

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. 10,568,113

Case No. IPR2025-00895

DECLARATION OF FRIEDHELM RODERMUND
IN SUPPORT OF A PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 10,568,113

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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 documents:

- Version 14.3.0 of technical specification 3GPP TS 36.321 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 14)”) (hereinafter “TS 36.321 V14.3.0”, APPLE-1023).
- Version 14.4.0 of technical specification 3GPP TS 36.133 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio

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resource management (Release 14)”) (hereinafter “TS 36.133 V14.4.0”, APPLE-1024).

- Version 14.3.0 of technical specification 3GPP TS 36.213 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14)”) (hereinafter “TS 36.213 V14.3.0”, APPLE-1025).
- Version 14.3.0 of technical specification 3GPP TS 36.300 (“Technical Specification Group (TSG) Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 14)”) (hereinafter “TS 36.300 v14.3.0”, APPLE-1026)
- Version 14.3.0 of technical specification 3GPP TS 36.331 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 14)”) (hereinafter “TS 36.331 V14.3.0”, APPLE-1027).
- Version 14.1.0 of technical specification 3GPP TS 36.201 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); LTE physical layer; General

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description (Release 14)”) (hereinafter “TS 36.201 V14.1.0”, APPLE-1028).

- Version 14.3.0 of technical specification 3GPP TS 36.212 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (Release 13)”) (hereinafter “TS 36.212 V14.3.0”, APPLE-1029).
- Version 14.3.0 of technical specification 3GPP TS 36.211 (“Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 14)”) (hereinafter “TS 36.211 V14.3.0”, APPLE-1035).
- T-doc R1-1710596, which represents a 3GPP document with the title “Discussion of beam recovery procedure” (hereinafter “R1-1710596”) (APPLE-1006).

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.

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4. I am also knowledgeable about document management practices and the usage of email reflectors by 3GPP working groups. This is due to the fact that all 3GPP working groups used the same document repository on <ftp.3gpp.org> and all working groups use the same email exploder tool. Thus, I'm able to testify regarding the availability and authenticity of any 3GPP documents.

5. 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.

6. I have been informed that Apex Beam Technologies, LLC ("Apex Beam Technologies" or "Patent Owner") is the current assignee of U.S. Patent No. 10,568,113 ("the '113 Patent") (Ex. 1001). I have no financial interest in the Patent Owner or the '113 patent.

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

II. **BACKGROUND AND QUALIFICATIONS**

8. I have more than 20 years of experience working with standards development organizations including 3GPP, ETSI, and the Open Mobile Alliance

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(“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.

9. 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.

10. 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).

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

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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”).

12. 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.

13. 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.

14. 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,

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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.

15. 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.

16. 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

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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.

17. 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.

18. 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.

19. 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.

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20. 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

21. It is my opinion that “TS 36.321 V14.3.0” (APPLE-1023) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than June 23, 2017.

22. It is my opinion that “TS 36.133 V14.4.0” (APPLE-1024) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than July 7, 2017.

23. It is my opinion that “TS 36.213 V14.3.0” (APPLE-1025) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than June 23, 2017.

24. It is my opinion that “TS 36.300 v14.3.0” (APPLE-1026) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than June 23, 2017.

25. It is my opinion that “TS 36.331 V14.3.0” (APPLE-1027) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than July 13, 2017.

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26. It is my opinion that “TS 36.201 V14.1.0” (APPLE-1028) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than March 23, 2017.

27. It is my opinion that “TS 36.212 V14.3.0” (APPLE-1029) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than June 23, 2017.

28. It is my opinion that “TS 36.211 V14.3.0” (APPLE-1035) is an authentic 3GPP specification and would have been publicly accessible through ftp.3gpp.org no later than June 23, 2017.

29. It is my opinion that R1-1710596 (APPLE-1006) is an authentic 3GPP T-doc and would have been publicly accessible through ftp.3gpp.org no later than June 16, 2017.

IV. PUBLICATION OF 3GPP SPECIFICATIONS AND RELATED DOCUMENTS

A. General Practices

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

31. 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.

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32. 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.

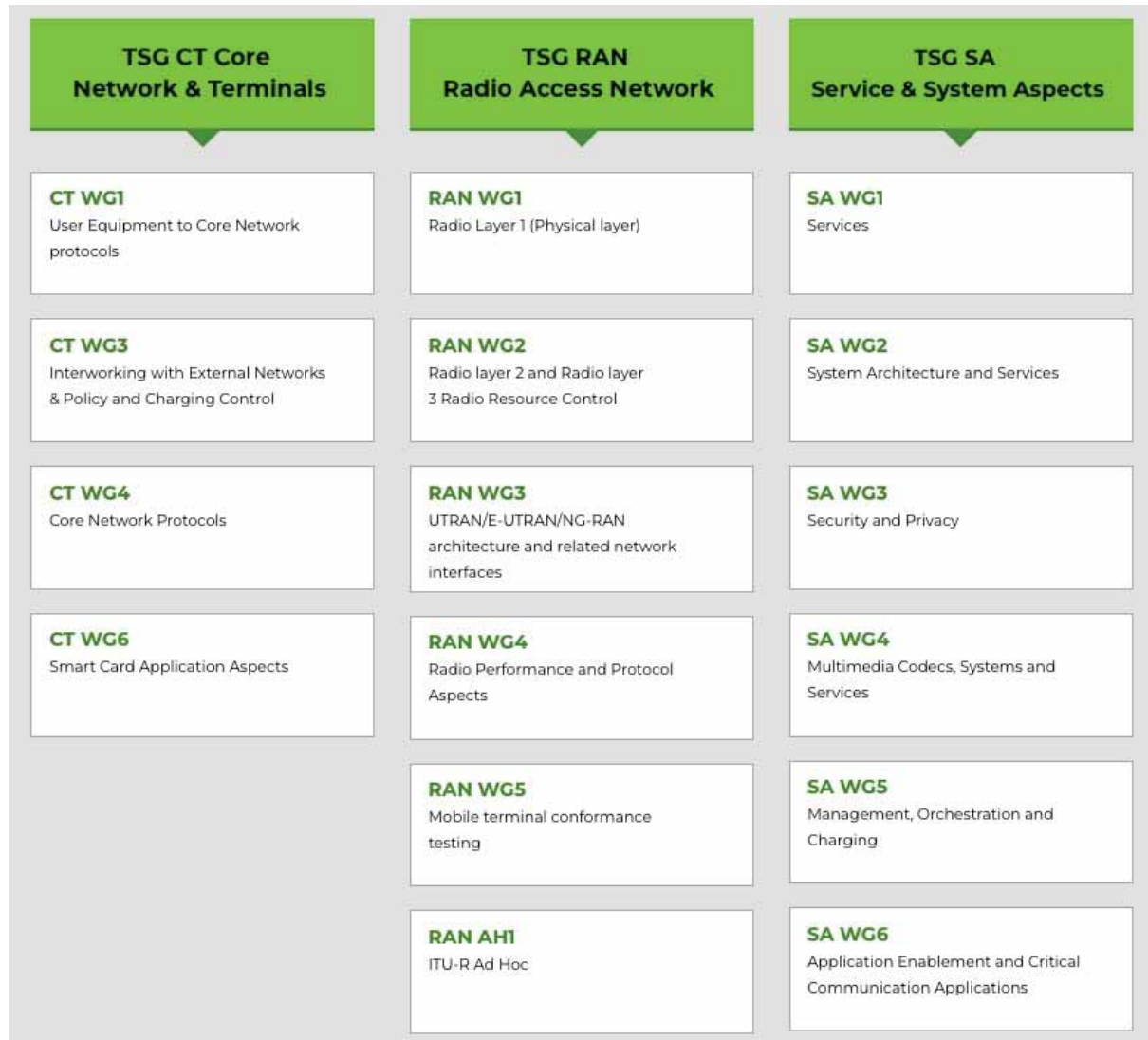
33. In the ordinary course of its regularly conducted business activities, and pursuant to its standard business practices, 3GPP publishes technical specifications, proposals, reports, and other documents related to the development of cellular telecommunications standards. Such documents are published 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.

34. 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](ftp://ftp.3gpp.org). Such documents are referred to as "T-docs." Final versions of the

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technical specifications also were, and continue to be, publicly available from that same ftp server.

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



36. Each Technical Specification Group (TSG) or Working Group adopts a structured numbering system for the documents associated with their meetings,

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and those systems typically follow a consistent numbering system as shown in the following example: xminnnzzzz. The numbering system normally comprises five logical elements: (1) x: a single letter corresponding to the TSG; wherein in 2007/2008 x was one of R (Radio Access Network), C (Core and Terminals), S (Service and System Aspects), or G (GSM/EDGE Radio Access Network); (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).

