW and/or large arrays

Discussion:
Ericsson: Alternative 2a is based on number of paths not in line with other WF. We like to see the scaling.
ZTE: Proposal is quite high level. It would be better to provide TP.
Decision: The document is revised in 5477

R1-165477 **TP for implementation of cluster delay and angle spread in TR38.900 on Clause 7.5NTT DOCOMO, Huawei, HiSilicon, Intel, Nokia, Qualcomm, Samsung**
Discussion:
LGE: Comments on 3 issues. How to use scaling factor? How to implement cluster delays in section 7.5? This is a new feature for large antenna array. How RAN1 us this new feature?
NTT DOCOMO: We will assume arrays. Clause belongs for rapporteur to handle.
Samsung: We prefer to capture in 7.6 instead.
LGE: New delay offset for narrow BWs.
ZTE: 2 values are not defined yet. Who will provide those definitions? Scaling factor is non-linear optimisation factor.
Companies are not sure about realization.
Fraunhofer: What to do with sub path powers?
Ericsson: Which agreement in Busan this is referring to? We could re-use agreed TP for the hybrid model.
NTT DOCOMO: WF in this meeting.
Decision: The document is revised in 5772

Friday
R1-165772 **WF on implementation of cluster delay and angle spread Ericsson, NTT DOCOMO, ZTE Corp, ZTE Microelectronics**
Discussion:
Decision: The document is agreed.

R1-166025 **WF on AoA, ZoA, ZoD Angular Scaling Huawei, HiSilicon, NTT DOCOMO**

- Agree the following example values for scaling:
  - AoA spread (ASA) for each CDL model: {30, 45, 60} degrees.
  - ZoA spread (ZSA) for each CDL model: {5, 10, 15} degrees.
  - ZoD spread (ZSD) for each CDL model: {1, 3, 5} degrees.

Decision: The document is agreed.

R1-165353 **Indoor Highly Resolved Channel Measurements at 60 GHz Ericsson, Telstra**

Observation 1: 1000-10000 MPCs needed to account for 95% of power
Observation 2: 100 strongest MPCs account for 10-70% of power
Observation 3: Number of observed clusters are at the order of 10-20
Observation 4: More clusters and MPCs needed in NLOS than in LOS

Proposal: The observations in this contribution are taken into account when deciding on the number of clusters and paths within clusters

Discussion:
Huawei: BW is 2 GHz with very large array. How did you consider the impact of that?
Ericsson: Broadening the clusters.
Decision: The document is noted.

7.2.3.4 Remaining details on modelling of other additional features

R1-164353 **Text proposal to update oxygen absorption loss ZTE**
Discussion:
Decision: The document is agreed

7.2.4 Remaining details on link-level channel models

Remaining issues

R1-164724 **Discussion on the link level channel models** **Huawei, HiSilicon**

Proposal 1: CDL-A/TDL-A two last tap powers adjusted 19.0 to -19.9 and -33.1 to -29.7.
Proposal 2: CDL-D/CDL-E/TLD-D/TDL-E delay spread is adjusted by multiplying all delays by a constant value to obtain 1.0000 rms delay spread.
Proposal 3: Correct the editorial error of CDL-D.

Discussion:
Decision: The document is agreed

TPs and WFs

R1-164051 **Text proposal to TR 38.900 to add link level channel model for LoS scenario** **Huawei, HiSilicon**
Discussion:
Decision: The document is agreed

R1-164052 **Text proposal to TR 38.900 to add antenna filtering for link level channel model** **Huawei, HiSilicon**
Discussion:
Fraunhofer: We had email discussions where we said there is something wrong in this. Filter has to be changed.
Huawei: This is a copy of agreed WF from Busan.
Decision: The document is revised in 5468

R1-165468 **Text proposal to TR 38.900 to add antenna filtering for link level channel model** **Huawei, HiSilicon**
Discussion:
Samsung: We have not got time to check.
Decision: The document is return.
Friday: The proposed TP is just noted.

R1-164257 **Text Proposal on the purpose of link-level channel modes for 38.900** **CATT**
Discussion:
Samsung: This is more a guideline for NR, not for channel model work.
CATT: WE have used similar statement also earlier SCM channel model work.
LGE: We are not sure why we have to capture this in a TR.
Huawei: This is not necessary text in a TR. It is up to RAN1 to decide which model to use.
Ericsson: This is not something we should mandate. We could have recommendation or guideline.
Decision: The document is noted

R1-164725 **Text proposal to TR 38.900, corrections and clarifications to the link level channel models** **Huawei, HiSilicon**
Discussion:
LGE: Comment on CDL table delay.
Huawei: Delay is normalised to 1 s.
CMCC: Do we have to align the numbers with system simulation parameters?
Huawei: These are different models agreed before system simulation model due to time pressure.
Decision: The document is agreed

R1-164731 **Scaling of the K-factor of the link level channel models** **Huawei, HiSilicon, Nokia, Samsung, AT&T, CMCC, Ericsson, Intel, KT Corporation, NTT DOCOMO, Qualcomm**
Discussion:
Decision: The document is revised in 5440

R1-165440 **Scaling of the K-factor of the link level channel models** **Huawei, HiSilicon, Ericsson, Nokia, Samsung, Intel, Qualcomm, NTT DOCOMO, AT&T, KT Corporation**

Proposal: The above procedure for K factor scaling and example K-factor values is added into the TR 38.900.

Discussion:

Decision: The document is agreed

R1-165349 **WF on link level models for MIMO simulations Ericsson, AT&T, CMCC, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Discussion:

Decision: The document is revised in 5402

R1-165402 **WF on link level models for MIMO simulations Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

- Proposal 1: Introduce angular translation and angular spread scaling to the agreed CDLs
  - A method for scaling and translation to be described in the TR
  - Guidelines on selecting scaling and translation parameters to be captured in the TR
  - Note: This can be done with a similar approach as the delay scaling
- Proposal 2: Introduce correlation matrices to be used together with the TDLs
  - The correlation matrix construction method from 36.101/36.104 can be reused
  - Guidelines on selecting correlation parameters to be captured in the TR
  - Note: This approach can be applied to TDLs derived from spatially filtered CDLs according to R1-163490 to emulate hybrid BF

Discussion:

Samsung: Are we going to capture the content in the TR? Angular spread need to be modified.

Ericsson: Typo need to be fixed.

Huawei: There should be example scaling factor values in proposal 1. We are preparing WF for that. Proposal 2 for channel or cluster correlation matrix? How it is defined for very large array? 4x4 MIMO leads to 16x16 correlation matrix. We could have 256x256 MIMO and the matrix will be huge.

Ericsson: It can be used for both. Per channel may be better but we are open for both. We don't need to write out the matrices.

Samsung: Proposal 2 2nd bullet needs clarification.

Ericsson: It is defined in the 3rd bullet.

Decision: The document is revised in 5470

R1-165470 **WF on link level models for MIMO simulations Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung, InterDigital**

Discussion:

Decision: The document is agreed

R1-165756 **WF on Angular Scaling Huawei, HiSilicon, Ericsson**

Agree the Proposal 1 of R1-165402.

Agree the following example values for AoD spread (ASD) for each CDL model: {5, 10, 15, 25} degrees.

Scaling of other angular parameters (ZSD, ASA, ZSA) are FFS.

Discussion:

Samsung: Did you address the zenith angle?

Huawei: That is quite limited case. The scalability of that is not important.

Samsung: We should define the upper limit. We should not have FFS anymore.

ZTE: Is the scaled number already normalized.

Huawei: Proposal was to first normalise, then scale.

Samsung: We should complete FFS and zenith angle during this week.

Decision: The document is agreed.

7.2.5 Channel modelling calibration results

R1-165184 **Further Discussion on O-to-I Parameters NTT DOCOMO, INC.**

Discussion:

Decision: The document is revised in 5427

R1-165427 **Further Discussion on O-to-I Parameters NTT DOCOMO, INC.**

Proposal 1: Use the UE-specific in d_{in}, i.e. UE to all the sectors has the same d_{in}.
Proposal 2: Replace the O-to-I shadow fading with O-to-I standard deviation.

Discussion:
Decision: The document is noted

R1-165770 **WF on calibration** **Nokia, Samsung**

- *Setup 3 email threads for collecting calibration results*
  - *For updating results for large scale calibration: Until June 10th*
  - *For full calibration results: Until June 25th*
  - *For additional feature calibration: Until July 25th*
- *Companies can decide which option(s) to calibrate for those additional features with multiple options*
  - *Rapporteur will provide separate excel templates for different options*
- *Capture the [reference tdoc # containing the excel sheet(s)] into TR38.900 similarly to 3D channel model calibration process*
  - *TP for capturing the results can be approved in the email discussion*

Discussion:
Decision: The document is agreed.

7.2.5.1 Large-scale calibration

Email discussion summary

R1-164802 **E-mail discussion summary of the large scale calibration** **Samsung, Nokia**

Large-scale calibration is completed, and the calibration results in the latest version of the excel sheet in the ftp folder are captured in the TR.

- *In the TR, average cdf plots will be provided for the calibration parameters with citing rapporteur's calibration summary tdoc similarly as done for TR36.873.*
- *In the rapporteur's calibration summary tdoc, the below table on the O2I parameters is included.*

For the full calibration, companies continue discuss how to align the three O2I parameters in [84b-17].

Discussion:
Decision: The document is agreed

Calibration results

R1-164195 **Large scale calibration results** **Intel Corporation**
Discussion:
Decision: The document is not treated

R1-164258 **Large scale calibration results** **CATT**
Discussion:
Decision: The document is not treated

R1-164384 **Discussion on large-scale calibration** **Huawei, HiSilicon**
Discussion:
Decision: The document is not treated

R1-164571 **Large scale calibration results** **LG Electronics**
Discussion:
Decision: The document is not treated

R1-164810 **Results of large-scale channel model calibration** **Samsung**
Discussion:
Decision: The document is not treated

R1-164899 **Large Scale Calibration Results** **Beijing Xinwei Telecom Techn.**
Discussion:
Decision: The document is not treated

R1-165286 **Large scale calibration results of channel model for frequency spectrum above 6 GHz** **CATR**
Discussion:
Decision: The document is not treated

R1-165404 **Large scale calibration results** **Lenovo, Motorola Mobility**
Discussion:
Decision: The document is not treated

Calibration discussions

R1-164715 **Initial results on large scale calibration and concerns on calibration specifications** **Qualcomm Incorporated**

Proposal 1: Baselines on which large and full scale calibration are to be made need to be specified completely and in as much detail as possible in the TP to avoid ambiguities and mismatches in calibration curves.
Proposal 2: UE-specific, link-specific, eNB-specific and sector-specific quantities need to be appropriately defined.
Proposal 3: Quantities that are to be correlated across sectors, across eNBs and across links need to be specified. In particular, assumptions on the following quantities need to be specified: Outdoor/indoor determination random variable, penetration loss determination random variable, d_In, shadow fading factors for LOS/NLOS, and shadow fading factors for penetration loss.

Discussion:
Decision: The document is noted

R1-164894 **Discussion on large-scale calibration results** **CHTTL**

Proposal 1: RAN1 should clarify whether it's UE-specific or link-specific for Building penetration loss through external wall, O-to-I penetration loss standard deviation, and Indoor distance d2D-in to improve the convergence of calibration results.

Discussion:
Decision: The document is noted

7.2.5.2 Full calibration

Email discussion summary

R1-164803 **E-mail discussion summary of the full calibration** **Samsung**
Discussion:
Decision: The document is noted

Calibration results

R1-164259 **Full scale calibration results** **CATT**
Discussion:
Decision: The document is not treated

R1-164385 **Discussion on fast fading calibration** **Huawei, HiSilicon**
Discussion:
Decision: The document is not treated

R1-164811 **Results of full channel model calibration** **Samsung**

Discussion:
Decision: The document is not treated

Calibration discussions

R1-164048 **Discussion on additional feature calibration** **Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**
Discussion:
Decision: The document is revised in 5441

R1-165441 **Discussion on additional feature calibration** **Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: adopt assumptions in Table 1 for calibration of oxygen absorption.
Proposal 2: adopt assumptions in Table 2 for calibration of large bandwidth and large antenna array.
Proposal 3: adopt assumptions in Table 3 for calibration of spatial consistency.
Proposal 4: adopt assumptions in Table 4 for calibration of blockage.

Discussion:
Decision: The document is revised in 5469

R1-165469 **Discussion on additional feature calibration** **Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**

Proposal 1: adopt assumptions in Table 1 for calibration of oxygen absorption.
Proposal 2: adopt assumptions in Table 2 for calibration of large bandwidth and large antenna array.
Proposal 3: adopt assumptions in Table 3 for calibration of spatial consistency.
Proposal 4: adopt assumptions in Table 4 for calibration of blockage.

Discussion:
Nokia: There are quite many scenarios to calibrate. We should try to down select the scenarios and metrics.
LGE: Which spatial consistency dropping method is intended? Large antenna array have 64 elements. Distance of the panels will be more than 3.5 lambda. We have too many metrics to calibrate.
Huawei: In stationary case we drop multiple users at the same time. We could consider down selection.
Decision: The document is revised in 5471

R1-164900 **Discussion on full calibration** **Beijing Xinwei Telecom Techn.**

Proposal 1: Companies are encouraged to adjust cross correlation values based on measurement data to make the cross correlation matrix positive definite.
Proposal 2: Reuse the same ZSD and ZoD offset parameters for UMa and UMi-Street Canyon LOS O-I scenarios as those values for UMa and UMi-Street Canyon LOS scenarios, as listed in Table 1 and Table 2 .
Proposal 3: Reuse the same ZSD and ZoD offset parameters for UMa and UMi-Street Canyon NLOS O-I scenarios as those values for UMa and UMi-Street Canyon NLOS scenarios, as listed in Table 1 and Table 2 .
Proposal 3: For indoor-office scenario, ZoD offset in LOS condition can be zero, and in NLOS condition, it should be a function that takes d2D or d3D as a variable.
Proposal 4: Constant C for the number of clusters equals to 4, 10 or 11 should be defined based on measurement data.
Proposal 5: For calibration purpose, whether O-I penetration loss is high or low is UE-specific, indoor distance is UE-specific, and replace shadow fading term by standard deviation which is link-specific and the same for three sectors of an eNodeB and different for different eNodeBs.

Discussion:
Decision: The document is noted

R1-165471 **Discussion on additional feature calibration** **Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation, Nokia, NTT DOCOMO, Qualcomm, Samsung**
Discussion:
Decision: The document is agreed

7.2.6 Consistent extension of the additional features to < 6GHz

R1-164716 **Considerations on link and system model extension to < 6GHz** **Qualcomm Incorporated**

Observation 1: Typically, when a UE is close to the base station it is more likely to experience a relatively lower delay spread, compared to that of a UE that is in the cell-edge.
Proposal 1: Perform link-level evaluations of different numerology proposals under a geometry-based scaled multi-path channel model.

Discussion:
Decision: The document is not treated

R1-164728 **Discussion on the extensions of the channel model to below 6GHzHuawei, HiSilicon, Intel, Qualcomm**

Proposal: TR38.900 is applicable to 6 - 100 GHz only.

Discussion:
Ericsson: RMa would then be valid only between 6 – 7 GHz.
Huawei: It would be valid for lower frequencies too. One way would be to include RMa in 3D CM.
Nokia: RMa is anyway exceptions as it is only for up to 7 GHz.
Samsung: How can solve the discrepancy between models at 6 GHz?
Huawei: We can adjust higher frequency PL or modify 3D CM PL. We prefer option 1 to modify 5G CM PL.
Ericsson: Observation 4 shows additional features are important also for < 6 GHz.
Nokia: We don't think the PL discontinuity is a critical issue.
Ericsson: NR evaluation has such scenario combining both frequency ranges. Having different models is not a good solution.
Telstra: <6GHz range is important. 2 models is not a good approach.
Huawei: Basically we agree it would be good to have only 1 model but we have very limited time schedule. We would need more time to study all implications.
Decision: The document is noted

R1-164806 **Discussion on using new channel model also below 6 GHzSamsung, AT&T, Ericsson, KT Corporation, ETRI**
Discussion:
Decision: The document is revised in 5400

R1-165400 **Discussion on using new channel model also below 6 GHzSamsung, Ericsson, ETRI, KT Corporation, Telstra**

This contribution made the following observations:

- *If two incompatible pathloss models are adopted according to Alt 1, pathloss discontinuities occur at 6 GHz.*
- *Alt 1 can introduce another problem of how to handle the range of 3.5-6GHz frequency band.*
- *The new channel models are proposed based on the dataset including both below and above 6 GHz measurement/ray-tracing.*
- *Following Alt 1, there is no 3D channel model for InH and RMa scenarios below 6 GHz; With Alt 2, 3D channel model is available for all prioritized scenarios and frequency bands.*
- *There was a precedence to make a full transition from one channel model to another – TR 25.996 SCM to ITU channel models during 3GPP RAN1 LTE advanced SI.*
- *Alt 2 can improve the accuracy of MU-MIMO simulations below 6 GHz.*
- *Alt 2 may be more attractive from the point of view of ITU-R*

Discussion:
Huawei: PL model is shown as reasoning but the same can be used also another way around. Do we need to redo all the simulations?
Samsung: Interference limited scenario was considered in 3D CM work. PL change doesn't affect the results so much. We saw in calibration results that we have Interference limited scenario in NR as well.
Huawei: We should consider different levels in NR study. The impact on PL will be more significant.
Decision: The document is noted

R1-164807 **Discussion on consistent pathloss model between below 6GHz and above 6GHz Samsung**

Proposal 1:

- *Considering the simplicity and the consistency in pathloss models, Solution #2 should be taken into TR38.900*

Proposal 2:

- *Alt 2 : New channel model in TR38.900 is applicable to 0.5 - 100 GHz in R1-164616 should be down-selected*

Discussion:
Decision: The document is not treated

R1-164616 **On the applicability range of new channel model Nokia, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT DOCOMO, Qualcomm, Samsung**

RAN1 should down-select between the two alternatives

- *Alt.1: New channel model in TR38.900 is applicable to 6 - 100 Ghz*
- *Alt.2: New channel model in TR38.900 is applicable to 0.5 - 100 Ghz*

Discussion:
ZTE: There is also 3rd alternative.
Decision: The document is noted

R1-165472 **WF on the applicability range of new channel model Nokia**
Discussion:
Decision: The document is withdrawn

R1-165479 **WF on the applicability range of the new channel model Ericsson, Samsung, Telstra, ETRI, KT, LGE, Straight Path**

Proposal: New channel model in TR38.900 is applicable to 0.5 - 100 GHz

Discussion:
Nokia: It is hard to find a compromise for the question yes or no. We could capture the new CM is applicable to at least 6-100 GHz.
Ericsson: There are colleagues in NR session planning to use this model for < 6GHz.
Huawei: We checked NR colleagues. If model is stable they can use it also, otherwise they use something else.
Ericsson: What is Huawei view? Is the model valid for <6 GHz or not?
Huawei: It is not valid for < 6 GHz.
CATT: Model is not valid for < 6 GHz. NR evaluations will start in the next meeting.
Nokia: There is no consensus for the values < 6GHz. We capture now what we have in a TR and add a sentence in the TR and close the SI.
Ericsson: That would be extremely confusing for NR evaluations. We need to solve this before closing the SI.
Huawei: NR assumption says also 3D model can be used. Title of the SI is > 6 GHz so this is very clear.
Ericsson: Why do you draft WF for link level which is mandatory for < 6 GHz?
Samsung: Current TR have different description for different features and applicability range. Link level is OK. It would be much nicer to use the 5G CM for the whole range of NR.
CMCC: We have not got enough time to evaluate parameters for < 6 GHz. If to cover also that then extension of the SI should be further discussed.
Samsung: There is no issue to use this for < 6GHz. There is no CM agreed for all NR simulation cases.
Telstra: This is important issue to solve.
Samsung: What is Huawei solution for indoor?
Huawei: Using 3D CM or ITU model.
Samsung: ITU model is not 3D.
Ericsson: Partial solution would be to agree extension to UMa and RMa.
Huawei: What is the reason to extend if UMa is according to 3D CM and RMa according to ITU?
Ericsson: We have re-used parameters and added some more parameters.
Samsung: Compromise could be to have applicability range in brackets and let NR to decide.
Huawei: RAN plenary discussed this range. We proposed then to cover the full range but it was objected by many companies. The whole SI focus have been >6 GHz only.
Samsung: We are not changing any opinion but consider extending to <6GHz as discussed in the plenary.
Ericsson: There are many issues to solve for <6GHz.
Ericsson: We have proposed solution to solve this issue. Blocking is not constructive.
CATT: We have not seen solution for extension.
Conclusion: 2 alternatives were discussed on the applicability frequency range either 0.5-100 GHz or 6-100 GHz but consensus was not reached.
Decision: The document is noted.

7.2.7 Map-based methodology

R1-164351 **Evaluations of map-based hybrid channel model ZTE, Keysight**

Proposal 1: RAN1 confirms the working assumption on map-based hybrid model in TR38.900

Discussion:
Huawei: Did you verify the spatial consistency between 2 closely located users? It seems to be good match between parameters. Why the SF is lower?
ZTE: Not in this document but we have done that earlier.

NTT DOCOMO: Question on Figure 2 calibrated PL decrease.
Ericsson: Do you think table 2 shows a good correspondence?
ZTE: On reason for the difference is the layout. Ray tracing results will be smaller than stochastic model. Hybrid model works with different maps.
Ericsson: Is the different from the map only?
ZTE: Yes. There are differences in results also in stochastic model.
Decision: The document is agreed

R1-164352 **Text proposal for remaining issues in map-based hybrid model** **ZTE, Keysight**
Discussion:
Decision: The document is revised in 5667

R1-165667 **Text proposal for remaining issues in map-based hybrid model** **ZTE, Keysight**

Proposal 1: The modeling of large bandwidth and large antenna array in map-based hybrid channel model is based on the splitting of whole bandwidth into multiple frequency bins, and has channel coefficients per bin given by (1) and corresponding delays given by (2).
Proposal 2: The modeling of blockage and UT rotation in map-based hybrid channel model obeys maximum similarity to those determined in stochastic-only model.
Proposal 3: To update the section 8 of TR38.900 with the attached TP.

Discussion:
Ericsson: Dividing the BW. Is this applicable to both models?
ZTE: In theory yes but the intention is to have that only in hybrid model.
Ericsson: If to have it in both models then more time is needed to evaluate.
Decision: The document is agreed.

8 Closing of the meeting

Thanks to the Chineese Friends of 3GPP for hosting and organizing such big meeting. High attendnace will surely becomes an issue for the upcoming meetings in Europe.
Mr Chair thanked all the chair persons who help managing the number of parallel sessions during the course of the week.
Good progress was achieved with the closing of NB-IoT work and other WI/SI as well.
Mr Chair then wished all a relaxing summer break.
Meeting was closed at 17:10.
See you all in Göteborg.

Annex A: List of Tdocs at RAN1 #85

Please see excel file attached to this report

Annex B: List of CRs agreed at RAN1 #85

TDoc #	Title	Source	Release	Spec #	Version	Related WIs	CR #	CR revision #	CR category
R1-164926	Correction on citations to a DAI bits table	ITRI	Rel-13	36.212	13.1.0	LTE_CA_enh_b5C-Core	0205		F
R1-164927	Some corrections for eMTC	ITRI	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0245		F
R1-165093	Correction on search space to decode the PDCCH configured by the SC-N-RNTI	TD Tech Ltd, Huawei	Rel-13	36.213	13.1.1	LTE_SC_PTM-Core	0654		F
R1-165387	Starting OFDM symbol for SIB1-BR for BL/CE UE	Ericsson	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0657		F
R1-165388	Collision between SIB1-BR and SI message for BL/CE UE	Ericsson	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0658		F
R1-165392	Definition of number of MPDCCH repetitions for BL/CE UE	Ericsson	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0662		F
R1-165393	PRB locations for Type0 MPDCCH search space for BL/CE UE	Ericsson	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0663		F
R1-165396	36.201CR0014r1 Introduction of NB-IoT	Nokia, Alcatel-Lucent Shanghai Bell	Rel-13	36.201	13.1.0	NB_IOT-Core	0014	1	B
R1-165515	Clarifications on DCH enhancements feature	Qualcomm Incorporated, Ericsson, Huawei, Nokia Networks, HiSilicon	Rel-12	25.212	12.1.0	UTRA_DCHenh-Core	0339		F
R1-165516	Clarifications on DCH enhancements feature (Mirror Rel-13)	Qualcomm Incorporated, Ericsson, Huawei, Nokia Networks, HiSilicon	Rel-13	25.212	13.0.0	UTRA_DCHenh-Core	0340		A
R1-165528	CR on FD-MIMO codebooks	Samsung	Rel-13	36.213	13.1.1	LTE_EBF_FDMIMO-Core	0666		F
R1-165529	CR on CSI-Reporting-Type	Samsung	Rel-13	36.213	13.1.1	LTE_EBF_FDMIMO-Core	0667		F
R1-165530	Introduction of 60ms periodicity for wideband CQI/PMI reporting	Nokia, Alcatel-Lucent Shanghai Bell, Apple, Broadcom, Ericsson, Intel, Mediatek	Rel-13	36.213	13.1.1	TEI13	0668		B
R1-165531	Correction on the usage of CEModeA and CEModeB for eMTC in TS 36.213	Huawei, HiSilicon	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0669		F
R1-165532	CR for clarification of MPDCCH over empty CRS tones in PBCH repetition	Qualcomm Incorporated	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0247		F
R1-165533	Correction on the DCI payload size for eMTC in TS 36.212	Huawei, HiSilicon	Rel-13	36.212	13.1.0	LTE_MTCe2_L1-Core	0207		F

TDoc #	Title	Source	Release	Spec #	Version	Related WIs	CR #	CR revision #	CR category
R1-165534	CR for scrambling sequence initialization	Qualcomm Incorporated	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0248		F
R1-165536	On MPDCCH AL and search space for 8 EREGs per ECCE in TS 36.213.	Huawei, HiSilicon	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0670		F
R1-165537	CR on MPDCCH quasi co-location	Panasonic	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0671		F
R1-165538	Correction on UE assumption on DMRS ports	ZTE Corporation, ZTE Microelectronics	Rel-13	36.213	13.1.1	LTE_EBF_FDMIMO-Core	0672		F
R1-165540	Frequency hopping flag definition in DCI formats for BL/CE UE	Ericsson, Samsung	Rel-13	36.212	13.1.0	LTE_MTCe2_L1-Core	0206	1	F
R1-165568	Correction on collision of dynamically scheduled data and semi-statically scheduled data for Rel-13 eMTC	Ericsson, LG Electronics	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0637	2	F
R1-165621	A-CSI reporting for TM6	Samsung	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0673		F
R1-165622	Corrections on CSI Reporting	Samsung	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0674		F
R1-165623	On MPDCCH AL for 8 EREGs per ECCE in TS 36.211	Huawei, HiSilicon	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0249		F
R1-165624	Correction on RV determination for PUSCH in TS 36.213	Huawei, HiSilicon	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0675		F
R1-165626	Clarification on Msg3 PUSCH repetition level in TS 36.213	Huawei, HiSilicon	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0677		F
R1-165627	Correction on SRS frequency location in TS 36.213	Huawei, HiSilicon	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0678		F
R1-165635	Channel interleaver correction for eMTC	Nokia, Alcatel-Lucent Shanghai Bell	Rel-13	36.212	13.1.0	LTE_MTCe2_L1-Core	0208		F
R1-165636	Correction on PDSCH reception timing for eMTC	Nokia, Alcatel-Lucent Shanghai Bell	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0679		F
R1-165672	Clarification on starting subframe for MPDCCH	Qualcomm	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0681		F
R1-165673	Overriding of valid-invalid subframes for R=1	Qualcomm	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0250		F
R1-165682	Correcting configuration parameter for number of PRB-pairs	Sequans Communications	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0680	1	F
R1-165686	Scrambling Sequence for paging MPDCCH and PDSCH	Nokia, Alcatel-Lucent Shanghai Bell, Intel, Ericsson	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0251		F
R1-165687	MCS for Random Access Response Grant	Nokia, Alcatel-Lucent Shanghai Bell	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0682		F
R1-165703	Scrambling sequence initialization for PDSCH	Qualcomm, NTT DOCOMO	Rel-13	36.211	13.1.0	LTE_MTCe2_L1-Core	0252		F

TDoc #	Title	Source	Release	Spec #	Version	Related WIs	CR #	CR revision #	CR category
R1-165724	Correction on RLM for PSCell in dual connectivity	Intel Corporation, panasonic	Rel-13	36.213	13.1.1	LTE_SC_enh_dualC-Core, TEI13	0684		F
R1-165737	Correction on PDSCH transmission scheme assumed for TM9 CSI reference resource in TS 36.213	Huawei, HiSilicon	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0685		F
R1-165746	eMTC MPDCCH corrections for 36.213	Sequans Communications	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0653	1	F
R1-165791	Correction on UCI multiplexing on PUSCH	Ericsson	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0683	2	F
R1-165862	Clarifications on DCH enhancements feature	Qualcomm Incorporated	Rel-12	25.214	12.3.0	UTRA_DCHenh-Core	0747		F
R1-165863	Clarifications on DCH enhancements feature (Mirror Rel-13)	Qualcomm Incorporated	Rel-13	25.214	13.2.0	UTRA_DCHenh-Core	0748		A
R1-165969	MPDCCH search space for random access in connected mode for BL/CE UE	Ericsson, Panasonic, Samsung	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0660	3	F
R1-165971	Introduction of NB-IoT	Ericsson	Rel-13	36.211	13.1.0	NB_IOT-Core	0224	8	B
R1-165972	Introduction of NB-IoT	Motorola Mobility	Rel-13	36.213	13.1.1	NB_IOT-Core	0656	1	B
R1-165973	Introduction of NB-IoT	Ericsson	Rel-13	36.214	13.1.0	NB_IOT-Core	0033	2	B
R1-166022	CR on clarification for channel sensing	Qualcomm Incorporated	Rel-13	36.213	13.1.1	LTE_LAA-Core	0686		F
R1-166039	CR on CWp adjustment	Qualcomm Incorporated	Rel-13	36.213	13.1.1	LTE_LAA-Core	0687		F
R1-166045	Introduction of Rel-13 feature of NB-IoT in 36.212	Huawei, HiSilicon	Rel-13	36.212	13.1.0	NB_IOT-Core	0192	3	B
R1-166048	Clarification of CSI measurements	Qualcomm Incorporated, Ericsson, Samsung, Panasonic	Rel-13	36.213	13.1.1	LTE_MTCe2_L1-Core	0688		F

Annex C-1: List of Outgoing LSs from RAN1 #85

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
R1-165511	LS on RAN1 multi-carrier enhancements for UMTS agreements	RAN1, Huawei	Rel-14	FS_UTRA_Mce		RAN2, RAN3			
R1-165512	LS on HS-SCCH DRx Design in Cell Fach	RAN1, Qualcomm	Rel-14	FACH_DTXDRX-Core		RAN2, RAN3			
R1-165710	Reply LS on TBS sizes for SI-messages for NB-IoT	RAN1, Huawei	Rel-13	NB_IoT-Core	R2-163294	RAN2			
R1-165711	Reply LS on updated TS 36.300 section 5 for NB-IoT	RAN1, Huawei	Rel-13	NB_IoT-Core	R2-161885	RAN2			
R1-165748	LS on MPDCCH configuration for BL/CE UE	RAN1, Ericsson	Rel-13	LTE_MTCe2_L1-Core		RAN2			
R1-165814	LS to RAN2 on Priority for V2V	RAN1, Qualcomm	Rel-14	LTE_SL_V2V-Core		RAN2	SA2		
R1-165820	Reply LS on Parameters for WP5D Sharing and compatibility studies	RAN1, NTT DOCOMO	Rel-15	FS_NR_newRAT	R4-162880	RAN4			
R1-165853	LS on OTDOA for the same PCI	RAN1, Huawei	Rel-14	UTRA_LTE_iPos_enh2-Core		RAN2, RAN3	RAN4		
R1-165906	LS on RRC parameter list for NB-IoT	RAN1, Huawei	Rel-13	NB_IoT-Core		RAN2			
R1-165913	LS on TR update for latency reduction	RAN1, Ericsson	Rel-14	FS_LTE_LATRED		RAN2			
R1-165984	LS on RAN1 Agreements in MUST	RAN1, MediaTek	Rel-14	LTE_MUST-Core		RAN4			
R1-165996	Reply LS on the feasibility of mobility enhancement solutions	RAN1, ZTE	Rel-14	LTE_eMob-Core	R2-163135	RAN2	RAN4, RAN3		
R1-166029	LS on Rel.14 eFD-MIMO WID update	RAN1, Nokia	Rel-14	LTE_eFDMIMO-Core		RAN			
R1-166033	LS on high level coexistence approaches between PC5 transport for V2V services and DSRC/IEEE 802.11p services in the same channel	RAN1, Ericsson	Rel-14	FS_LTE_V2X		RAN			
R1-166044	LS on Uplink Capacity Enhancements for LTE	RAN1, Ericsson	Rel-14	LTE_UL_CAP_enh-Core		RAN2	RAN4		
R1-166037	LS on NB-IoT performance	RAN1, Huawei	Rel-13	NB_IoT-Core		RAN	RAN2, RAN4		
R1-166038	LS on DRX and Reception of PDCCH scrambled by CC-RNTI	RAN1, Panasonic	Rel-13	LTE_LAA-Core		RAN2			
R1-166040	Response LS to 802dot11 regarding LAA	RAN1, Qualcomm Incorporated	Rel-13	LTE_LAA-Core		IEEE 802 LAN/MAN Standards Committee	Wi-Fi Alliance, The City of New York Office of the Mayor, RAN, RAN2, RAN4		
R1-166041	Response LS to WFA regarding LAA	RAN1, Qualcomm Incorporated	Rel-13	LTE_LAA-Core		Wi-Fi Alliance	IEEE 802 LAN/MAN Standards Committee,		

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
							The City of New York Office of the Mayor, RAN, RAN2, RAN4		
R1-166042	Reply LS on continuous uplink transmission in eMTC	RAN1, Intel	Rel-13	LTE_MTCe2_L1-Core		RAN4, RAN2	RAN		
R1-165965	LS on RAN1 agreements potentially related to RAN2 in sidelink-based V2V	RAN1, LGE	Rel-14	LTE_SL_V2V-Core		RAN2, RAN4			
R1-166043	LS on UL DM-RS for NPUSCH format 1	RAN1, Huawei	Rel-13	NB_IoT-Core		RAN4			
R1-166044	LS on Uplink Capacity Enhancements for LTE	RAN1, Ericsson	Rel-14	LTE_UL_CAP_enh-Core		RAN2	RAN4		
R1-166050	LS on Enhanced LAA for LTE	RAN1, Ericsson, Huawei	Rel-14	LTE_eLAA-Core		RAN2			
R1-166051	LS on L1 parameters for Enhanced LAA	RAN1, Ericsson, Huawei	Rel-14	LTE_eLAA-Core		RAN2	RAN4		
R1-166052	LS on RRC Parameters and PRACH for Enhanced LAA for LTE	RAN1, Ericsson	Rel-14	LTE_eLAA-Core		RAN2	RAN4		
R1-166053	Reply LS on the feasibility of mobility enhancement solutions	RAN1, ZTE	Rel-14	LTE_eMob-Core	R1-163968	RAN2	RAN4, RAN3		