37. 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 T-docs 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](ftp://ftp.3gpp.org).

38. 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.

39. 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

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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. 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.

40. 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.

41. 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

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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.

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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		

42. 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:



The screenshot shows the 3GPP website interface. At the top, there is a navigation bar with the 3GPP logo and a search bar. Below the navigation bar, there is a header section with the text "This site is 3GPP working area. Log in to access full features. For general information go to the public site 3gpp.org". The main content area displays a list of specifications for the 23 series. The list is organized into columns: Specification Number, Title, Status, and Date. The specifications are listed in descending order of their specification number, starting from 23.978 down to 23.101. The status of each specification is indicated by a colored icon: a green circle for "Under development", a yellow circle for "Under review", and a red circle for "Withdrawn". The date of the specification is also provided.

Specification Number	Title	Status	Date
23.978	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.977	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.976	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.975	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.974	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.973	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.972	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.971	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.970	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.969	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.968	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.967	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.966	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.965	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.964	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.963	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.962	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.961	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.960	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.959	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.958	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.957	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.956	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.955	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.954	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.953	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.952	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.951	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.950	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.949	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.948	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.947	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.946	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.945	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.944	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.943	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.942	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.941	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.940	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.939	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.938	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.937	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.936	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.935	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.934	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.933	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.932	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.931	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.930	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.929	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.928	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.927	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.926	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.925	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.924	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.923	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.922	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.921	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.920	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.919	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.918	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.917	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.916	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.915	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.914	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.913	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.912	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.911	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.910	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.909	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.908	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.907	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.906	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.905	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.904	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.903	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.902	Technical specification of 5G New Radio (NR)	Under development	2018-03-20
23.901	Technical specification of 5G New Radio (NR)	Under development	2018-03-20

43. 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.

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44. 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 38.921. Excluding withdrawn specifications, the 5G NR standard consists of more than 140 specifications. Each specification can span from a few pages to hundreds of pages. One full version of the 5G standard is massive, spanning tens of thousands of pages across the particular series of technical specifications.

45. In the ordinary course of 3GPP’s regularly conducted business activities, and pursuant to its standard business practices, T-docs are usually uploaded to 3GPP’s ftp server and website before the meeting where they are to be discussed. Documents created or revised during the course of a meeting are normally uploaded at the latest during the week following the meeting (e.g., the meeting report of the meeting is usually published for review during the week following the meeting).

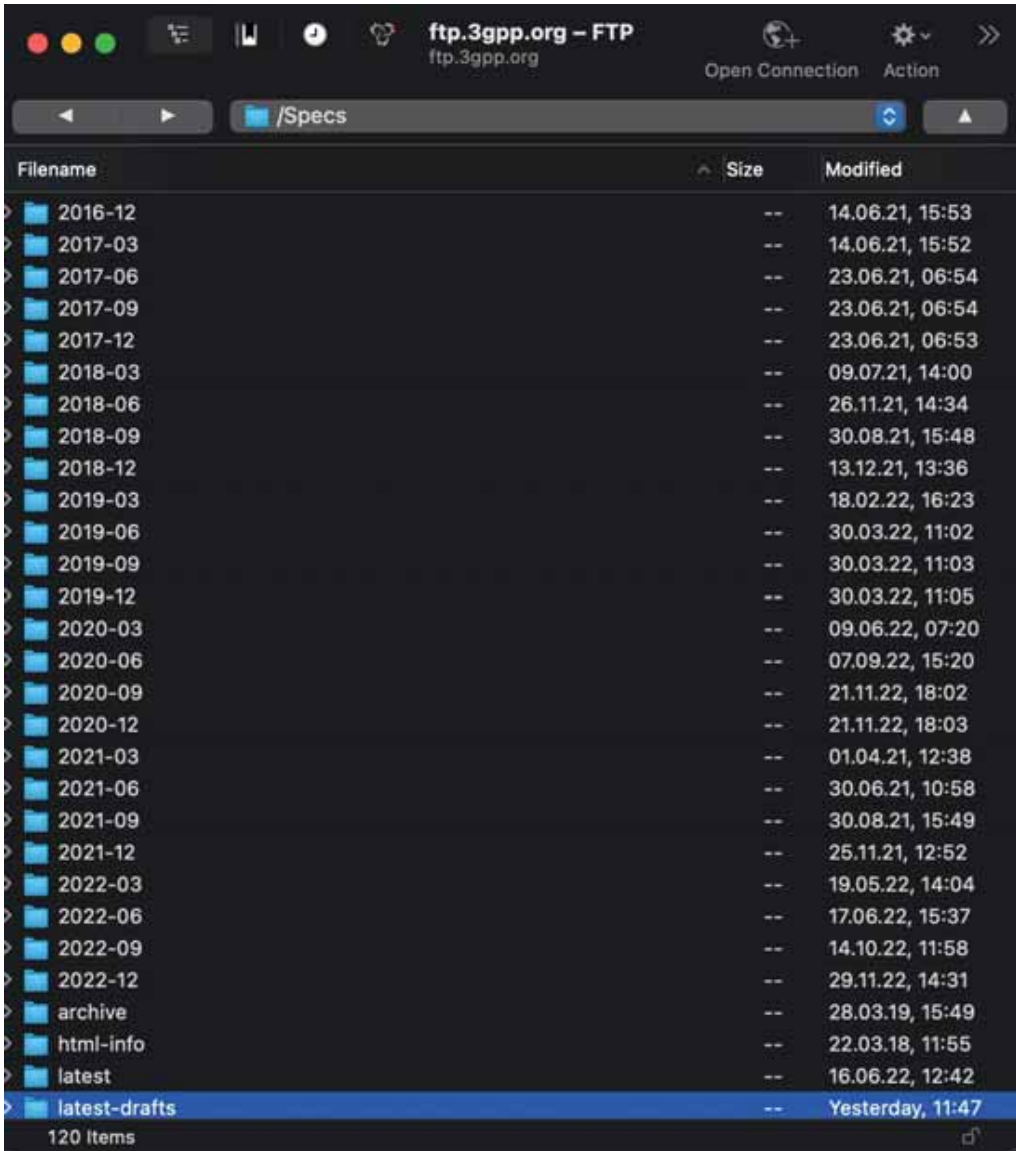
1

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

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46. 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.

47. 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>:



Filename	Size	Modified
2016-12	--	14.06.21, 15:53
2017-03	--	14.06.21, 15:52
2017-06	--	23.06.21, 06:54
2017-09	--	23.06.21, 06:54
2017-12	--	23.06.21, 06:53
2018-03	--	09.07.21, 14:00
2018-06	--	26.11.21, 14:34
2018-09	--	30.08.21, 15:48
2018-12	--	13.12.21, 13:36
2019-03	--	18.02.22, 16:23
2019-06	--	30.03.22, 11:02
2019-09	--	30.03.22, 11:03
2019-12	--	30.03.22, 11:05
2020-03	--	09.06.22, 07:20
2020-06	--	07.09.22, 15:20
2020-09	--	21.11.22, 18:02
2020-12	--	21.11.22, 18:03
2021-03	--	01.04.21, 12:38
2021-06	--	30.06.21, 10:58
2021-09	--	30.08.21, 15:49
2021-12	--	25.11.21, 12:52
2022-03	--	19.05.22, 14:04
2022-06	--	17.06.22, 15:37
2022-09	--	14.10.22, 11:58
2022-12	--	29.11.22, 14:31
archive	--	28.03.19, 15:49
html-info	--	22.03.18, 11:55
latest	--	16.06.22, 12:42
latest-drafts	--	Yesterday, 11:47

48. 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 T-docs at working group and at plenary meetings (as

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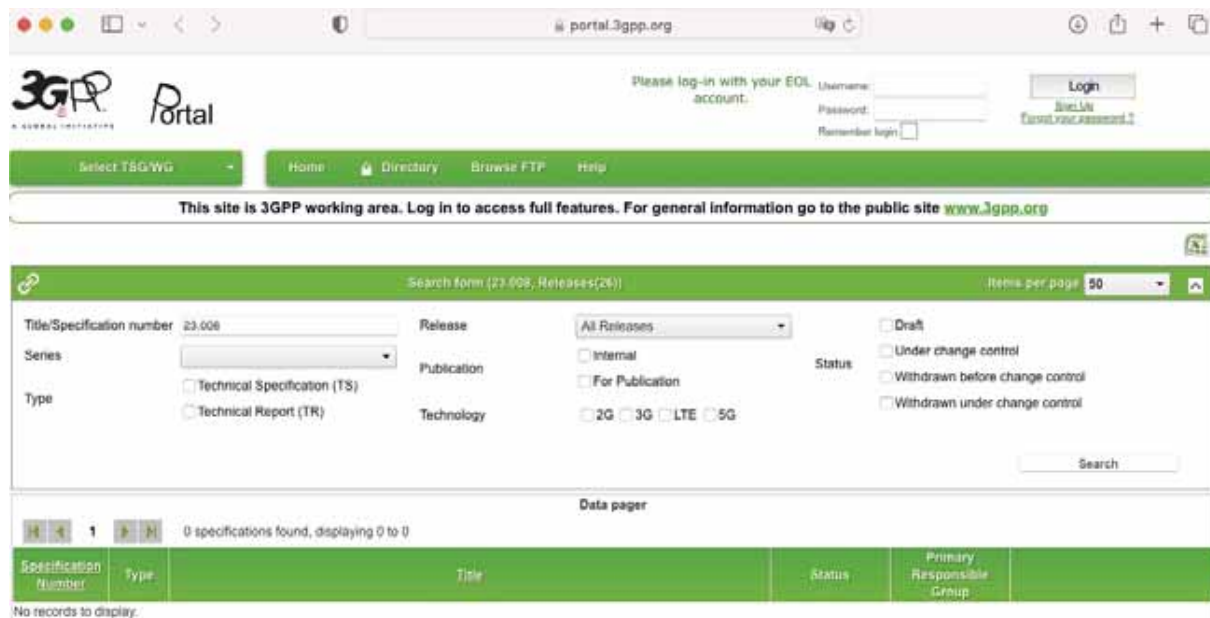
soon as the working group decides to submit the specification to the plenary meeting for information or approval). In many cases, the T-docs are also distributed on the email exploder of the working group prior to the meeting, making the T-docs available to all those subscribed to the email distribution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

49. 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.

50. An additional means of accessing 3GPP documents including T-docs 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

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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/>.

51. 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

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added. 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 documents² providing further details on its way of working:

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

B. Specific Documents

1. TS 36.321 V14.3.0

53. Based on my personal knowledge and my review of 3GPP’s business records, I recognize APPLE-1023 as a true and correct copy of version 14.3.0 of technical specification 3GPP TS 36.321 (“Technical Specification Group Radio

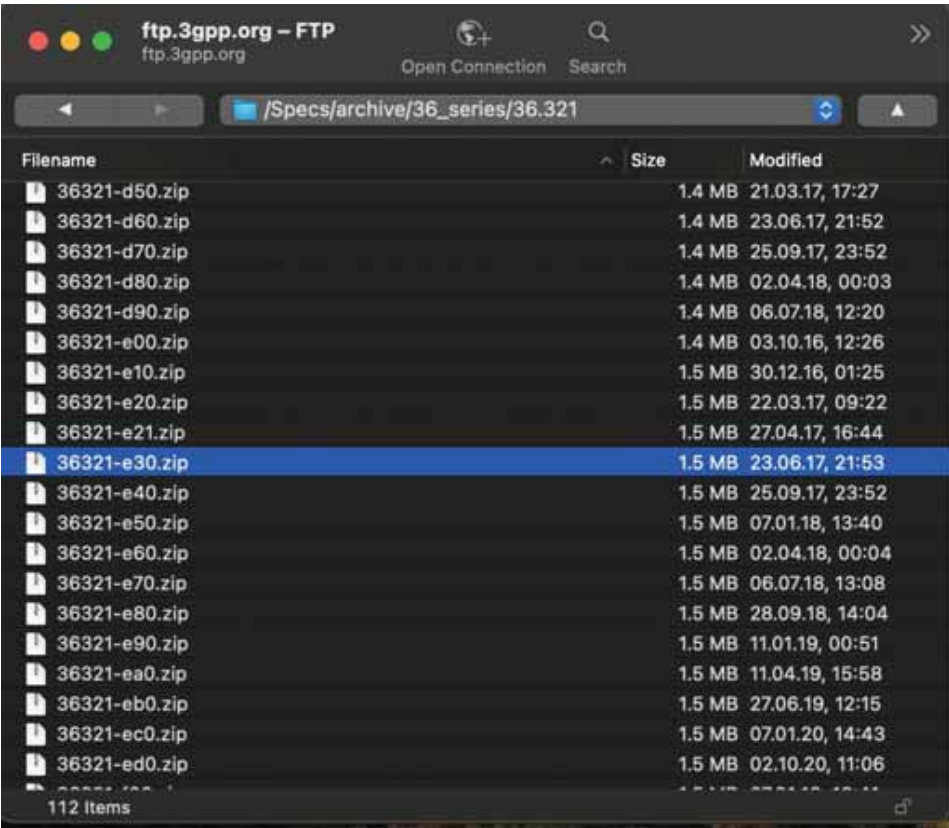
² All available from <https://www.3gpp.org/delegates-corner/3gpp-working-procedures>

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Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 14)”), which shows on its cover page “2017-06” as the year (2017) and month (June) during which this document was released by 3GPP. The document was published and freely available on 3GPP’s ftp server by June 23, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file (“36321-e30.zip”), as maintained by the Internet Archive at

https://web.archive.org/web/20170703035121/http://www.3gpp.org/ftp/Specs/archive/36_series/36.321. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at

https://www.3gpp.org/ftp/Specs/archive/36_series/36.321, as shown by the screen shot below:



54. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of “23. June 2017”, as shown in the screenshot below:

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3GPP TS 36.321 V14.3.0 (2017-06)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 14)




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□

3GPP TS 36.321 V14.3.0 (2017-06)

3

Release 14

Keywords

LMTS, radio

3GPP

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36321-e30.doc

5,2 MB

Information

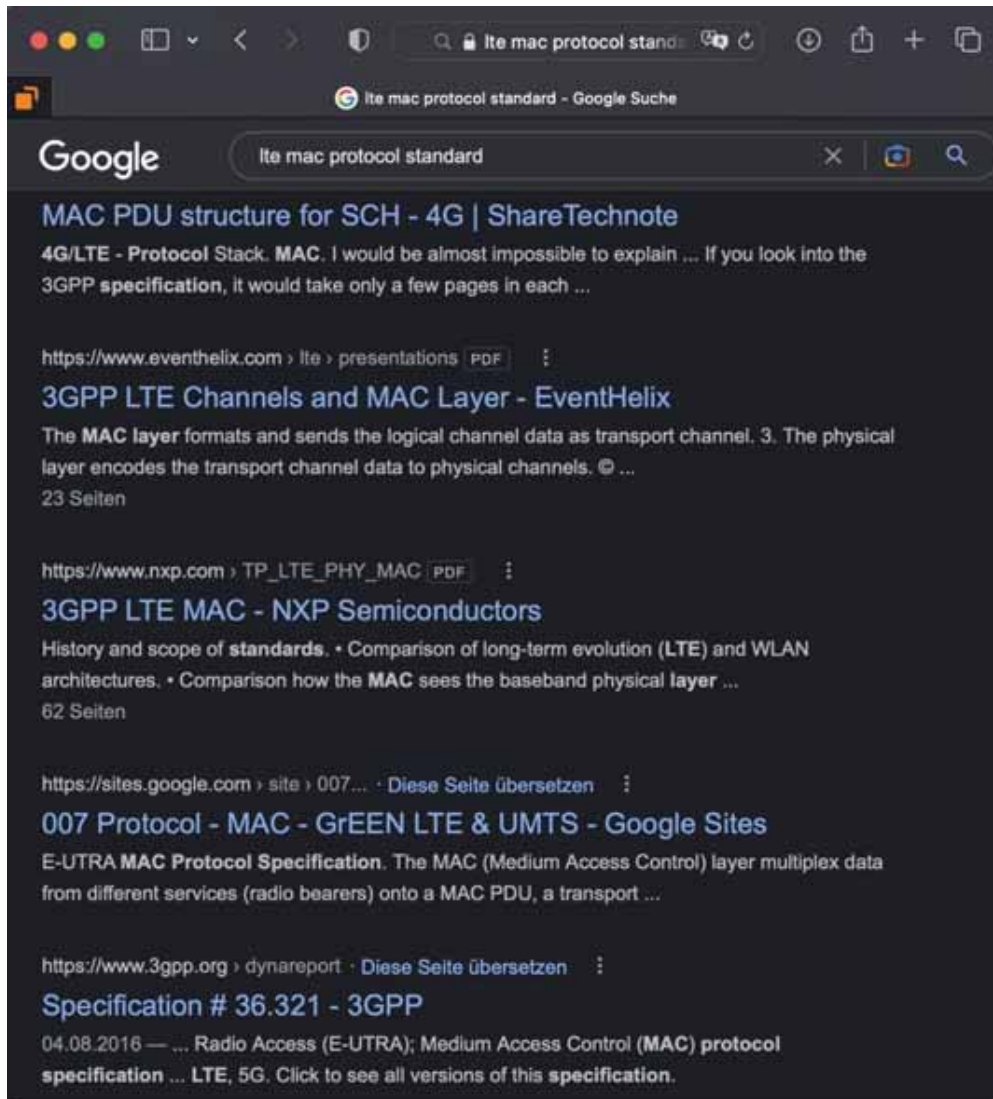
Show Less

Created	Friday, 23. June 2017 at 23:48
Modified	23. June 2017 at 23:48
Last opened	Today, 17:29

55. 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 June 23, 2017, at the latest.