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Annex C-2: List of Incoming LSs from RAN1 #85

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
R1-163962	Reply LS on Cell FACH DTx/DRx Enhancements signalling	RAN2, Qualcomm	Rel-14	FACH_DTXDRX-Core	R1-161187	RAN1		R2-162986	
R1-163963	LS on NB-IoT RRM requirements	RAN2, Huawei	Rel-13	NB_IOT-Core		RAN4	RAN1	R2-163046	
R1-163964	Reply LS on per-UE configuration to allow exception reporting	RAN2, Qualcomm	Rel-13	NB_IOT-Core		CT1, SA2	RAN1, CT4	R2-163048	
R1-163965	Reply LS on direct SI update indication for NB-IoT	RAN2, Ericsson	Rel-13	NB_IOT-Core	R1-162068	RAN1		R2-163049	
R1-163966	Response to LS on questions on CIoT	RAN2, Vodafone	Rel-13	NB_IOT-Core		SA2, CT1	CT4, RAN1, SA3, RAN3	R2-163064	
R1-163967	Reply LS on NB-IoT	RAN2, Huawei	Rel-13	NB_IOT-Core	R1-161566, R1-162065	RAN1		R2-163125	
R1-163968	LS on the feasibility of mobility enhancement solutions	RAN2, ZTE	Rel-14	LTE_eMob-Core		RAN1, RAN3, RAN4		R2-163135	
R1-163969	LS on RLM for PSCell in dual connectivity	RAN2, Intel	Rel-12	LTE_SC_enh_dualC-Core		RAN1, RAN4		R2-163137	
R1-163970	LS on RAN2 agreements on eLAA	RAN2, Huawei	Rel-14	LTE_eLAA-Core		RAN1		R2-163146	
R1-163971	Response LS on Reply LS on questions on NB-IOT	RAN3, Nokia	Rel-13	NB_IOT-Core, CIoT		SA2, CT1, RAN2	RAN1, CT4	R3-161032	
R1-163972	LS on Parameters for WP5D Sharing and compatibility studies	RAN4, Ericsson	Rel-15	FS_NR_newRAT		RAN1		R4-162880	
R1-163973	LS to RAN on new RAN4 TR for documenting multi-node tests for LAA	RAN4, Ericsson	Rel-13	LTE_LAA-Perf		RAN	RAN1	R4-163134	
R1-163974	LS on continuous uplink transmission in eMTC	RAN4, Intel	Rel-13	LTE_MTCe2_L1-Core		RAN1, RAN2		R4-163150	
R1-163975	LS on EPC procedures for providing eNB with V2X authorization information	SA2, LGE	Rel-14	FS_V2XARC		RAN2, RAN3, SA1	RAN1	S2-162248	
R1-164114	LS regarding 3GPP LTE based technologies operating in the unlicensed bands	City of New York (Counsel to the Mayor of)	Rel-13	LTE_LAA-Core		RAN, RAN1	FCCOffice of Engineering & Technology, FCC Wireless Telelcommunications Bureau, WiFi Alliance, IEEE 802	Flore nagata May 2 2016	
R1-164119	Reply LS on questions on NB-IOT	RAN2, Nokia	Rel-13	NB_IOT-Core	R3-161032	RAN3, SA2, CT1	RAN1, CT4	R2-163290	
R1-164120	LS on direct indication DCI bits for NB-IoT	RAN2, Huawei	Rel-13	NB_IOT-Core		RAN1		R2-163292	
R1-164260	Formation of IEEE 1914 Next Generation Fronthaul Interface Working Group	IEEE 1914 Next Generation Fronthaul				RAN1, RAN2, RAN3		201604 LS IEEE1914 to 3GPP	

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
		Interface (NGFI) Working Group							
R1-164286	LS on Remaining Issues on Path Loss Scenarios	New York University Wireless	Rel-14	FS_6GHz_CH_model		RAN1			
R1-165414	Reply LS on EPC procedures for providing eNB with V2X authorization information	SA1, LGE	Rel-14	V2XLTE	S2-162248	SA2	RAN1, RAN2, RAN3	S1-161587	
R1-165415	Reply LS on V2X message characteristics	SA3, TNO	Rel-14	V2XLTE	S1-154509	RAN2, SA1	SA2, RAN1	S3-160777	
R1-165417	LS on TB sizes for SI-messages for NB-IoT	RAN2, Ericsson	Rel-13	NB_IOT-Core		RAN1		R2-163294	
R1-165449	Review of 3GPP LAA Specification Rel. 13	IEEE 802 LAN/MAN SC	Rel-13	LTE_LAA-Core		RAN1	RAN, IEEE 802.19 Coexistence	802 to 3GPP 22 May 2016 Liaison r00.pdf	
R1-165655	LS to RAN1 on RAN2 agreements related to V2X	RAN2, LGE	Rel-14	FS_LTE_V2X		RAN1		R2-164373	
R1-165722	Reply LS on questions on NB-IOT	CT1, Nokia	Rel-13	NB_IOT-Core, CIoT-CT	R3-161032	RAN3, RAN2, SA2	RAN1, CT4	C1-162926	
R1-165723	LS to RAN1 on SPS	RAN2, LGE	Rel-14	LTE_SL_V2V-Core		RAN1		R2-164359	
R1-165727	LS on V2V transmission path selection	RAN2, Huawei	Rel-14	LTE_SL_V2V-Core		SA2, RAN1, RAN3		R2-164356	
R1-165753	Reply LS on NB-IoT RRM requirements	RAN4, Huawei	Rel-13	NB_IoT-Core	R2-163046	RAN2	RAN1	R4-164085	
R1-165754	LS on RRM measurement for NB-IOT	RAN4, Ericsson	Rel-13	NB_IoT-Core		RAN1, RAN2		R4-164454	
R1-165817	Response LS on PUSCH transmission for eLAA	RAN4, Nokia	Rel-14	LTE_eLAA-Core		RAN1		R4-164678	
R1-165838	LS to RAN1 on RAN2 agreement on eLAA	RAN4, Nokia	Rel-14	LTE_eLAA-Core		RAN1		R2-164489	
R1-165894	Response to LS on uplink transmission gap in NB-IoT	RAN4, Sony	Rel-13	NB_IoT-Core	R1-162069	RAN1	RAN2	R4-164459	
R1-165895	LS on Tx Gaps for Frequency Error Correction	RAN4, Qualcomm	Rel-13	NB_IoT-Core		RAN2	RAN1	R4-164532	
R1-166004	Response LS on realistic power amplifier model for NR waveform evaluation	RAN4, Nokia	Rel-14	FS_NR_newRAT		RAN1		R4-164542	

Annex D: List of Approved updated WIDs

None

Annex E: List of draft TSs/TRs agreed at RAN1 #85

Tdoc Number	Title	Source	Conclusion/Decision
R1-164298	TR Skeleton for Study on FeCoMP	ZTE, Intel	endorsed
R1-165216	Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects	NTT DOCOMO, INC.	endorsed
R1-165465	TR38.900 v0.3.0	Nokia, Samsung	agreed
R1-165514	TR 25.707 v0.3.0 on Multi-Carrier Enhancements for UMTS	Huawei	agreed
R1-165866	TR 25.707 v1.0.0 on Multi-Carrier Enhancements for UMTS	Huawei	agreed
R1-165889	TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects	NTT DOCOMO	agreed
R1-165966	TR38.900 v0.4.0	Samsung, Nokia	agreed
R1-165967	3GPP TR 36.885 v.2.0.0 Study on LTE-based V2X Services	LG Electronics	agreed
R1-165970	TR38.900 v1.0.0	Samsung, Nokia	agreed

Annex F: List of actions

- **Outgoing LS.**

[85-07] Hanbyul (LGE)
V2V LS (summarizing all the agreements/working assumptions made during the week) to RAN2/4 for email approval until June 2nd
Done: Final LS is agreed, according to Mr Chair's email posted on June 3rd, as follows:
R1-165965 LS on RAN1 agreements potentially related to RAN2 in sidelink-based V2V RAN1, LGE

[85-26] Matthew (Huawei)
LS to RAN4 about UL DM-RS for NB-IoT for email approval until June 2nd
During the meeting, we agreed to to send LS to RAN 2 and cc-RAN 4 on UL DMRS hopping, but agreed LS did not include RAN4
Done: Final LS is agreed, according to Mr Chair's email posted on June 3rd, as follows:
R1-166043 LS on UL DM-RS for NPUSCH format 1 RAN1, Huawei

[85-27] Sorour (Ericsson)
UL category for UL capacity enhancement for email approval until June 2nd
There was a typo that UL Category 15 instead of 17 in the RAN1 agreements as well as the LS R1-166034 to RAN2.
Done: Final LS is agreed, according to Mr Chair's email posted on June 3rd, as follows:
R1-166044 LS on Uplink Capacity Enhancements for LTE RAN1, Ericsson
R1-166044 supersedes the former agreed LS in R1-166034.

[85-24] Hanbyul (LGE)
RRC parameter lists for V2V for email approval until 2nd June
Done: Final LS is agreed, according to Mr Chair's email posted on June 4th, as follows:
R1-165968 LS on L1 parameters for sidelink-based V2V RAN1, LGE

[85-29] Havish (Ericsson)
LS to RAN2 about PRACH inclusion in eLAA
Further to RAN2's request to understand whether RAN1 intends introducing PRACH in eLAA, for email approval until August 8th.
Done: Final LS is agreed, according to Mr Chair's email posted on August 10th, as follows:
R1-166052 LS on Enhanced LAA for LTE RAN1, Ericsson

[85-28] Zhongda/Zhisong (ZTE)
Reply LS for mobility enhancement (RAN2-led item – reply to R1-163968 (R2-163135) for email approval until August 8th.

Done: Final LS is agreed, according to Mr Chair's email posted on August 11th, as follows:
R1-166053 Reply LS on the feasibility of mobility enhancement solutions RAN1, ZTE

- **CR approval**

[85-02] Johan (Ericsson)
R1-165958 MPDCCH search space for random access in connected mode for BL/CE UE Ericsson
Email approval until June 3rd
Done: According to Mr Chair's email posted on June 9th, rev 3 of CR0660 to 36.213 is agreed in:
R1-165969 MPDCCH search space for random access in connected mode for BL/CE UE Ericsson, Panasonic, Samsung

[85-03] Alberto (Qualcomm)
Clarification on CSI measurements for eMTC
Email discussion on the issue raised in R1-164399 and R1-165542 till June 10th
Done: According to Mr Chair's email posted on June 10th, CR is agreed in:
R1-166048 Clarification of CSI measurements Qualcomm Incorporated, Ericsson, Samsung, Panasonic Rel-13 36.213 13.1.1 LTE_MTCe2_L1-Core CR0688 F

[85-04] Editors/Rapporteur
NB-IoT CRs - Editors should provide updated CRs to 36.211, 36.212, 36.213, 36.214 by June 3rd , for approval by June 7th
Rapporteur shall submit a summary of all agreements by May 30th
Done: Summary available for information in R1-165977. The following are agreed:
R1-165971 Introduction of NB-IoT Ericsson 36.211 13.1.0 NB_IOT-Core CR0224r8 B
R1-166045 Introduction of NB-IoT Huawei 36.212 13.1.0 NB_IOT-Core CR0192r3 B
R1-165973 Introduction of NB-IoT Ericsson 36.214 13.1.0 NB_IOT-Core CR0033r2 B
R1-165972 Introduction of NB-IoT Motorola Mobility 36.213 13.1.1 NB_IOT-Core CR0656r1 B

[85-06] Editors/Rapporteur
eLAA CRs. Editors should provide draft CRs to 36.211, 36.212, 36.213, 36.214 by August 18th based on the list provided by rapporteur (regarding all agreements/WA), list to be submitted by June 30th
Done: Summary available for information in R1-166049.

[85-08] Editors/Rapporteur
V2V CRs. Editors should provide draft CRs to 36.211, 36.212, 36.213, 36.214 by August 18th based on the list provided by rapporteur (regarding all agreements/WA), list to be submitted by June 30th

Done: Summary available for information in R1-165978.

[85-31] Gerardo (Ericsson)
R1-165336 Clarification on UL DPCH 10ms Mode Ericsson
Email approval until June 8, 2016
Done: According to Mr Chair's email posted on June 10th, there was still no consensus on rev 1 of CR0337 to 25.212 (rel-12, F) in R1-166046 and rev 1 of CR0338 to 25.212 (rel-13, A) in R1-166047. Finally revision 2 of both CRs were agreed (Mr Chair's email posted on June 15th}, submitted to RAN#72 and approved as company's contributions.

- **Text proposal for TS and TR**

[85-32] Peter (Huawei)
TR25.707 for email discussion on updated TR25.707 until Monday June 6, 2016.
Done: According to Mr Chair's email dated on June 7th, TR is agreed as:
R1-165514 TR 25.707 v0.3.0 on Multi-Carrier Enhancements for UMTS ETSI
Endorsed as v1.0.0 in R1-165866 for one step approval by plenary.

[85-23] Young-Han (Samsung)
TR38.900 for channel model for email approval to check the consistency with the agreements in this meeting and the previous meeting until June 2nd
Done: According to Mr Chair's email dated on June 4th, TR is agreed as:
R1-165966 TR38.900 v0.4.0 Samsung, Nokia
Endorsed as v1.0.0 in R1-165970 for one step approval by plenary.

- **Miscellaneous**

[85-30] Harish (Qualcomm)
Clarifications to DCH enhancements feature
Email discussion on proposals 2/4/7/8 from R1-164364 until June 8, 2016
Done: Postponed to next meeting.

[85-01] Aris (Samsung)
R1-164733 **HARQ-ACK Codebook on PUSCH for TDD** **Samsung**
Email discussion until June 30th
Done: The text that was removed from the first version of 36.213 on eCA was later added through the approved CR in R1-161517 and is incorporated in the current specification. Therefore, there is no need to further discuss the proposal in R1-164733.

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[85-5-1] Scheduling aspects for eLAA, Joon (LGE)
Scheduling aspects including BD reduction and working assumptions on some fields for email approval until 6th June
Done: As per final decision posted by Mr Chair on June 14th, the conclusions are as follows:

Agreements on PDCCH BD allocation

- **DCI format 0A and 4A (when TM2 is configured) are default DCI formats for UL scheduling for LAA SCell**
- **DCI format 0A and 4A can be disabled for each LAA SCell by RRC signaling independently**
- **Note: It was already agreed that usage of DCI format 0B and 4B (when TM2 is configured) is configurable for each LAA SCell by RRC signaling**
- **A new RRC signaling *pdcch-candidateAdjustment* can adjust number of BDs on UE specific search space independently for each AL (CCE aggregation level) for each of the DCI formats 0A, 4A, 0B and 4B for each scheduled carrier. The applicable values for BD adjustment for each DCI format are as follows.**
    - **(0, 33, 66, 100)% BD adjustment**
        - **Applicable to DCI Format 0A**
        - **FFS: applicability to DCI Formats 0B and/or 4A**
    - **(0, 33, 66, 100)% for 1st and 2nd AL and (0, [50 or 66], 100, [150 or 200])% for 3rd to 5th AL**
        - **Applicable to DCI Format 4B**
        - **FFS: applicability to DCI Formats 0B and/or 4A**
    - **Re-13 *pdcch-candidateReductions* applies (if configured) to the other DCIs**
    - **If *pdcch-candidateAdjustment* is not configured, Re-13 *pdcch-candidateReductions* applies (if configured) to all the DCIs**
- **FFS: Special handling of potential (E)PDCCH blocking issue due to the possibility of transmitting multiple UL scheduling DCIs for a UE.**

Agreements on scheduling aspects for eLAA

- **Confirm the WA: For LAA uplink with single codeword, maximum number of HARQ processes = 16 are supported**
- **Timing offset is counted from subframe N+4+k, and k is signalled with 4 bits ([0….15] SFs) (FFS in case of 2-step scheduling)**
- **DCI format 0B/4B can schedule PUSCH transmission in a single subframe**
- **For DCI format 0B/4B, bit width of number of scheduled subframes is 1 bit when N_sf is configured as 2 and 2 bits when N_sf is configured as larger than 2**
- **CSI request in DCI format 0B/4B applies to last subframe if number of scheduled subframes is smaller than 3, and otherwise to the second last scheduled subframe**
- **Rel-14 eLAA UE is required to decode UL grant PDCCHs as well as the common PDCCH in the ending partial subframe even if the number of occupied OFDM symbols for the ending partial subframe is not indicated from the previous subframe**
- **FFS special handling of MCS/TBS for PUSCH containing UCI and/or SRS and/or blanked symbol(s)**
    - **Note: Common MCS value for all the scheduled subframes is already agreed**
- **The UE is not expected to process a DCI format 0B/4B indicating scheduling in a single subframe and triggering SRS in a different subframe**

Notes as basis for further discussion: FFS on the indication of starting PUSCH DFT-S-OFDM symbol

- **option 1) Starting PUSCH DFT-S-OFDM symbol in a DCI format 0B/4B applies only to the first scheduled subframe.**
  - **A single UL grant for an LAA SCell can only schedule subframes which composes a same UL transmission burst of a same UE**
- **option 2) DCI format 0B/4B indicates starting PUSCH DFS-S-OFDM symbol in one or multiples of the scheduled subframes**
  - **option 2-1) 2-bit joint indication for the starting PUSCH DFT-S-OFDM symbol, the 4 states define the starting in symbol #1 as: {in none of SFs, in all SFs, only in the 1st subframe, in 1st and 3rd subframe}**
  - **option 2-2) N_sf size bitmap to indicate the starting PUSCH DFT-S-OFDM symbol position for multiple scheduled subframes. The bitmap size changes according to the configuration of N_sf for MSF, i.e., 2~4.**
  - **option 2-3) One bit to indicate the starting PUSCH DFT-S-OFDM symbol for the 1st subframe, x bit to indicate starting PUSCH DFT-S-OFDM symbol position in one of the following subframes if N_max >=2. The size of x changes according to the configuration of N_max for MSF.**

[85-5-2] Resource allocation aspects for eLAA, Srinivas (Qualcomm)
Resource allocation aspects including resource allocation type alternatives and applicability of fields for legacy vs. interlaced resource allocation
Email approval until 6th June
Done: As per final decision posted by Mr Chair on June 7th, the conclusion is as follows:
Agreements

- **Enhanced LAA can operate without the introduction of legacy resource allocation for UL PUSCH on an LAA SCell.**
- **Introduction of optional legacy resource allocation is not precluded for future work items (if agreed).**

No consensus about the resource allocation type. Discussion will continue at next meeting.

[85-5-3] PUSCH structure, Havish (Ericsson)
Start times of PUSCH transmission including within first OFDM symbol and means to achieve this
Email approval until 6th June
Done: As per final decision posted by Mr Chair on June 9th, the conclusion is as follows:
Agreements

- **Transmission on UL is allowed to start at the following times in a UL subframe**
  - **Start of DFTS-OFDM symbol 0**
  - **Start of DFTS-OFDM symbol 1**
  - **25 us after start of DFTS-OFDM symbol 0**
  - **25 us + TA value after start of DFTS-OFDM symbol 0**
- **FFS: Choose between the following options to enable the start times within the first DFTS-OFDM symbol**
  - **Option 1: Extension of cyclic prefix of the next DFTS-OFDM symbol to occupy part of the first DFTS-OFDM symbol**
  - **Option 2: Rate matching around the modulation symbols corresponding to the first 25 μs of DFTS-OFDM symbol 0 and also around the modulation symbols at the end of DFTS-OFDM symbol 0 corresponding to the cyclic prefix length**
    - **FFS: Whether windowing at the beginning of the UL transmission is necessary to reduce the impact on out of band emissions.**

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[85-5-4] SRS aspects, Xia Yuan (Huawei)
SRS aspects including triggering of SRS without PUSCH with DL grants and common/group DCI
Email approval until June 6th
Done: As per final decision posted by Mr Chair on June 7th, the conclusion is as follows:
Agreements

- **If the triggering for SRS without PUSCH is received in subframe n, the UE should send SRS without PUSCH in subframe n+k (not considering the LBT failure).**
- **k is indicated by 3 bits in DL grant. "000" represents no triggering for SRS without PUSCH; "001"~"111" represents SRS without PUSCH is transmitted in subframe n+4~n+11 respectively.**

In addition, there is no consensus to introduce common/group DCI to trigger SRS without PUSCH for a group of UEs in this WI.

- **Support of this feature in future LAA enhancement item(s) is not precluded.**

[85-5-5] UCI on an LAA SCell, Havish (Ericsson)
Further discussion on transmission of HARQ-ACKs on an LAA SCell
Email approval until 6th June
Done: According to Mr Chair's email dated June 8th, RAN1 reached the following conclusion:

- **Enhanced LAA can operate without the introduction of HARQ-ACK transmission on an LAA SCell**
- **Support for transmission of HARQ-ACK on an LAA SCell can be beneficial and it is recommended to include it in future enhancements for LAA.**

[85-5-6] Channel access framework, Sorour (Ericsson)
Channel access aspects including Cat. 4 LBT parameters, CW adjustments for Cat. 4 LBT, Signaling of LBT type, ED threshold, DL-UL traffic multiplexing and LBT parameters for SRS
Email approval until 6th June
Done: The conclusions are as follows:

Agreements (based on the WF on LBT Priority Class for UL Transmission in R1-165715):

- **Rel-14 supports four LBT priority classes for UL transmissions as in the following table.**
  - **Note: CWmin, CWmax, n refer to the minimum CW, maximum CW and the number of consecutive CCA slots in the defer period, respectively.**
  - **Note: the smaller the LBT priority class number, the higher the priority.**
- **FFS: additional set of LBT parameters for the LBT priority classes that can be chosen by the eNB**

LBT priority class	n	CWmin	CWmax	MCOT	Set of CW sizes
1	2	3	7	2 ms	{3,7}
2	2	7	15	4 ms	{7,15}
3	3	15	1023	6ms (see note 1) or 10 ms (see note 2)	{15,31,63,127,255,511,1023}
4	7	15	1023	6ms (see note 1) or 10 ms (see note 2)	{15,31,63,127,255,511,1023}

NOTE 1: The MCOT of 6 ms may be increased to 8 ms by inserting one or more gaps. The minimum duration of a pause shall be 100 μs. The maximum duration (Channel Occupancy) before including any such gap shall be 6 ms. The gap duration is not included in the channel occupancy time.

NOTE 2: If the absence of any other technology sharing the carrier can be guaranteed on a long term basis (e.g. by level of regulation), the maximum channel occupancy time (MCOT) for LBT priority classes 3 and 4 is for 10 ms, otherwise, the MCOT for LBT priority classes 3 and 4 is 6ms as in note 1.

Agreements:

- When the UE performs 25 microsecond LBT on an LAA SCell,
  - There is no additional restriction at the UE (other than the multiplexing rules defined in RAN2) on the type of the traffic that can be carried in the scheduled subframes.
  - eNB shall not schedule the UE more subframes than the minimum necessary to transmit all the traffic corresponding to the same LBT priority class or lower (i.e., with a lower number in the LBT priority class table) than the LBT priority class used by the eNB based on the DL traffic and the latest BSR and received UL traffic from the UE.
  - The eNB is responsible for making sure that the mapping between QCI and LBT priority class is consistent with section 5.7.1 in TS 36.300.
    - The eNB is expected to take the QCI with the lowest priority in the logical channel group into account when defining the LBT priority class for a logical channel group
- Send an LS to RAN2 informing them of above agreement. Done in R1-166050.

Agreement: LBT type (i.e. Cat.4 LBT or LBT based on 25us CCA) is signaled via UL grant.

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Agreements:

- **UE is not expected to be signaled different LBT types for ~~all~~ consecutively scheduled subframes when there is no gap between the consecutive subframes.**
- **FFS: For a set of consecutive scheduled subframes without any gaps that are subject to LBT, after the first successful LBT in that set, the UE continues transmission for all the remaining subframes in the set.**
- **For a set of consecutive scheduled subframes without any gaps that are subject to LBT, if LBT fails for a subframe in that set, the UE continues the LBT according to the signaled LBT type for the next subframe in the set.**

Agreement:

- **For an aperiodic SRS that is not multiplexed with PUSCH in the same subframe,**
  - **If the aperiodic SRS is followed by PUSCH without a gap between SRS and following PUSCH,**
    - **UE performs LBT indicated for the following PUSCH.**
  - **If the aperiodic SRS is followed by PUSCH with gap between SRS and following PUSCH,**
    - **Within eNB's channel occupancy, UE performs 25 usec one shot LBT**
      - **Outside of eNB's channel occupancy, UE performs random backoff based on LBT priority Class 1.**
        - **Choose one of the following options:**
          - **Option 1: UE performs Cat 3 LBT with fixed CWS values. The value is chosen from [3,7].**
          - **Option 2: UE performs Cat 3 LBT with CWS 7.**
          - **Option 3: UE performs Cat 4 LBT.**
  - **FFS: SRS transmission if the gap between SRS and following PUSCH is smaller than Xus.**
    - **FFS the exact value of X > 25us**

Agreement: The absence/presence on a long term basis (e.g. by level of regulation) of any other technology sharing the carrier is indicated by RRC signaling

[85-5-7] RRC parameters, Havish (Ericsson), Xia Yuan (Huawei)
RRC parameter list for eLAA for email approval until June 6th
Done: RRC parameter excel sheet sent in LS R1-166051 – then updated in LS R1-166052.

[85-09] Hanbyul (LGE)
Semi-persistent transmission for mode 2 for V2V. Email approval about FFSs until June 9th
Done: According to Mr Chair's email dated June 14th, RAN1 agreed the following:

- **UE skips sensing at least on the subframes used for its own transmissions.**
  - **FFS how this is reflected in the resource (re)selection, e.g., whether/how to exclude the subframes for which sensing result (including information gathered from both energy measurement and SA decoding) is not available at least in case of SA and data are transmitted in the same subframe.**
- **Discuss in RAN1#86 whether the following is needed.**

- **UE is not required to transmit PSCCH at TTI n+c with $c<c_{min}$.**
  - **FFS the exact value of c_{min}.**

- **$c <= d <= d_{max}$**
  - **FFS how d_{max} is determined to fulfil the latency requirement of the packet to transmit, e.g., whether d_{max} is dependent of the priority level.**
- **Discuss in RAN1#86 whether further clarification is needed on the time reference of resource reselection, e.g., including the proposal in R1-165909.**
- **Continue discussion in RAN1#86 on "e," including the following proposal discussed in this email discussion:**
  - **A receiver UE decoded an SA assumes that the same frequency resource is reserved by the SA transmitter UE at TTI n + d +P*j for j=i, 2*i, …, J*i.**
    - **P=100**
      - **FFS details of J, e.g., whether it is explicitly signalled in the SA, J is fixed in the specification (including fixed to 1).**
      - **FFS details of i, e.g., whether it is explicitly signalled in the SA, (pre)configuration can be used to restrict the selection of i, i is fixed in the specification, or it is an integer between 0 and 10.**

[85-10] Joerg (Ericsson)
R1-165438 **Link level simulation assumptions for evaluation of longer CP for MBSFN subframes** **Ericsson**
Email approval until June 30th
Done: Still pending… status to be checked at RAN1#86.

[85-11] Alberto (Qualcomm)
eMBMS proposal
Email approval about above proposed agreements and proposed working assumptions until 30th June
Done: Still pending… status to be checked at RAN1#86.

[85-12] Hanbyul (LGE)
TP for V2V
Email approval of TP for TR including approval of next version of TR and updated simulation results by June 2nd
Done: Final TP (for capturing V2X evaluation results in TR) is agreed in R1-165967, according to Mr Chair's email posted on June 4th.

[85-13] Alexei (Intel)
Antenna model for NR for email approval (w.r.t brackets in R1-166026) until June 9th
Done: According to Mr Chair's email dated June 10th, the following is agreed:
- **Reduce the gain (directivity) to 4dBi and keep HPBW = 40 deg in Option 1 (outdoor micro cell TRP antenna element model - omni in horizontal, directional in vertical)**

[85-14] Hasegawa (Mitsubishi)

R1-166001 **Proposal for email discussion on evaluation assumptions for high speed train scenario: Macro + relay around 30GHz Mitsubishi Electric, ETRI**

Email approval until June 8th about brackets and FFS parts

Done: According to Mr Chair's email dated June 28th, the evaluation assumptions for the high speed train scenario for around 30GHz (RRH + relay) for NR are agreed in R1-165979.

[85-15] Youngtae (LGE)

Performance metrics for NR for email discussion, starting from the ones in R1-165612, till June 8th

Done: According to Mr Chair's email dated June 10th, the following performance metric is agreed:

CAR (Communication Availability and Resilience) = (1-X)*(1-Y)

- **CAR metric is used for 1) sidelink only, 2) downlink only, or 3) uplink only simulation.**
  - **For the other case, the equation can be modified.**
- **1-X represents the availability of the communication connection, where X is the time portion during which the communication is interrupted by handover failure or link failure.**
  - **X is simulated like mobility management similar to HetNet mobility in TR36.839.**
  - **Depending on application, X can be prefixed without evaluation of X, e.g., X=0 for sidelink.**
- **1-Y represents the resilience of the communication scheme:**
  - **Alt. 1: (1-Y) is simulated as PRR (packet reception ratio) within a specific range as defined in TR36.885.**
  - **Alt. 2: (1-Y) is simulated as a function of packet reception ratio per link.**
    - **Detailed method for Alt. 2 is further studied in RAN1#86.**
  - **Depending on the application, choose Alt. 1 and/or Alt.2.**
- **X and Y are simulated each. And those are used to calculate (1-X)*(1-Y).**
- **The packet which is correctly received within D ms is regarded as successfully received packet. (NOTE: re-transmission is allowed within the latency boun d.)**
  - **The requirement for the reliability and the latency depends on the targeting use cases.**
  - **The reliability and latency requirement is defined based on single communication pair**

[85-16] Frank (Huawei)

Calibration for NR waveform for email discussion until June 30th

Done: According to Mr Chair's email dated July 1st , a summary on calibration for NR waveform will be submitted to the RAN1#86 meeting.

[85-17] Frank (Huawei)

Collect information for NR waveform for email discussion until August 4th

Done: According to Mr Chair's email dated August 8th , a summary on NR waveform will be submitted to the RAN1#86 meeting.

[85-18] Mihai (Nokia)
PA assumption for NR for email discussion and approval about power amplifier assumptions for NR DL waveform evaluations by utilizing R1-166004 and R1-166010 and also email approval to confirm WA until June 9th

Done: According to Mr Chair's email dated June 17th , the following is agreed:

[UL part]

The following working assumption was decided in the previous RAN1 meeting and is subject for confirmation: "RAN1 adopts the models provided in RAN4 LS (R1-166004) to the NR UL waveform evaluations"

- **Confirm the working assumption. For below 6GHz UL use the model as given in RAN4 LS in R1-166004, for above 6GHz UL continue the discussion for polynomial model parametrization considering also potential impact from memory effects (consider the below 6GHz parametrization as a starting point).**

[DL part]

- **For below 6 GHz DL, consider as a starting point the below Rapp model parametrization assuming 46 dBm total output power and 57.6 dBm saturation power (this model considers DPD and CFR) .**

Parameter for Rapp model < 6GHz DL	
Target output power [dBm]	46
Saturation output power [dBm]	57.6
Smoothness factor p	3
Smoothness factor q	5
Fitting parameter A	-0.14
Fitting parameter B	1.2

Note that the gain of the model can be chosen freely, as it depends on the input signal reference level. The expected output for LTE10 DL 64-QAM signal is 46 dBm, with ACLR 45 dB and meeting respective spectrum emission masks.

- **For above 6GHz DL, consider as a starting point a suitable Rapp model parametrization.**

[General]

- **Proposal 4: The PA operating point shall be set considering the**
  - **spectrum mask for BS**
    - **36.104 clause 6.6.3.2.2 (Table 6.6.3.2.2-1) for WA BS when TX power is 46 dBm**
  - **spectrum mask for UE**
    - **36.101 clause 6.6.2.1.1 (Table 6.6.2.1.1-1) for UE when TX power is 22 dBm**
  - **ACLR for BS => 45 dB (Table 6.6.2.1-1 of 36.104)**
  - **ACLR for UE => 30 dB (Table 6.6.2.3.1-1 of 36.101)**

  - **EVM requirement for BS according to Table 6.5.2-1 of 36.104**
  - **EVM requirement for UE according to Table 6.5.2.1.1-1 of 36.101**

- **Proposal 5: Provided that spectrum mask, ACLR, and EVM are met, companies are reporting the PA operating point. In addition, companies may provide waveform evaluations with same PA operating point and fulfilling the spectrum mask, ACLR, and EVM.**
- **Proposal 6: The potential impact from memory effects should be considered at least for above 6GHz operation and DL/UL wideband allocations.**
- **Proposal 7: Further refinement on the above DL and UL PA models and parameters is not precluded, like for example considering the indoor hotspot BS with target out power of 24 dBm.**
- Proposal 8: Strive for a single model for each of UL and DL PA respectively which parameters does not depend on the TX power.

Note1: the 22 dBm UL power level is according to the RAN4 utilized power level in PA model investigation.
Note2: The common output phase shift due to the polynomial PA model for UL is compensated and is not included in the Tx EVM calculation for waveform evaluation.

[85-19] Young-Han Nam (Samsung)
Large scale calibration for channel model
For updating results for large scale calibration: Until June 10th
Done: Summary capturing the large scale calibration results available in R1-165974.

[85-20] Young-Han Nam (Samsung)
Full calibration for channel model
For full calibration results: Until June 25th
Done: Summary capturing full calibration results available in R1-165975.

[85-21] Young-Han Nam (Samsung)
Additional feature calibration for channel model for discussion until July 25th
Done: According to Mr Chair's email dated August 8th , a summary on additional feature calibration will be submitted to the RAN1#86 meeting.

[85-22] Young-Han Nam (Samsung)
TP for channel model
For approval of the summary for all the calibration results and updated TP: Until August 10th
Done: According to Mr Chair's email dated August 11th , a draftCR to TR38.900 (now under change control) is agreeable and should be be submitted to the RAN1#86 meeting.