56. Furthermore, the availability of the new RAN2 specification versions which included TS 36.321 v14.3.0 was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on June 24, 2017, as shown in Appendix B. As of today, the 3GPP_TSG_RAN_WG2 email exploder has 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.

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



58. Following the provided search result link “Specification # 36.321 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.321 including version 14.3.0, as shown by the screenshot below:

The screenshot shows the 3GPP Portal website for Specification # 36.321. The page has a navigation bar with tabs: General, Versions, Responsibility, and Related. The 'Versions' tab is selected. The page title is 'Specification #: 36.321'. Below the title, there is a section for 'Release 14 (Spec is UCC for this Release)' with a 'Latest Remark:' link. A table lists the versions of Release 14, with columns: Meetings, Version, Upload date, and Comment. The version 14.3.0 is highlighted in red. Below the table, there is a section for 'Release 13 (Spec is UCC for this Release)' with a 'Latest Remark:' link. An 'Exit' button is located at the bottom left of the page.

Meetings	Version	Upload date	Comment
RAN#89-e	14.13.0	2020-10-02	
RAN#86	14.12.0	2020-01-07	
RAN#84	14.11.0	2019-06-27	
RAN#83	14.10.0	2019-04-11	
RAN#82	14.9.0	2019-01-11	
RAN#81	14.8.0	2018-09-28	
RAN#80	14.7.0	2018-07-06	
RAN#79	14.6.0	2018-04-02	
RAN#78	14.5.0	2018-01-07	
RAN#77	14.4.0	2017-09-25	
RAN#76	14.3.0	2017-06-23	
RAN#75	14.2.1	2017-04-27	
RAN#75	14.2.0	2017-03-22	
RAN#74	14.1.0	2016-12-30	
RAN#73	14.0.0	2016-10-03	

59. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even without prior knowledge of 3GPP to locate any version of TS 36.321, including version 14.3.0, for download.

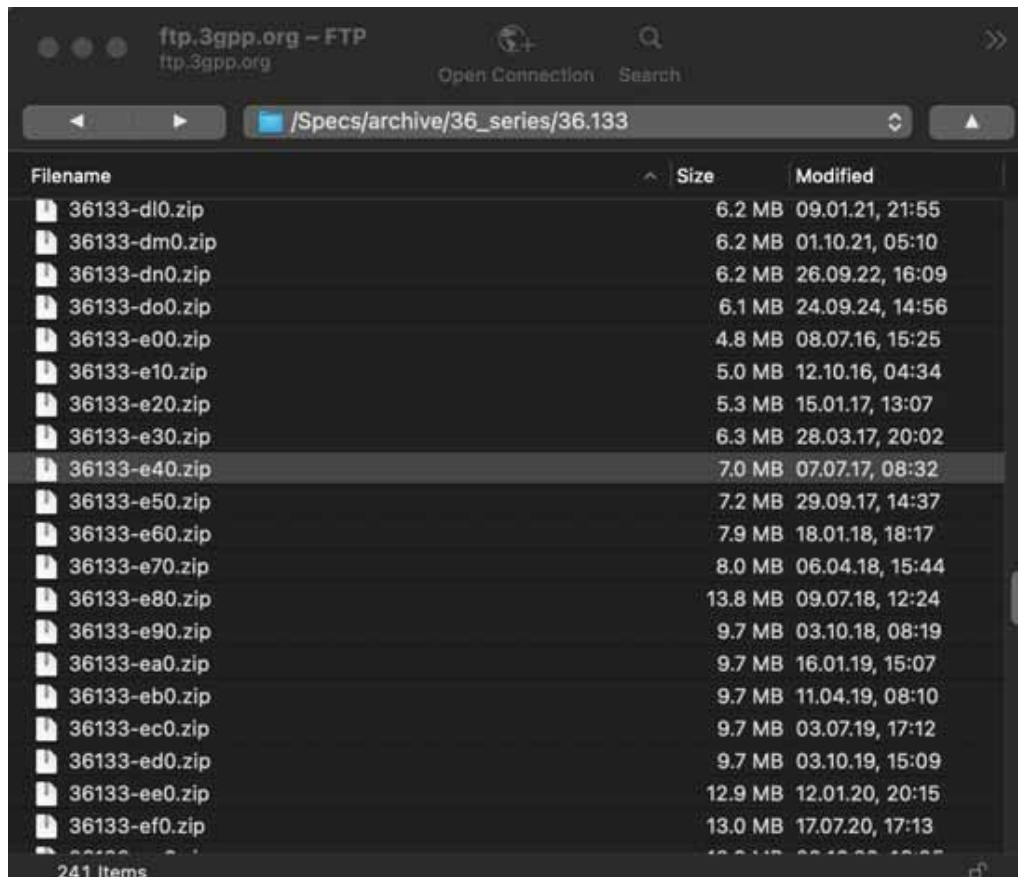
60. The above search was performed at the time of writing this report. According to my personal experience, similar searches done in June 2017 or around that timeframe would have similarly provided the path to download version 14.3.0 of TS 36.321.

2. TS 36.133 V14.4.0

61. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1024 as a true and correct copy of version 14.4.0 of technical specification 3GPP TS 36.133 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management (Release 13)"), which shows on its cover page "2017-06" as the year (2017) and month (June) during which this document was released by 3GPP. The document was published and freely available on 3GPP's ftp server by July 7, 2017, at the latest. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36133-e40.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20181119004549/https://www.3gpp.org/ftp/Specs/2017-06/Rel-14/36_series/. The upload 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/36.133, as shown by the

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screenshot below. This screenshot is from a different folder on the same 3GPP FTP server and shows the upload date as July 7, 2017:



62. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of “7. July 2017”³, as shown in the screenshot below:

³ Most 3GPP specifications consist of one single file but TS 36.133 is a specification which has been split up into five Word documents, all included in 36133-e40.zip.

All five parts included in 36133-e40.zip show the same last Modified date 7. July 2017.

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3GPP TS 36.133 V14.4.0 (2017-06)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Requirements for support of radio resource management
(Release 14)

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Keywords

UMTS, radio

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36133-e40_cover.doc

491 KB

Information [Show Less](#)

Created Friday, 7. July 2017 at 10:16

Modified Friday, 7. July 2017 at 10:16

63. Thus, based on my personal knowledge and experience with ETSI’s and 3GPP’s standard business practices, this information tells me that this document

34

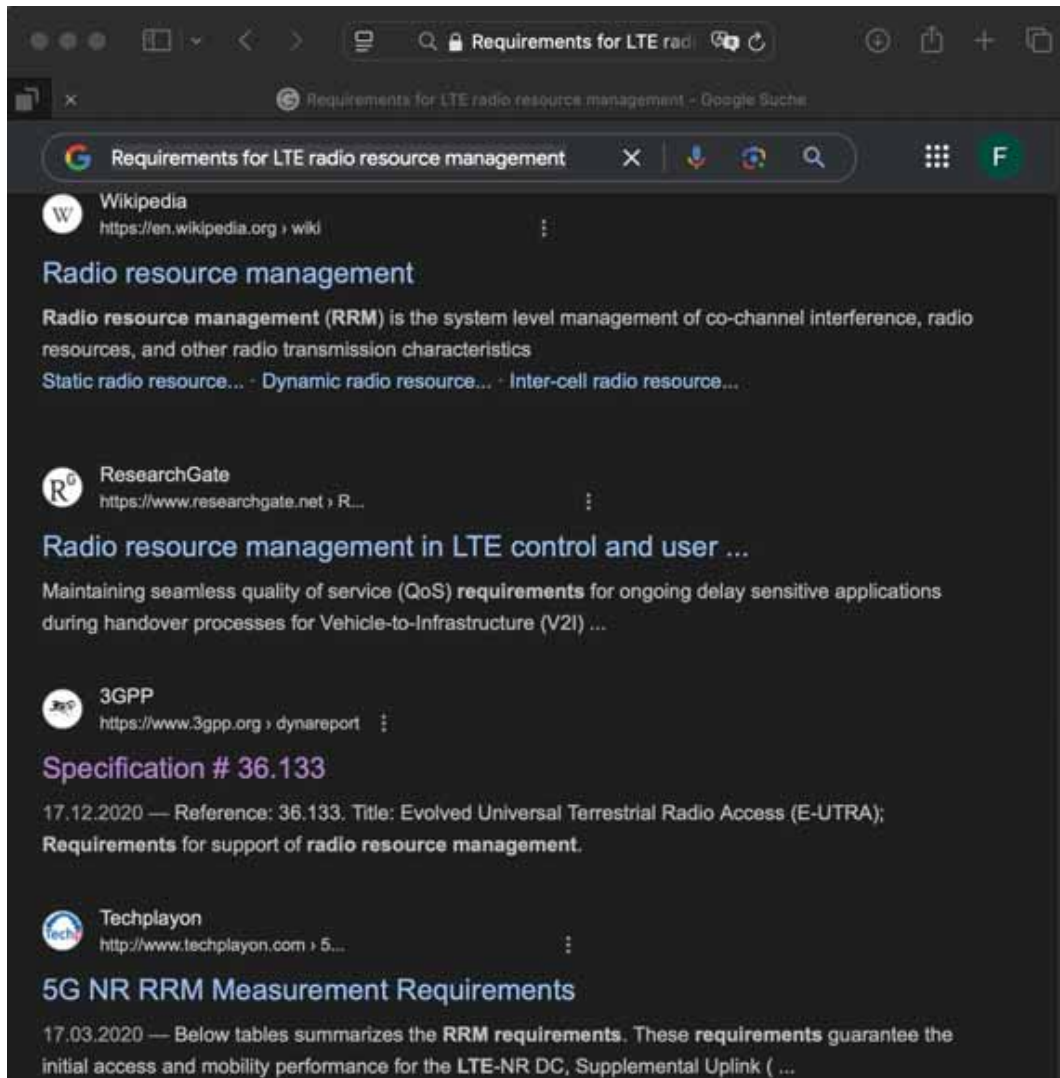
37

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was available to all 3GPP members and the general public by July 7, 2017, at the latest.

64. Furthermore, the availability of the new draft RAN4 specification versions which included TS 36.133 was announced by the RAN WG4 secretary via the public 3GPP_TSG_RAN_WG4 email exploder on July 2, 2017, as shown in Appendix C. As of today, the 3GPP_TSG_RAN_WG4 email exploder has 887 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.

65. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to also easily find the TS for download via internet search. For instance, a Google search for “Requirements for LTE radio resource management” provides the TS number “36.133” as one of the top results as can be seen in the screenshot below:



66. Following the provided search result link “Specification # 36.133 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.133 including version 14.4.0, as shown by the screenshot below:

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The screenshot shows the 3GPP Portal interface for Specification # 36.133. The 'Versions' tab is selected, displaying a list of releases. The table below represents the data shown in the screenshot:

RAN#	Version	Upload date	ETSI	3GPP	CR
RAN#86	14.14.0	2020-01-12	66	ETSI	CR
RAN#85	14.13.0	2019-10-03	66	ETSI	CR
RAN#84	14.12.0	2019-07-03	66	ETSI	CR
RAN#83	14.11.0	2019-04-11	66	ETSI	CR
RAN#82	14.10.0	2019-01-16	66	ETSI	CR
RAN#81	14.9.0	2018-10-03	66	ETSI	CR
RAN#80	14.8.0	2018-07-09	66	ETSI	CR
RAN#79	14.7.0	2018-04-06	66	ETSI	CR
RAN#78	14.6.0	2018-01-18	66	ETSI	CR
RAN#77	14.5.0	2017-09-29	66	ETSI	CR
RAN#76	14.4.0	2017-07-07	66	ETSI	CR
RAN#75	14.3.0	2017-03-28	66	ETSI	CR
RAN#74	14.2.0	2017-01-15	66	ETSI	CR
RAN#73	14.1.0	2016-10-12	66	ETSI	CR
RAN#72	14.0.0	2016-07-08	66	ETSI	CR

Below the main table, there is a section for 'Release 13 (Spec is UCC for this Release)' with a 'Latest Remark:' field. It contains a sub-table with the following data:

Meetings	Version	Upload date	ETSI	3GPP	CR
RAN#105	13.24.0	2024-09-24	66	ETSI	CR
RAN#97-e	13.23.0	2022-09-26	66	ETSI	CR

An 'Exit' button is located at the bottom left of the page.

67. 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 36.133, including version 14.4.0, for download.

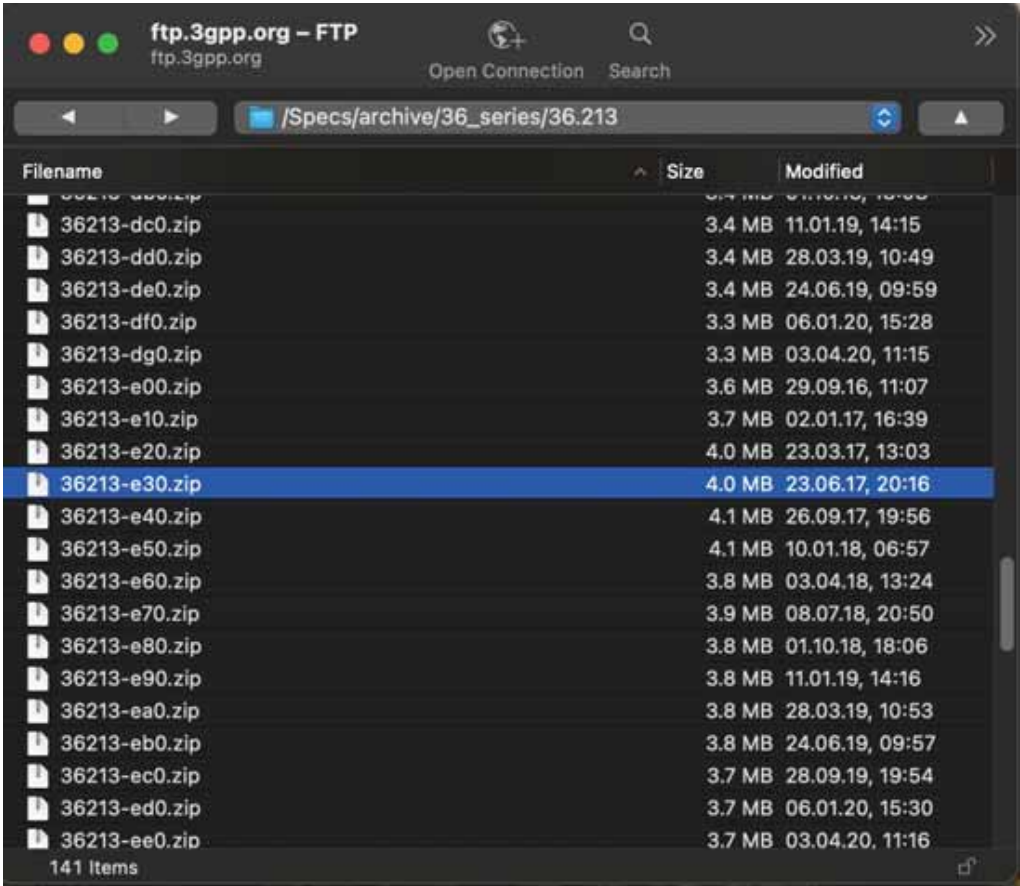
68. The above search was performed at the time of writing this report. According to my personal experience, similar searches done in 2017 or around that timeframe would have similarly provided the path to download version 14.4.0 of TS 36.133.