[85-25] Taeyoung (Samsung)

3GPP TSG RAN WG1 Meeting #86 **R1-166056**
Göteborg, Sweden, 22nd – 26th August 2016

UE noise figure for NR for email approval until 2nd June

Done: As per Mr chair's email decision posted on June 3rd, the following clarification is agreed:

- **The agreed noise figures (baseline performance: 13dB, high performance: 10dB) for evaluation of NR above 6GHz apply for both "Dense urban" and "Urban macro".**

3GPP TSG RAN WG1 Meeting #86 **R1-166056**
Göteborg, Sweden, 22nd – 26th August 2016

Annex G: List of participants at RAN1 #85

Please see excel file attached to this report

3GPP TSG RAN WG1 Meeting #86 **R1-166056**
Göteborg, Sweden, 22nd – 26th August 2016

Annex H: **TSG RAN WG1 meetings in 2016 – 2017**

TITLE	TYPE	DATES	LOCATION	CTRY
3GPPRAN1#86	WG	22 – 26 Aug 2016	Goteborg	Sweden
3GPPRAN1#86bis	WG	10 – 14 Oct 2016	Lisbon	Portugal
3GPPRAN1#87	WG	14 – 18 Nov 2016	TBD	US
3GPPRAN1#88	WG	13 – 17 Feb 2017	Athens	Greece
3GPPRAN1#88bis	WG	03 – 07 Apr 2017	TBD	US
3GPPRAN1#89	WG	15 – 19 May 2017	TBD	China
3GPPRAN1#90	WG	21 – 25 Aug 2017	Berlin (TBC)	Germany
3GPPRAN1#90bis	WG	09 – 13 Oct 2017	Prague (TBC)	Rep Czech
3GPPRAN1#91	WG	27 Nov – 01 Dec 2017	TBD	US

MEETING TYPES	
AH = Ad Hoc	CM = Chairmen's meeting
JM = Joint	OR = Ordinary
PM = Preparatory Meeting	RG = Rapporteurs Group
RM = Resolution Meeting	SG = Steering Group
ST = Startup Meeting	TG = Task Group
WG = Working Group	XO = Extraordinary

End of document

Appendix E

TDoc #	Title	Source	TDoc Status	Reservation date	Uploaded
R1-163960	Draft Agenda of RAN1#85 meeting	RAN1 Chair	approved	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163961	Final Report of 3GPP TSG RAN1 #84bis v1.0.0	ETSI	revised	2016-05-02 12:09:42	2016-05-19 19:02:29
R1-163962	Reply LS on Cell FACH DTx/DRx Enhancements	RAN2,	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163963	LS on NB-IoT RRM requirements	RAN2, Huawei	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163964	Reply LS on per-UE configuration to allow exception	RAN2,	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163965	Reply LS on direct SI update indication for NB-IoT	RAN2, Ericsson	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163966	Response to LS on questions on CIoT	RAN2,	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163967	Reply LS on NB-IoT	RAN2, Huawei	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163968	LS on the feasibility of mobility enhancement solutions	RAN2, ZTE	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163969	LS on RLM for PSCell in dual connectivity	RAN2, Intel	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163970	LS on RAN2 agreements on eLAA	RAN2, Huawei	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163971	Response LS on Reply LS on questions on NB-IOT	RAN3, Nokia	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163972	LS on Parameters for WP5D Sharing and compatibility	RAN4, Ericsson	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163973	LS to RAN on new RAN4 TR for documenting multi-node tests for LAA	RAN4, Ericsson	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163974	LS on continuous uplink transmission in eMTC	RAN4, Intel	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163975	LS on EPC procedures for providing eNB with V2X authorization information	SA2, LGE	treated	2016-05-02 12:09:42	2016-05-02 12:39:16
R1-163976	TP-specific PRS sequence generation for indoor positioning	Ericsson	available	2016-05-02 13:08:13	2016-05-14 05:39:26
R1-163977	PRS pattern enhancements for indoor positioning	Ericsson	available	2016-05-02 13:08:13	2016-05-14 05:39:26
R1-163978	Richer RSTD reporting for indoor positioning	Ericsson	available	2016-05-02 13:08:13	2016-05-14 05:39:26
R1-163979	On PRS-based beacons for indoor positioning	Ericsson	withdrawn	2016-05-02 13:08:13	
R1-163980	E-CID enhancements for indoor positioning	Ericsson	available	2016-05-02 13:08:13	2016-05-14 05:39:26
R1-163981	Indoor/outdoor classification for indoor positioning	Ericsson	available	2016-05-02 13:08:13	2016-05-14 05:39:26
R1-163982	Forward compatibility for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 10:24:53
R1-163983	Evaluation assumptions for NR multiple access	Samsung	noted	2016-05-02 23:11:28	2016-05-13 12:07:03
R1-163984	Discussion on phase noise modeling	Samsung	noted	2016-05-02 23:11:28	2016-05-13 18:39:15
R1-163985	Discussion on achieving data rate and spectral efficiency KPIs for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 20:16:33
R1-163986	Remaining details of TRP antenna modeling and TXRU mapping/virtualization	Samsung	noted	2016-05-02 23:11:28	2016-05-13 19:27:02
R1-163987	Remaining details of UE antenna modeling and TXRU mapping/virtualization	Samsung	available	2016-05-02 23:11:28	2016-05-13 20:20:44
R1-163988	Evaluation methodology and KPI for URLLC	Samsung	noted	2016-05-02 23:11:28	2016-05-13 20:16:33

R1-163989	Waveform for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 10:24:53
R1-163990	Preliminary evaluation results for OFDMA-based	Samsung	available	2016-05-02 23:11:28	2016-05-13 13:14:31
R1-163991	Orthogonal vs. non-orthogonal waveforms for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 13:14:55
R1-163992	Non-orthogonal multiple access candidate for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 12:07:03
R1-163993	Non-Orthogonal Multiple Access Considerations for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 23:40:34
R1-163994	Discussions on control signaling for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 10:24:53
R1-163995	Discussions on reference signal design for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 07:42:50
R1-163996	Discussion on the base subcarrier spacing for NR	Samsung	available	2016-05-02 23:11:28	2016-05-13 06:56:37
R1-163997	Cell search for NR: design consideration	Samsung	available	2016-05-02 23:11:29	2016-05-13 22:46:25
R1-163998	Proposed set of numerologies for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 10:24:53
R1-163999	Discussion on different scaling methods for NR subcarrier spacing	Samsung	available	2016-05-02 23:11:29	2016-05-14 02:53:01
R1-164000	Unified framework for NR physical layer	Samsung	available	2016-05-02 23:11:29	2016-05-13 07:47:33
R1-164001	Framework for multiplexing verticals in NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 07:58:58
R1-164002	Design aspects of URLLC for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 18:00:22
R1-164003	Dynamic TDD for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 23:38:06
R1-164004	Discussion on TTI, subframe and signaling timing for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 19:58:07
R1-164005	Support of wireless relay for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 19:58:07
R1-164006	Design aspects of mMTC for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 10:24:53
R1-164007	Flexibility of LDPC - Length, Rate and IR-HARQ	Samsung	available	2016-05-02 23:11:29	2016-05-14 04:28:17
R1-164008	Preliminary evaluation results on new channel coding scheme for NR	Samsung	available	2016-05-02 23:11:29	2016-05-14 03:02:03
R1-164009	Discussion on throughput, latency for new channel coding scheme for NR	Samsung	available	2016-05-02 23:11:29	2016-05-14 03:02:03
R1-164010	Discussions on CSI-RS design for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 07:42:50
R1-164011	Discussions on CSI reporting for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 07:45:11
R1-164012	Discussion on advanced MIMO transceivers for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 11:19:03
R1-164013	Framework for beamformed access	Samsung	noted	2016-05-02 23:11:29	2016-05-13 08:45:16

R1-164014	Discussion on RS for beamformed access	Samsung	available	2016-05-02 23:11:29	2016-05-13 08:52:28
R1-164015	DL MIMO framework for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 22:46:25
R1-164016	UL MIMO framework for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 22:46:25
R1-164017	Advanced CSI feedback for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 21:50:01
R1-164018	Analog/digital/hybrid beamforming for massive MIMO	Samsung	available	2016-05-02 23:11:29	2016-05-13 19:27:02
R1-164019	Discussion on CSI acquisition for beamformed access	Samsung	available	2016-05-02 23:11:29	2016-05-13 20:12:09
R1-164020	Co-existence of LTE and NR	Samsung	noted	2016-05-02 23:11:29	2016-05-13 10:24:54
R1-164021	Network topology and system operation for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 10:24:54
R1-164022	Discussion on interference coordination for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 06:56:37
R1-164023	Discussion on interference management based on advanced transceivers for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 08:43:44
R1-164024	Shared spectrum support for NR	Samsung	available	2016-05-02 23:11:29	2016-05-13 19:58:07
R1-164025	Chairman's Notes of Agenda Item 7.2 on Channel model for >6 GHz	Nokia	endorsed	2016-05-03 05:39:27	
R1-164026	Updated Draft NB-IoT CR to 36.213 post Busan	Motorola Mobility Germany	available	2016-05-03 11:37:12	2016-06-01 19:38:03
R1-164027	Design of massive MIMO for New Radio	Mitsubishi Electric Co.	available	2016-05-03 12:58:33	2016-05-14 03:39:09
R1-164028	Link-level evaluation results for UW-DFT-s-OFDM	Mitsubishi	available	2016-05-03 13:00:52	2016-05-14 03:39:09
R1-164029	Clarification and proposals on parameters for high speed train scenarios	Mitsubishi Electric Co.	noted	2016-05-03 13:02:58	2016-05-14 03:39:09
R1-164030	Evaluation of scalable numerology proposals	Huawei, HiSilicon	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164031	Analysis and comparison on numerology candidates	Huawei, HiSilicon	noted	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164032	Discussion on frame structure for NR	Huawei, HiSilicon	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164033	f-OFDM scheme and filter design	Huawei,	revised	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164034	Further evaluation assumptions for waveform	Huawei, HiSilicon	noted	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164035	Link level evaluation results of waveform proposals	Huawei,	revised	2016-05-04 14:06:12	2016-05-14 03:36:50
R1-164036	Multiple access for UL small packets transmission	Huawei,	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164037	LLS results for uplink multiple access	Huawei,	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164038	Motivations and Considerations on Massive MIMO for New RAT	Huawei, HiSilicon	available	2016-05-04 14:06:12	2016-05-14 03:36:51
R1-164039	Polar codes - encoding and decoding	Huawei,	noted	2016-05-04 14:06:12	2016-05-14 03:36:51

R1-164040	On latency and complexity	Huawei,	available	2016-05-04 14:06:12	2016-05-14 03:36:51
R1-164041	Phase noise model for above 6GHz	Huawei, HiSilicon	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164042	Wideband support for NR	Huawei,	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164043	Considerations on vehicular communications for NR	Huawei,	available	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164044	Evaluation assumption for non-eMBB deployment scenarios	Huawei, HiSilicon	noted	2016-05-04 14:06:12	2016-05-15 21:21:17
R1-164045	SLS parameters for evaluation scenarios for multiple access evaluation	Huawei, HiSilicon	noted	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164046	Forward compatibility consideration on reference signals and control information/channels	Huawei, HiSilicon	available	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164047	General consideration on forward compatibility for new radio interface	Huawei, HiSilicon	available	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164048	Discussion on additional feature calibration	Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation,	revised	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164049	Discussion on removal of square bracket for LSP	Huawei, HiSilicon,	available	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164050	Dynamic modeling for time evolution	Huawei, HiSilicon	available	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164051	Text proposal to TR 38.900 to add link level channel model for LoS scenario	Huawei, HiSilicon	agreed	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164052	Text proposal to TR 38.900 to add antenna filtering for link level channel model	Huawei, HiSilicon	revised	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164053	Support for flexible backhauling for NR	Huawei,	available	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164054	Support for energy efficient NR	Huawei,	available	2016-05-04 14:06:13	2016-05-15 21:21:17
R1-164055	Resource allocation for RB interleaved PUSCH for eLAA	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:15:42
R1-164056	Resource pool design and multiplexing of SA and its associated data	Huawei, HiSilicon	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164057	Uu DL enhancements for V2X	Huawei, HiSilicon	noted	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164058	Views on TTI length	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164059	sPDCCH design for short TTI	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164060	DCI design for short TTI	Huawei,	noted	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164061	PUCCH design for short TTI	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164062	Discussion on DL RS for short TTI	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164063	Discussion on UL RS for short TTI	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164064	Discussion on UL scheduling timing for short TTI	Huawei, HiSilicon	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164065	Discussion on CSI feedback for short TTI	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164066	Discussion on DL HARQ timing for short TTI	Huawei, HiSilicon	available	2016-05-04 14:26:29	2016-05-14 02:18:44

R1-164067	Processing time reduction for short TTI	Huawei, HiSilicon	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164068	The co-existence consideration of legacy TTI and sTTI in one carrier	Huawei, HiSilicon	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164069	Discussion on enhanced frame structure type 2 for latency reduction	Huawei, HiSilicon	noted	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164070	Discussion on U-plane latency for TDD	Huawei,	available	2016-05-04 14:26:29	2016-05-14 02:18:44
R1-164071	Discussion on the applications of LBT options in eLAA	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164072	UL category 4 LBT with eNB assistance	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164073	Contention window size adjustment for UL category 4 LBT for eLAA	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164074	SRS configurations for eLAA	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164075	Multi-subframe scheduling design for eLAA	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164076	UCI transmission for eLAA	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164077	PRACH waveform for eLAA	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164078	PRACH configurations for eLAA	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164079	Discussion on power ratios for MUST	Huawei,	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164080	Signaling mechanisms for MUST	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164081	SRS carrier based switching for UEs with multiple	Huawei,	noted	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164082	Evaluations of different numerologies for eMBMS	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164083	Radio frame design for increased number of MBSFN subframes	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164084	Overview on further enhancements to Coordinated Multi-Point Operation	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164085	Discussion on simulation scenarios and methodology for FeCoMP	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164086	Potential enhancement for FeCoMP with ideal backhaul links	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164087	Discussion on FeCoMP with non-ideal backhaul links	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164088	Discussion on CSI measurement and feedback for FeCoMP	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164089	Co-channel of PC5 V2V with other techniques	Huawei, HiSilicon	revised	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164090	CSI feedback for beam space MIMO	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164091	TBS table design for UL 256QAM	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42

R1-164092	MCS table design for UL 256QAM	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164093	Physical layer aspects for UL 256QAM	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164094	DMRS for PSCCH and PSSCH	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164095	DMRS for PSBCH	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164096	Resource (re)selection triggering mechanisms	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164097	Discussion and evaluation of analog CSI feedback	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164098	Enhancement on CQI measurement and feedback for MU-MIMO	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164099	Discussion on more orthogonal DMRS ports with partial overlapping	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164100	Time reference for A/N transmission	Huawei,	noted	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164101	The remaining issues for V2V PC5 synchronization priority	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164102	Discussion on sensing details for measurement and reservation	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164103	Discussion on SCI contents for V2V	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164104	Discussion on the priority handling	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164105	Sidelink synchronization enhancement in V2V communication	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164106	Discussion on synchronous and asynchronous HARQ method for eLAA	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164107	SRS subframe design for SRS carrier based switching	Huawei, HiSilicon	noted	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164108	Power control for SRS on TDD CCs without PUSCH	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164109	Timing advance for SRS on TDD CCs without PUSCH	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164110	Support of periodic and/or aperiodic SRS	Huawei,	noted	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164111	Collision handling for SRS carrier based switching	Huawei,	available	2016-05-04 14:26:30	2016-05-14 02:18:44
R1-164112	Coexistence of cellular and V2V services on the same carrier	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42
R1-164113	Timing alignment of different synchronization sources for V2V	Huawei, HiSilicon	available	2016-05-04 14:26:30	2016-05-14 02:15:42

R1-164114	LS regarding 3GPP LTE based technologies operating in the unlicensed bands	City of New York (Counsel to the Mayor of)	**treated**	2016-05-04 16:03:47	2016-05-06 07:38:22
R1-164115	Reducing UL RS overhead for sPUSCH	Mitsubishi Electric	**available**	2016-05-04 16:06:43	2016-05-13 22:50:14
R1-164116	Consideration on muti-antenna schemes for new radio	Beijing Xinwei Telecom Techn.	**noted**	2016-05-05 12:13:26	2016-05-13 15:28:51
R1-164117	Overview of Massive MIMO for NR	National Instruments	**noted**	2016-05-05 16:52:31	2016-05-13 14:10:57
R1-164118	Frame Structure and Signaling for Reciprocity Calibration in Massive MIMO	National Instruments	withdrawn	2016-05-05 16:54:43	
R1-164119	Reply LS on questions on NB-IOT	RAN2, Nokia	**treated**	2016-05-06 07:31:13	2016-05-06 07:38:22
R1-164120	LS on direct indication DCI bits for NB-IoT	RAN2, Huawei	**treated**	2016-05-06 07:31:13	2016-05-06 07:38:22
R1-164121	Discussion on RLM for PSCell in dual connectivity	Intel	**noted**	2016-05-08 03:34:53	2016-05-14 06:41:57
R1-164122	Draft CR on correction on RLM for PSCell in dual connectivity	Intel Corporation	**noted**	2016-05-08 03:34:53	2016-05-14 06:41:57
R1-164123	Evaluation of MU-MIMO performance with Rel-13 DM-RS	Intel Corporation	**noted**	2016-05-08 03:34:53	2016-05-14 06:41:57
R1-164124	Draft CR on PDSCH scrambling for eMTC	Intel Corporation	**noted**	2016-05-08 03:34:53	2016-05-14 06:41:57
R1-164125	PUSCH DM-RS and support of symbol-level combining	Intel Corporation	**noted**	2016-05-08 03:34:53	2016-05-14 06:41:57
R1-164126	Time domain resource allocation for NPUSCH with 1-bit A/N feedback	Intel Corporation	**noted**	2016-05-08 03:34:53	2016-05-14 06:42:22
R1-164127	On the DCI design for multi-subframe scheduling	Intel	**available**	2016-05-08 03:34:53	2016-05-14 06:42:22
R1-164128	Remaining details on resource allocation for eLAA PUSCH transmission	Intel Corporation	**available**	2016-05-08 03:34:53	2016-05-14 06:42:22
R1-164129	Remaining details of SRS transmission for eLAA	Intel	**available**	2016-05-08 03:34:53	2016-05-14 06:42:22
R1-164130	UCI transmission for eLAA Scells	Intel Corporation	**available**	2016-05-08 03:34:53	2016-05-14 06:42:22

R1-164131	PRACH transmission for eLAA	Intel	available	2016-05-08 03:34:53	2016-05-14 06:42:49
R1-164132	Remaining details for UL LBT	Intel	available	2016-05-08 03:34:53	2016-05-14 06:42:49
R1-164133	UL grant transmission	Intel	available	2016-05-08 03:34:53	2016-05-14 06:42:49
R1-164134	On DMRS physical structure enhancements for PSCCH and PSSCH	Intel Corporation	available	2016-05-08 03:34:53	2016-05-14 06:42:49
R1-164135	On DMRS physical structure enhancements for PSBCH	Intel	available	2016-05-08 03:34:53	2016-05-14 06:42:49
R1-164136	Utilization of PSCCH decoding and energy measurements for sensing based V2V communication	Intel Corporation	available	2016-05-08 03:34:53	2016-05-14 06:43:38
R1-164137	Transmitter behavior for sidelink resource re-selection	Intel Corporation	available	2016-05-08 03:34:53	2016-05-14 06:43:38
R1-164138	Discussion on resource reselection triggers for V2V communication	Intel Corporation	available	2016-05-08 03:34:53	2016-05-14 06:43:38
R1-164139	Design options to support priority for V2V communication	Intel	available	2016-05-08 03:34:53	2016-05-14 06:43:38
R1-164140	Details of resource pool design for sidelink V2V communication	Intel Corporation	available	2016-05-08 03:34:53	2016-05-14 06:43:38
R1-164141	Scheduling assignment for sidelink V2V communication	Intel	available	2016-05-08 03:34:53	2016-05-14 06:44:03
R1-164142	Discussion on CSI-RS for Class A FD-MIMO with overhead reduction	Intel Corporation	noted	2016-05-08 03:34:53	2016-05-14 06:44:03
R1-164143	Discussion on CSI-RS overhead reduction schemes for Class B FD-MIMO	Intel Corporation	noted	2016-05-08 03:34:53	2016-05-14 06:44:03
R1-164144	Discussion on UL DMRS Enhancement for FD-MIMO	Intel	noted	2016-05-08 03:34:53	2016-05-14 06:44:03
R1-164145	Discussion on Class A codebook extension	Intel	noted	2016-05-08 03:34:53	2016-05-14 06:44:03
R1-164146	Performance evaluation of Class A codebooks with 32 ports	Intel	noted	2016-05-08 03:34:53	2016-05-14 06:44:31
R1-164147	Evaluation of beam selection in Class B for hybrid FD-	Intel	available	2016-05-08 03:34:54	2016-05-14 06:44:31
R1-164148	Beam combining codebook enhancements for Class B FD-MIMO	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:44:31
R1-164149	Discussion on the performance of CQI reporting based on the NZP CSI-RS	Intel Corporation	revised	2016-05-08 03:34:54	2016-05-14 06:44:31
R1-164150	Explicit CSI reporting for FD-MIMO	Intel Corporation	revised	2016-05-08 03:34:54	2016-05-14 06:44:31
R1-164151	Evaluation of open loop schemes	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:44:53
R1-164152	Discussion on superposition transmission	Intel	available	2016-05-08 03:34:54	2016-05-14 06:44:53
R1-164153	On downlink control signalling for MUST	Intel	available	2016-05-08 03:34:54	2016-05-14 06:44:53
R1-164154	On the support of longer cyclic prefix for MBSFN subframes	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:44:53
R1-164155	On the support of increased number of MBSFN subframes per radio frame	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:44:53
R1-164156	On the support of MBSFN subframes without a unicast control region and cell-specific reference signals	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:45:24
R1-164157	Consideration on Support SRS Carrier based Switching	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:45:24

R1-164158	Performance analysis of Uu broadcast transmission schemes for V2V communication	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:45:24
R1-164159	Discussion on multi-cell multicast/broadcast enhancements for V2V communication	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:45:24
R1-164160	Downink control singaling design for shorten TTI	Intel	noted	2016-05-08 03:34:54	2016-05-14 06:45:24
R1-164161	Consideration on S-PDCCH design for latency reduction	Intel	available	2016-05-08 03:34:54	2016-05-14 06:45:24
R1-164162	UL design aspects of TTI shortening Intel Corporation	Intel	available	2016-05-08 03:34:54	2016-05-14 06:45:45
R1-164163	On the processing time reduction and maximum TA limitations	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:45:45
R1-164164	Link level evaluation for PDSCH in a short TTI	Intel	available	2016-05-08 03:34:54	2016-05-14 06:45:45
R1-164165	Work plan for FeCoMP study item	Intel Corporation, ZTE	noted	2016-05-08 03:34:54	2016-05-14 06:45:45
R1-164166	Scenarios for FeCoMP evaluations	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:45:45
R1-164167	Evaluation assumptions for FeCoMP evaluations	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:46:06
R1-164168	CSI feedback enhancements for non coherent JT	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:06
R1-164169	Control signalling enhancements for non coherent JT	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:06
R1-164170	Initial evaluation results for non coherent JT	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:06
R1-164171	Enhancements for CS/CB CoMP	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:06
R1-164172	Forward compatible and low overhead structure for NR	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:25
R1-164173	Discussion on URLLC evaluation assumptions and scenarios	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:46:25
R1-164174	Discussion on channel modeling framework for UE-UE and eNB-eNB interference	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:25
R1-164175	Traffic model for small packet size	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:25
R1-164176	Discussion on waveform for high frequency bands	Intel	available	2016-05-08 03:34:54	2016-05-14 06:46:25
R1-164177	Link-level evaluation of filtered/windowed OFDM	Intel	available	2016-05-08 03:34:54	2016-05-14 06:46:48
R1-164178	Uplink non-orthogonal multiple access for NR access technology	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:48
R1-164179	Subcarrier spacing and scaling for new RAT	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 07:23:19
R1-164180	Low Latency Frame Structure Design for NR	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:48
R1-164181	NR Operation in Unlicensed Spectrum	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:46:48
R1-164182	Comparison of coding schemes for NR	Intel	revised	2016-05-08 03:34:54	2016-05-14 06:46:48

R1-164183	LDPC code design for NR	Intel	available	2016-05-08 03:34:54	2016-05-14 06:47:09
R1-164184	Polar code design for NR	Intel	noted	2016-05-08 03:34:54	2016-05-14 06:47:09
R1-164185	Polar code constructions for evaluations	Intel	available	2016-05-08 03:34:54	2016-05-14 06:47:09
R1-164186	Performance evaluation of coding schemes for NR	Intel	available	2016-05-08 03:34:54	2016-05-14 06:47:09
R1-164187	Modulation schemes for New RAT	Intel	available	2016-05-08 03:34:54	2016-05-14 06:47:09
R1-164188	Overview of multi-antenna schemes for new radio interface	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:47:35
R1-164189	On UE side beamforming	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:47:35
R1-164190	RSRP modeling with UE side beamforming	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:47:35
R1-164191	UL MIMO for new radio interface	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:47:35
R1-164192	Evaluation methodology for UL MIMO	Intel Corporation	available	2016-05-08 03:34:54	2016-05-14 06:47:35
R1-164193	Remaining details for blockage modeling	Intel	revised	2016-05-08 03:34:54	2016-05-14 06:48:08
R1-164194	Calibration methodology for spatial consistency	Intel Corporation	noted	2016-05-08 03:34:54	2016-05-14 06:48:08
R1-164195	Large scale calibration results	Intel	available	2016-05-08 03:34:54	2016-05-14 06:48:08
R1-164196	Draft 36.213 CR Clarification on PUCCH format 4/5 resource derivation	CATT	noted	2016-05-09 05:59:56	2016-05-14 01:14:29
R1-164197	PUSCH scheduling for Rel-14 eLAA	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164198	UCI transmission for Rel-14 eLAA	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164199	PRACH design for Rel-14 eLAA	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164200	UL channel access for Rel-14 eLAA	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164201	DMRS enhancement in PC5-based V2V	CATT	revised	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164202	DMRS enhancement for PSBCH	CATT	withdrawn	2016-05-09 05:59:57	
R1-164203	Discussion on sensing mechanism in PC5-based V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164204	Discussion on resource selection mechanism in PC5-based V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164205	Discussion on time duration of sensing in PC5-based V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164206	Further consideration on UE autonomous resource allocation in PC5-based V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164207	Considerations on V2V priority handling	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164208	Resource pool enhancement in PC5-based V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164209	Discussion on contents of scheduling assignment	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164210	Synchronization enhancements in PC5-based V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164211	Discussion on synchronization issues of physical design	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164212	Discussion on PSBCH issues	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29

R1-164213	Timing alignment for V2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164214	CSI-RS enhancement for {20,24,28,32} ports	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164215	Discussion on CSI-RS overhead reduction	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164216	Discussion on backward compatiblity of Rel.12 and Rel.13 CSI-RS	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164217	On aperiodic CSI-RS transmission	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164218	Enhancements on beamformed CSI-RS	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164219	Discussion on UL DMRS enhancement	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164220	Antenna port layouts for Rel-14 FD-MIMO	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164221	Codebook design for {20,24,28,32} ports	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164222	CSI reporting for hybrid CSI-RS	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164223	On Interference enhancement for multi-user MIMO operation	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164224	Discussion on DMRS based open-loop MIMO	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164225	Evaluation of DMRS-based open-loop and semi-open-loop MIMO	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164226	Selection of superposition transmission scheme and parameterization	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164227	Support of downlink superposition transmission	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164228	Considerations on SRS carrier based switching	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164229	Discussion on resource allocation for PC5-based P2V	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164230	Evaluation results on PC5-based V2P	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164231	Evaluation results on PC5-based V2I	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164232	Design of sPDCCH for shortened TTI	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164233	Design of sPUCCH for shortened TTI	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164234	Design of sPUSCH DMRS	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164235	Discussion on the simultaneous transmissions of normal TTI and sTTI	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164236	TDD system design for shortened TTI and related procedures for latency reduction	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164237	TDD system performance evaluation of latency reduction	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164238	System performance evaluation for dynamic control channel overhead	CATT	revised	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164239	Discussion on scenarios and evaluation assumptions for CoMP enhancement	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164240	Enhancement for non-coherent joint transmission	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164241	Coordinated beamforming with FD-MIMO	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164242	NR system design for forward compatibility	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29

R1-164243	Remaining issues on deployment scenarios	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164244	Remaining issues on link/system-level evaluation assumptions for MA	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164245	Discussion on link-level evaluation assumptions for channel coding	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164246	Discussion on scenarios and use cases for MA	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164247	Performance on LLS of PDMA	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164248	NR frame structure design	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164249	Discussion of NR numerology	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164250	Performance evaluation of non-binary LDPC codes	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164251	Performance evaluation of binary turbo codes with low complexity decoding algorithm	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164252	Performance evaluation of non-binary turbo codes	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164253	Performance evaluation of binary LDPC codes	CATT	revised	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164254	Views on NR MIMO design	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164255	Discussion on beam-based operation	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164256	NR MIMO based on channel reciprocity	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164257	Text Proposal on the purpose of link-level channel modes for 38.900	CATT	noted	2016-05-09 05:59:57	2016-05-14 01:37:06
R1-164258	Large scale calibration results	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:28
R1-164259	Full scale calibration results	CATT	available	2016-05-09 05:59:57	2016-05-14 01:14:29
R1-164260	Formation of IEEE 1914 Next Generation Fronthaul Interface Working Group	IEEE 1914 Next Generation Fronthaul Interface	treated	2016-05-09 08:37:03	2016-05-09 08:46:56
R1-164261	Forward compatibility of numerology and frame structure design	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164262	Remaining issue with link level simulation for multiple access	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164263	Remaining issue with system level simulation for multiple access	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164264	Requirement KPIs and system performance targets for multiple access	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164265	Discussion on FB-OFDM of new waveform for new radio interface	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164266	Simulation results of new waveform in case 1a and 1b	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164267	Simulation results of new waveform in case 2	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:20:33
R1-164268	Grant-based and grant-free multiple access for mMTC	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:22:01

R1-164269	Contention-based non-orthogonal multiple access for UL mMTC	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:22:59
R1-164270	Receiver implementation for MUSA	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:24:11
R1-164271	Overview of numerology candidates	ZTE	noted	2016-05-09 14:35:45	2016-05-14 06:24:49
R1-164272	Performance evaluation of numerology candidates	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:24:49
R1-164273	Frequency multiplexing of different numerologies	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:26:42
R1-164274	Frame structure for NR	ZTE	available	2016-05-09 14:35:45	2016-05-14 06:26:42
R1-164275	NR frame structure for unlicensed spectrum	ZTE	available	2016-05-09 14:35:46	2016-05-14 06:26:42
R1-164276	Discussions on HARQ operation for NR	ZTE	available	2016-05-09 14:35:46	2016-05-14 06:26:42
R1-164277	Evaluation on performance and complexity of channel coding for NR	ZTE	noted	2016-05-09 14:35:46	2016-05-14 06:26:42
R1-164278	Consideration on LDPC codes for NR	ZTE	revised	2016-05-09 14:35:46	2016-05-14 06:27:32
R1-164279	Throughput and latency analysis on new channel coding candidates for NR	ZTE	available	2016-05-09 14:35:46	2016-05-14 06:28:38
R1-164280	Consideration on outer code for NR	ZTE	available	2016-05-09 14:35:46	2016-05-14 06:28:38
R1-164281	Multiuser superposition transmission scheme for LTE	ZTE	available	2016-05-09 14:37:09	2016-05-14 06:15:17
R1-164282	Performance evaluation of MUST for selection of potential power ratios	ZTE	noted	2016-05-09 14:37:09	2016-05-14 06:15:49
R1-164283	Method to provide assistance information to a UE	ZTE	available	2016-05-09 14:37:09	2016-05-14 06:16:13
R1-164284	Potential mechanisms for MUST operation	ZTE	available	2016-05-09 14:37:09	2016-05-14 06:17:51
R1-164285	Evaluation for MUST using up to 8Tx antennas	ZTE	available	2016-05-09 14:37:09	2016-05-14 06:17:51
R1-164286	LS on Remaining Issues on Path Loss Scenarios	New York University	treated	2016-05-09 16:04:11	2016-05-09 16:15:48
R1-164287	Power headroom report enhancement for eLAA	Sony	available	2016-05-09 16:30:02	2016-05-13 17:50:21
R1-164288	LBT operation for SRS in eLAA	Sony	available	2016-05-09 16:30:02	2016-05-13 17:50:21
R1-164289	Continuous Uplink Transmission in eMTC	Sony	revised	2016-05-09 16:30:02	2016-05-13 17:50:21
R1-164290	UL Transmission Gap Duration	Sony	noted	2016-05-09 16:30:02	2016-05-13 17:50:21
R1-164291	Monitoring of NPDCCH after NPDSCH/NPUSCH transmission	Sony	noted	2016-05-09 16:30:02	2016-05-13 17:50:21
R1-164292	On forward compatibility for new radio interface	ZTE	available	2016-05-09 18:06:19	2016-05-14 11:55:15
R1-164293	Evaluation Assumptions for NR MIMO	ZTE	revised	2016-05-09 18:06:19	2016-05-14 08:32:43
R1-164294	Overview on NR MIMO for sub-6 GHz	ZTE	available	2016-05-09 18:06:20	2016-05-14 08:32:43
R1-164295	Overview on NR MIMO for above-6 GHz	ZTE	available	2016-05-09 18:06:20	2016-05-14 08:32:43

R1-164296	Discussion on beamforming architecture for NR MIMO	ZTE	available	2016-05-09 18:06:20	2016-05-14 08:32:43
R1-164297	Consideration on CSI measurement and feedback for NR MIMO	ZTE	available	2016-05-09 18:06:20	2016-05-14 08:32:43
R1-164298	TR Skeleton for Study on FeCoMP	ZTE, Intel	endorsed	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164299	Overview on FeCoMP	ZTE, Intel	available	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164300	Deployment scenarios and evaluation assumptions for JT	ZTE	noted	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164301	Deployment scenarios and evaluation assumptions for CS/CB	ZTE	available	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164302	Potential Enhancements for Joint Transmission	ZTE	available	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164303	QCL Issues of Joint Transmission	ZTE, ASTRI	available	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164304	Using FD-MIMO framework for CS/CB	ZTE	available	2016-05-09 18:33:58	2016-05-14 08:32:43
R1-164305	Introduction of LTE Physical Layer Enhancements for NB-IoT	Motorola Mobility Germany	available	2016-05-09 23:05:23	2016-05-16 20:23:22
R1-164306	Consideration on increasing number of MBSFN subframes	ZTE	noted	2016-05-09 23:41:13	2016-05-11 05:35:34
R1-164307	Consideration on support of MBSFN subframes without a unicast region	ZTE	noted	2016-05-09 23:43:46	2016-05-11 05:35:34
R1-164308	Views on non-precoded CSI-RS design for eFD-MIMO	ZTE	available	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164309	Aperiodic CSI-RS for non-precoded CSI-RS	ZTE	available	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164310	Enhancements on Beamformed CSI-RS	ZTE	available	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164311	Discussion on UL DMRS enhancement for eFD-MIMO	ZTE	noted	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164312	Discussion on rank 1-2 codebook design for eFD-MIMO	ZTE	noted	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164313	Discussion on CSI reporting for hybrid CSI-RS	ZTE	available	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164314	Discussion on CSI reporting of linear combination codebook	ZTE	revised	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164315	Discussion on interference measurement for MU-CSI	ZTE	available	2016-05-10 05:57:51	2016-05-14 09:08:01