3. TS 36.213 V14.3.0

69. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1025 as a true and correct copy of version 14.3.0 of technical specification 3GPP TS 36.213 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14)"), which shows on its cover page "2017-06" as the year (2017) and month (June) during which this document was released by 3GPP. The document was published and freely available on 3GPP's ftp server by June 23, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36213-e30.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20170701004804/http://www.3gpp.org:80/ftp/specs/archive/36_series/36.213/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at

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https://www.3gpp.org/ftp/Specs/archive/36_series/36.213, as shown by the screenshot below:



70. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of “20. June 2017”, as shown in the screenshot below:

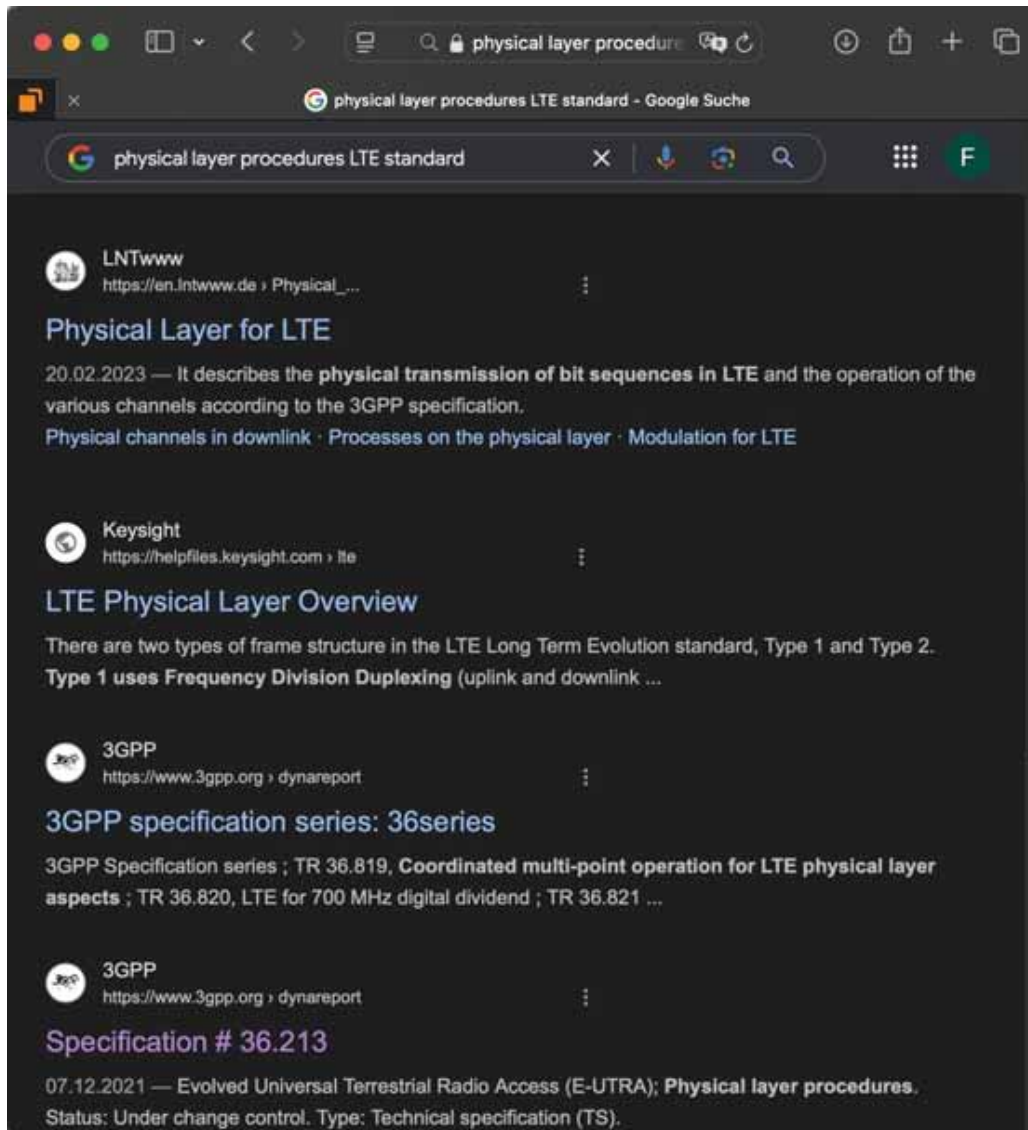
71. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document



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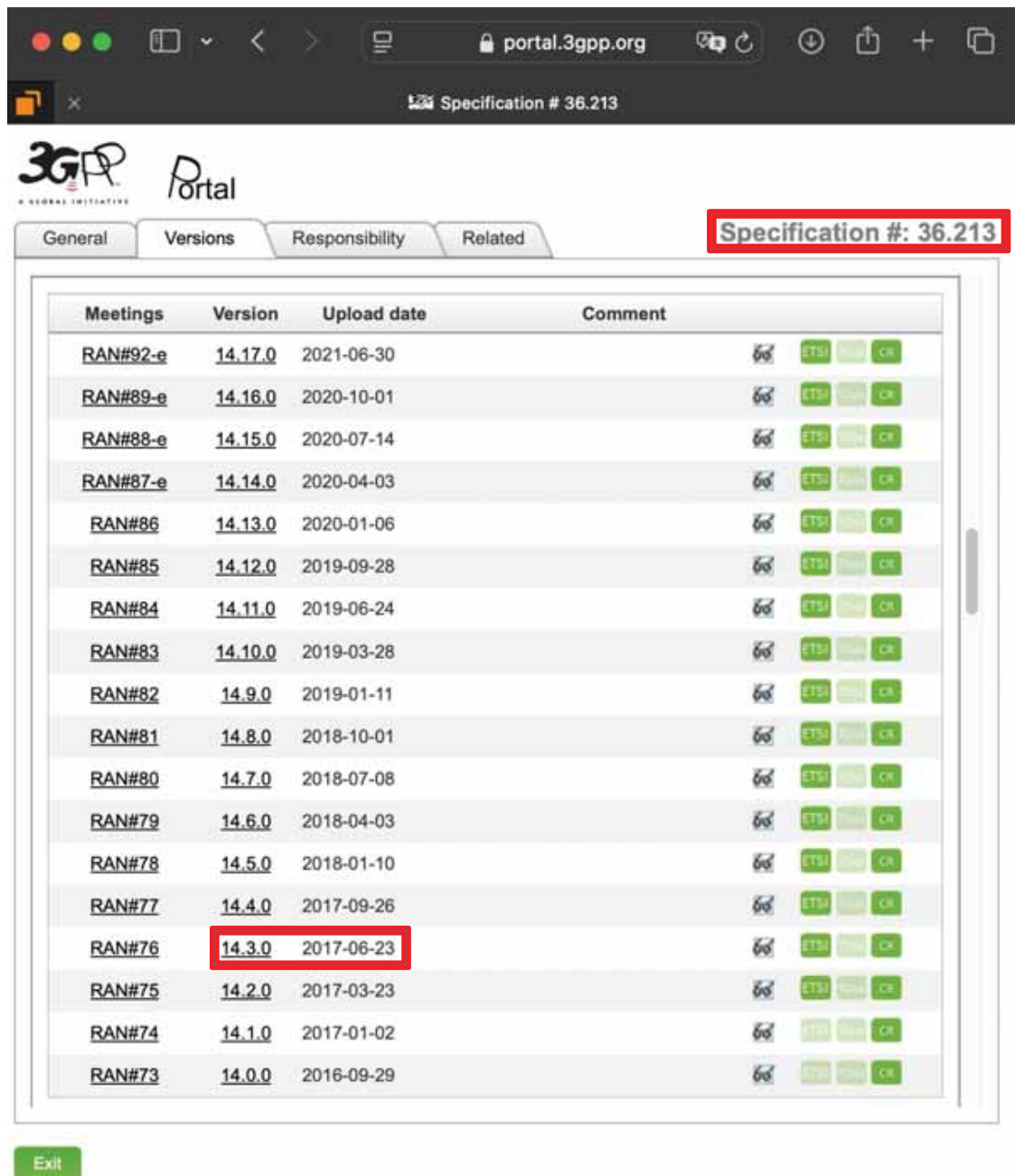
was available to all 3GPP members and the general public by June 23, 2017, at the latest.

72. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for “physical layer procedures LTE standard” provides the TS number “36.213” as one of the top results as can be seen in the screenshot below:



73. Following the provided search result link “Specification # 36.213 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.213 including version 14.3.0, as shown by the screenshot below:

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The screenshot shows the 3GPP Portal interface for Specification # 36.213. The 'Versions' tab is selected, displaying a table of historical versions. The table has four columns: Meetings, Version, Upload date, and Comment. The version 14.3.0 is highlighted with a red box, and its corresponding row is also highlighted. The 'Exit' button is visible at the bottom left.

Meetings	Version	Upload date	Comment
RAN#92-e	14.17.0	2021-06-30	
RAN#89-e	14.16.0	2020-10-01	
RAN#88-e	14.15.0	2020-07-14	
RAN#87-e	14.14.0	2020-04-03	
RAN#86	14.13.0	2020-01-06	
RAN#85	14.12.0	2019-09-28	
RAN#84	14.11.0	2019-06-24	
RAN#83	14.10.0	2019-03-28	
RAN#82	14.9.0	2019-01-11	
RAN#81	14.8.0	2018-10-01	
RAN#80	14.7.0	2018-07-08	
RAN#79	14.6.0	2018-04-03	
RAN#78	14.5.0	2018-01-10	
RAN#77	14.4.0	2017-09-26	
RAN#76	14.3.0	2017-06-23	
RAN#75	14.2.0	2017-03-23	
RAN#74	14.1.0	2017-01-02	
RAN#73	14.0.0	2016-09-29	

74. 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 36.213, including version 14.3.0, for download.

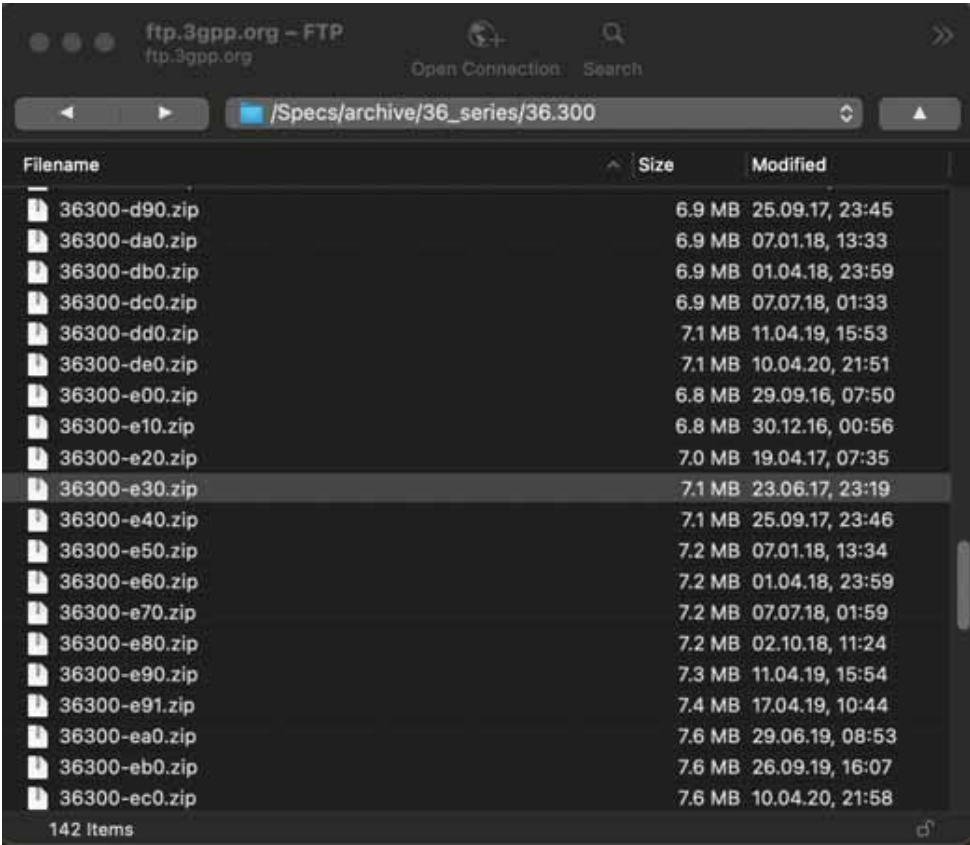
75. The above search was performed at the time of writing this report. According to my personal experience, similar searches done in June 2017 or around that timeframe would have similarly provided the path to download version 14.3.0 of TS 36.213.

4. **TS 36.300 V14.3.0**

76. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1026 as a true and correct copy of version 14.3.0 of technical specification 3GPP TS 36.300 ("Technical Specification Group (TSG) Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 14)"), which shows on its cover page "2017-06" as the year (2017) and month (June) during which this document was approved by 3GPP. Shortly after its approval, the document was published and freely available on 3GPP's ftp server by June 23, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36300-e30.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20170817123823/http://www.3gpp.org:80/ftp/Specs/archive/36_series/36.300, as well as the date stamp for the present-day listing of the same document on the 3GPP ftp server at

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https://www.3gpp.org/ftp/Specs/archive/36_series/36.300 as shown by the screen shot below:



77. In addition, the information for the downloaded and extracted specification file states a last Modified date of “24. June 2017⁴.” Here is a screen shot showing those file details:

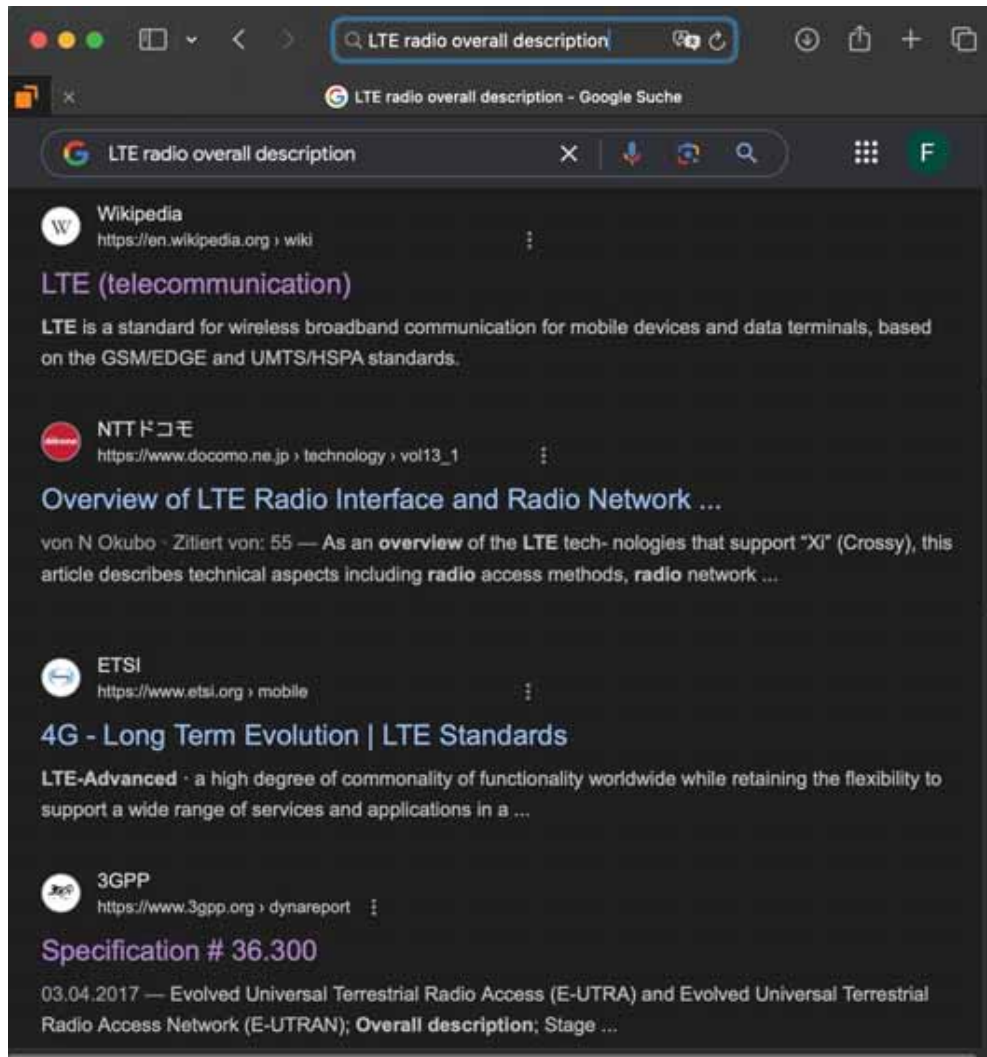
⁴ The Modified date of 24. June 2017 is shown as being later than the upload date June 23, 2017. This is likely because the last file modification was performed on a PC running on a different time zone than the ETSI FTP server (e.g. CEST is two hours ahead of UTC).