R1-164316	Discussion on DMRS-based Open-Loop and Semi-Open-Loop Transmission	ZTE	revised	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164317	Correction on UE assumption on DMRS ports	ZTE	noted	2016-05-10 05:57:51	2016-05-14 09:08:01
R1-164318	Considerations for UL LBT	Sequans Communication	available	2016-05-10 08:28:27	2016-05-13 15:27:20
R1-164319	eLAA PUSCH transmission	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164320	Discussion on DM-RS for PSBCH for sidelink-based V2V communication	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164321	Discussion on the resource allocation enhancement for sidelink-based V2V communication	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164322	Discussion on resource allocation for V2V based on LTE sidelink	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164323	Discussion on Resource Pool for PC5 based V2V	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164324	Discussion on non-precoded CSI-RS	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164325	Discussion on enhancement to DL multicast/broadcast transmissions	Fujitsu	noted	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164326	Multicast/Broadcast enhancements for V2X	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164327	On coexistence of new waveforms for NR	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164328	Discussion on real domain OFDM for mMTC	Fujitsu	withdrawn	2016-05-10 09:01:11	
R1-164329	Initial LLS results for UL non-orthogonal multiple access	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164330	NR sub-carrier spacing	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164331	TDD frame structure with mixed numerology	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164332	NR Frame structure considerations for low latency TDD operation	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164333	Discussion on flexible/dynamic TDD	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164334	Discussion on massive MIMO in NR	Fujitsu	available	2016-05-10 09:01:11	2016-05-13 21:14:49
R1-164335	CSI-RS Design Supporting up to 32 Antenna Ports	Nokia, Alcatel-Lucent Shanghai	available	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164336	CSI-RS Overhead Reduction for Beamformed CSI-RS Transmission Schemes	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164337	UL DMRS Enhancement and Evaluations for FD-MIMO	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164338	Codebook Design Supporting Antenna Configurations Up to 32 Ports	Nokia, Alcatel-Lucent Shanghai	available	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164339	Hybrid CSI measurement and reporting schemes	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-10 10:49:17	2016-05-13 19:20:31

R1-164340	Initial Evaluation Results with Analog CSI Reporting	Nokia, Alcatel-Lucent Shanghai	withdrawn	2016-05-10 10:49:17	
R1-164341	Evaluation Results of DMRS-based open-loop transmission schemes	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164342	Considerations of FeCoMP deployment scenarios	Nokia, Alcatel-Lucent Shanghai	available	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164343	Overview of non-coherent joint transmission for FeCoMP	Nokia, Alcatel-Lucent Shanghai	available	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164344	Overview of FD-MIMO based CSCB transmission	Nokia, Alcatel-Lucent Shanghai	available	2016-05-10 10:49:17	2016-05-13 19:20:31
R1-164345	Discussion on control signalling of MUST	Fiberhome Technologies	available	2016-05-10 11:34:17	2016-05-12 01:36:05
R1-164346	MA for eMBB in mmWave spectrum	Fiberhome Technologies	available	2016-05-10 11:40:21	2016-05-10 12:31:28
R1-164347	Numerology for 5G NR	Fiberhome Technologies	available	2016-05-10 11:41:49	2016-05-10 12:31:28
R1-164348	General views on DM-RS enhancements in uplink for FD-MIMO	Fiberhome Technologies	available	2016-05-10 11:43:12	2016-05-10 12:31:28
R1-164349	Discussion the transmission scheme of M-MIMO for 5G system	Fiberhome Technologies	available	2016-05-10 11:44:21	2016-05-12 13:13:46
R1-164350	Draft LS on OTDOA enhancements for indoor positioning	Ericsson	withdrawn	2016-05-10 14:04:38	
R1-164351	Evaluations of map-based hybrid channel model	ZTE, Keysight	agreed	2016-05-10 14:38:28	2016-05-14 04:34:01
R1-164352	Text proposal for remaining issues in map-based hybrid model	ZTE, Keysight	revised	2016-05-10 14:42:07	2016-05-14 04:34:01
R1-164353	Text proposal to update oxygen absorption loss	ZTE	agreed	2016-05-10 14:47:58	2016-05-14 04:34:00
R1-164354	Underlay Common Control Channel for Unlicensed Spectrum Access and Underlay Low-Rate Data Channel for Licensed Spectrum	Idaho National Laboratory	available	2016-05-10 16:07:02	2016-05-13 21:26:01
R1-164355	Circularly Pulse Shaped OFDM-based Waveform	Idaho National Laboratory	available	2016-05-10 16:26:30	2016-05-13 21:27:07
R1-164356	Performance Evaluation of TBCC and Polar Codes	Ericsson	available	2016-05-10 19:16:34	2016-05-14 05:47:55
R1-164357	Analysis of Candidate Code Types for Short Block Length	Ericsson	available	2016-05-10 19:16:34	2016-05-14 05:47:55
R1-164358	Performance Evaluation of Turbo Codes and LDPC Codes at Lower Code Rates	Ericsson	available	2016-05-10 19:16:34	2016-05-14 05:47:55
R1-164359	Performance Evaluation of Turbo Codes and LDPC Codes at Higher Code Rates	Ericsson	noted	2016-05-10 19:16:34	2016-05-14 05:47:55
R1-164360	Analysis of Candidate Code Types for Long Block Length	Ericsson	noted	2016-05-10 19:16:34	2016-05-14 05:47:55
R1-164361	Turbo Code Enhancements	Ericsson	noted	2016-05-10 19:16:34	2016-05-14 05:47:55
R1-164362	HS-SCCH DRX lite design with enhanced servicing ability	Qualcomm Europe	noted	2016-05-10 20:30:11	2016-05-14 06:58:34
R1-164363	Open Issues on HS-SCCH DRx lite proposal	Qualcomm Europe	noted	2016-05-10 20:37:46	2016-05-14 06:58:34

R1-164364	Clarifications to DCH enhancements feature	Qualcomm Europe	noted	2016-05-10 20:45:30	2016-05-14 06:57:58
R1-164365	Clarifications on DCH enhancements feature	Qualcomm Europe	revised	2016-05-10 20:57:08	2016-05-14 06:57:58
R1-164366	Clarifications on DCH enhancements feature (Mirror Rel-13)	Qualcomm Europe	revised	2016-05-10 20:59:14	2016-05-14 06:57:58
R1-164367	Clarifications on DCH enhancements feature	Qualcomm Europe	revised	2016-05-10 21:00:39	2016-05-14 06:57:58
R1-164368	Clarifications on DCH enhancements feature (Mirror Rel-13)	Qualcomm Europe	revised	2016-05-10 21:01:34	2016-05-14 06:57:58
R1-164369	Discussion on waveform for high frequencies	Huawei,	available	2016-05-10 21:33:39	2016-05-15 21:21:17
R1-164370	SLS evaluation methodology for grant-free based multiple access	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:21:17
R1-164371	Considerations on new radio access mechanisms in NR	Huawei,	available	2016-05-10 21:33:39	2016-05-15 21:21:17
R1-164372	Coverage Issues of Massive MIMO in NR	Huawei, HiSilicon	noted	2016-05-10 21:33:39	2016-05-14 03:36:51
R1-164373	Evaluation methodology for Massive MIMO in New Radio	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-14 03:36:51
R1-164374	CSI Acquisition Framework for Massive MIMO in New Radio	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-14 03:36:51
R1-164375	Evaluation of polar codes for eMBB scenario	Huawei,	available	2016-05-10 21:33:39	2016-05-14 03:36:51
R1-164376	On UL transmission gaps and related RAN4 analysis	Huawei,	noted	2016-05-10 21:33:39	2016-05-14 02:15:42
R1-164377	Performance of channel coding schemes for eMBB	Huawei,	noted	2016-05-10 21:33:39	2016-05-14 03:36:51
R1-164378	Performance of channel coding schemes for mMTC and URLLC scenarios	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-14 03:36:51
R1-164379	Support for UE Cooperation in NR	Huawei,	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164380	Frame Structure Design Considerations for Bands above 6 GHz	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164381	Impact of directional transmission on NR numerology for high frequency bands	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164382	Advanced Link Adaptation for NR	Huawei,	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164383	Further discussion on evaluation assumption for eMBB deployment scenarios	Huawei, HiSilicon	noted	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164384	Discussion on large-scale calibration	Huawei,	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164385	Discussion on fast fading calibration	Huawei,	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164386	Discussion on Rma channel model	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164387	Forward compatibility considerations on physical layer procedures	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164388	Discussion on removal of square bracket for cluster level SSP	Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation,	revised	2016-05-10 21:33:39	2016-05-15 21:23:05

R1-164389	Cluster delay with time evolution	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164390	Transceiver implementation and complexity analysis for SCMA	Huawei, HiSilicon	revised	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164391	Overview of remaining issues of evaluation assumption	Huawei, HiSilicon	available	2016-05-10 21:33:39	2016-05-15 21:23:05
R1-164392	Discussion on intra-UE coexistence between 5.9GHz PC5 chain and 2GHz Uu chain for V-UE	CATT	withdrawn	2016-05-11 00:50:58	
R1-164393	Draft response LS to 802dot11 regarding LAA	Qualcomm Incorporated	revised	2016-05-11 02:03:28	2016-05-14 01:48:36
R1-164394	Draft response LS to WFA regarding LAA	Qualcomm Incorporated	revised	2016-05-11 02:03:28	2016-05-14 01:38:41
R1-164395	Draft CR on CWp adjustment	Qualcomm Incorporated	noted	2016-05-11 02:03:28	2016-05-14 01:36:41
R1-164396	DCI Format 1C signaling and expected UE behavior	Qualcomm Incorporated	noted	2016-05-11 02:03:28	2016-05-14 02:13:53
R1-164397	Draft CR on DCI Format 1C signaling and expected UE behavior	Qualcomm Incorporated	not pursued	2016-05-11 02:03:29	2016-05-14 02:13:53
R1-164398	Discussion on paging occasion overlap for eMTC	Qualcomm Incorporated	postponed	2016-05-11 02:03:29	2016-05-14 02:06:41
R1-164399	Clarification on CSI measurements	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:03:50
R1-164400	Draft CR for clarification on CSI measurements	Qualcomm Incorporated	revised	2016-05-11 02:03:29	2016-05-14 02:03:50
R1-164401	Draft CR for scrambling sequence initialization	Qualcomm Incorporated	revised	2016-05-11 02:03:29	2016-05-14 02:03:50
R1-164402	Remaining issues for eMTC	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:03:50
R1-164403	Potential issues of NB-SSS in asynchronous deployment	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 07:20:45
R1-164404	On NPDCCH search space	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 01:27:12
R1-164405	Draft CR on clarification for channel sensing	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 01:48:36
R1-164406	PUSCH design details	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164407	PUSCH and SRS multiplexing	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164408	PUSCH resource allocation granularity	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164409	Control details for UL scheduling	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164410	DCI design for PUSCH scheduling in eLAA	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27

R1-164411	SRS procedures for eLAA	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164412	UCI reporting on unlicensed carriers	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164413	PRACH waveforms for eLAA	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164414	PRACH procedures for eLAA	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164415	UL channel access for eLAA	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164416	Discussion on ED threshold for UEs in eLAA	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:32:27
R1-164417	DM-RS Enhancements for V2V PSCCH and PSSCH	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164418	DM-RS Enhancements for V2V PSBCH	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164419	Details of sensing for V2V	Qualcomm Incorporated	revised	2016-05-11 02:03:29	2016-05-14 02:43:47
R1-164420	Priority handling for autonomous resource selection	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:47
R1-164421	eNodeB signaling for SPS resource allocation	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164422	UE reporting for eNodeB resource allocation	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164423	Resource pool design for V2V	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164424	MPR for same subframe control and data transmission for V2V	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164425	Scheduling Assignments for V2V	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164426	Synchronization Procedure for V2V	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:43:48
R1-164427	Non-precoded CSI-RS design for up to 32 ports	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:50:42
R1-164428	Enhancements on Beamformed CSI-RS for eFD-MIMO	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:50:42
R1-164429	Performance evaluation of uplink DMRS enhancements for MU-MIMO	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:50:42
R1-164430	Non-precoded CSI-RS Codebooks for eFD-MIMO	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:50:42
R1-164431	Discussion on Hybrid CSI-RS Operation for eFD-MIMO	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:50:42
R1-164432	Discussion on advanced CSI reporting and initial evaluation results	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:50:42

R1-164433	Discussion on DMRS based OL and Semi-OL Transmission	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:50:42
R1-164434	Superposition transmissions	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:58:55
R1-164435	Power ratio set considerations for MUST	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 02:58:55
R1-164436	Mechanisms for efficient operation	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:58:55
R1-164437	MUST UE pairing with existing CQI feedback	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 02:58:55
R1-164438	Evaluation results for longer cyclic prefix	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:11:45
R1-164439	Design options for longer cyclic prefix for MBSFN subframes	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:11:45
R1-164440	Increased number of MBSFN subframes per radio frame	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:11:45
R1-164441	MBSFN subframes without a unicast control region and cell-specific reference signals	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:11:45
R1-164442	Standalone eMBMS carrier	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:11:45
R1-164443	Simultaneous reception of broadcast and unicast	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:11:45
R1-164444	SRS Transmission on TDD CCs without PUSCH	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164445	Support of Periodic and/or aperiodic SRS	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164446	Collision Handling	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164447	Introduction of OTDOA enhancements for the shared Cell-ID scenario	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164448	Draft CR Introduction of OTDOA enhancements for the shared Cell-ID scenario	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164449	Introduction of UE inter-frequency RSTD calibration accuracy reporting	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164450	Introduction of PRS based Terrestrial Beacon Systems	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164451	Way Forward on PRS-based Beacons	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164452	Discussion of UL 256QAM	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:29:30
R1-164453	MCS table design considerations for UL 256QAM	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:29:30

R1-164454	System level performance using SC-PTM and eMBMS	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:41:45
R1-164455	PC5 for V2P	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:41:45
R1-164456	Downlink Enhancements for Uu based V2V	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:41:45
R1-164457	Co-channel coexistence between V2V and DSRC	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:41:45
R1-164458	DL channel design for shortened TTI	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164459	UL channel design for shortened TTI	Qualcomm Incorporated	noted	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164460	Processing time reduction and related procedures for DL	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164461	Processing time reduction and related procedures for UL	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164462	TDD-specific processing time reduction and related procedures	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164463	Updated link-level evaluation of TTI shortening in DL	Qualcomm Incorporated	withdrawn	2016-05-11 02:03:29	
R1-164464	Updated link-level evaluation of TTI shortening in UL	Qualcomm Incorporated	available	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164465	Updated system level evaluations	Qualcomm Incorporated	revised	2016-05-11 02:03:29	2016-05-14 03:48:14
R1-164466	Discussion on the mode-2 resource allocation for V2V	Guangdong OPPO Mobile	available	2016-05-11 04:34:18	2016-05-13 09:21:49
R1-164467	UE sensing based congestion control for mode-2	Guangdong OPPO Mobile	available	2016-05-11 04:36:09	2016-05-13 09:21:49
R1-164468	Discussion on the SPS configuration for mode-2	Guangdong OPPO Mobile	available	2016-05-11 04:37:22	2016-05-13 09:21:49
R1-164469	Discussion on the GNSS based synchronization	Guangdong OPPO Mobile	available	2016-05-11 04:38:19	2016-05-13 09:21:49
R1-164470	Discussion on TTI shortening	Guangdong OPPO Mobile	available	2016-05-11 04:39:27	2016-05-13 09:21:49
R1-164471	On forward compatibility of NR	Guangdong OPPO Mobile	available	2016-05-11 04:40:37	2016-05-13 09:21:49
R1-164472	Frame structure supporting flexible parameter allocations	Guangdong OPPO Mobile	available	2016-05-11 04:41:35	2016-05-13 09:21:49
R1-164473	Schedule Assignment for SPS	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164474	Triggering resource reselection based on collision detection	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32

R1-164475	Reporting of radio-level measurements of sidelink	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164476	Resource pool design for collision detection and handling	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164477	Determining the radio frame and subframe for V2X synchronisation signals	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164478	Discussion on candidate assistance information for signalling or blind detection	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164479	Remaining issues on PUSCH resource allocation	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164480	Remaining details on multiple-subframe scheduling for LAA	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164481	Design for Non-precoded CSI-RS for overhead reduction	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164482	Considerations on the design of frame structure for NR	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164483	Discussion on CSI-RS with CDM8	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164484	Proposals for uplink DM-RS enhancement	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164485	Discussion on Multi-antenna scheme for NR	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164486	Subcarrier spacing and other parameters for numerology	NEC	available	2016-05-11 05:38:38	2016-05-13 05:36:32
R1-164487	Details of Two-stage downlink control channel	NEC	available	2016-05-11 05:38:38	2016-05-13 09:24:58
R1-164488	Correction of cyclic hopping term for PUSCH DMRS	NEC	not pursued	2016-05-11 05:38:38	2016-05-13 09:24:58
R1-164489	Enhancements to Coordinated Multi-point Operation: Impact of interference averaging	NEC	available	2016-05-11 05:38:41	2016-05-13 05:36:32
R1-164490	Discussion on CWS update for multiple channel access priority classes	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164491	Correction on CWS update for multiple channel access priority classes	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164492	Clarification on DL ending partial subframe	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164493	Discussion on remaining issues on NB-IoT	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164494	Discussion and comments on NB-IoT CRs	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164495	PUSCH resource allocation in LAA	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164496	Multi-subframe scheduling in LAA	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164497	Summary of email discussion on multi-subframe	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164498	SRS transmission in LAA	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164499	UCI transmission in LAA	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164500	Random access preamble in LAA	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164501	Random access procedure in LAA	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:05:51
R1-164502	LBT schemes in LAA UL	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164503	Further details on channel access in LAA UL	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164504	Impact of UE-to-UE interference on LAA performance	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164505	Initial signal in LAA uplink	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164506	Power control in LAA uplink	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164507	Discussion on DMRS for PSCCH and PSSCH	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:08

R1-164508	Discussion on DMRS for PSBCH	LG Electronics	revised	2016-05-11 06:02:05	2016-05-14 05:14:08
R1-164509	Discussion on adaptation of MCS depending on UE speed	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:08
R1-164510	Discussion on details of sensing operation for PC5 based V2V	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:08
R1-164511	Discussion on details of resource selection for PC5 based V2V	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164512	Discussion on details of resource reselection for PC5 based V2V	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164513	Discussion on details of priority handling for PC5 based	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164514	Discussion on details of (E)PDCCH used for sidelink SPS	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164515	Discussion on details of UE reporting	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164516	Discussion on remaining issues on resource pool design for PC5 based V2V	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164517	Discussion on details of scheduling assignment for PC5 based V2V	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164518	Discussion on details of prioritizing sidelink transmissions over UL transmissions	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164519	Discussion on remaining issues on coexistence of PC5-based V2V and legacy Uu	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164520	Discussion on details of synchronization enhancements	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164521	Discussion on sidelink subframe timing and number determination	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 05:14:09
R1-164522	Discussion on CSI-RS designs for eFD-MIMO	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164523	Beamformed CSI-RS enhancements including aperiodic CSI-RS	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164524	Uplink DMRS enhancements for eFD-MIMO	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164525	Discussion on codebook design for eFD-MIMO	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164526	Discussion on CSI reporting enhancements for hybrid CSI-	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164527	Initial performance evaluation on advanced implicit CSI	LG Electronics	revised	2016-05-11 06:02:05	2016-05-14 04:08:47
R1-164528	Initial performance evaluation on semi-OL MIMO	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:08:47
R1-164529	Discussion on power ratio and modulation order	LG Electronics	noted	2016-05-11 06:02:05	2016-05-14 04:07:00
R1-164530	Discussion on Gray mapping for superposed constellation	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:08:47
R1-164531	Discussion on Signaling Assistance Information	LG Electronics	available	2016-05-11 06:02:05	2016-05-14 04:08:47
R1-164532	3GPP TR 36.885 v.1.1.0 Study on LTE-based V2X Services	LG Electronics	revised	2016-05-11 06:02:05	
R1-164533	Discussion on collecting V2X evaluation results in	LG Electronics	revised	2016-05-11 06:02:06	2016-05-14 05:14:09
R1-164534	Evaluation results on the enhancement of Uu transport for V2V, V2P and V2I/N	LG Electronics	revised	2016-05-11 06:02:06	2016-05-14 05:14:09
R1-164535	Evaluation results on PC5 transport for V2P and V2I/N	LG Electronics	available	2016-05-11 06:02:06	2016-05-20 17:10:21
R1-164536	Further details on enhancements for multi-cell multicast/broadcast	LG Electronics	noted	2016-05-11 06:02:06	2016-05-14 05:14:09

R1-164537	Discussion on UE feedback for DL multicast/broadcast	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 05:14:09
R1-164538	Discussion on UL SPS for V2X	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 05:14:09
R1-164539	Discussions on SL enhancements for V2P	LG Electronics	withdrawn	2016-05-11 06:02:06	
R1-164540	Discussion on coexisting LTE-V2V and IEEE802.11p on the same carrier	LG Electronics	noted	2016-05-11 06:02:06	2016-05-14 05:14:09
R1-164541	Discussion on candidate length for sTTI	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164542	Discussions on DCI and sPDCCH for latency reduction	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164543	Discussions on sPDSCH for latency reduction	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164544	Discussion on sPUSCH design with TTI shortening	LG Electronics	noted	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164545	Discussion on sPUCCH for HARQ-ACK in latency	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164546	Discussion on sPUCCH for CSI in latency reduction	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164547	Processing time reduction for latency reduction	LG Electronics	revised	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164548	System-level simulation results for TDD scenario with latency reduction	LG Electronics	revised	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164549	Further link level evaluation of sPUSCH for shortened TTI	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:08:47
R1-164550	Discussion on enhancements for non-coherent JT	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164551	Discussion on enhancements for CS/CB with FD-MIMO	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164552	Forward compatibility support design of NR	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164553	Evaluation assumptions for eV2X	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164554	Proposal for UE antenna model for new RAT	LG Electronics	noted	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164555	Remaining Issues on Evaluation Assumptions for New Radio Interface	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164556	Initial Evaluation Result for waveform	LG Electronics	revised	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164557	Initial LLS Evaluation Result for NoMA	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164558	Multiple Access scheme for eMBB	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164559	Initial Evaluation Result for NR Numerology	LG Electronics	revised	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164560	Discussion on frame structure for NR	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164561	Support different numerology and different usage scenarios	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:09:38
R1-164562	Consideration of Flexible and Full duplex operation in NR design	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164563	Discussion on channel coding scheme considering NR	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10

R1-164564	Performance and complexity comparison of existing Turbo and LDPC codes	LG Electronics	noted	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164565	Discussions on polar code design	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164566	Maximum Supported Modulation Order for above 6GHz	LG Electronics	available	2016-05-11 06:02:06	2016-05-18 11:22:58
R1-164567	Massive MIMO for New Radio Interface	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164568	High level view on eV2X	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164569	Remaining issues on large scale modeling	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164570	Remaining issues on fast fading modeling	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164571	Large scale calibration results	LG Electronics	available	2016-05-11 06:02:06	2016-05-14 04:11:10
R1-164572	HARQ for UL LAA	ZTE	available	2016-05-11 06:15:20	2016-05-13 13:40:09
R1-164573	Consideration of LBT failure in LAA UL HARQ operation	ZTE	available	2016-05-11 06:25:51	2016-05-13 13:40:09
R1-164574	On UL Resource Allocation for PUSCH	ZTE	available	2016-05-11 06:28:15	2016-05-13 13:40:09
R1-164575	Discussion on UL scheduling for LAA	ZTE	available	2016-05-11 06:30:34	2016-05-13 13:40:09
R1-164576	TPC and PHR for UL LAA	ZTE	available	2016-05-11 06:32:31	2016-05-13 13:40:09
R1-164577	Clarifications for NB-IoT CRs	Spreadtrum Communication	noted	2016-05-11 06:53:13	2016-05-13 11:42:21
R1-164578	Discussion on UL Grant Transmission for eLAA	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164579	Discussion on the remaining issues for SRS transmission in eLAA	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58

R1-164580	Discussion on SR Enhancements for V2X	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164581	Discussion on DL control for shortened TTI	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164582	Considerations on shortened TTI transmission within MBSFN subframe	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164583	sTTI schedule impact due to MBSFN or ABS subframe	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164584	HARQ feedback for sTTI scheduling	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164585	Forward compatibility for waveform evolution	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164586	LLS assumptions for waveform evaluation in mMTC UL transmissions	Spreadtrum Communication	noted	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164587	Further consideration on the evaluation assumption of multiple access	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164588	Initial LLS evaluation results of NR waveforms under case 1a/1b/2	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164589	Initial LLS evaluation results on multiple access schemes	Spreadtrum Communication	revised	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164590	Discussion on numerology sets	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164591	Discussion on frame structure	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164592	Simulation results of Turbo and Polar codes	Spreadtrum Communication	available	2016-05-11 06:53:13	2016-05-13 12:14:58
R1-164593	down-selection for superposition scheme	Sequans Communication	available	2016-05-11 06:54:33	2016-05-13 17:05:41
R1-164594	initial configuration and dynamic indication	Sequans Communication	available	2016-05-11 06:55:28	2016-05-13 17:05:41
R1-164595	WF on UL scheduling and transmission for LAA	ZTE	available	2016-05-11 07:01:08	2016-05-13 13:40:09
R1-164596	Discussion on SRS design for eLAA UL	ZTE	available	2016-05-11 07:02:52	2016-05-13 13:40:09
R1-164597	Collision between PUCCH and PUSCH	Sequans Communication	noted	2016-05-11 07:04:40	2016-05-15 06:49:29

R1-164598	Discussion on UCI transmission on LAA SCell	ZTE	available	2016-05-11 07:06:28	2016-05-13 13:40:09
R1-164599	Correction for collision between PUCCH and PUSCH	Sequans Communication	not pursued	2016-05-11 07:08:12	2016-05-15 06:49:29
R1-164600	PRACH Design for LAA	ZTE	available	2016-05-11 07:08:25	2016-05-13 13:40:09
R1-164601	Frame design and signalling for LAA UL based on FS3	ZTE	available	2016-05-11 07:11:51	2016-05-13 13:40:09
R1-164602	eMTC MPDCCH corrections for 36.213	Sequans Communication	revised	2016-05-11 07:12:03	2016-05-15 06:49:29
R1-164603	Discussion on the UL LBT for LAA	ZTE	available	2016-05-11 07:13:44	2016-05-13 13:40:09
R1-164604	LBT for Frequency and reuse and Multiplexing in Uplink	ZTE	available	2016-05-11 07:15:55	2016-05-13 13:40:09
R1-164605	WF on UE initiated TxOP/MCOT shared by the eNB	ZTE	available	2016-05-11 07:17:47	2016-05-13 13:45:28
R1-164606	List of open issues for channel modelling SI	Nokia, Samsung	noted	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164607	TP for TR38.900 on Section 7.2	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164608	TP for TR38.900 on Section 7.4	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52

R1-164609	TP for TR38.900 on Section 7.5	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164610	TP for TR38.900 on Section 7.6	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164611	TP for TR38.900 on Section 7.7	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164612	TP for TR38.900 on Section 7.8	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164613	TP for TR38.900 on Section 8	Nokia, Samsung	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164614	WF on TR clean up_v2	Nokia, Samsung, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel,	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164615	Detailed parameters for RMa scenario description	Nokia, Samsung, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel,	agreed	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164616	On the applicability range of new channel model	Nokia, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT	noted	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164617	Clarifications on O-I implementation	Nokia, AT&T, Ericsson, ETRI, Huawei, HiSilicon, Intel, KT Corporation, NTT	revised	2016-05-11 07:18:35	2016-05-13 18:49:52
R1-164618	On baseline UE receiver for NR	ORANGE	revised	2016-05-11 07:21:50	2016-05-11 07:44:25
R1-164619	Flexibly configured OFDM (FC-OFDM) waveform	ORANGE	available	2016-05-11 07:28:47	2016-05-11 10:02:45
R1-164620	Performance evaluation of FC-OFDM	ORANGE	revised	2016-05-11 07:34:44	2016-05-11 10:04:26

R1-164621	On a 30kHz subcarrier spacing option for NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164622	NR numerology	Ericsson	noted	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164623	Mixed Numerology in an OFDM System	Ericsson	revised	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164624	Principles for downlink control signaling in NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164625	Design principles for system access in a beam-centric system	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164626	On modulation schemes for NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164627	Hybrid-ARQ acknowledgements for NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164628	Frame structure for NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164629	On OFDM in NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164630	Performance difference between 60 and 75 kHz subcarrier spacing	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164631	Duplex schemes for NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164632	Flexible bandwidth in NR	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164633	On forward compatibility	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164634	Instant uplink access	Ericsson	available	2016-05-11 08:17:07	2016-05-13 20:16:37
R1-164635	Improved LTE turbo codes for NR	ORANGE	noted	2016-05-11 09:08:42	2016-05-11 09:24:42
R1-164636	SA contents for V2V	Lenovo (Beijing)	available	2016-05-11 09:11:18	2016-05-13 13:57:31
R1-164637	System-level performance evaluation for TDD	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164638	Latency reduction solutions for TDD	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164639	Discussion on sPDCCH for shortened TTI	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164640	PUCCH design and evaluation for shortened TTI	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164641	Processing time reduction and related procedures	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164642	Study on PDSCH transmission in shortened TTI	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164643	Study on PUSCH transmission in shortened TTI	ZTE	available	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164644	Draft reply LS on the feasibility of mobility enhancement solutions	ZTE	revised	2016-05-11 09:14:25	2016-05-14 04:49:06
R1-164645	UE autonomous resource selection for semi-persistent transmission	Lenovo (Beijing) Ltd	available	2016-05-11 09:21:43	2016-05-13 13:57:31
R1-164646	Resource pool for V2V	Lenovo (Beijing)	available	2016-05-11 09:27:42	2016-05-13 12:55:48
R1-164647	UCI transmission on LAA Scell	Lenovo (Beijing) Ltd	available	2016-05-11 09:27:42	2016-05-13 12:55:48
R1-164648	LBT mechanism for LAA uplink	Lenovo (Beijing)	available	2016-05-11 09:27:42	2016-05-13 12:55:48
R1-164649	Design of DL channels for shortened TTI	Lenovo (Beijing)	available	2016-05-11 09:27:42	2016-05-13 12:02:44

R1-164650	Design of UL channels for shortened TTI	Lenovo (Beijing)	available	2016-05-11 09:27:42	2016-05-13 12:02:44
R1-164651	Forward compatibility for new radio interface	Lenovo (Beijing) Ltd	available	2016-05-11 09:27:42	2016-05-13 12:02:44
R1-164652	Frame structure design for new radio interface	Lenovo (Beijing) Ltd	available	2016-05-11 09:27:42	2016-05-13 12:02:44
R1-164653	Considerations for non-uniform constellations for NR	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164654	Consideration on forward compatibility for NR	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164655	Discussion on filtered waveform for NR	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164656	Consideration on the Non-Orthogonal Multiple Access for	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164657	Discussion on frame structure design for NR	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164658	Discussion on numerology design for NR	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164659	Considerations on MU-CQI Transmission	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164660	Enhanced multiple antenna transmission for NR	Sony	available	2016-05-11 09:53:23	2016-05-13 17:50:21
R1-164661	Adaptive RSTD reporting for indoor positioning	Ericsson	available	2016-05-11 10:34:30	2016-05-14 05:39:26
R1-164662	Introduction of NB-IoT	Ericsson	revised	2016-05-11 13:34:31	2016-05-13 21:13:20
R1-164663	Discussion on control signaling design for reduced TTI	HTC	available	2016-05-11 15:13:00	2016-05-13 07:19:42
R1-164664	Framework for forward compatible NR design	INTERDIGITAL COMMUNICA	available	2016-05-11 15:39:58	2016-05-14 01:32:22
R1-164665	Frame structure for New Radio	INTERDIGITAL COMMUNICA	available	2016-05-11 15:41:57	2016-05-14 01:32:22
R1-164666	Numerology for New Radio	INTERDIGITAL COMMUNICA	available	2016-05-11 15:43:18	2016-05-14 01:32:22
R1-164667	Outer erasure code for efficient multiplexing	INTERDIGITAL COMMUNICA	available	2016-05-11 15:44:52	2016-05-14 01:32:22
R1-164668	OTDOA Enhancement for Same PCI Issue	Nokia, Alcatel-Lucent Shanghai	available	2016-05-11 16:00:07	2016-05-13 19:20:31
R1-164669	Considerations of Efficient Control Signaling for MUST	Sony	available	2016-05-11 16:12:45	2016-05-13 17:50:21
R1-164670	Discussion on the transmitter UE behavior in resource selection/reselection	Sony	available	2016-05-11 16:12:45	2016-05-13 17:50:21
R1-164671	Discussion on the priority handling for UE-autonomous resource (re)selection	Sony	available	2016-05-11 16:12:45	2016-05-13 17:50:21
R1-164672	NR multiple access	Ericsson	available	2016-05-11 16:21:10	2016-05-13 20:16:37
R1-164673	Characteristics of NR services	Qualcomm Incorporated	withdrawn	2016-05-11 16:27:39	
R1-164674	Channel bandwidth consideration for forward compatibility	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 06:05:50
R1-164675	Initial DL KPI evaluation for eMBB	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 04:30:34

R1-164676	Initial UL KPI evaluation for eMBB	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 04:30:34
R1-164677	mmW related simulation assumption parameters	Qualcomm Incorporated	noted	2016-05-11 16:27:39	2016-05-14 04:30:34
R1-164678	High speed train scenario clarification	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 06:02:12
R1-164679	Highway and urban grid evaluation scenarios	Qualcomm Incorporated	noted	2016-05-11 16:27:39	2016-05-14 04:30:34
R1-164680	Other KPI evaluation assumptions	Qualcomm Incorporated	noted	2016-05-11 16:27:39	2016-05-14 07:27:02
R1-164681	URLLC KPI evaluation assumptions	Qualcomm Incorporated	noted	2016-05-11 16:27:39	2016-05-14 04:30:34
R1-164682	Other KPI evaluation assumptions	Qualcomm Incorporated	revised	2016-05-11 16:27:39	2016-05-14 04:30:34
R1-164683	Multiple access evaluation assumption	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 04:55:43
R1-164684	Single carrier waveform evaluation	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 05:43:33
R1-164685	OFDM based waveform single user evaluation	Qualcomm Incorporated	revised	2016-05-11 16:27:39	2016-05-14 05:43:33
R1-164686	OFDM based waveform multi user evaluation	Qualcomm Incorporated	revised	2016-05-11 16:27:39	2016-05-14 05:43:33
R1-164687	mmW waveform selection considerations	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 04:30:34
R1-164688	RSMA	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 05:30:58
R1-164689	RSMA and SCMA comparison	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 04:55:43
R1-164690	NB-IOT Coexistence Analysis for NR Numerology	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 05:27:49
R1-164691	NR numerology design and evaluation for long delay spread channels	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 05:27:49
R1-164692	Numerology and TTI multiplexing for NR Forward Compatibility Analysis	Qualcomm Incorporated	noted	2016-05-11 16:27:39	2016-05-14 05:27:49
R1-164693	NR sampling rate related numerology considerations for eMBB and mMTC	Qualcomm Incorporated	available	2016-05-11 16:27:39	2016-05-14 05:27:49
R1-164694	Frame structure requirements	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 05:34:02
R1-164695	Candidate frame structures	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 05:17:22
R1-164696	Summary of email discussion on frame structure	Qualcomm Incorporated	revised	2016-05-11 16:27:40	2016-05-14 04:30:34
R1-164697	LDPC design overview	Qualcomm Incorporated	noted	2016-05-11 16:27:40	2016-05-14 04:19:48

R1-164698	LDPC - Performance evaluation	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:19:48
R1-164699	Polar code design overview	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:19:48
R1-164700	Polar - Performance evaluation	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:19:48
R1-164701	TBCC design overview	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:19:48
R1-164702	TBCC-Performance evaluation	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:19:48
R1-164703	Outer erasure code use cases and evaluation assumptions	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 05:04:51
R1-164704	Channel coding evaluation assumptions - performance and complexity	Qualcomm Incorporated	noted	2016-05-11 16:27:40	2016-05-14 04:19:48
R1-164705	NR modulation requirements	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 05:09:05
R1-164706	Evaluation assumptions for NR modulation schemes	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 05:09:05
R1-164707	Massive MIMO architecture	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:12:25
R1-164708	NR Massive MIMO design considerations	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:12:25
R1-164709	Sidelink design for NR	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 06:25:35
R1-164710	Mobility considerations for NR	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 06:25:35
R1-164711	NR positioning	Qualcomm Incorporated	revised	2016-05-11 16:27:40	2016-05-14 05:11:51
R1-164712	Penetration loss parameters for RMa settings	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:12:25
R1-164713	Advantages of stochastic blockage model	Qualcomm Incorporated	noted	2016-05-11 16:27:40	2016-05-14 04:12:25
R1-164714	NR positioning	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 07:30:03
R1-164715	Initial results on large scale calibration and concerns on calibration specifications	Qualcomm Incorporated	noted	2016-05-11 16:27:40	2016-05-14 04:12:25
R1-164716	Considerations on link and system model extension to < 6GHz	Qualcomm Incorporated	available	2016-05-11 16:27:40	2016-05-14 04:12:25
R1-164717	Multi-subframe scheduling for eLAA	Kyocera	available	2016-05-11 21:52:29	2016-05-13 18:22:27
R1-164718	Discussion on System-Level Evaluations for NR	Samsung	revised	2016-05-11 21:53:00	2016-05-13 19:28:06
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R1-164720	Channel Access Scheme for UE multiplexing	Kyocera	available	2016-05-11 21:54:31	2016-05-13 18:22:27

R1-164721	On justification of the parameter selection for PA models in link level evaluation	Huawei, HiSilicon	noted	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164722	LLS results for downlink multiple access	Huawei,	withdrawn	2016-05-11 22:15:04	
R1-164723	Numerology and Frame Structure for NR-Unlicensed	Huawei, HiSilicon	available	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164724	Discussion on the link level channel models	Huawei, HiSilicon	agreed	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164725	Text proposal to TR 38.900, corrections and clarifications to the link level channel models	Huawei, HiSilicon	agreed	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164726	Discussion on spatial consistency in 5G channel model in time variant case	Huawei, HiSilicon	available	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164727	Discussion on remaining details on large antenna array modeling	Huawei, HiSilicon	noted	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164728	Discussion on the extensions of the channel model to below 6GHz	Huawei, HiSilicon, Intel,	available	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164729	WF on Pathloss clean up	Huawei, HiSilicon, Nokia, Samsung, AT&T, Ericsson, Intel,	agreed	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164730	Cross-correlation on LSP for Indoor office	Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation,	noted	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164731	Scaling of the K-factor of the link level channel models	Huawei, HiSilicon, Nokia, Samsung, AT&T, CMCC, Ericsson, Intel,	revised	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164732	Discussion on frequency dependent channel characteristics for InH and UMi	Huawei, HiSilicon, CMCC, ETRI,	revised	2016-05-11 22:15:04	2016-05-15 21:23:05
R1-164733	HARQ-ACK Codebook on PUSCH for TDD	Samsung	noted	2016-05-11 23:28:19	2016-05-13 23:38:06
R1-164734	Draft CR on FD-MIMO codebooks (36.213)	Samsung	noted	2016-05-11 23:28:20	2016-05-13 21:50:01

R1-164735	Draft CR on CSI-Reporting-Type in TS 36.213	Samsung	noted	2016-05-11 23:28:20	2016-05-13 07:45:11
R1-164736	Clarification on non-PMI based CSI reporting in TS 36.213	Samsung	noted	2016-05-11 23:28:20	2016-05-13 07:42:50
R1-164737	Draft CR on non-PMI based CSI reporting in TS 36.213	Samsung	not pursued	2016-05-11 23:28:20	2016-05-13 07:42:50
R1-164738	Draft CR on CSI Reporting	Samsung	revised	2016-05-11 23:28:20	2016-05-13 23:38:06
R1-164739	Draft CR on A-CSI reporting for TM6	Samsung	revised	2016-05-11 23:28:20	2016-05-13 23:38:06
R1-164740	UL Waveform for PUSCH	Samsung	available	2016-05-11 23:28:20	2016-05-13 23:38:06
R1-164741	Multi-subframe scheduling for PUSCH	Samsung	available	2016-05-11 23:28:20	2016-05-13 23:38:06
R1-164742	Discussion on UL power issues for eLAA	Samsung	available	2016-05-11 23:28:20	2016-05-14 04:31:12
R1-164743	Discussion on scheduling options for eLAA	Samsung	available	2016-05-11 23:28:20	2016-05-14 03:28:19
R1-164744	Remaining issues on PUSCH design for eLAA	Samsung	available	2016-05-11 23:28:20	2016-05-14 03:28:19
R1-164745	Further Discussion on PUSCH DTX Handling for eLAA	Samsung	available	2016-05-11 23:28:20	2016-05-13 11:58:43
R1-164746	Remaining issues of SRS transmission	Samsung	available	2016-05-11 23:28:20	2016-05-14 04:31:13
R1-164747	UCI Transmission on LAA Scell	Samsung	noted	2016-05-11 23:28:20	2016-05-13 23:38:06
R1-164748	PRACH Transmission for UL LAA	Samsung	available	2016-05-11 23:28:20	2016-05-13 23:38:06
R1-164749	Discussion on random access procedure for eLAA	Samsung	available	2016-05-11 23:28:20	2016-05-14 04:31:13
R1-164750	Discussion of LAA-LAA coexistence	Samsung	available	2016-05-11 23:28:20	2016-05-13 15:43:14
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R1-164824	Performance evaluation for latency reduction based on frame structure set 3	Huawei, HiSilicon	available	2016-05-11 23:52:42	2016-05-14 02:18:44
R1-164825	Performance evaluation for latency reduction based on enhanced frame structure set 1	Huawei, HiSilicon	available	2016-05-11 23:52:42	2016-05-14 02:18:44
R1-164826	Performance evaluation for latency reduction based on enhanced frame structure set 2	Huawei, HiSilicon	available	2016-05-11 23:52:42	2016-05-14 02:18:44
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R1-164834	Correction on the usage of CEModeA and CEModeB for eMTC in TS 36.213	Huawei, HiSilicon	revised	2016-05-11 23:52:42	2016-05-14 02:15:42
R1-164835	Correction on the DCI payload size for eMTC in TS 36.212	Huawei, HiSilicon	revised	2016-05-11 23:52:42	2016-05-14 02:15:42
R1-164836	Clarification on Msg3 PUSCH repetition level in TS 36.213	Huawei, HiSilicon	revised	2016-05-11 23:52:42	2016-05-14 02:15:42
R1-164837	Correction on the supported PUCCH format for CEModeA in TS 36.213	Huawei, HiSilicon	noted	2016-05-11 23:52:42	2016-05-14 02:15:42
R1-164838	Clarification on collision between SR and PDSCH with repetitions in TS 36.213	Huawei, HiSilicon	postponed	2016-05-11 23:52:42	2016-05-14 02:15:43
R1-164839	Correction on PDSCH transmission scheme assumed for TM9 CSI reference resource in TS 36.213	Huawei, HiSilicon	revised	2016-05-11 23:52:42	2016-05-14 02:15:43

R1-164840	Correction on collision between PUCCH and PUSCH in TS 36.213	Huawei, HiSilicon	noted	2016-05-11 23:52:42	2016-05-14 02:15:43
R1-164841	Correction on SRS frequency location in TS 36.213	Huawei, HiSilicon	revised	2016-05-11 23:52:42	2016-05-14 02:15:43
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R1-164845	PDSCH rate matching enhancement for aperiodic NZP and ZP CSI-RS	Huawei, HiSilicon	noted	2016-05-11 23:52:43	2016-05-14 02:15:43
R1-164846	Clarifications on collision handling in 36.211 and 36.213	Huawei,	noted	2016-05-11 23:52:43	2016-05-14 02:15:43
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R1-164850	Evaluation results for UL 256QAM	Huawei, HiSilicon	noted	2016-05-11 23:52:43	2016-05-14 02:15:42
R1-164851	Initial discussion on UL PUSCH in TDD special subframes	Huawei, HiSilicon	available	2016-05-11 23:52:43	2016-05-14 02:15:42
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R1-164857	Discussion on codebook design to support up to 32 ports CSI-RS	Huawei, HiSilicon	noted	2016-05-11 23:52:43	2016-05-14 02:15:42
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R1-164859	Discussion on DMRS based open and semi open loop transmission	Huawei, HiSilicon	noted	2016-05-11 23:52:43	2016-05-14 02:15:42
R1-164860	Discussion on Joint utilization of different types of CSI-RS	Huawei,	noted	2016-05-11 23:52:43	2016-05-14 02:15:42
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R1-164876	Design target on multiple access schemes for NR	Panasonic	available	2016-05-12 01:16:39	2016-05-13 09:46:50
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R1-164894	Discussion on large-scale calibration results	CHTTL	noted	2016-05-12 02:52:07	2016-05-12 03:23:14
R1-164895	Discussion on CSI reporting for hybird CSI-RS	Beijing Xinwei Telecom Techn.	available	2016-05-12 03:15:59	2016-05-13 15:28:20
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R1-164897	Discussion on Advanced CSI Reporting	Beijing Xinwei Telecom Techn.	available	2016-05-12 03:58:34	2016-05-13 15:24:32
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R1-164901	Discussion on V2V Priority Handling	Beijing Xinwei Telecom Techn.	available	2016-05-12 03:58:34	2016-05-13 15:24:32
R1-164902	Link performance of DMRS Enhancement for PSCCH and PSSCH	Beijing Xinwei Telecom Techn.	available	2016-05-12 03:58:34	2016-05-13 15:24:32
R1-164903	Enhancement on V2V geo-based resource pool	Beijing Xinwei Telecom Techn.	available	2016-05-12 03:58:34	2016-05-13 15:24:32
R1-164904	Discussion on PRACH design for LAA	HTC	available	2016-05-12 05:09:42	2016-05-13 09:31:29
R1-164905	Dynamic carrier selection for LAA	HTC	available	2016-05-12 05:09:42	2016-05-13 09:31:29
R1-164906	Signaling design to support SPS activation/release in V2V	Panasonic	available	2016-05-12 05:24:38	2016-05-13 11:11:38
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R1-164914	UL aspect of shortened TTI	Panasonic	available	2016-05-12 05:24:38	2016-05-13 11:11:38
R1-164915	Transient period on NR uplink frame structure design	Panasonic Corporation	available	2016-05-12 05:45:38	2016-05-13 11:06:43
R1-164916	draft CR on MPDCCH quasi co-location	Panasonic Corporation	revised	2016-05-12 05:49:09	2016-05-13 11:04:49
R1-164917	Clarification of antenna port usage of NB-IoT	Panasonic	noted	2016-05-12 05:51:47	2016-05-13 11:05:19

R1-164918	On PUSCH Transmit Power on LAA SCells	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 05:53:33	2016-05-13 20:51:38
R1-164919	PUSCH Resource Allocation Details	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 05:54:23	2016-05-13 13:58:46
R1-164920	UCI Transmission on LAA SCells	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 05:55:09	2016-05-13 13:58:46
R1-164921	On the Support for UL Operation in FS3 and C-PDCCH	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 05:55:55	2016-05-13 13:58:46
R1-164922	sPUCCH Design for Shortened TTI	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 05:56:58	2016-05-13 13:58:46
R1-164923	Simultaneous Transmissions of UL Signals for Shortened TTI Operation	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 05:57:56	2016-05-13 13:58:46
R1-164924	Considerations on shorter TTI for TDD duplex mode	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 05:58:42	2016-05-13 13:58:46
R1-164925	Considerations of digital beam forming on multi antenna scheme	MTI	noted	2016-05-12 06:36:22	2016-05-13 09:43:35
R1-164926	Correction on citations to a DAI bits table	ITRI	agreed	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164927	Some corrections for eMTC	ITRI	agreed	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164928	Discussion on scheduling combinations for eLAA	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164929	Discussions of codebook enhancement for up to 32 ports	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164930	Discussion on beamformed CSI-RS	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164931	Discussion on Reference Signal Design	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164932	Enhancement to sidelink physical layer structure in supper high Doppler case for V2V	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164933	Discussion on explicit and implicit approaches for enhanced random resource selection	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164934	Discussion multiple synchronization references on sidelink synchronization procedure for PC5-basde V2V communication	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164935	Zone based dynamic resource management in V2X service	ITRI	available	2016-05-12 06:46:47	2016-05-13 11:56:42
R1-164936	On SRS transmission on TDD CCs without PUSCH	Ericsson	noted	2016-05-12 07:05:35	2016-05-13 19:49:48
R1-164937	On Periodic and aperiodic SRS switching	Ericsson	noted	2016-05-12 07:07:21	2016-05-13 19:49:48
R1-164938	On collision handling of SRS and channels on other carriers	Ericsson	available	2016-05-12 07:09:00	2016-05-13 19:49:48
R1-164939	Clarification on repetition and Pseudo-random hopping of NPRACH	NEC Corporation	noted	2016-05-12 07:57:02	2016-05-13 06:24:37
R1-164940	On LAA UL/DL Scheduling Combinations	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164941	eLAA UL scheduling / UL grant details	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33

R1-164942	On Two-Stage UL scheduling for eLAA	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164943	On 256QAM UL UE categories and UE capability signalling	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164944	On 256QAM to 64QAM MCS table fall-back	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164945	On supported Shorter TTI lengths and its configurability	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164946	On simultaneous unicast PDSCH and sPDSCH operation	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164947	Legacy TTI processing time considerations for supporting latency reduction	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164948	sTTI processing time considerations for supporting latency reduction	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 08:02:22	2016-05-13 16:57:33
R1-164949	DMRS Enhancements for PSSCH and PSCCH	ZTE	available	2016-05-12 08:17:01	2016-05-13 15:57:44
R1-164950	On new antenna model for NR basestation	Ericsson	noted	2016-05-12 08:29:39	2016-05-13 14:20:14
R1-164951	Scenarios and Evaluation methodology for NR	Ericsson	available	2016-05-12 08:29:39	2016-05-13 14:20:14
R1-164952	On CSI for multi-antenna operation in NR	Ericsson	available	2016-05-12 08:29:39	2016-05-13 14:20:14
R1-164953	Multi-antenna transmission principles for data channels in NR	Ericsson	available	2016-05-12 08:29:39	2016-05-13 14:20:14
R1-164954	SU-MIMO performance for antenna arrays with a massive number of antennas	Ericsson	available	2016-05-12 08:29:40	2016-05-13 14:20:14
R1-164955	Reciprocity based MIMO in NR	Ericsson	noted	2016-05-12 08:29:40	2016-05-13 14:20:14
R1-164956	Multi-point MIMO connectivity	Ericsson	available	2016-05-12 08:29:40	2016-05-13 14:20:14
R1-164957	On UE side beamforming in NR	Ericsson	available	2016-05-12 08:29:40	2016-05-13 14:20:14
R1-164958	DMRS for PSBCH	ZTE	available	2016-05-12 08:32:49	2016-05-13 15:57:44
R1-164959	SA decoding and energy measurement	ZTE	available	2016-05-12 08:43:42	2016-05-13 15:57:44

R1-164960	Transmitter UE behavior in V2V	ZTE	available	2016-05-12 08:47:15	2016-05-13 15:57:44
R1-164961	Geo Based Resource Allocation for V2V	ZTE	available	2016-05-12 08:49:45	2016-05-13 15:57:44
R1-164962	Discussion on V2V resource reselection	ZTE	available	2016-05-12 08:52:39	2016-05-13 15:57:44
R1-164963	Trigger and release of V2V SPS	ZTE	available	2016-05-12 08:56:09	2016-05-13 15:57:44
R1-164964	Discussion on UE reporting	ZTE	available	2016-05-12 08:58:17	2016-05-13 15:57:44
R1-164965	Discussion on resource pools and SA resource pattern	ZTE	available	2016-05-12 09:00:18	2016-05-13 15:57:44
R1-164966	Discussion on SA content	ZTE	available	2016-05-12 09:02:37	2016-05-13 15:57:44
R1-164967	Coexistence of PC5-based V2V operation and legacy Uu operation	ZTE	available	2016-05-12 09:06:22	2016-05-13 15:57:44
R1-164968	Priority order of synchronization references	ZTE	available	2016-05-12 09:09:05	2016-05-13 15:57:44

R1-164969	Enhancement to the sidelink synchronization	ZTE	available	2016-05-12 09:11:19	2016-05-13 15:57:44
R1-164970	Enhancement to DL multicast/broadcast transmissions	ZTE	available	2016-05-12 09:18:06	2016-05-13 15:57:44
R1-164971	Uu transport enhance for V2X	ZTE	available	2016-05-12 09:21:02	2016-05-13 15:57:44
R1-164972	Discussion on V2P design aspects	ZTE	available	2016-05-12 09:23:40	2016-05-13 15:57:44
R1-164973	NR frame structure considering coexistence with TDD LTE	SoftBank Corp.	available	2016-05-12 09:30:10	2016-05-13 00:47:48
R1-164974	Scenarios for feCoMP	SoftBank Corp.	noted	2016-05-12 09:35:04	2016-05-13 00:47:48
R1-164975	New measurements at 24 GHz in a rural macro environment	Telstra Corporation	revised	2016-05-12 10:08:47	2016-05-13 16:17:00

R1-164976	Discussion on NR numerology	KT Corp.	revised	2016-05-12 10:24:27	2016-05-13 12:15:32
R1-164977	Selection of Power Ratios and Modulation for MUST	MediaTek Inc.	noted	2016-05-12 10:39:21	2016-05-13 12:30:48
R1-164978	Discussion on the EVM requirement for MUST	MediaTek Inc.	available	2016-05-12 10:40:10	2016-05-13 12:30:48
R1-164979	Blind detection evaluation on interference existence for	MediaTek Inc.	noted	2016-05-12 10:40:52	2016-05-13 12:30:48
R1-164980	Mechanisms for Operation of MUST	MediaTek Inc.	available	2016-05-12 10:41:23	2016-05-13 12:30:48
R1-164981	Downlink power allocation for MUST	MediaTek Inc.	available	2016-05-12 10:42:02	2016-05-13 12:30:48
R1-164982	Preliminary evaluation results for MUST Case 3	MediaTek Inc.	available	2016-05-12 10:42:43	2016-05-13 12:30:48
R1-164983	Performance of GPO and OFDM with PA model and windowing	IITH, CEWiT, Reliance Jio	revised	2016-05-12 11:00:21	2016-05-13 09:42:03
R1-164984	Discussion on SA Decoding and Energy Measurement	Beijing Xinwei Telecom Techn.	available	2016-05-12 11:07:42	2016-05-13 15:24:32
R1-164985	Discussion on the multiplexing of different numerologies	Panasonic	available	2016-05-12 11:15:39	2016-05-13 11:14:17
R1-164986	Remaining issues on aperiodic SRS transmission without PUSCH	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 11:23:01	2016-05-13 14:19:11
R1-164987	Remaining issues on LAA SRS with PUSCH allocation	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 11:23:01	2016-05-13 14:19:11
R1-164988	Discussion on PRACH design for eLAA	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 11:23:01	2016-05-13 14:19:11
R1-164989	Performance Evaluation of PRACH for eLAA	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 11:23:01	2016-05-13 14:19:11
R1-164990	Channel Access for LAA UL	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 11:23:01	2016-05-13 14:19:11
R1-164991	NB-IoT - Collision handling	Ericsson	noted	2016-05-12 11:35:26	2016-05-13 21:01:35
R1-164992	DCI design for multiple-subframe scheduling for LAA UL	Sharp	available	2016-05-12 13:19:57	2016-05-14 02:04:59
R1-164993	Resource allocation of PUSCH for eLAA	Sharp	available	2016-05-12 13:20:58	2016-05-14 02:06:54
R1-164994	UCI transmission on LAA carrier	Sharp	available	2016-05-12 13:21:41	2016-05-14 02:07:10
R1-164995	Methods of UL LAA channel access	Sharp	available	2016-05-12 13:22:25	2016-05-14 02:07:55
R1-164996	Remaining Issue Discussions on V2X Synchronization	Sharp	available	2016-05-12 13:23:34	2016-05-14 02:08:16
R1-164997	On transmission power ratios for MUST	Sharp	noted	2016-05-12 13:24:25	2016-05-14 02:08:32
R1-164998	Handling of cyclic shift in UL DMRS sequence selection	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 13:25:05	2016-05-13 13:08:27
R1-164999	Shortened TTI for DL transmissions	Sharp, MTI	available	2016-05-12 13:25:21	2016-05-14 02:08:51
R1-165000	Time Reference for Ack/Nack Transmission	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 13:25:54	2016-05-13 13:08:27

R1-165001	Channel design of shortened PUCCH	Sharp	available	2016-05-12 13:26:11	2016-05-14 02:10:09
R1-165002	Non-anchor PRB location for NB-IoT multi-carrier operation	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 13:26:46	2016-05-13 13:08:27
R1-165003	Short TTI and processing time reduction for TDD	Sharp, MTI	available	2016-05-12 13:26:56	2016-05-14 02:10:31
R1-165004	Contention based multiple access for NR uplink	Sharp	available	2016-05-12 13:28:07	2016-05-14 02:13:17
R1-165005	On the evaluation of PN model	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165006	On the evaluation of PA model	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165007	Details on the system simulation scenarios	Nokia, Alcatel-Lucent Shanghai	withdrawn	2016-05-12 14:04:49	
R1-165008	UE battery life evaluation for mMTC use cases	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165009	System level simulation assumptions for mMTC use cases	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165010	Waveform comparison simulation assumptions for 30 GHz and beyond	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165011	OFDM based Waveform for 5G new radio interface	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165012	New radio waveforms for the Multi-Service Air Interface below 6 GHz	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165013	Initial uplink performance results for new radio waveform for below 6GHz	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165014	Subband-wise filtered OFDM for New Radio below 6 GHz	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165015	Waveform proposal for carrier frequencies beyond 40 GHz	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165016	Potential for system level gains for low-PAPR waveforms	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165017	Scheduled TDMA-OFDMA for NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165018	Overview of the proposed non-orthogonal MA schemes	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165019	Non-orthogonal multiple access for New Radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165020	Contention-based non-orthogonal multiple access with frequency hopping for mMTC uplink	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165021	Performance of Interleave Division Multiple Access (IDMA) in combination with OFDM family waveforms	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165022	Uplink contention-based access in 5G New Radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31

R1-165023	Scheduling framework and related requirements	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165024	Flexible numerology for 5G	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165025	Comparison of different numerology scaling principles	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165026	Comparison of different subcarrier spacings	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165027	Basic frame structure principles for 5G	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165028	URLLC U-plane latency analysis	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165029	Main components for forward compatible frame structure design in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:49	2016-05-13 21:41:31
R1-165030	On the unlicensed band operation in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:50	2016-05-13 21:41:31
R1-165031	On the wireless relay operation in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 14:04:50	2016-05-13 21:41:31
R1-165032	Error Cases due to Failed Clear Channel Assessment for UL Transmissions	Panasonic	available	2016-05-12 14:54:03	2016-05-13 11:59:11
R1-165033	Uplink Subframe Structure	Panasonic	available	2016-05-12 14:54:03	2016-05-13 11:59:11
R1-165034	PRACH Bandwidth on Unlicensed Carriers	Panasonic	available	2016-05-12 14:54:03	2016-05-13 11:59:11
R1-165035	[NR] 5G waveforms PAPR and out of channel emissions measurements	Skyworks Solutions Inc.	available	2016-05-12 15:10:59	2016-05-13 20:23:37
R1-165036	Impact of Number of Iterations in Decoding Turbo and LDPC codes	Ericsson Inc.	available	2016-05-12 18:14:19	2016-05-14 05:47:55
R1-165037	Discussion on Design of Reference Signals for NR MIMO	ZTE	available	2016-05-12 21:09:23	2016-05-14 08:32:43
R1-165038	Discussion on Control Channel Design for NR MIMO	ZTE	available	2016-05-12 21:09:23	2016-05-14 08:32:43
R1-165039	On sensing with SA decoding and energy measurement for V2V	INTERDIGITAL COMMUNICA	available	2016-05-12 21:22:16	2016-05-13 18:51:07

R1-165040	On priority handling for V2V	INTERDIGITAL COMMUNICA	available	2016-05-12 21:23:53	2016-05-13 18:51:21
R1-165041	Evaluations of DMRS Enhancement for PSCCH and PSSCH	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 22:53:55	2016-05-13 23:03:43
R1-165042	On sensing with semi-persistent transmission	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 22:53:55	2016-05-13 23:03:43
R1-165043	On resource selection with sensing	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 22:53:55	2016-05-13 23:03:43
R1-165044	Priority considerations for autonomous V2V communication	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 22:53:55	2016-05-13 23:03:43
R1-165045	Prioritization of sidelink synchronization sources	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 22:53:55	2016-05-13 23:03:43
R1-165046	On SCI Contents	Nokia, Alcatel-Lucent Shanghai	available	2016-05-12 22:53:55	2016-05-13 23:03:44
R1-165047	On non-precoded CSI-RS overhead reduction	InterDigital	noted	2016-05-12 23:48:02	2016-05-13 21:24:27
R1-165048	On Hybrid CSI-RS reporting scheme	InterDigital	noted	2016-05-12 23:50:45	2016-05-13 21:24:27
R1-165049	Consideration on sPDCCH Design	InterDigital	available	2016-05-12 23:52:14	2016-05-13 21:24:27
R1-165050	Consideration on sPDSCH Design	InterDigital	available	2016-05-12 23:53:31	2016-05-13 21:24:27
R1-165051	Consideration on sPUCCH Design	InterDigital	available	2016-05-12 23:55:12	2016-05-13 21:24:27
R1-165052	Consideration on sPUSCH Design	InterDigital	available	2016-05-12 23:56:21	2016-05-13 21:24:27
R1-165053	Performance Results for OTFS Modulation	Cohere	revised	2016-05-13 00:24:30	2016-05-14 05:06:23
R1-165054	An additional requirement on SRS switching	SoftBank Corp.	noted	2016-05-13 00:24:43	2016-05-13 08:34:45
R1-165055	Discussion on Frame Structure for NR	Cohere Technologies	available	2016-05-13 00:25:31	2016-05-14 05:06:23
R1-165056	Views on antenna configuration for above-6GHz NR	CATT	available	2016-05-13 00:32:45	2016-05-14 01:14:29
R1-165057	Performance Evaluation of UW DFT-S-OFDM for UL	INTERDIGITAL COMMUNICA	available	2016-05-13 00:52:18	2016-05-14 03:19:46
R1-165058	Performance Evaluation of Asynchronous UL NOMA	INTERDIGITAL COMMUNICA	available	2016-05-13 00:55:20	2016-05-14 03:19:46
R1-165059	Performance Evaluation of Channel Coding for URLLC and mMTC	INTERDIGITAL COMMUNICA	available	2016-05-13 00:56:33	2016-05-14 04:10:33
R1-165060	Performance Evaluation of Channel Coding for eMBB	INTERDIGITAL COMMUNICA	noted	2016-05-13 00:57:35	2016-05-14 04:10:33
R1-165061	Evaluation of Spatial Modulation for New Radio	INTERDIGITAL COMMUNICA	available	2016-05-13 00:58:27	2016-05-14 04:10:33
R1-165062	Views on Beamforming with a Large Number of Antennas	INTERDIGITAL COMMUNICA	available	2016-05-13 00:59:39	2016-05-14 03:19:46
R1-165063	Views on Massive MIMO for New Radio	INTERDIGITAL COMMUNICA	available	2016-05-13 01:00:37	2016-05-14 03:19:46
R1-165064	Design considerations on URLLC for New Radio systems	INTERDIGITAL COMMUNICA	available	2016-05-13 01:01:32	2016-05-14 03:19:46

R1-165065	Discussion on Unique Word DFT-S-OFDM Waveform for New Radio	INTERDIGITAL COMMUNICATIONS,	available	2016-05-13 01:13:42	2016-05-14 03:19:46
R1-165066	Details of V2V resource pool design	Potevio	available	2016-05-13 01:26:16	2016-05-13 08:23:32
R1-165067	Contents of SCI for V2V communication	Potevio	available	2016-05-13 01:27:57	2016-05-13 08:23:32
R1-165068	Operation mechanism for MUST case 1 and case 2	China Telecommunica	available	2016-05-13 01:29:13	2016-05-13 10:12:55
R1-165069	Discussion on length of shortened TTI	China Telecommunica	available	2016-05-13 01:31:38	2016-05-13 10:12:55
R1-165070	Performance Evaluation for PRACH for eLAA	Intel	available	2016-05-13 01:35:50	2016-05-14 06:48:08
R1-165071	Defer period for UL LBT	Intel	available	2016-05-13 01:35:50	2016-05-14 06:48:08
R1-165072	Enhancements of sidelink physical layer structure for PC5 V2V communication	Intel Corporation	available	2016-05-13 01:35:50	2016-05-14 06:48:34
R1-165073	Discussion on sensing aspects to support V2V communication with different traffic periodicity	Intel Corporation	available	2016-05-13 01:35:50	2016-05-14 06:48:34
R1-165074	Priority order of synchronization references for sidelink V2V communication	Intel Corporation	available	2016-05-13 01:35:50	2016-05-14 06:48:34
R1-165075	Support of SRS transmission switching	Intel	noted	2016-05-13 01:35:50	2016-05-14 06:48:34
R1-165076	Link level simulation results for S-PDCCH	Intel	available	2016-05-13 01:35:50	2016-05-14 06:48:34
R1-165077	System level simulations with FTP model 3	Intel	revised	2016-05-13 01:35:50	2016-05-14 06:48:58
R1-165078	Remaining details of NR evaluation assumptions	Intel Corporation	available	2016-05-13 01:35:50	2016-05-14 06:48:58
R1-165079	Consideration on advanced receivers for NR	Intel Corporation	available	2016-05-13 01:35:50	2016-05-14 06:48:58
R1-165080	Draft CR for overriding of valid-invalid subframes for R=1	Qualcomm Incorporated	revised	2016-05-13 01:50:25	2016-05-14 01:57:42
R1-165081	Draft CR for clarification on starting subframe for MPDCCH	Qualcomm Incorporated	revised	2016-05-13 01:52:27	2016-05-14 01:57:42
R1-165082	Draft CR for clarification of MPDCCH over empty CRS tones in PBCH repetition	Qualcomm Incorporated	revised	2016-05-13 01:53:48	2016-05-14 01:57:42
R1-165083	Consideration on URLLC in NR frame structure	ZTE	available	2016-05-13 02:29:16	2016-05-14 06:28:38
R1-165084	Further evaluation results for [2+10]ms TTI in DB-DC-HSUPA	Huawei, HiSilicon	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165085	Further evaluation results for [10+10]ms TTI in DB-DC-HSUPA and DC-HSUPA	Huawei, HiSilicon	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165086	Impact on legacy terminals	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165087	TP on impact on legacy terminals	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165088	Impact on specifications	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165089	TP on impact on specifications	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165090	Conclusion on MultiCarrier enhancements	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165091	Evaluation results for DTX in CELL_FACH	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22
R1-165092	Further considerations on the design of DTX in	Huawei,	noted	2016-05-13 02:47:31	2016-05-14 03:43:22

R1-165093	Correction on search space to decode the PDCCH configured by the SC-N-RNTI	TD Tech Ltd, Huawei	agreed	2016-05-13 02:55:45	2016-05-13 09:13:55
R1-165094	CSI-RS Design for Class A eFD-MIMO	Ericsson	available	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165095	Dynamic CSI-RS Design and Overhead Reduction	Ericsson	revised	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165096	Discussion on UL DMRS Enhancements	Ericsson	available	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165097	Class A Codebook Design for up to 32 Ports in Rel-14	Ericsson	noted	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165098	Hybrid CSI Reporting with One and Two CSI Processes	Ericsson	available	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165099	Discussion on Interference Measurement Enhancements	Ericsson	available	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165100	High Resolution CSI feedback	Ericsson	noted	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165101	DMRS-based Open-loop MIMO	Ericsson	revised	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165102	Email Summary: Use of 3D RMa Channel Model in Semi-Open Loop Evaluations	Ericsson	noted	2016-05-13 02:57:16	2016-05-14 05:41:10
R1-165103	feCoMP Scenarios and Evaluation	Ericsson	available	2016-05-13 02:57:17	2016-05-14 06:12:16
R1-165104	feCoMP Motivations and Techniques	Ericsson	available	2016-05-13 02:57:17	2016-05-14 05:50:21
R1-165105	Clarification of OCC=2 and OCC=4 MU-MIMO Transmission	Ericsson	noted	2016-05-13 02:57:17	2016-05-14 05:46:06
R1-165106	MU-MIMO with Mixed Orthogonal Cover Code Length	Ericsson	not pursued	2016-05-13 02:57:17	2016-05-14 05:46:06
R1-165107	Numerology and Frame Structure for NR	Motorola Mobility	available	2016-05-13 03:25:27	2016-05-14 04:57:27
R1-165108	Waveform candidates for NR	Motorola	available	2016-05-13 03:25:27	2016-05-14 04:57:27
R1-165109	Shortened TTI Design	Motorola	available	2016-05-13 03:25:27	2016-05-14 04:57:27
R1-165110	Multiplexing of Regular TTI and shortened TTI	Motorola	available	2016-05-13 03:25:27	2016-05-14 04:57:27
R1-165111	Introduction of NB-IoT	Motorola	revised	2016-05-13 03:31:42	2016-05-14 04:57:27
R1-165112	NR Numerology Design Principles	Qualcomm Incorporated	noted	2016-05-13 03:59:14	2016-05-14 05:54:26
R1-165113	OFDM-Based Waveform With Precoding Techniques	National Taiwan University	available	2016-05-13 04:31:37	2016-05-13 10:55:10
R1-165114	Evaluation of OFDM-Based Waveforms	National Taiwan University	available	2016-05-13 04:32:45	2016-05-13 10:55:10

R1-165115	Considerations on eLAA PUSCH design	Mediatek	available	2016-05-13 05:04:06	2016-05-14 04:21:00
R1-165116	Control channel design for eLAA	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165117	SRS design for LAA	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165118	UCI transmission in LAA	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165119	Considerations on PRACH desgin in eLAA	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165120	eLAA Uplink channel access	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165121	On priority classes for uplink LBT	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165122	Discussion on latency reduction with short TTIs	Mediatek	withdrawn	2016-05-13 05:04:06	
R1-165123	Control channel design for latency reduction	Mediatek	available	2016-05-13 05:04:06	2016-05-14 00:18:40
R1-165124	Remaining issues on UL Transmission reference for NB-	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165125	Collision handling for NB-IoT	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165126	Potential issue on value of DL Gap configuration for NB-IoT	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165127	Remaining issue on SI messages for NB-IoT	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165128	Remaining issues on DMRS for NPUSCH format 2	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165129	Comments on UE procedures for NB-IoT and TP for 36.213	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165130	Comments on NPUSCH format 1 and TP for 36.213	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165131	Issues on NPRACH UL Gap configuration	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165132	On collision between NPRACH and NPUSCH	ZTE	noted	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165133	Discussion on UL gap for eMTC	ZTE	available	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165134	Draft reply LS on continuous uplink transmission in eMTC	ZTE	available	2016-05-13 05:32:28	2016-05-14 01:05:55
R1-165135	On network assistance and operation of MUST	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 06:18:23	2016-05-13 17:41:28
R1-165136	MUST Case 1 and 2 schemes	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 06:18:23	2016-05-13 17:41:28
R1-165137	On the specification approach of MUST	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 06:18:23	2016-05-13 17:41:28
R1-165138	System-level Evaluation of Case 1 and 3 MUST	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 06:18:23	2016-05-13 17:41:28
R1-165139	Discussion on starting subframe of NPDCCH search space	MediaTek Inc.	noted	2016-05-13 06:22:14	2016-05-14 03:08:16
R1-165140	PUSCH DTX Detection for LAA UL	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 06:48:27	2016-05-13 14:19:11
R1-165141	Uplink Resource Allocation Design for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165142	Multi-subframe scheduling design for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165143	Performance impact of UL short LBT periods in symbol #0	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165144	Solutions supporting UL short LBT period in Symbol #0	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165145	On Power Spectral Density Regulations for Enhanced LAA Transmissions	Ericsson	noted	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165146	On SRS Design for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165147	Summary of Email Discussion [84b-05] on UCI Transmission for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 06:16:19

R1-165148	On the Transmission of Uplink Control Information for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165149	Performance impact of large HARQ-ACK payloads multiplexed with PUSCH	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165150	Solutions supporting large HARQ-ACK payloads multiplexed with PUSCH	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165151	PRACH Design for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165152	On Performance of PRACH for Enhanced LAA	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165153	Summary of Email Discussion [84b-06] on UL Channel Access Schemes	Ericsson	withdrawn	2016-05-13 06:58:00	
R1-165154	On Channel Access Procedures for PRACH and SRS	Ericsson	available	2016-05-13 06:58:00	2016-05-14 05:57:35
R1-165155	On Channel Access Procedures for Transmissions with Only UL Grants	Ericsson	available	2016-05-13 06:58:01	2016-05-14 05:57:35
R1-165156	On Support of Conditional UL Transmissions without LBT	Ericsson	available	2016-05-13 06:58:01	2016-05-14 05:57:35
R1-165157	On UL Channel Access Procedures	Ericsson	available	2016-05-13 06:58:01	2016-05-14 05:57:35
R1-165158	On Performance of UL Channel Access Procedures	Ericsson	available	2016-05-13 06:58:01	2016-05-14 05:57:35
R1-165159	On Signaling of UL Channel Access Parameters	Ericsson	available	2016-05-13 06:58:01	2016-05-14 05:57:35
R1-165160	Discussion on Forward Compatible System Design for NR	MediaTek Inc.	available	2016-05-13 07:00:54	2016-05-14 05:40:59
R1-165161	Initial link level evaluation result for NR waveform	MediaTek Inc.	available	2016-05-13 07:00:54	2016-05-14 05:11:18
R1-165162	On Numerology for New Radio Access Technology	MediaTek Inc.	available	2016-05-13 07:00:54	2016-05-14 05:11:18
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R1-165164	Discussion on LDPC Code Design and Performance Evaluation	MediaTek Inc.	revised	2016-05-13 07:00:54	2016-05-16 02:21:11
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R1-165166	Support of Multiuser Transmission in 5G New Radio Interface below 6GHz	MediaTek Inc.	available	2016-05-13 07:00:54	2016-05-14 05:11:18
R1-165167	Beamforming Considerations for above 6 GHz Deployment Scenarios	MediaTek Inc.	available	2016-05-13 07:00:54	2016-05-14 05:11:18
R1-165168	Introduction of 60ms periodicity for wideband CQI/PMI reporting	Nokia, Alcatel-Lucent Shanghai Bell, Apple, Broadcom,	noted	2016-05-13 07:04:16	2016-05-14 05:06:06
R1-165169	Discussion on PRACH for eLAA	Shenzhen Coolpad	available	2016-05-13 07:15:35	2016-05-13 09:33:16
R1-165170	Workplan for Study on Study on New Radio Access Technology	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 01:40:29
R1-165171	Forward compatibility for NR	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 04:54:08
R1-165172	Forward compatibility related to mMTC and URLLC	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 01:40:27
R1-165173	Comparison of candidate waveforms	NTT	available	2016-05-13 07:16:49	2016-05-14 01:40:27

R1-165174	Uplink multiple access schemes for NR	NTT	available	2016-05-13 07:16:49	2016-05-14 01:40:27
R1-165175	Initial views and evaluation results on non-orthogonal multiple access for NR	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 01:40:27
R1-165176	Discussion on frame structure for NR	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 04:54:08
R1-165177	Views on numerology for NR	NTT DOCOMO,	revised	2016-05-13 07:16:49	2016-05-14 04:54:08
R1-165178	Views on domodulation RS design for NR access technology	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 04:54:08
R1-165179	Discussion on NR MIMO	NTT DOCOMO,	noted	2016-05-13 07:16:49	2016-05-14 02:00:05
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R1-165182	Discussion on affinity for unlicensed spectrum access in 5G new radio	NTT DOCOMO,	available	2016-05-13 07:16:49	2016-05-14 03:03:13
R1-165183	Implementation of cluster delay and angle spread	NTT DOCOMO, AT&T, Ericsson, Huawei, HiSilicon, Intel,	revised	2016-05-13 07:16:49	2016-05-13 12:06:03
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R1-165187	Discussion on SRS design for eLAA UL	NTT	available	2016-05-13 07:18:16	2016-05-14 03:03:13
R1-165188	Discussion on UCI transmission for eLAA UL	NTT DOCOMO,	noted	2016-05-13 07:18:16	2016-05-14 03:03:13
R1-165189	Discussion on PRACH for eLAA UL	NTT	available	2016-05-13 07:18:16	2016-05-14 03:03:13
R1-165190	Discussion on channel access framework for eLAA UL	NTT	available	2016-05-13 07:18:16	2016-05-14 03:03:13
R1-165191	Discussion on SA decoding and energy measurement for sensing	NTT DOCOMO,	available	2016-05-13 07:18:16	2016-05-14 01:41:03
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R1-165206	Evaluation for CRS-based MUST with 4 Tx antennas	NTT	available	2016-05-13 07:18:16	2016-05-14 01:41:21
R1-165207	Evaluation of PC5 transport for V2P/V2I/I2V	NTT	available	2016-05-13 07:18:16	2016-05-14 01:41:03
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R1-165209	sPDCCH for shortened TTI	NTT	available	2016-05-13 07:18:16	2016-05-14 04:04:30
R1-165210	sPDSCH for shortened TTI	NTT	available	2016-05-13 07:18:16	2016-05-14 04:04:31
R1-165211	sPUSCH for shortened TTI	NTT	available	2016-05-13 07:18:16	2016-05-14 04:06:17
R1-165212	sPUCCH for shortened TTI	NTT	available	2016-05-13 07:18:16	2016-05-14 04:48:26
R1-165213	Views on sTTI length	NTT	available	2016-05-13 07:18:16	2016-05-14 04:48:26
R1-165214	Views on processing time reduction and related procedures	NTT DOCOMO,	available	2016-05-13 07:18:16	2016-05-14 04:48:26
R1-165215	Further Discussion about TDD Frame Structure for Latency Reduction	NTT DOCOMO,	available	2016-05-13 07:18:16	2016-05-14 04:48:26
R1-165216	Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects	NTT DOCOMO,	endorsed	2016-05-13 07:28:11	2016-05-14 01:40:29
R1-165217	Consideration on frame structure for NR	Beijing Xiaomi Mobile Software	available	2016-05-13 07:37:02	2016-05-13 11:58:45
R1-165218	Time-Varying Delays and Angles	Keysight	noted	2016-05-13 07:52:24	2016-05-13 11:12:44
R1-165219	System simulation results for longer CP in MBSFN subframes	Ericsson	revised	2016-05-13 08:03:08	2016-05-14 05:44:07
R1-165220	Link level simulation assumptions for evaluation of longer CP for MBSFN subframes	Ericsson	noted	2016-05-13 08:03:08	2016-05-14 05:44:07
R1-165221	Radio frame design for extended MBSFN subframe allocation	Ericsson	noted	2016-05-13 08:03:08	2016-05-14 05:44:07
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R1-165223	Unicast control region configuration for eMBMS enhancements	Ericsson	noted	2016-05-13 08:03:08	2016-05-14 05:44:07
R1-165224	Discussion on continuous uplink transmissions in eMTC	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:48:57
R1-165225	Draft reply LS on continuous uplink transmissions in eMTC	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:48:58
R1-165226	Discussion on feasibility of mobility enhancement solutions	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:49:16

R1-165227	DRAFT Reply LS on the feasibility of mobility enhancement solutions	Intel Corporation	withdrawn	2016-05-13 08:17:55	
R1-165228	On resource allocation for SIB1-NB in TS 3.213	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:49:16
R1-165229	Some remaining issues on NPDCCH related to TS 36.213	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:49:16
R1-165230	On scrambling initialization for NPDSCH	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:49:16
R1-165231	TBS values and resource mapping for SI messages	Intel	noted	2016-05-13 08:17:55	2016-05-14 06:49:16
R1-165232	OTDOA enhancement	Intel	available	2016-05-13 08:17:55	2016-05-14 06:49:33
R1-165233	WF on correlation distance for spatial consistency in RMa	Intel, Ericsson, AT&T, ETRI, Huawei, HiSilicon, KT Corporation, Nokia, NTT	agreed	2016-05-13 08:17:55	2016-05-14 06:49:33
R1-165234	WF on mobility enhancement for spatial consistency	Intel, Ericsson, AT&T, ETRI, Huawei, HiSilicon, KT Corporation, Nokia, NTT	agreed	2016-05-13 08:17:55	2016-05-14 06:49:33
R1-165235	Uplink Channel Access Mechanisms in eLAA	III	available	2016-05-13 08:21:39	2016-05-13 15:27:21
R1-165236	On DL control channel design for shorter TTI operation	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 08:28:55	2016-05-13 18:12:46
R1-165237	On two-level DL control channel design for shorter TTI operation	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 08:28:55	2016-05-13 18:12:46
R1-165238	System level study on processing time reduction and TCP parametrization impact	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 08:28:55	2016-05-13 18:12:46
R1-165239	SRS design in Rel-14 eLAA	Innovative Technology Lab	available	2016-05-13 08:31:15	2016-05-14 06:30:19
R1-165240	Considerations on UE autonomous resource selection for V2V	Innovative Technology Lab	available	2016-05-13 08:32:24	2016-05-14 09:30:54
R1-165241	Considerations on priority order of synchronization references for V2V	Innovative Technology Lab	available	2016-05-13 08:33:10	2016-05-14 07:14:59
R1-165242	On Frame Structure for NR	Innovative Technology Lab	available	2016-05-13 08:34:14	2016-05-14 06:30:19
R1-165243	Detection Sequence in LTE-ITS Sidelink for Coexistence with IEEE 802.11p	Ericsson	noted	2016-05-13 08:35:44	2016-05-13 23:41:24
R1-165244	Adaptation of MCS, RB allocation, and number of retransmissions	Ericsson	available	2016-05-13 08:37:41	2016-05-13 23:41:24
R1-165245	Observations on CAM Message Periodicity and Payload	Ericsson	available	2016-05-13 08:39:00	2016-05-13 23:41:24
R1-165246	Contents of Downlink Control Information for V2V over PC5	Ericsson	available	2016-05-13 08:42:38	2016-05-13 23:41:24

R1-165247	Remaining details of multi-subframe scheduling for eLAA	ETRI	available	2016-05-13 08:43:39	2016-05-13 15:32:33
R1-165248	Remaining details of SRS transmission on eLAA	ETRI	available	2016-05-13 08:44:22	2016-05-13 15:32:44
R1-165249	Impact of shortened TTI on uplink transmission	ASUSTEK COMPUTER (SHANGHAI)	available	2016-05-13 08:44:47	2016-05-14 04:28:50
R1-165250	On channel access mechanism for eLAA	ETRI	available	2016-05-13 08:45:05	2016-05-13 15:32:56
R1-165251	HARQ-ACK transmission on LAA SCell PUSCH for eLAA	WILUS Inc.	available	2016-05-13 08:45:06	2016-05-14 05:28:15
R1-165252	Consideration on UL LBT Type Switching for eLAA	WILUS Inc.	available	2016-05-13 08:45:06	2016-05-14 05:28:15
R1-165253	CWS adjustment for UL PUSCH in eLAA	WILUS Inc.	available	2016-05-13 08:45:06	2016-05-14 05:28:15
R1-165254	Downlink Enhancements for V2X	Ericsson	noted	2016-05-13 08:45:16	2016-05-13 23:41:24
R1-165255	Construction of DMRS sequences	Ericsson	available	2016-05-13 08:46:21	2016-05-13 23:41:24
R1-165256	Latency Reduction for FS2 with 1-ms TTI	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 08:47:14	2016-05-13 13:58:46
R1-165257	Link level evaluation of waveforms for open-loop synchronized Uplink	KDDI Corporation	available	2016-05-13 08:54:18	2016-05-13 10:57:12
R1-165258	Geo-Info reporting to eNB	Ericsson	available	2016-05-13 08:54:25	2016-05-13 23:41:24
R1-165259	On the Need for V2V Gaps	Ericsson	available	2016-05-13 08:56:17	2016-05-13 23:41:24
R1-165260	Priority handling for V2V over PC5	Ericsson	available	2016-05-13 08:57:02	2016-05-13 23:41:24
R1-165261	Initial downlink performance results for new radio waveform for below 6GHz	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-13 08:58:15	2016-05-13 21:41:31
R1-165262	Relation between SA and data for V2V over PC5	Ericsson	available	2016-05-13 09:01:10	2016-05-13 23:41:24
R1-165263	Resource reselection	Ericsson	available	2016-05-13 09:02:43	2016-05-13 23:41:24
R1-165264	Contents of PSCCH for V2V over PC5	Ericsson	available	2016-05-13 09:04:53	2016-05-13 23:41:24
R1-165265	Discussion on Downlink Control Signaling for MUST	ASUSTEK COMPUTER (SHANGHAI)	available	2016-05-13 09:05:24	2016-05-13 10:23:04
R1-165266	Sensing and autonomous resource selection	Ericsson	revised	2016-05-13 09:05:54	2016-05-13 23:41:24
R1-165267	Discussion on PUCCH design for shortened TTI	KDDI	available	2016-05-13 09:06:14	2016-05-13 10:57:12
R1-165268	Radio measurements for congestion control for V2X	Ericsson	available	2016-05-13 09:08:49	2016-05-13 23:41:24
R1-165269	Discussion on HARQ Process for Slot-based TTI	ASUSTEK COMPUTER (SHANGHAI)	available	2016-05-13 09:10:39	2016-05-13 10:23:04
R1-165270	Proposed TP for 36.885 Conclusions	Ericsson	noted	2016-05-13 09:10:40	2016-05-13 23:41:24
R1-165271	How Should PC5 Autonomous Resource Allocation be Specified?	Ericsson	available	2016-05-13 09:12:04	2016-05-13 23:41:24
R1-165272	Mode-1 SPS for V2V over PC5	Ericsson	available	2016-05-13 09:13:16	2016-05-13 23:41:24
R1-165273	Subbands and measurements for sensing for V2V over PC5	Ericsson	available	2016-05-13 09:15:03	2016-05-13 23:41:24
R1-165274	UL SPS and reporting to eNB for V2X	Ericsson	available	2016-05-13 09:16:09	2016-05-13 23:41:24
R1-165275	Discussion on P2x-x2P	Ericsson	noted	2016-05-13 09:16:58	2016-05-13 23:41:24

R1-165276	Discussion on V2X PC5 Scheduling, Resource Pools and Resource Patterns	Ericsson	available	2016-05-13 09:18:53	2016-05-13 23:41:24
R1-165277	L1 Format for V2V Transmissions using Sidelink	Ericsson	available	2016-05-13 09:20:03	2016-05-13 23:41:24
R1-165278	Channel interleaver correction for eMTC	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-13 09:31:52	2016-05-13 10:14:09
R1-165279	Correction on PDSCH reception timing for eMTC	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-13 09:31:52	2016-05-13 10:14:09
R1-165280	Correction on UCI multiplexing on PUSCH	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 09:31:52	2016-05-13 10:14:09
R1-165281	UL transmission on DL-only carrier for SRS carrier based switching	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 09:31:52	2016-05-13 10:14:09
R1-165282	Discussion on SRS transmission triggering	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 09:31:52	2016-05-13 10:14:09
R1-165283	Collision handling for SRS carrier based switching	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 09:31:52	2016-05-13 10:14:09
R1-165284	Channel Coding for NR	NTT	available	2016-05-13 09:33:37	2016-05-14 01:40:29
R1-165285	Bidirectional frame structure for imparity CCFD scheme	III	available	2016-05-13 09:37:46	2016-05-13 15:27:21
R1-165286	Large scale calibration results of channel model for frequency spectrum above 6 GHz	CATR	available	2016-05-13 09:40:10	2016-05-13 15:57:05
R1-165287	Initial link level simulation results of new multiple access scheme	CATR	revised	2016-05-13 09:40:10	2016-05-13 15:57:05
R1-165288	Initial simulation results of DMRS based semi-open-loop MIMO	CATR	revised	2016-05-13 09:40:10	2016-05-13 15:57:05
R1-165289	link level performance of DM RS for V2V	CATR	revised	2016-05-13 09:40:10	2016-05-14 03:42:41
R1-165290	Discussions on the channel design for latency reduction	CATR	available	2016-05-13 09:40:10	2016-05-13 15:57:05
R1-165291	Discussions on the numerology and frame structure design for NR	CATR	available	2016-05-13 09:40:10	2016-05-13 15:57:05
R1-165292	Physical design aspects of sPDCCH	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165293	sPDCCH search space design	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165294	DCI for sTTI scheduling	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165295	Physical design aspects of sPDSCH	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165296	Physical design aspects of sPUSCH	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165297	Physical design aspects of sPUCCH	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165298	Short TTI operation in FS2	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165299	On the operation with different TTI lengths	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165300	On reduced processing time for short TTI	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165301	Additional system level results for short TTI and downlink traffic	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165302	Additional system level results for short TTI and uplink	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165303	Additional system level results for short TTI with different processing times	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07

R1-165304	Additional link results for sPDSCH	Ericsson	available	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165305	Additional link results for sPUCCH	Ericsson	revised	2016-05-13 09:59:55	2016-05-13 18:45:07
R1-165306	Discussion on SA decoding and energy measurement for sensing	Sony	available	2016-05-13 10:42:55	2016-05-13 17:50:21
R1-165307	DMRS design for PSBCH	Samsung	available	2016-05-13 10:55:36	2016-05-13 19:28:44
R1-165308	V2V synchronization remaining issues	PANASONIC	available	2016-05-13 11:15:40	2016-05-13 16:35:15
R1-165309	Details on PC5 SPS enhancement	PANASONIC	available	2016-05-13 11:17:46	2016-05-13 15:22:51
R1-165310	Discussion on short PUSCH design	KT Corp.	available	2016-05-13 12:00:38	2016-05-13 12:05:59
R1-165311	Considerations on frame structure for NR	KT Corp.	available	2016-05-13 12:03:54	2016-05-13 12:06:14
R1-165312	Scrambling Sequence for paging MPDCCH and PDSCH	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-13 12:45:54	2016-05-16 12:25:05
R1-165313	Need for study on In-Band Full Duplex communication	CEWiT	noted	2016-05-13 12:54:42	2016-05-13 13:01:14
R1-165314	MCS for Random Access Response Grant	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-13 12:56:18	2016-05-13 13:03:45
R1-165315	Sensing and SPS for UE Autonomous Mode	PANASONIC	available	2016-05-13 13:04:10	2016-05-13 15:41:52
R1-165316	Scalable numerology for New RAT	Sharp	available	2016-05-13 13:04:30	2016-05-14 05:42:31
R1-165317	Distributed Synchronization Procedure for V2X over PC5	Ericsson	available	2016-05-13 13:07:26	2016-05-13 23:41:24
R1-165318	Discussion on LAA paused COT and UL traffic multiplexing	BROADCOM LIMITED	available	2016-05-13 13:18:16	2016-05-14 05:37:40
R1-165319	Remaining Physical Layer Design Aspects of UL 256QAM	Ericsson	noted	2016-05-13 13:20:06	2016-05-13 20:17:14
R1-165320	Further Discussion on MCS Table Design for UL 256QAM	Ericsson	noted	2016-05-13 13:20:06	2016-05-13 20:17:14
R1-165321	Design Principles for New UL 256 QAM MCS Entries	Ericsson	noted	2016-05-13 13:20:06	2016-05-13 20:17:14
R1-165322	New TBS Designs Supporting UL 256QAM	Ericsson	noted	2016-05-13 13:20:06	2016-05-13 20:17:14
R1-165323	Discussion on LAA UL no LBT	BROADCOM LIMITED	available	2016-05-13 13:20:56	2016-05-14 05:37:40
R1-165324	Draft CR on LAA DL Multichannel access	BROADCOM LIMITED	noted	2016-05-13 13:28:21	2016-05-14 05:37:40
R1-165325	Further Evaluation of Multicarrier Enhancements for DC HSUPA	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165326	Further Evaluation of Multicarrier Enhancements for DB-DC HSUPA	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165327	Impact of Multicarrier Enhancements on L1 Mechanisms and standards	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53

R1-165328	View on the conclusions for the SI on Multicarrier Enhancements for UMTS	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165329	Text proposal: Evaluation of Multicarrier Enhancements	Ericsson	revised	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165330	Text proposal: Impact of Multicarrier Enhancements on L1 Mechanisms and standards	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165331	Text proposal: View on the conclusions for the SI on Multicarrier Enhancements for UMTS	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165332	A view on DRX enhancements in CELL_FACH	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:41:53
R1-165333	An assessment on the potential gains associated to the introduction of DTX in CELL_FACH	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165334	On applying DTX on the UL DPCCH prior to an E-DCH retransmission in CELL_FACH	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165335	Summary of the potential gains and technical implications of introducing DTX in CELL_FACH	Ericsson	noted	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165336	Clarification on UL DPCH 10ms Mode	Ericsson	revised	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165337	Clarification on UL DPCH 10ms Mode	Ericsson	revised	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165338	Clarification on measuring the transmitted code power for the downlink DPCH slot formats #17 and #18	Ericsson	not pursued	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165339	Clarification on measuring the transmitted code power for the downlink DPCH slot formats #17 and #18	Ericsson	not pursued	2016-05-13 13:33:51	2016-05-13 21:42:32
R1-165340	Considerations for eMBMS	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 13:34:17	2016-05-13 13:59:54
R1-165341	Discussions on DMRS based Open/Semi-open loop MIMO schemes	CEWiT	available	2016-05-13 13:35:13	2016-05-14 04:54:45
R1-165342	MBSFN Measurements	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 13:37:28	2016-05-13 13:59:54
R1-165343	Clarifications on channel model correlations	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165344	WF on O2I penetration for the RMa scenario	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39

R1-165345	WF on RMa LSPs	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165346	WF on modifying channel coefficient equation for time-varying Doppler frequencies	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165347	WF on Blockage modeling	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165348	WF on O2I spatial consistency	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165349	WF on link level models for MIMO simulations	Ericsson, AT&T, CMCC, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO,	revised	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165350	Clarifications on frequency correlation	Ericsson, AT&T, ETRI, Intel, KT Corporation, Nokia, NTT	available	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165351	Frequency-dependence of LSPs	Ericsson, Telstra	revised	2016-05-13 13:42:53	2016-05-13 23:30:34

R1-165352	On number of clusters and paths within clusters	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	noted	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165353	Indoor Highly Resolved Channel Measurements at 60 GHz	Ericsson, Telstra	noted	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165354	WF on further enhancements for spatial consistency	Ericsson, Intel, AT&T, ETRI, Huawei, HiSilicon, KT Corporation, Nokia, NTT	agreed	2016-05-13 13:42:53	2016-05-13 20:40:39
R1-165355	NB-IoT-NPDCCH ordered PRACH	Ericsson	noted	2016-05-13 13:43:12	2016-05-14 04:48:18
R1-165356	On the forward compatibility of new radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165357	Performance of eMBB channel coding candidates	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165358	Performance of mMTC and URLLC channel coding candidates	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165359	Latency considerations for URLLC channel coding candidates	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165360	Selection of the eMBB channel coding scheme	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165361	Digital Modulation for 5G New Radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165362	Multi-antenna Architectures and Implementation Issues in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165363	Scalability of MIMO operation across NR carrier frequencies	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165364	Support for Beam Based Common Control Plane	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165365	On the UE beamforming in new radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165366	Channel reciprocity support in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:10:30	2016-05-13 21:41:31
R1-165367	On forward compatibility for NR	China Unicom	available	2016-05-13 14:14:36	2016-05-14 08:06:54
R1-165368	Discussions on waveforms for new radio interface	CEWiT	withdrawn	2016-05-13 14:18:21	
R1-165369	Power ratio and modulation order for MUST with HARQ	National Taiwan University	withdrawn	2016-05-13 14:37:39	

R1-165370	Discussion on the mobility enhancements solutions	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-13 14:42:40	2016-05-14 05:06:06
R1-165371	Discussion of Numerology for NR	Convida Wireless LLC	available	2016-05-13 14:47:28	2016-05-14 05:59:57
R1-165372	Notation of log-normal distributed random variables	Fraunhofer HHI	agreed	2016-05-13 14:52:07	2016-05-13 22:36:39
R1-165373	On Hybrid ARQ functionality for 5G	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165374	On the utilization of UE Advanced Receivers in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165375	On the cross-link interference mitigation	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165376	Radio resource management in NR	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165377	Random access principles for New Radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165378	On network energy efficiency requirement and evaluation for the 5G new radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165379	Network-based inter-cell interference coordination	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165380	Uplink power control for 5G New Radio	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165381	Punctured Scheduling for Latency Critical Transmissions	Nokia, Alcatel-Lucent Shanghai	available	2016-05-13 14:52:37	2016-05-13 21:41:31
R1-165382	Draft LS on MPDCCH configuration for BL/CE UE	Ericsson	revised	2016-05-13 14:55:42	2016-05-14 05:42:21
R1-165383	PUCCH frequency retuning for BL/CE UE	Ericsson	revised	2016-05-13 14:55:42	2016-05-14 06:53:32
R1-165384	PUCCH power control configuration for BL/CE UE	Ericsson	withdrawn	2016-05-13 14:55:42	
R1-165385	Enable cross-subframe channel estimation for BL/CE UE	Ericsson	revised	2016-05-13 14:55:42	2016-05-14 05:42:21
R1-165386	Frequency hopping flag definition in DCI formats for BL/CE UE	Ericsson	revised	2016-05-13 14:55:42	2016-05-14 05:42:21
R1-165387	Starting OFDM symbol for SIB1-BR for BL/CE UE	Ericsson	agreed	2016-05-13 14:55:42	2016-05-14 05:57:12
R1-165388	Collision between SIB1-BR and SI message for BL/CE UE	Ericsson	agreed	2016-05-13 14:55:43	2016-05-14 05:42:21
R1-165389	Overlapping MPDCCH search spaces for BL/CE UE	Ericsson	revised	2016-05-13 14:55:43	2016-05-14 05:42:21
R1-165390	MPDCCH search space for random access in connected mode for BL/CE UE	Ericsson	revised	2016-05-13 14:55:43	2016-05-14 05:42:21

R1-165391	Ambiguous terminology for number of repetitions for BL/CE UE	Ericsson	withdrawn	2016-05-13 14:55:43	
R1-165392	Definition of number of MPDCCH repetitions for BL/CE UE	Ericsson	agreed	2016-05-13 14:55:43	2016-05-14 05:42:21
R1-165393	PRB locations for Type0 MPDCCH search space for BL/CE UE	Ericsson	agreed	2016-05-13 14:55:43	2016-05-14 05:42:22
R1-165394	Multiplexing of UCI and PUSCH for BL/CE UE	Ericsson	not pursued	2016-05-13 14:55:43	2016-05-14 05:42:21
R1-165395	Correction on collision of dynamically scheduled data and semi-statically scheduled data for Rel-13 eMTC	Ericsson	merged	2016-05-13 14:55:43	2016-05-14 05:42:21
R1-165396	36.201CR0014r1 Introduction of NB-IoT	Nokia, Alcatel-Lucent Shanghai	agreed	2016-05-13 15:17:27	2016-05-13 23:40:18
R1-165397	Discussion on Non-precodes CSI-RS for eFD-MIMO	Beijing Xinwei Telecom Techn.	available	2016-05-13 16:00:03	2016-05-13 16:11:56
R1-165398	Additional Considerations on Building Penetration Loss Modeling for 5G System Performance Evaluation	Straight Path Communication	available	2016-05-14 07:41:47	2016-05-15 21:18:04
R1-165399	Consideration on LDPC HARQ Combining and Coding	MediaTek	withdrawn	2016-05-14 07:45:39	
R1-165400	Discussion on using new channel model also below 6 GHz	Samsung, AT&T, CMCC, Ericsson, Huawei, HiSilicon, Intel, KT Corporation,	noted	2016-05-16 07:01:42	2016-05-19 06:53:12
R1-165401	Initial downlink performance results for new radio waveform for below 6GHz	Nokia, Alcatel-Lucent Shanghai	available	2016-05-16 12:43:17	2016-05-16 20:17:45
R1-165402	WF on link level models for MIMO simulations	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT	revised	2016-05-16 15:25:09	2016-05-18 08:35:25
R1-165403	Evaluation results on the enhancement of Uu transport for V2V, V2P and V2I/N	LG Electronics	available	2016-05-17 07:41:29	2016-05-20 17:10:21
R1-165404	Large scale calibration results	Lenovo, Motorola	available	2016-05-17 07:44:04	2016-05-17 08:18:14
R1-165405	Remaining details for blockage modeling	Intel	noted	2016-05-17 08:05:58	2016-05-19 06:53:12
R1-165406	Dynamic CSI-RS Design and Overhead Reduction	Ericsson	noted	2016-05-17 15:14:53	2016-05-30 09:00:00
R1-165407	DMRS-based Open-loop MIMO	Ericsson	noted	2016-05-17 15:17:20	2016-05-30 09:00:00
R1-165408	Explicit CSI reporting for FD-MIMO	Intel Corporation	available	2016-05-18 08:00:36	2016-05-19 06:53:12
R1-165409	Consideration on LDPC codes for NR	ZTE	noted	2016-05-18 08:02:27	2016-05-18 10:31:01
R1-165410	Initial link level simulation results of new multiple access scheme	CATR	available	2016-05-18 10:31:44	2016-05-20 08:39:10

R1-165411	Initial simulation results of DMRS based semi-open-loop MIMO	CATR	available	2016-05-18 10:32:23	2016-05-20 08:39:10
R1-165412	Link level performance of DM RS for V2V	CATR	available	2016-05-18 10:33:08	2016-05-20 08:39:10
R1-165413	Continuous Uplink Transmission in eMTC	Sony	available	2016-05-18 11:24:02	2016-05-18 15:55:40
R1-165414	Reply LS on EPC procedures for providing eNB with V2X authorization information	SA1, LGE	treated	2016-05-18 11:59:59	2016-05-18 12:13:53
R1-165415	Reply LS on V2X message characteristics	SA3, TNO	treated	2016-05-18 12:11:36	2016-05-18 12:13:53
R1-165416	Overview of the proposed non-orthogonal MA schemes	Nokia, Alcatel-Lucent Shanghai	available	2016-05-18 15:53:19	2016-05-19 11:35:28
R1-165417	LS on TB sizes for SI-messages for NB-IoT	RAN2, Ericsson	treated	2016-05-18 16:01:31	2016-05-18 16:07:56
R1-165418	System level simulations with FTP model 3	Intel	available	2016-05-19 06:55:23	2016-05-19 07:35:12
R1-165419	Discussion on DMRS for PSBCH	LG Electronics	available	2016-05-19 06:57:23	2016-05-20 08:39:10
R1-165420	Introduction of V2V into TS36.212	Huawei	available	2016-05-19 07:06:53	2016-05-20 17:04:58
R1-165421	Additional link results for sPUCCH	Ericsson	available	2016-05-19 11:40:53	2016-05-19 20:03:29
R1-165422	Performance of GPO and OFDM with PA model and windowing	IITH, CEWiT, Reliance-jio,	available	2016-05-19 13:11:50	2016-05-21 16:42:02
R1-165423	Performance evaluation of FC-OFDM	ORANGE	available	2016-05-19 13:15:02	2016-05-20 08:39:10
R1-165424	On baseline UE receiver for NR	ORANGE, Vodafone	available	2016-05-19 13:29:47	2016-05-20 08:39:10
R1-165425	f-OFDM scheme and filter design	Huawei,	available	2016-05-19 20:01:35	2016-05-22 15:36:16
R1-165426	Link level evaluation results of waveform proposals	Huawei,	available	2016-05-19 20:02:16	2016-05-22 15:36:16
R1-165427	Further Discussion on O-to-I Parameters	NTT	noted	2016-05-19 20:05:58	2016-05-20 08:39:10
R1-165428	Performance evaluation of binary LDPC codes	CATT	available	2016-05-20 08:23:44	2016-05-20 17:04:58
R1-165429	Processing time reduction for latency reduction	LG Electronics	available	2016-05-20 08:25:28	2016-05-20 17:04:58
R1-165430	System-level simulation results for TDD scenario with latency reduction	LG Electronics	available	2016-05-20 08:26:00	2016-05-20 17:04:58
R1-165431	Initial Evaluation Result for NR Numerology	LG Electronics	available	2016-05-20 08:27:45	2016-05-20 17:04:58
R1-165432	UL DMRS Enhancement and Evaluations for FD-MIMO	Nokia, Alcatel-Lucent Shanghai	available	2016-05-20 08:32:21	2016-05-30 09:00:00
R1-165433	Evaluation Results of DMRS-based open-loop transmission schemes	Nokia, Alcatel-Lucent Shanghai	available	2016-05-20 08:32:50	2016-05-22 01:45:26
R1-165434	Initial Evaluation Result for waveform	LG Electronics	available	2016-05-20 08:40:50	2016-05-22 01:44:11
R1-165435	Initial LLS evaluation results on multiple access schemes	Spreadtrum Communication	available	2016-05-20 08:42:07	2016-05-20 17:04:58
R1-165436	Discussions on reference signal design for NR	Samsung	available	2016-05-20 08:43:54	2016-05-30 09:00:00
R1-165437	System simulation results for longer CP in MBSFN subframes	Ericsson	noted	2016-05-20 16:31:44	2016-05-30 09:00:00
R1-165438	Link level simulation assumptions for evaluation of longer CP for MBSFN subframes	Ericsson	noted	2016-05-20 16:32:19	2016-05-30 09:00:00

R1-165439	Views on numerology for NR	NTT DOCOMO,	noted	2016-05-20 16:44:54	2016-05-30 09:00:00
R1-165440	Scaling of the K-factor of the link level channel models	Huawei, HiSilicon, Nokia, Samsung, AT&T, CMCC, Ericsson, Intel,	agreed	2016-05-20 16:48:20	2016-05-21 16:42:01
R1-165441	Discussion on additional feature calibration	Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation,	revised	2016-05-20 16:49:22	2016-05-21 16:42:01
R1-165442	L1 parameters spreadsheet for NB-Io	Huawei	revised	2016-05-20 16:52:08	2016-05-22 07:07:25
R1-165443	Evaluation Assumptions for NR MIMO	ZTE	available	2016-05-21 16:44:12	2016-05-30 09:00:00
R1-165444	Discussion on CSI reporting of linear combination codebook	ZTE	available	2016-05-21 16:45:05	2016-05-30 09:00:00
R1-165445	Discussion on DMRS-based Open-Loop and Semi-Open-Loop Transmission	ZTE	available	2016-05-21 16:45:43	2016-05-30 09:00:00
R1-165446	System performance evaluation for dynamic control channel overhead	CATT	available	2016-05-21 16:46:10	2016-05-22 01:44:11
R1-165447	Proposed work plan for RAN1#85	Samsung, Nokia, CATT	noted	2016-05-21 16:51:19	2016-05-30 09:00:00
R1-165448	Final Report of 3GPP TSG RAN1 #84bis v2.0.0	ETSI	approved	2016-05-22 03:01:05	2016-05-22 15:24:39
R1-165449	Review of 3GPP LAA Specification Rel. 13	IEEE 802 LAN/MAN SC	treated	2016-05-22 07:55:46	2016-05-22 08:04:51
R1-165450	Correction on the usage of CEModeA and CEModeB for eMTC in TS 36.213	Huawei, HiSilicon	revised	2016-05-22 13:22:13	2016-05-30 09:00:00
R1-165451	WF on O-to-I penetration modeling	LG Electronics, CATT, CHTTL,	revised	2016-05-22 13:23:49	2016-05-30 09:00:00
R1-165452	Reply LS on EPC procedures for providing eNB with V2X authorization information	NEC	not pursued	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165453	Discussion on LDPC Code Design and Performance Evaluation	MediaTek Inc.	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165454	Discussion on Polar Code Design and Performance	MediaTek Inc.	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165455	Updated system level evaluations	Qualcomm Incorporated	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165456	Summary of email discussion on frame structure	Qualcomm Incorporated	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165457	Minutes of offline session on Tue	Nokia	noted	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165458	Clarifications on O-I implementation	Nokia	withdrawn	2016-05-31 16:05:39	
R1-165459	Discussion on recommended split of low and high penetration loss for NR	Samsung	withdrawn	2016-05-31 16:05:39	
R1-165460	Discussion on removal of square bracket for cluster level SSP	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165461	WF on frequency dependent LSP	Huawei, HiSilicon, Samsung, NTT	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165462	WF on dynamic blockage	Qualcomm, Intel, Samsung,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165463	WF on Composition of O2I penetration loss models	Huawei, HiSilicon,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165464	WF on O-to-I penetration modeling	LG Electronics, Straight Path, Ericsson, Samsung, Nokia, Alcatel-Lucent Shanghai Bell, ETRI, CHTTL, NTT	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165465	TR38.900 v0.3.0	Nokia, Samsung	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165466	WF on implementation of cluster delay and angle spread	NTT DOCOMO, Huawei, HiSilicon, Intel,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165467	Minutes of offline session on Wed	Samsung	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165468	Text proposal to TR 38.900 to add antenna filtering for link level channel model	Huawei, HiSilicon, Fraunhofer HHI,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165469	Discussion on additional feature calibration	Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165470	WF on link level models for MIMO simulations	Ericsson, AT&T, ETRI, Huawei, HiSilicon, Intel, KT Corporation, Nokia, NTT DOCOMO,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165471	Discussion on additional feature calibration	Huawei, HiSilicon, AT&T, Ericsson, Intel, KT Corporation,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165472	WF on the applicability range of new channel model	Nokia	withdrawn	2016-05-31 16:05:39	
R1-165473	void	ETSI	withdrawn	2016-05-31 16:05:39	
R1-165474	WF on number of MPCs	Ericsson, NTT DOCOMO	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165475	WF on frequency dependent LSP for indoor office	Huawei, HiSilicon, NTT DOCOMO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165476	WF on number of MPCs	Huawei, HiSilicon	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165477	TP for implementation of cluster delay and angle spread in TR38.900 on Section 7.5	NTT DOCOMO, Huawei, HiSilicon, Intel,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165478	Corrections for CIR Equations	Fraunhofer HHI, Motorola Mobility, Lenovo	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165479	WF on the applicability range of the new channel model	Ericsson, Samsung, Telstra, ETRI,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165480	WF on frequency-dependent LSPs	Ericsson, Telstra	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165481	WF on frequency correlation	Ericsson, ETRI, Telstra	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165482	Remaining issues on evaluation assumptions for NR	NTT DOCOMO,	noted	2016-06-07 13:05:22	
R1-165483	Discussion on System-Level Evaluations for NR	Samsung	noted	2016-06-07 13:05:22	

R1-165484	WF on evaluation assumptions for high speed train scenario: Macro + relay at 30GHz	Mitsubishi Electric, ETRI	agreed	2016-06-07 13:05:22	
R1-165485	WF on Extreme Long Range KPI Evaluation	Qualcomm	agreed	2016-06-07 13:05:22	
R1-165486	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165487	WF on URLLC KPIs and Evaluation	Qualcomm	noted	2016-06-07 13:05:23	
R1-165488	WF for TRP Antenna Modeling	Samsung, Intel, Ericsson	revised	2016-06-07 13:05:23	
R1-165489	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165490	Way-forward for TRP antenna modeling	Samsung, Intel, Ericson, Qualcomm,	noted	2016-06-07 13:05:23	
R1-165491	WF on hybrid UE antenna modelling	Intel, Samsung, LGE	**available**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165492	WF on channel coding evaluation	Qualcomm	**available**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165493	LS on Rel.14 eFD-MIMO WID update	Nokia	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165494	[DRAFT] LS on high level coexistence approaches between PC5 transport for V2V services and DSRC/IEEE 802.11p services in the same channel	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165495	On 256QAM UL UE categories & related capabilities	Nokia, Alcatel-Lucent Shanghai	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165496	[DRAFT] LS on Uplink Capacity Enhancements for LTE	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165497	Matthew session	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165498	WF on PRACH for Enhanced LAA	Ericsson	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165499	Updated WF on sub-channelization	LGE	**available**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165500	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165501	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165502	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165503	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165504	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165505	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165506	void	ETSI	withdrawn	2016-06-07 13:05:23	
R1-165507	Text proposal: Impact of Multicarrier Enhancements on L1 Mechanisms and specifications	Ericsson	**agreed**	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165508	Text proposal: Evaluation of Multicarrier Enhancements	Ericsson	**agreed**	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165509	TP on evaluation results	Huawei,	**agreed**	2016-05-28 02:34:27	2016-05-30 09:00:00

R1-165510	TP on conclusions for the Multicarrier Enhancements for UMTS	Huawei, HiSilicon	agreed	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165511	LS on RAN1 multi-carrier enhancements for UMTS agreements	RAN1, Huawei	agreed	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165512	LS on HS-SCCH DRx Design in Cell Fach	RAN1,	agreed	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165513	Text proposal: Evaluation of Multicarrier Enhancements	Qualcomm	agreed	2016-05-28 02:34:27	2016-05-30 09:00:00
R1-165514	TR 25.707 v0.3.0 on Multi-Carrier Enhancements for	ETSI	agreed	2016-05-28 02:34:27	2016-06-08 13:36:45
R1-165515	Clarifications on DCH enhancements feature	Qualcomm Incorporated, Ericsson, Huawei, Nokia	agreed	2016-05-28 02:34:30	2016-05-30 09:00:00
R1-165516	Clarifications on DCH enhancements feature (Mirror Rel-13)	Qualcomm Incorporated, Ericsson, Huawei, Nokia	agreed	2016-05-28 02:34:32	2016-05-30 09:00:00
R1-165517	WF on scaling of subcarrier spacing in NR	Samsung, Intel, KT Corp., Verizon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165518	Updates to Link level results	Ericsson	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165519	Updates to Link level observations	Ericsson	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165520	Updates to System level results	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165521	Updates to System level observations	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165522	Way forward on sPDSCH	Ericsson	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165523	Way forward on sPDCCH	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165524	Way forward on processing timing reduction for sTTI	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165525	Discussion on NR numerology	KT Corp., Verizon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165526	Summary of PRS sequence generation proposals for indoor positioning	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165527	Text proposal for Uu-V2P power consumption analysis in TR36.885	LGE	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165528	CR on FD-MIMO codebooks	Samsung	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165529	CR on CSI-Reporting-Type	Samsung	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165530	Introduction of 60ms periodicity for wideband CQI/PMI reporting	Nokia, Alcatel-Lucent Shanghai Bell, Apple, Broadcom,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165531	Correction on the usage of CEModeA and CEModeB for eMTC in TS 36.213	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165532	CR for clarification of MPDCCH over empty CRS tones in PBCH repetition	Qualcomm Incorporated	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165533	Correction on the DCI payload size for eMTC in TS 36.212	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165534	CR for scrambling sequence initialization	Qualcomm Incorporated	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165535	DMRS enhancement in PC5-based V2V	CATT	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165536	On MPDCCH AL and search space for 8 EREGs per ECCE in TS 36.213.	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165537	CR on MPDCCH quasi co-location	Panasonic	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165538	Correction on UE assumption on DMRS ports	ZTE Corporation, ZTE	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165539	WF on time reference of ACK/NACK of NPDSCH	Huawei, HiSilicon, CATT, Intel,	noted	2016-06-02 06:39:42	
R1-165540	Frequency hopping flag definition in DCI formats for BL/CE UE	Ericsson, Samsung	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165541	WF on CSI reporting framework for NR	Samsung, Interdigital,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165542	Clarification of CSI measurements	Qualcomm Incorporated	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165543	Correction on DCI payload size	Qualcomm Incorporated	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165544	Way forward on sPUCCH design	LG Electronics, Ericsson,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165545	WF on DM-RS for sPUSCH	LG Electronics, CATT, NTT DOCOMO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165546	WF on UCI transmission on sPUSCH	LG Electronics, Ericsson, Intel, Nokia, Alcatel-Lucent Shanghai Bell, NTT	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165547	Way forward on latency reduction for TDD	ZTE, CMCC, Ericsson, CATT, Sharp,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165548	Way Forward on sPDCCH transmitted in sTTI and legacy PDCCH region	ZTE, ZTE Microelectronic	noted	2016-06-07 13:05:24	2016-08-15 00:00:00
R1-165549	Way forward on sTTI length	Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165550	WF on UL DMRS for sTTI	Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165551	Way Forward on TDD FS2 for latency reduction	Huawei, HiSilicon, Panasonic, CATT, Qualcomm,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165552	WF on E-CID for the same PCI	Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165553	WF on OTDOA for the same PCI	Huawei, HiSilicon, Intel,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165554	Proposed TR structure for Multiple Access Studies	Huawei,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165555	Sensing and autonomous resource selection	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165556	WF on Multi-subframe scheduling in LAA	LG Electronics, Nokia, Alcatel-Lucent Shanghai Bell, Huawei,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165557	WF on uplink power control in LAA	LG Electronics, ZTE Microelectronic	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165558	WF on PRACH procedure in LAA	LG Electronics,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165559	WF on Supported NR Operations	Samsung, Nokia, Alcatel Lucent Shanghai	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165560	WF on subframe definition for NR	Samsung	withdrawn	2016-06-07 13:05:25	
R1-165561	Way Forward on priority information in SCI	Huawei, HiSilicon, Intel, Ericsson, Sharp, LG Electronics, NTT DoCoMo,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165562	WF on UL gaps for eMTC	Intel Corporation, Sony, Sequans,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165563	WF on NR beamforming	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165564	WF on UE beamforming and beam management	Nokia, Alcatel-Lucent Shanghai	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165565	WF on LBT scheme for SRS transmission on LAA Scell	LG Electronics, ITL, Sharp	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165566	WF on ending partial TTI with duration of 3 symbols for eLAA	LG Electronics, ITL, Sharp	available	2016-06-07 13:05:25	2016-08-10 09:00:00

R1-165567	WF on PDCCH reception in ending partial subframe for eLAA	LG Electronics, Intel, Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Sharp,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165568	Correction on collision of dynamically scheduled data and semi-statically scheduled data for Rel-13 eMTC	Ericsson, LG Electronics	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165569	WF on ZoD offset for Indoor office	Huawei, HiSilicon, Ericsson, Nokia, NTT	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165570	Discussion on frequency dependent channel characteristics for InH and Umi	Huawei, HiSilicon, CMCC, ETRI,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165571	Way forward on scheduling mechanism for sTTI	Ericsson, Intel, Nokia, Alcatel-Lucent Shanghai	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165572	WF on general SRS aspects	Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165573	WF on transmission and triggering SRS without PUSCH	Huawei, HiSilicon, ZTE	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165574	PRACH configuration for LAA Scell	Huawei,	withdrawn	2016-06-07 13:05:25	
R1-165575	Way Forward On Frame Structure	Qualcomm, Ericsson, Panasonic, NTT Docomo, ZTE, Convida, Nokia,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165576	WF on evaluation assumptions for high speed train scenario	CMCC, CATT, Huawei, CATR, China Unicom,	noted	2016-06-07 13:05:25	
R1-165577	WF on Scrambling Code Nacc Value	Nokia, Alcatel-Lucent Shanghai	withdrawn	2016-06-01 17:45:05	
R1-165578	Scrambling Sequence for paging MPDCCH and PDSCH	Nokia, Alcatel-Lucent Shanghai Bell, Intel,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165579	MCS for Random Access Response Grant	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165580	OFDM based waveform single user evaluation	Qualcomm Incorporated	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165581	OFDM based waveform multi-user evaluation	Qualcomm Incorporated	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165582	Summary of offline email discussions on numerology	Qualcomm Incorporated	withdrawn	2016-06-07 13:05:25	

R1-165583	WF on Scalable Numerology Symbol Boundary Alignment	Qualcomm, ZTE, ETRI, NEC, OPPO , Panasonic, DoCoMo,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165584	Design target and initial evaluation results on waveform for NR	Panasonic Corporation	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165585	WF on beamformed CSI-RS enhancements	LG Electronics, Samsung,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165586	WF on NR UL MIMO	Intel, NTT DOCOMO	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165587	WF on remaining details of antenna modeling	Intel, NTT DOCOMO	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165588	WF on hybrid UE antenna modelling	Intel, Samsung	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165589	WF on NP CSI-RS Aggregation	ZTE,Qualcomm , Xinwei	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165590	WF on aperiodic CSI for NR	ZTE, ZTE Microelectronics, ASTRI, Ericsson, Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165591	WF on Same Subframe SA and Data transmission	Qualcomm, Ericsson, LGE	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165592	WF on Supporting 500kmph for SA	Qualcomm,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165593	WF on enhancements for non-precoded CSI-RS	LG Electronics, Samsung, NEC	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165594	WF on enhancements on codebook for Rel-14	LG Electronics, ZTE,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165595	WF on scenarios for multiple access	ZTE, ZTE Microelectronics, InterDigital, Qualcomm Inc.,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165596	WF on categorization for multiple access schemes	ZTE, ZTE Microelectronics, Qualcomm	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165597	Discussion on the performance of CQI reporting based on the NZP CSI-RS	Intel Corporation	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165598	WF on channel coding for small block lengths	Huawei, HiSilicon, Interdigital,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165599	Evaluation of TBCC and polar codes for small block lengths	Huawei,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165600	Introduction of NB-IoT	Huawei	endorsed	2016-06-02 06:39:42	

R1-165601	[DRAFT]Reply LS on updated TS 36.300 section 5 for NB-	Huawei	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165602	WF on TBS for NB-IoT SI-messages	Huawei, HiSilicon, CATT, Ericsson, Intel, Nokia, ASB,	noted	2016-06-02 06:39:42	
R1-165603	WF on NR forward compatibility	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165604	WF on Multi-Cluster PSSCH Transmissions	Qualcomm Incorporated	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165605	Details of sensing for V2V	Qualcomm Incorporated	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165606	WF on Hybrid CSI	Samsung, CATT, Interdigital, LG Electronics, Nokia, ALU Shanghai Bell,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165607	WF on implicit dependencies assumptions	InterDigital, Ericsson,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165608	Summary of Tuesday offline discussions on V2V	LG Electronics	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165609	Way Forward on unicast control region, incl. CRS	Ericsson, Qualcomm, BBC, EBU	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165610	Way Forward on longer CP for MBSFN	Ericsson, Qualcomm,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165611	Way Forward on link level simulations and RS design	Ericsson, Qualcomm,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165612	WF on SLS evaluation assumptions for eV2X	LG Electronics, Deutsche	noted	2016-06-07 13:05:26	
R1-165613	Wf on non-precoded CSI-RS	Samsung, LGE,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165614	WF on numerology supported in MBSFN subframes	Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165615	WF on system information and idle mode reception for eMBMS enhancements	Qualcomm, EBU, BBC,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165616	Way-forward on CDM-8 for non-precoded CSI-RS	CATT, Intel,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165617	WF on hybrid CSI reporting	ZTE, NTT DOCOMO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165618	WF on categorizing candidate multiple access schemes for NR	CMCC, Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165619	Transceiver implementation and complexity analysis for SCMA	Huawei, HiSilicon	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165620	Performance Results for OTFS Modulation	Cohere	noted	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165621	A-CSI reporting for TM6	Samsung	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165622	Corrections on CSI Reporting	Samsung	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165623	On MPDCCH AL for 8 EREGs per ECCE in TS 36.211	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165624	Correction on RV determination for PUSCH in TS 36.213	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165625	Correction on the supported PUCCH format for CEModeA in TS 36.213	Huawei, HiSilicon	withdrawn	2016-06-01 17:45:10	
R1-165626	Clarification on Msg3 PUSCH repetition level in TS 36.213	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165627	Correction on SRS frequency location in TS 36.213	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165628	WF on NR forward compatibility	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165629	WF on collision with SI transmission and overlapping NPDCCH search space	Qualcomm, Ericsson, MediaTek,	noted	2016-06-02 06:39:42	
R1-165630	WF on NB-IoT UL DMRS Hopping	Qualcomm	noted	2016-06-02 06:39:42	
R1-165631	Way forward on sPDCCH	Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Mediatek, Sharp, Huawei, HiSilicon, CATT, CATR,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165632	TP for inclusion of evaluation assumptions for FS2	Ericsson	endorsed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165633	Way Forward on SLS evaluation assumptions	LG Electronics	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165634	Way Forward on evaluation methodologies	LG Electronics	revised	2016-06-07 13:05:27	
R1-165635	Channel interleaver correction for eMTC	Nokia, Alcatel-Lucent Shanghai	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165636	Correction on PDSCH reception timing for eMTC	Nokia, Alcatel-Lucent Shanghai	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165637	Way Forward on Channel Coding Scheme for New Radio	Samsung, Nokia,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165638	Second WF on Multi-subframe scheduling in LAA	LG Electronics,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165639	Way forward on further evaluation assumptions for NR waveform	Huawei, HiSilicon	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165640	WF on remaining details of antenna modeling	Intel, NTT DOCOMO	noted	2016-06-07 13:05:27	

R1-165641	Comparison of coding schemes for NR	Intel	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165642	WF on beamformed CSI-RS	Huawei, HiSilicon,	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165643	WF on LDPC coding scheme for NR	ZTE, ZTE Microelectronics, Nokia, Qualcomm, InterDigital,	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165644	WF on clarification for timing of DL transmission	ZTE, MediaTek, Huawei, HiSilicon, Sony	noted	2016-06-02 06:39:42	
R1-165645	WF on NPRACH UL gap	ZTE, MediaTek,	noted	2016-06-02 06:39:42	
R1-165646	Correcting configuration parameter for number of PRB-pairs	Sequans Communication	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165647	WF on eLAA UL/DL scheduling combinations	Nokia, Alcatel-Lucent Shanghai Bell, CATT, LG Electronics, NTT DOCOMO, Qualcomm, Intel, Ericsson, ZTE, Fujitsu,	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165648	WF on OFDM based waveform in NR	Samsung	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165649	WF on eLAA PUSCH retransmission with synchronous HARQ	Huawei	**available**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165650	WF on the antenna port and QCL assumption study in NR	Intel, Ericsson	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165651	WF on Time Reference for Ack/Nack Transmission	Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Sony, Verizon, AT&T,	noted	2016-06-02 06:39:42	
R1-165652	WF NPDCCH ordered PRACH	Ericsson	noted	2016-06-02 06:39:42	
R1-165653	WF on scenarios for non-orthogonal multiple access	CATT, Huawei, HiSilicon	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165654	WF on CSI Acquisition framework in NR	Huawei, HiSilicon, NTT DOCOMO, Intel, China Telecom, ZTE, China Unicom, Deutsche	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165655	LS to RAN1 on RAN2 agreements related to V2X	RAN2, LGE	postponed	2016-05-28 02:34:33	2016-05-30 09:00:00
R1-165656	WF on multltiplke access scheme for NR Uplink	NTT DOCOMO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165657	WF on channel coding for eMBB	Nokia, Alcatel Lucent Shanghai	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165658	WF on L1 Format for V2V Communication	Intel, ITRI	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165659	Co-channel of PC5 V2V with other techniques	Huawei, HiSilicon	withdrawn	2016-06-07 13:05:28	
R1-165660	WF on Scalable NCP	Qualcomm Incorporated,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165661	WF on Scalable Numerology TTI Boundary Alignment	Qualcomm	withdrawn	2016-06-07 13:05:28	
R1-165662	WF on NR frame structure	Samsung, Mediatek, Intel, NTT DOCOMO, CMCC,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165663	WF on SI messages for NB-IoT	ZTE, Nubia Technology	noted	2016-06-02 06:39:42	
R1-165664	WF on time reference of ACK/NACK of NPDSCH	Huawei, HiSilicon, CATT, Intel, Panasonic, u-blox, ZTE, Samsung,	noted	2016-06-02 06:39:42	
R1-165665	WF on definition of OFDM based waveform	Spreadtrum, Orange, Sony,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165666	WF on waveform candidates categorization	Orange, Spreadtrum, InterDigital,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165667	Text proposal for remaining issues in map-based hybrid model	ZTE, Keysight	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165668	WF on TXRU Virtualization for NR MIMO	Xinwei, NEC	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165669	Way Forward On Frame Structure	Qualcomm, OPPO, MediaTek, Intel, CATT, DOCOMO, InterDigital,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165670	WF on NPDCCH starting subframe	MediaTek, LGE, Huawei,	noted	2016-06-02 06:39:42	
R1-165671	Scrambling sequence initialization for PDSCH	Qualcomm, NTT DOCOMO	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165672	Clarification on starting subframe for MPDCCH	Qualcomm	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165673	Overriding of valid-invalid subframes for R=1	Qualcomm	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165674	WF on forward compatibility for waveform evolution	Spreadtrum, CATR, CMCC, Cohere, Deutsche Telekom, InterDigital,	noted	2016-06-07 13:05:29	
R1-165675	WF on Case 5 for waveform LLS evaluation	Spreadtrum, Orange, ZTE	noted	2016-06-07 13:05:29	
R1-165676	WF on PSSCH DMRS and SA ID	LG Electronics, ZTE, Qualcomm,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165677	WF on PSBCH DMRS	LG Electronics, ZTE,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165678	WF on transmission parameter adaptation	LG Electronics, Ericsson, ITL, KRRI, NTT	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165679	WF on sub-channelization	LG Electronics	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165680	WF on V2V timing	LG Electronics	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165681	WF on UL gaps for eMTC	Intel Corporation, Sony, Sequans, Sierra	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165682	Correcting configuration parameter for number of PRB-pairs	Sequans Communication	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165683	On NSSS design and SFN index detection ambiguity	Intel	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165684	WF on beamforming procedures	Nokia	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165685	WF on phase noise modeling	Nokia, Alcatel-Lucent Shanghai Bell, NTT DoCoMo, Samsung,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165686	Scrambling Sequence for paging MPDCCH and PDSCH	Nokia, Alcatel-Lucent Shanghai Bell, Intel,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165687	MCS for Random Access Response Grant	Nokia, Alcatel-Lucent Shanghai	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165688	WF on CCA Detection Threshold for eLAA	CableLabs, Broadcom,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165689	WF on PRACH waveform for eLAA	Nokia, Alcatel-Lucent Shanghai	withdrawn	2016-06-07 13:05:29	
R1-165690	WF on eMTC evaluation assumptions	Huawei, HiSilicon	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165691	WF on remaining issues on multiple access evaluation assumptions	Huawei, HiSilicon	noted	2016-06-07 13:05:29	
R1-165692	WF on UE measurement and reporting	Huawei, HiSilicon, NEC	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165693	WF on UE Noise Figure	Straight Path, Samsung, Intel, Nokia, KT	noted	2016-06-07 13:05:29	
R1-165694	[DRAFT]Reply LS on TBS sizes for SI-messages for NB-	Huawei	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165695	[DRAFT]LS on RRC parameter list for NB-IoT	Huawei	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165696	Way Forward on evaluation methodologies for mMTC	LG Electronics, Nokia, Alcatel-Lucent Shanghai	noted	2016-06-07 13:05:29	
R1-165697	Way Forward on KPIs discussion for RAN1 evaluation	LG Electronics	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165698	WF on timeline for sensing based UE autonomous resource selection	NTT DOCOMO	noted	2016-06-07 13:05:30	2016-08-15 00:00:00
R1-165699	WF on ePDCCH used for multiple SPS configuration	NTT DOCOMO	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165700	Way Forward on frame structure timing relations	Ericsson, Qualcomm,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165701	WF on RS design for CSI measurements in NR	Samsung, ZTE, ZTE Microelectronic	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165702	WF on categorizing candidate multiple access schemes for NR	CMCC, ZTE, Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165703	Scrambling sequence initialization for PDSCH	Qualcomm, NTT DOCOMO	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165704	WF on SLS evaluation assumptions for eV2X	LG Electronics, Deutsche	noted	2016-06-07 13:05:30	
R1-165705	Updates to System level results	Ericsson	endorsed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165706	Updates to System level observations	Ericsson	endorsed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165707	Way forward on processing timing reduction for sTTI	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165708	Correction on UCI multiplexing on PUSCH	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165709	[DRAFT]LS on RRC parameter list for NB-IoT	Huawei	revised	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165710	Reply LS on TBS sizes for SI-messages for NB-IoT	RAN1, Huawei	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165711	Reply LS on updated TS 36.300 section 5 for NB-IoT	RAN1, Huawei	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165712	WF on hybrid UE antenna modelling	Intel, Samsung	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165713	WF on CW adjustment for UL LBT based on Cat. 4	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165714	WF on Selection of LBT Priority Class for UL Transmission	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165715	WF on LBT Priority Class for UL Transmission	Ericsson, ZTE, Nokia, Alcatel-Lucent Shanghai	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165716	WF on MCOT limit Signaling and Modifying LBT type	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165717	WF on PUSCH Transmissions with 25 µs CCA Period	Ericsson	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165718	WF on baseline modulation schemes for NR study	LG Electronics, Intel, Nokia,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165719	Discussion on frequency-domain initiated numerology and time-domain initiated numerology	CMCC	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165720	[Draft]Reply LS on Parameters for WP5D Sharing and compatibility studies	NTT DOCOMO	revised	2016-05-28 02:34:33	2016-05-30 09:00:00
R1-165721	WF on TXRU Virtualization for NR MIMO	Xinwei, NEC	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165722	Reply LS on questions on NB-IOT	CT1, Nokia	postponed	2016-05-28 02:34:33	2016-05-30 09:00:00
R1-165723	LS to RAN1 on SPS	RAN2, LGE	postponed	2016-05-28 02:34:33	2016-05-30 09:00:00
R1-165724	Correction on RLM for PSCell in dual connectivity	Intel Corporation,	agreed	2016-05-28 02:34:33	2016-05-30 09:00:00
R1-165725	Turbo Code Performance Comparison	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165726	WF on Code Type for Short Info Block Lengths in NR	Ericsson,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165727	LS on V2V transmission path selection	RAN2, Huawei	postponed	2016-05-28 02:34:35	2016-05-30 09:00:00
R1-165728	WF on DCI for SL SPS	LGE	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165729	WF on HARQ feedback for DL broadcast	LGE	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165730	L1 parameters list for NB-IoT	Huawei	noted	2016-06-02 06:39:42	
R1-165731	WF on numerology	LG Electronics, NTT DOCOMO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165732	Way forward for RMa model frequency range	Telstra, Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165733	WF on V2V TX gap	NTT DOCOMO	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165734	WF on subcarrier spacing in NR	Verizon Wireless, KT Corp., Reliance-jio, CHTTL, Samsung, Intel, Potevio, Fiberhome,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165735	WF on assumption details for case 5 in waveform LLS evaluation	Spreadtrum, Fraunhofer IIS, National Taiwan University, Orange, ZTE	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165736	Feasibility of interference presence blind detection in case 1 MUST	Nokia	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165737	Correction on PDSCH transmission scheme assumed for TM9 CSI reference resource in TS 36.213	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165738	Way forward on evaluation assumptions for NR waveform in high frequency bands	Huawei, HiSilicon	withdrawn	2016-06-07 13:27:46	
R1-165739	NR Frame Structure Timing Relations	Ericsson	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165740	WF on semi-persistent transmission for mode 2	Ericsson, Qualcomm	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165741	WF on further study of complexity for channel codes	LGE	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165742	WF on UE Receiver Noise Figures	Samsung, Ericsson, Intel, Nokia, ZTE, MediaTek, Straight Path, KT Corp., Verizon, ETRI, IITH, CeWiT, Reliance-jio, Tejas Networks, Fiberhome, Sony, Coolpad, InterDigital,	noted	2016-06-07 13:27:46	
R1-165743	Way Forward on differentiate the GNSS timing and eNB timing	Huawei, HiSilicon, Qualcomm, Samsung, NTT DOCOMO , LG Electronics,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165744	Way Forward on Sync Priority for OOC	Huawei, HiSilicon, Samsung, Panasonic,	available	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165745	Way Forward on timing offset between eNB timing and PC5 based V2V	Huawei, HiSilicon, Qualcomm,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165746	eMTC MPDCCH corrections for 36.213	Sequans Communication	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165747	WF on NB-IoT Multi-PRB operation	LG Electronics, Nokia, ASB	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165748	LS on MPDCCH configuration for BL/CE UE	RAN1, Ericsson	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165749	Way Forward on V2V PC5 SLSS/PSBCH transmission	Huawei, HiSilicon, ITRI,	available	2016-06-07 13:27:46	2016-08-15 00:00:00
R1-165750	Draft LS to RAN2 on Priority for V2V	Qualcomm	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165751	WF on hybrid UE antenna modelling	Intel, Samsung, LGE	withdrawn	2016-06-07 13:27:46	
R1-165752	WF on CWS adjustment for category 4 UL LBT in eLAA	LGE	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165753	Reply LS on NB-IoT RRM requirements	RAN4, Huawei	treated	2016-05-28 02:34:35	
R1-165754	LS on RRM measurement for NB-IOT	RAN4, Ericsson	treated	2016-05-28 02:34:35	
R1-165755	WF on resource pool configuration	Huawei	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165756	WF on Angular Scaling	Huawei, HiSilicon,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165757	Applicability of TR38.900 channel models	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165758	Discussion on the channel model names and abbreviations	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165759	Way forward on further evaluation assumptions for NR waveform	Huawei, HiSilicon,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165760	Way Forward on SRS Transmission on TDD CCs without PUSCH	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165761	Way Forward on Support of Periodic and/or Aperiodic SRS	Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165762	Way Forward on Collision Handling	Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165763	WF on MUST power ratio	Qualcomm	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165764	WF on modulation order	LG Electronics, Intel, MediaTek, NTT DOCOMO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165765	WF on power ratios	LG Electronics, ZTE, Nokia	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165766	[DRAFT] LS on DRX and Reception of PDCCH scrambled by CC-RNTI	Panasonic	revised	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165767	Correction on UCI multiplexing on PUSCH	Nokia, Alcatel-Lucent Shanghai	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165768	TR38.900 v0.4.0	Samsung, Nokia	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165769	Way Forward for RMa model frequency range	Telstra, Ericsson	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165770	WF on calibration procedure	Nokia,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165771	WF on number of MPCs	Huawei, HiSilicon	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165772	WF on implementation of cluster delay and angle spread	Ericsson, NTT DOCOMO, ZTE Corp, ZTE	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165773	TP for blockage modeling	Qualcomm, Intel, Samsung,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165774	Corrections for CIR Equations	Fraunhofer HHI, Motorola Mobility, Lenovo, CATT,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165775	WF for TR clean-up	Nokia, Samsung, Huawei, Hisilicon, Intel, NTT DOCOMO, Qualcomm,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165776	void	ETSI	withdrawn	2016-05-31 16:05:40	
R1-165777	void	ETSI	withdrawn	2016-05-31 16:05:40	
R1-165778	void	ETSI	withdrawn	2016-05-31 16:05:40	
R1-165779	void	ETSI	withdrawn	2016-05-31 16:05:40	
R1-165780	void	ETSI	withdrawn	2016-05-31 16:05:40	
R1-165781	void	ETSI	withdrawn	2016-05-31 16:05:40	

R1-165782	void	ETSI	withdrawn	2016-05-31 16:05:40	
R1-165783	WF on handling PUSCH errors after 25us LBT in eLAA	Broadcom	available	2016-06-07 13:27:46	2016-08-10 08:01:02
R1-165784	[DRAFT] Reply LS on continuous uplink transmission in eMTC	Intel	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165785	Draft 36.211 eMTC CR capturing RAN1 #84bis and #85 agreements	Ericsson	available	2016-06-01 17:45:32	2016-06-14 12:05:43
R1-165786	Draft 36.212 eMTC CR capturing RAN1 #84bis and #85 agreements	Ericsson	available	2016-06-01 17:45:32	2016-06-14 12:05:43
R1-165787	Draft 36.213 eMTC CR capturing RAN1 #84bis and #85 agreements	Ericsson	available	2016-06-01 17:45:32	2016-06-14 12:05:43
R1-165788	WF on NB-IoT UL DMRS Hopping	Qualcomm	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165789	Initial performance evaluation on advanced implicit CSI	LG Electronics	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165790	WF on the three “evaluate and, if needed, specify” Items	Nokia	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165791	Correction on UCI multiplexing on PUSCH	Ericsson	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165792	WF on observation of turbo code	LGE, Ericsson,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165793	WF on transmission mode for MUST	ZTE, MediaTek	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165794	WF on DCI transmission for MUST	ZTE, MediaTek, Qualcomm	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165795	Discussion on collecting V2X evaluation results in	LG Electronics	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165796	Way forward on MUST power ratios	MediaTek	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165797	Way forward on MUST transmission	MediaTek	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165798	Way forward on MUST transmission when MUST-Far UE has 16QAM	MediaTek	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165799	Way forward on MUST mechanism for MUST operation	MediaTek	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165800	WF on PUSCH resource allocation for eLAA	Huawei, HiSilicon, Intel, Qualcomm,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165801	WF on adbanced CSI feedback	Huawei, HiSilicon	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165802	Enable cross-subframe channel estimation for BL/CE UE	Ericsson	postponed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165803	Way forward on MUST codewords multiplexing	Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165804	Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects	NTT DOCOMO	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165805	[Draft]Reply LS on Parameters for WP5D Sharing and compatibility studies	NTT DOCOMO	revised	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165806	WF on supporting different numerologies in a NR carrier	LG Electronics, Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165807	WF on timing relations for NR Frame structure	CMCC, CATT, OPPO,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165808	WF on NR UL MIMO	Intel, NTT DoCoMo	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165809	TP for conclusion of latency reduction SI	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165810	TP for latency reduction	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165811	WF on Frame Structure and Control Interference	Qualcomm	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165812	WF on ED Threshold for UL LBT	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165813	WF on Evaluation assumptions in UL LLS for contention based transmission in NR	LGE	withdrawn	2016-06-07 14:10:26	
R1-165814	LS to RAN2 on Priority for V2V	RAN1,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165815	WF on DL broadcast enhancement for V2X	LGE	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165816	WF on considerations for multiple access	LGE, Ericsson	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165817	Response LS on PUSCH transmission for eLAA	RAN4, Nokia	treated	2016-05-28 02:34:35	
R1-165818	WF on frame structure for NR	LG Electronics, CATT, ETRI,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165819	Draft reply LS on the feasibility of mobility enhancement solutions	ZTE	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165820	Reply LS on Parameters for WP5D Sharing and compatibility studies	RAN1, NTT DOCOMO	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165821	WF on Scalable Numerology Symbol Boundary Alignment	Panasonic, InterDigital, Ericsson,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165822	Second WF on Multi-subframe scheduling in LAA	LGE	noted	2016-06-07 13:51:47	2016-08-10 13:07:19
R1-165823	WF on PDCCH BD in LAA	LGE	withdrawn	2016-06-07 13:51:47	
R1-165824	WF on initial signal transmission in LAA	LG Electronics, Huawei,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165825	Way Forward on PRS-based Beacons	Qualcomm Incorporated	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165826	Way Forward on DSRC co-existence	Samsung, ZTE, LG Electronics, Sony	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165827	Offline session notes	Ericsson	noted	2016-06-07 13:51:47	2016-08-15 00:00:00

R1-165828	[Draft] LS on TR update for latency reduction	Ericsson	noted	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165829	TP for conclusion of latency reduction SI	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165830	WF on DSRC/LTE-based ITS coexistence	Ericsson, Huawei, HiSilicon	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165831	Discussion on power ratios optimization for MUST scheme	NTT	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165832	WF on aperiodic CSI for NR	ZTE	available	2016-06-07 14:12:05	2016-08-15 00:00:00
R1-165833	Mixed Numerology in an OFDM System	Ericsson	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165834	WF on E-CID for the same PCI	Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165835	[Draft]LS on OTDOA for the same PCI	Huawei	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165836	TP for latency reduction	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165837	WF on supporting different numerologies in a NR carrier	LG Electronics, Huawei,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165838	LS to RAN1 on RAN2 agreement on eLAA	RAN4, Nokia	treated	2016-05-28 02:34:35	
R1-165839	[Draft]LS on E-CID for the same PCI	Huawei, HiSilicon	not pursued	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165840	WF on NR frame structure with asynchronous UL HARQ	ZTE, Qualcomm, Ericsson,	noted	2016-06-07 14:25:34	
R1-165841	WF on NR CP type	Huawei, HiSilicon, Intel, LGE, CATT, IITH, CEWiT, Reliance-jio, Tejas	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165842	Proposals for evaluation of CP requirements in NR	CMCC	noted	2016-06-07 14:25:34	
R1-165843	WF on CSI acquisition in NR	Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165844	WF on DL broadcast enhancement for V2X	Huawei, HiSilicon, Ericsson	noted	2016-06-07 13:51:47	

R1-165845	Way Forward on scenarios for FeCoMP evaluations	Intel, ZTE, Softbank, Huawei/HiSilicon, LGE, CATT, Xinwei,	**agreed**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165846	Way Forward on eMBMS enhancements	Ericsson, Qualcomm, BBC, EBU, Nokia, ASB,	**noted**	2016-06-07 13:51:47	2016-08-15 00:00:00
R1-165847	WF on remaining issues on multiple access evaluation assumptions	Huawei, HiSilicon	revised	2016-06-07 14:25:34	
R1-165848	WF on mMTC evaluation assumptions	Huawei, HiSilicon	noted	2016-06-07 14:25:34	
R1-165849	WF on clarification on O2I penetration modeling for Rma	LG Electronics, Ericsson, ETRI, Samsung, Straight Path, NTT DOCOMO, Intel, Nokia,	**agreed**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165850	WF on antenna placement in Indoor scenarios	Intel, NTT DoCoMo,	agreed	2016-06-07 14:25:34	
R1-165851	Way Forward on Prioritization of Scenarios for FeCoMP	ZTE, ZTE Microelectronics, Intel, ASTRI	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165852	Way Forward on Evaluation Assumptions for FeCoMP	ZTE, ZTE Microelectronics, Intel, Ericsson, Nokia, ASB,	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165853	LS on OTDOA for the same PCI	RAN1, Huawei	**agreed**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165854	Way forward on processing timing reduction for sTTI	Ericsson	**noted**	2016-06-07 13:51:47	2016-08-15 00:00:00
R1-165855	TP for conclusion of latency reduction SI	Ericsson	**agreed**	2016-06-07 13:51:47	2016-08-15 00:00:00
R1-165856	TP for latency reduction	Ericsson	**agreed**	2016-06-07 13:51:47	2016-08-15 00:00:00
R1-165857	Summary and observations on simulation results in Cases 1a, 1b and 2	Spreadtrum, Orange, National Taiwan	noted	2016-06-07 14:25:34	
R1-165858	WF on subcarrier spacing in NR	Samsung	withdrawn	2016-06-08 12:03:05	

R1-165859	Way forward on further evaluation assumptions for NR waveform	Huawei, HiSilicon,	agreed	2016-06-08 12:03:05	
R1-165860	Draft LS on Rel.14 eFD-MIMO WID update	Samsung	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165861	WF on channel coding for small block lengths	Huawei	withdrawn	2016-06-08 12:05:13	
R1-165862	Clarifications on DCH enhancements feature	Qualcomm Incorporated	**agreed**	2016-05-28 02:34:35	2016-05-30 09:00:00
R1-165863	Clarifications on DCH enhancements feature (Mirror Rel-13)	Qualcomm Incorporated	**agreed**	2016-05-28 02:34:37	2016-05-30 09:00:00
R1-165864	void	ETSI	withdrawn	2016-05-28 02:34:39	
R1-165865	Chairpersons' summary of the UMTS sessions	UMTS Session Chairpersons (Huawei,	endorsed	2016-05-28 02:34:39	
R1-165866	TR 25.707 v1.0.0 on Multi-Carrier Enhancements for	ETSI	**agreed**	2016-05-28 02:34:39	2016-06-08 13:35:19
R1-165867	Overlapping MPDCCH search spaces for BL/CE UE	Ericsson	**postponed**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165868	MPDCCH search space for random access in connected mode for BL/CE UE	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165869	PUCCH frequency retuning for BL/CE UE	Ericsson	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165870	TP for TR 36.885 Conclusions	LGE	reserved	2016-06-07 13:51:48	
R1-165871	WF on timing relations for NR Frame structure	CMCC, CATT, OPPO, MediaTek,	noted	2016-06-08 12:26:18	
R1-165872	WF on minimum HARQ Timing	LG Electronics, Panasonic	revised	2016-06-08 12:26:18	
R1-165873	Way Forward on fixed DL physical resource for dynamic operation in NR	LG Electronics, Qualcomm, Panasonic, NTT	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165874	WF on UL gaps for eMTC	Intel Corporation, Sony, Sequans, Sierra Wireless, ZTE, Qualcomm, Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, Nordic Semiconductor,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165875	WF on remaining issues on multiple access evaluation assumptions	Huawei, HiSilicon	**noted**	2016-06-08 12:26:18	2016-06-08 13:34:07

R1-165876	WF on non-coherent JT schemes for FeCoMP	Huawei, HiSilicon, Intel, SoftBank Corp,	noted	2016-06-07 13:51:48	
R1-165877	WF on wireless relay/backhaul for NR	Samsung, AT&T Ericsson	revised	2016-06-08 12:26:18	
R1-165878	WF on further step on numerology study	Huawei, CMCC, National Instruments,	noted	2016-06-08 12:26:18	
R1-165879	WF on NPPCCH search space monitoring	MediaTek, Nokia, Huawei, Hisilicon,	noted	2016-06-02 06:39:42	
R1-165880	WF on UL 256QAM TBS table	Huawei, HiSilicon	**noted**	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165881	WF on far UE spec impact	LG Electronics,	**noted**	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165882	Draft TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects	NTT DOCOMO	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165883	WF on initial signal transmission in LAA	LGE	noted	2016-06-07 13:51:48	
R1-165884	WF on Time Reference for Ack/Nack Transmission	Ericsson	noted	2016-06-02 06:39:42	
R1-165885	WF on carrier spacing in NR	Verizon Wireless, KT Corp., Reliance-jio, CHTTL, China Telecom, Samsung, Intel, Potevio, Fiberhome, IITH, CEWiT,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165886	WF on Scalable Numerology Symbol Boundary Alignment	Panasonic, InterDigital, Ericsson,	noted	2016-06-08 12:26:18	
R1-165887	WF on minimum HARQ Timing	LG Electronics, Panasonic, Qualcomm, NTT DOCOMO	noted	2016-06-08 12:26:18	
R1-165888	Draft LS on RAN1 Agreements in MUST	MediaTek	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165889	TR 38.802 Study on New Radio (NR) Access Technology - Physical Layer Aspects	NTT DOCOMO	**agreed**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165890	Way Forward on determining UL LBT priority class	MediaTek	**noted**	2016-06-07 13:51:48	2016-08-10 13:07:19

R1-165891	WF on carrier spacing in NR	Verizon Wireless, KT Corp., Reliance-jio, CHTTL, China Telecom, Samsung, Intel, Potevio, Fiberhome, IITH, CEWiT,	noted	2016-06-08 12:26:18	
R1-165892	WF on TDD latency reduction	Huawei	**noted**	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165893	WF on power headroom report for eLAA	Sony	**available**	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165894	Response to LS on uplink transmission gap in NB-IoT	RAN4, Sony	treated	2016-05-28 02:34:39	
R1-165895	LS on Tx Gaps for Frequency Error Correction	RAN4,	treated	2016-05-28 02:34:39	
R1-165896	WF on frame structure for NR	LG Electronics, CATT, ETRI,	noted	2016-06-08 12:26:18	
R1-165897	WF on the determination of LBT priority class at the UE	Nokia, Alcatel-Lucent Shanghai	**noted**	2016-06-07 13:51:48	2016-08-09 13:51:48
R1-165898	Summary of Thursday offline discussions on V2V	LGE	noted	2016-06-07 13:51:48	
R1-165899	Way forward on V2X study conclusion	LGE	**noted**	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165900	Way-Forward on DL+UL Traffic multiplexing for eLAA	Broadcomm	**available**	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165901	Way-Forward on the No LBT option for UL transmissions in eLAA	Broadcomm	**available**	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165902	WF on wireless backhaul for NR	Samsung, AT&T, Ericsson, Intel, IITH, CEWiT, Tejas	agreed	2016-06-08 12:26:18	
R1-165903	WF on PUCCH frequency retuning for BL/CE UE	Ericsson, Qualcomm, NEC, Sequans, Virtuosys, Softbank, NTT DoCoMo, Sierra Wireless, CATT, Sony,	**noted**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165904	WF on resource usage indication	LGE	**available**	2016-06-07 13:51:48	2016-08-15 00:00:00

R1-165905	WF on the antenna port and QCL assumption study in NR	Intel, Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165906	LS on RRC parameter list for NB-IoT	RAN1, Huawei	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165907	WF on cross carrier scheduling in PC5-based V2V	CMCC	available	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165908	WF on V2V and D2D SLSS differentiation	Samsung	available	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165909	WF on Timing Relationship for V2V Sensing and Resource Selection	Intel	available	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165910	Details of sensing for V2V	Qualcomm Incorporated	available	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165911	[Draft] LS on TR update for latency reduction	Ericsson	withdrawn	2016-06-01 10:19:46	
R1-165912	TP for latency reduction Ericsson	Ericsson	withdrawn	2016-06-07 13:51:48	
R1-165913	LS on TR update for latency reduction	RAN1, Ericsson	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165914	WF on further evaluation assumption for NR waveform 30GHz and beyond	Nokia, Intel	noted	2016-06-08 12:26:18	
R1-165915	WF on beam management	Intel	noted	2016-06-08 12:36:58	2016-08-15 00:00:00
R1-165916	WF on DL Multiple Acess for eMBB	MediaTek, Spreadtrum	noted	2016-06-08 12:26:18	
R1-165917	Way Forward on High Speed link level evaluation	Cohere, AT&T, CMCC, Deutsche Telekom, InterDigital,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165918	WF on ED Threshold for UL LBT	Ericsson	revised	2016-06-07 13:51:48	2016-08-09 13:51:48
R1-165919	WF on modulation for NR	InterDigital	available	2016-06-08 12:36:58	2016-08-15 00:00:00
R1-165920	WF on Additional hybrid CSI mechanism	NTT DOCOMO	noted	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165921	WF on UL resource allocation for eLAA	Qualcomm Incorporated	available	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165922	WF on UCI transmission for eLAA Scells	Qualcomm Incorporated	available	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165923	WF on supporting trigger based transmission for UL in eLAA	Qualcomm Incorporated	available	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165924	WF on determining maximum UE TX power on a LAA SCell for ED threshold computation	Qualcomm Incorporated	available	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165925	WF on frame structure for NR	LG Electronics, CATT	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165926	WF on additional evaluation assumptions for high speed train scenario: Macro + relay around 30GHz	Mitsubishi Electric, ETRI,	noted	2016-06-08 12:26:18	
R1-165927	WF on CCA Detection Threshold for eLAA	CableLabs, Broadcom, Orange,	available	2016-06-07 13:51:48	2016-08-10 08:01:02

R1-165928	System level study on processing time reduction of 2OS and 7OS TTI	Nokia, Alcatel-Lucent Shanghai	**available**	2016-06-07 13:51:48	2016-08-15 00:00:00
R1-165929	WF on beamformed control channel for NR	Qualcomm, Ericsson, Intel, Nokia, CATT,	noted	2016-06-08 12:36:58	
R1-165930	WF on evaluation assumptions for eMBB	LGE	**available**	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165931	WF on time interval for NR	LGE, CATT	noted	2016-06-08 12:26:18	
R1-165932	Chairman's Notes of Agenda Item 6.1.5 on eMTC CRs	Ad-hoc chair (Qualcomm)	endorsed	2016-06-01 17:45:37	
R1-165933	Chairman's Notes of Agenda Item 6.1.6 on NB-IoT CRs	Ad-hoc chair (Qualcomm)	endorsed	2016-06-02 06:39:42	
R1-165934	Chairman's Notes of Agenda Item 6.2.1 on eLAA	Ad-hoc chair (Nokia, Ericsson)	**endorsed**	2016-06-07 13:51:48	2016-08-10 08:01:02
R1-165935	Chairman's Notes of Agenda Item 6.2.2 on V2V	Ad-hoc chair (Nokia, LGE)	endorsed	2016-06-07 13:51:49	
R1-165936	Chairman's Notes of Agenda Item 6.2.3 on FDMIMO	Ad-hoc chair (Qualcomm, Samsung)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165937	Chairman's Notes of Agenda Item 6.2.4 on MUST	Ad-hoc chair (Qualcomm)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165938	Chairman's Notes of Agenda Item 6.2.5 on eMBMS	Rapporteur (Ericsson)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165939	Chairman's Notes of Agenda Item 6.2.6 on SRS	Ad-hoc chair (Qualcomm)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165940	Chairman's Notes of Agenda Item 6.2.7 on enh_Ind_Pos	Ad-hoc chair (Qualcomm)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165941	Chairman's Notes of Agenda Item 6.2.8 on V2X	Ad-hoc chair (Nokia,	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165942	Chairman's Notes of Agenda Item 6.2.9 on Latency	Ad-hoc chair (Qualcomm)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165943	Chairman's Notes of Agenda Item 6.2.10 on eCOMP	Ad-hoc chair (Qualcomm)	endorsed	2016-06-07 13:51:49	
R1-165944	Chairman's Notes of Agenda Item 7.1.2 on NR eval_assumptions	Session Chairman (Nokia,	endorsed	2016-06-08 12:26:18	
R1-165945	Chairman's Notes of Agenda Item 7.1.5 on Ch_Coding	Ad-hoc chair (Nokia)	endorsed	2016-06-08 12:36:58	
R1-165946	WF on multi-antenna tramsmissions for NR	LG Electronics, CATT, Intel,	noted	2016-06-08 12:36:58	

R1-165947	WF on the antenna port and QCL assumption study in NR	Intel, Ericsson	agreed	2016-06-08 12:36:58	
R1-165948	WF on the CWS adjustment for Cat-4 LBT at the UE	Nokia, Alcatel-Lucent Shanghai Bell, Ericsson	**noted**	2016-06-07 13:51:49	2016-08-09 13:51:48
R1-165949	WF on NPUSCH format 2 phase rotation	ZTE	noted	2016-06-02 06:39:42	
R1-165950	WF on Remaining Evaluation Assumptions	NTT DOCOMO, Intel	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165951	Chairman's Notes of Agenda Item 6.2.8 on UL_cap_enh	Ad-hoc chair (Nokia)	**endorsed**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165952	WF on priority handling for V2V	Huawei, HiSilicon, Intel, Ericsson, Sharp, LG Electronics, NTT DoCoMo, OPPO , ITRI, Kyocera, Nokia,	**available**	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165953	WF on UL gaps for eMTC	Intel Corporation, Sony, Sequans Communications, Verizon, Sierra Wireless, ZTE, Qualcomm, Ericsson , AT&T, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, NTT DoCoMo, SoftBank Mobile, CATT, Panasonic, NEC, KT Corporation, MediaTek, LG	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165954	WF on Outer Code	ZTE	**noted**	2016-06-08 12:36:58	2016-08-15 00:00:00
R1-165955	WF on time interval X	Huawei, HiSilicon, Qualcomm,	revised	2016-06-08 12:26:18	

R1-165956	WF on DCI transmission for MUST	ZTE, MediaTek, Qualcomm	available	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165957	WF on semi-persistent transmission for mode 2	Ericsson, Qualcomm	available	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165958	MPDCCH search space for random access in connected mode for BL/CE UE	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165959	WF on channel coding simulation data sharing	Qualcomm Incorporated	noted	2016-06-08 12:36:58	2016-08-15 00:00:00
R1-165960	Way forward on DL and PC5 for V2X	LG Electronics, Huawei, HiSilicon, Ericsson, NTT DOCOMO,	agreed	2016-06-07 13:51:49	2016-08-15 00:00:00
R1-165961	WF on PC5 congestion control	Ericsson	withdrawn	2016-06-07 13:51:49	
R1-165962	WF on ED Threshold for UL LBT	Ericsson, Huawei,	available	2016-06-07 13:51:49	2016-08-09 13:51:48
R1-165963	Introduction of NB-IoT	Ericsson	revised	2016-06-02 11:36:23	2016-06-08 11:46:24
R1-165964	Introduction of NB-IoT	Ericsson	revised	2016-06-02 11:36:26	2016-06-08 13:20:26
R1-165965	LS on RAN1 agreements potentially related to RAN2 in sidelink-based V2V	RAN1, LGE	agreed	2016-06-07 13:51:49	2016-06-08 13:20:26
R1-165966	TR38.900 v0.4.0	Samsung, Nokia	agreed	2016-06-08 12:40:46	2016-06-08 13:20:26
R1-165967	3GPP TR 36.885 v.2.0.0 Study on LTE-based V2X Services	LG Electronics	available	2016-06-07 13:51:49	2016-06-09 08:43:16
R1-165968	LS on L1 parameters for sidelink-based V2V	RAN1, LGE	agreed	2016-06-07 13:51:49	2016-06-08 13:20:26
R1-165969	MPDCCH search space for random access in connected mode for BL/CE UE	Ericsson, Panasonic,	agreed	2016-06-08 12:40:46	2016-06-09 06:45:57
R1-165970	TR38.900 v1.0.0	Samsung, Nokia	agreed	2016-06-08 12:40:47	2016-06-08 13:20:26
R1-165971	Introduction of NB-IoT	Ericsson	agreed	2016-06-07 13:51:49	2016-06-09 06:45:57
R1-165972	Introduction of NB-IoT	Motorola	agreed	2016-06-07 13:51:49	2016-06-10 13:08:11
R1-165973	Introduction of NB-IoT	Ericsson	agreed	2016-06-07 13:51:49	2016-06-09 08:20:45
R1-165974	Large-scale calibration results	Samsung	available	2016-06-07 13:51:49	2016-08-12 13:07:44
R1-165975	Full calibration results	Samsung	available	2016-06-07 13:51:49	2016-08-12 13:07:44
R1-165976	Additional-feature calibration results	Samsung	withdrawn	2016-06-07 13:51:49	
R1-165977	RAN1 agreements for Rel-13 NB-IoT	Ericsson	available	2016-06-07 13:51:49	2016-08-11 15:52:39
R1-165978	List of agreements for “Support for V2V services based on LTE sidelink”	LGE	available	2016-06-07 13:51:49	2016-08-11 15:52:39
R1-165979	Evaluation assumptions for the high speed train scenario for around 30GHz (RRH + relay) for NR	Mitsubishi	agreed	2016-06-07 13:51:49	2016-08-12 09:11:10

R1-165980	void	ETSI	withdrawn	2016-06-07 13:51:49	
R1-165981	void	ETSI	withdrawn	2016-06-07 13:51:49	
R1-165982	WF on UE antenna number	Huawei, HiSilicon	revised	2016-06-08 12:26:18	2016-06-08 13:20:26
R1-165983	WF on remaining issues for SLS parameters	Huawei	withdrawn	2016-06-08 12:26:18	
R1-165984	LS on RAN1 Agreements in MUST	RAN1, MediaTek	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165985	WF on UL gaps for NB-IoT	Huawei, HiSilicon, Sony, Ericsson, MediaTek, Vodafone, ZTE, Nubia	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165986	[Draft]Reply LS on the feasibility of mobility enhancement solutions	ZTE	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165987	Draft response LS to 802dot11 regarding LAA	Qualcomm Incorporated	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165988	Draft response LS to WFA regarding LAA	Qualcomm Incorporated	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165989	Way forward on calibration assumptions for NR waveform	Huawei, HiSilicon, NTT	agreed	2016-06-08 12:26:18	2016-06-08 13:20:26
R1-165990	WF Frame Structure and Evaluation	Qualcomm, Huawei, HiSilicon, NTT	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165991	Summary of Friday offline discussions on V2V	LGE	noted	2016-06-07 13:51:49	2016-06-08 13:20:26
R1-165992	[DRAFT]LS on NB-IoT performance	Huawei, HiSilicon, Vodafone, Deutsche Telekom, China	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165993	CAT-M1 Coverage Enhancement Analysis	Sierra Wireless, Ericsson, Sequans	available	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-165994	WF on the antenna model for outdoor TRP	Intel, NTT DOCOMO	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-165995	WF on PSBCH DMRS and SLSS/PSBCH periodicity	LGE	withdrawn	2016-06-07 13:51:49	
R1-165996	Reply LS on the feasibility of mobility enhancement	RAN1, ZTE	agreed	2016-05-28 02:34:39	2016-05-30 09:00:00
R1-165997	WF on beamforming for control message transmission in NR	Qualcomm	available	2016-06-08 12:36:58	2016-06-08 13:20:26
R1-165998	Draft response LS to 802dot11 regarding LAA	Qualcomm Incorporated	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-165999	Draft response LS to WFA regarding LAA	Qualcomm Incorporated	revised	2016-05-14 04:49:06	2016-05-14 04:49:06
R1-166000	WF on further evaluation assumption for NR waveform 30GHz and beyond	Nokia, Alcatel-Lucent Shanghai Bell, Intel, Samsung,	revised	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166001	Proposal for email discussion on evaluation assumptions for high speed train scenario: Macro + relay around 30GHz	Mitsubishi Electric, ETRI	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166002	WF on synchronization for NR forward compatibility	LG Electronics, Panasonic	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166003	Way Forward on managing UE blind decoding for LAA SCells in Rel-14 eLAA	Qualcomm	noted	2016-06-07 13:51:49	2016-06-08 13:20:26
R1-166004	Response LS on realistic power amplifier model for NR waveform evaluation	RAN4, Nokia	treated	2016-05-28 02:34:39	2016-06-08 13:20:26
R1-166005	WF on Channel coding selection	Qualcomm Incorporated,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166006	WF on remaining issues on SLS parameters for multiple access	Huawei, HiSilicon, CATT, Orange,	noted	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166007	WF on Remaining Evaluation Assumptions	NTT DOCOMO, Intel	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166008	WF on supporting different numerologies in a NR carrier	LG Electronics, Huawei, HiSilicon,	noted	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166009	[DRAFT]LS on NB-IoT performance	Huawei, HiSilicon, Vodafone, Deutsche Telekom, CMCC, China	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166010	WF on power amplifier assumptions for NR wavwform evaluations	Nokia, Alcatel Lucent Shanghai	noted	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166011	WF on UE antenna number	Huawei, HiSilicon	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26

R1-166012	Way Forward on Ack/Nack feedback of DL HARQ for NR	ZTE, ZTE Microelectronics, Ericsson, Qualcomm,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166013	WF on time interval X	Huawei, HiSilicon, Qualcomm,	noted	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166014	Way-Forward on UL PSD limit in eLAA	Broadcom, Marvell,	available	2016-06-07 13:51:50	2016-06-08 13:20:26
R1-166015	WF on UL gaps for eMTC	Intel Corporation, Sony, Sequans Communications, Verizon, Sierra Wireless, ZTE, Ericsson , AT&T, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, NTT DoCoMo, SoftBank Mobile, CATT, Panasonic, NEC, KT Corporation, MediaTek, LG Electronics,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166016	Way forward on email discussion for waveforms	Huawei, HiSilicon, National Taiwan University, NTT	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166017	[DRAFT] LS on Uplink Capacity Enhancements for LTE	Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166018	WF on UL gaps for NB-IoT	Huawei	withdrawn	2016-06-02 06:39:42	
R1-166019	WF on the antenna model for outdoor TRP	Intel, NTT DOCOMO, ZTE, Samsung, Xinwei, CATT, Ericsson,	revised	2016-06-08 12:26:19	2016-06-08 13:20:26

R1-166020	Way Forward on High Speed link level evaluation	Cohere, AT&T, CMCC, Deutsche Telekom, InterDigital, National Taiwan University,	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166021	[Draft]LS on Mapping of QCI to LBT Priority Classes in UL	CableLabs	not pursued	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166022	CR on clarification for channel sensing	Qualcomm Incorporated	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166023	WF on UL gaps for NB-IoT	Huawei, HiSilicon, CATT, Ericsson, Intel, MediaTek, Nokia,	agreed	2016-06-02 06:39:42	2016-06-08 13:20:26
R1-166024	LS on NB-IoT performance	Huawei, HiSilicon, Vodafone, Deutsche Telekom, CMCC, China	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166025	WF on AoA, ZoA, ZoD Angular Scaling	Huawei, HiSilicon, NTT	agreed	2016-05-31 16:05:40	2016-06-08 13:20:26
R1-166026	WF on the antenna model for outdoor TRP	Intel, NTT DOCOMO, ZTE, Samsung, Xinwei, CATT, Ericsson,	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166027	WF Frame Structure and Evaluation	Qualcomm, Panasonic, NTT DOCOMO, KT	noted	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166028	WF on further evaluation assumption for NR waveform 30GHz and beyond	Nokia, Alcatel-Lucent Shanghai Bell, Intel, Samsung,	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166029	LS on Rel.14 eFD-MIMO WID update	RAN1, Nokia	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166030	WF on beamn management	Intel	agreed	2016-06-08 12:36:58	2016-06-08 13:20:26

R1-166031	Way Forward on High Speed link level evaluation	Cohere, AT&T, CMCC, Deutsche Telekom, InterDigital, National Taiwan University,	agreed	2016-06-08 12:26:19	2016-06-08 13:20:26
R1-166032	Way Forward on Ack/Nack feedback of DL HARQ for NR	ZTE, ZTE Microelectronics, Ericsson, Qualcomm,	available	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166033	LS on high level coexistence approaches between PC5 transport for V2V services and DSRC/IEEE 802.11p services in the same channel	RAN1, Ericsson	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166034	LS on Uplink Capacity Enhancements for LTE	RAN1, Ericsson	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166035	WF on UL gaps for eMTC	Intel Corporation, Sony, Sequans Communications, Verizon, Sierra Wireless, ZTE, Ericsson , AT&T, Nokia, Alcatel-Lucent Shanghai Bell, Samsung, NTT DoCoMo, SoftBank Mobile, CATT, Panasonic, NEC, KT Corporation, MediaTek, LG Electronics,	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00

R1-166036	LS on NB-IoT performance	Huawei, HiSilicon, Vodafone, Deutsche Telekom, CMCC, China	revised	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166037	LS on NB-IoT performance	RAN1, Huawei	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166038	LS on DRX and Reception of PDCCH scrambled by CC-RNTI	RAN1, Panasonic	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166039	CR on CWp adjustment	Qualcomm Incorporated	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166040	Response LS to 802dot11 regarding LAA	RAN1, Qualcomm Incorporated	agreed	2016-05-28 02:34:39	2016-05-30 09:00:00
R1-166041	Response LS to WFA regarding LAA	RAN1, Qualcomm Incorporated	agreed	2016-05-28 02:34:39	2016-05-30 09:00:00
R1-166042	Reply LS on continuous uplink transmission in eMTC	RAN1, Intel	agreed	2016-05-30 09:00:00	2016-05-30 09:00:00
R1-166043	LS on UL DM-RS for NPUSCH format 1	RAN1, Huawei	agreed	2016-06-01 12:24:02	2016-06-07 10:23:08
R1-166044	LS on Uplink Capacity Enhancements for LTE	RAN1, Ericsson	agreed	2016-06-01 12:24:02	2016-06-07 10:23:08
R1-166045	Introduction of Rel-13 feature of NB-IoT in 36.212	Huawei,	agreed	2016-06-08 15:27:39	2016-06-09 06:51:58
R1-166046	Clarification on UL DPCH 10ms Mode	Ericsson	revised	2016-06-09 07:15:35	2016-06-09 08:07:28
R1-166047	Clarification on UL DPCH 10ms Mode	Ericsson	revised	2016-06-09 07:19:42	2016-06-09 08:07:28
R1-166048	Clarification of CSI measurements	Qualcomm Incorporated, Ericsson,	agreed	2016-06-10 04:03:50	2016-06-10 13:08:11
R1-166049	RAN1 Agreements, Working Assumptions and Conclusions for Rel-14 Enhanced LAA	Ericsson, Huawei	available	2016-06-30 12:08:54	2016-08-11 06:39:01
R1-166050	LS on Enhanced LAA for LTE	RAN1, Ericsson, Huawei	agreed	2016-07-03 07:56:41	2016-08-10 13:07:19
R1-166051	LS on L1 parameters for Enhanced LAA	RAN1, Ericsson, Huawei	agreed	2016-07-03 08:01:02	2016-08-10 13:07:19
R1-166052	LS on RRC Parameters and PRACH for Enhanced LAA for LTE	RAN1, Ericsson	agreed	2016-08-11 15:11:58	2016-08-16 07:35:16
R1-166053	Reply LS on the feasibility of mobility enhancement	RAN1, ZTE	agreed	2016-08-11 15:11:58	2016-08-12 13:56:07