78. 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 June 23, 2017, at the latest.

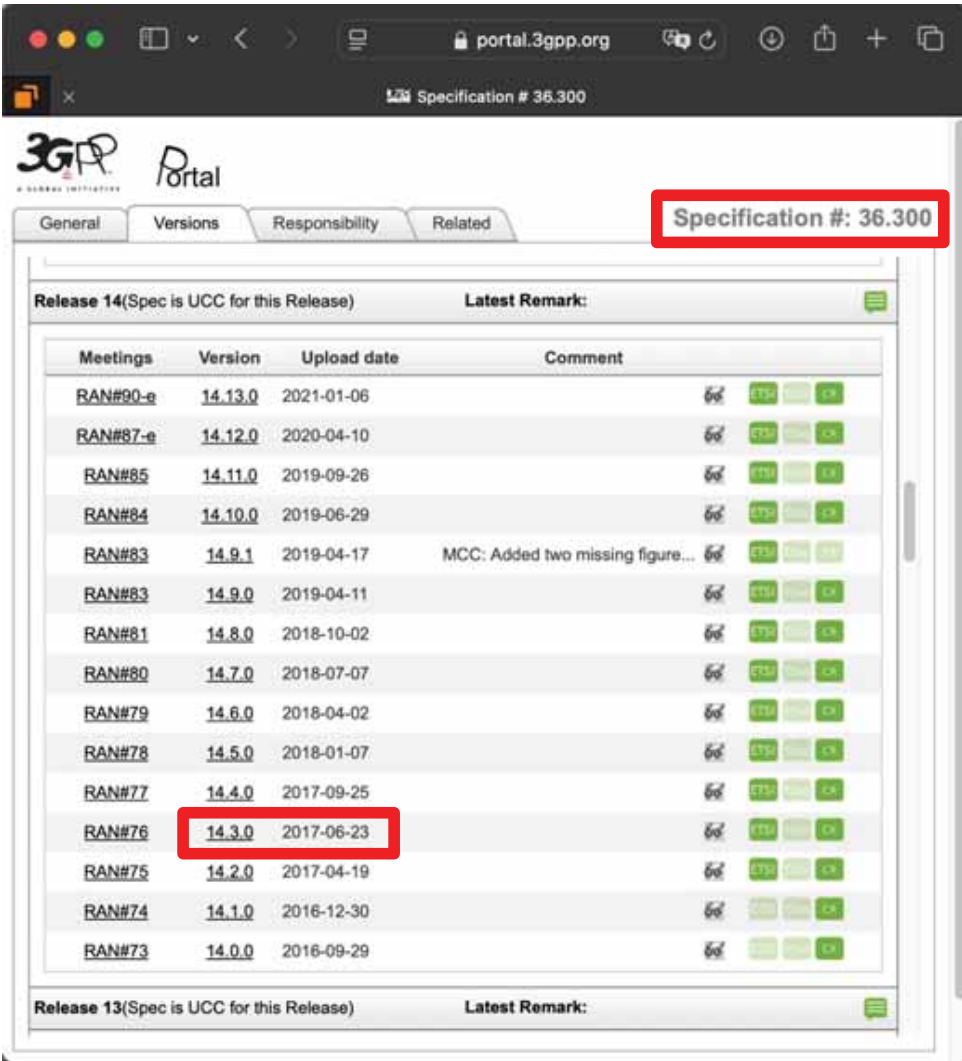
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79. Furthermore, the availability of the new RAN2 specification versions which included TS 36.300 v14.3.0 was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on June 24, 2017, as shown in Appendix B. As of today, the 3GPP_TSG_RAN_WG2 email exploder has 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.

80. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for “LTE radio overall description” provides the TS number “36.300” as one of the top results as can be seen in the screenshot below:



81. Following the provided search result link “Specification # 36.300 – 3GPP” leads to a 3GPP web page offering under the tab “General” a link “Click to see all versions of this specification” which leads to a page offering all versions of TS 36.300 including version 14.3.0, as shown by the screenshots below:



82. The above example searches illustrate 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 36.300, including version 14.3.0, for download.

83. The above searches were performed at the time of writing this report. According to my personal experience, similar searches done in June 2017 or

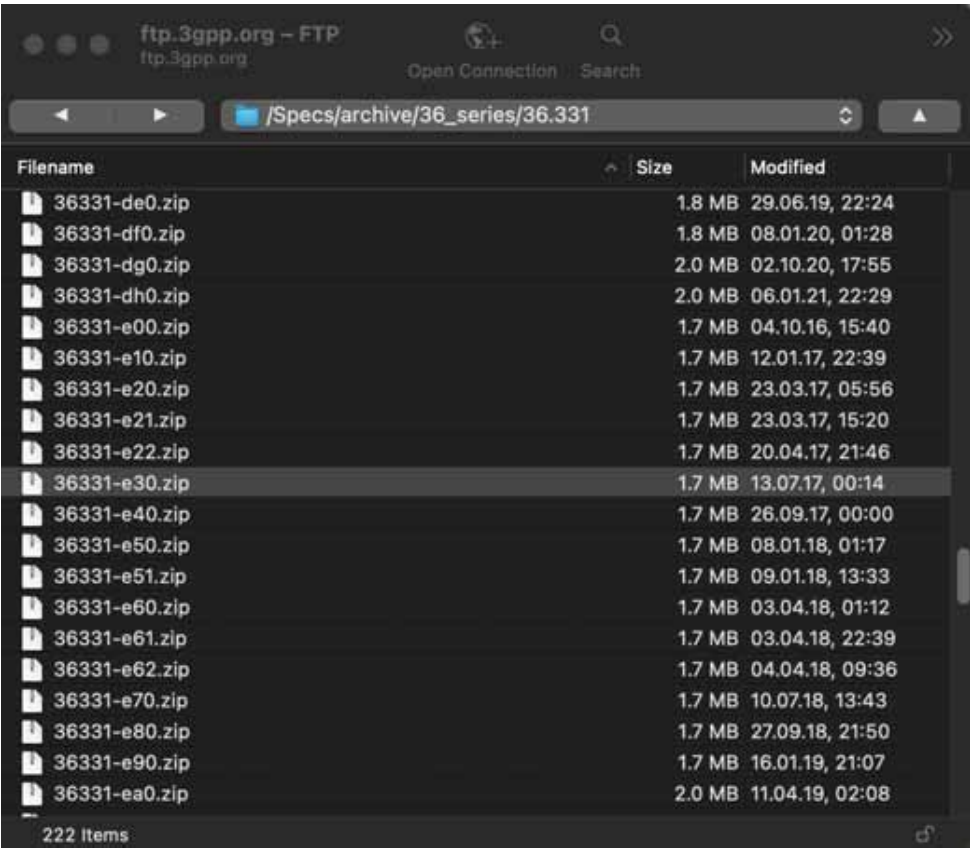
around that timeframe would have similarly provided the path to download version 14.3.0 of TS 36.300.

5. TS 36.331 V14.3.0

84. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1027 as a true and correct copy of version 14.3.0 of technical specification 3GPP TS 36.331 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 14)"), which shows on its cover page "2017-06" as the year (2017) and month (June) during which this document was released by 3GPP. The document was published and freely available on 3GPP's ftp server by July 13, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36331-e30.zip"), as maintained by the Internet Archive at

https://web.archive.org/web/20170802053950/http://www.3gpp.org:80/ftp/Specs/archive/36_series/36.331/. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at

https://www.3gpp.org/ftp/Specs/archive/36_series/36.331, as shown by the screen shot below:



Filename	Size	Modified
36331-de0.zip	1.8 MB	29.06.19, 22:24
36331-df0.zip	1.8 MB	08.01.20, 01:28
36331-dg0.zip	2.0 MB	02.10.20, 17:55
36331-dh0.zip	2.0 MB	06.01.21, 22:29
36331-e00.zip	1.7 MB	04.10.16, 15:40
36331-e10.zip	1.7 MB	12.01.17, 22:39
36331-e20.zip	1.7 MB	23.03.17, 05:56
36331-e21.zip	1.7 MB	23.03.17, 15:20
36331-e22.zip	1.7 MB	20.04.17, 21:46
36331-e30.zip	1.7 MB	13.07.17, 00:14
36331-e40.zip	1.7 MB	26.09.17, 00:00
36331-e50.zip	1.7 MB	08.01.18, 01:17
36331-e51.zip	1.7 MB	09.01.18, 13:33
36331-e60.zip	1.7 MB	03.04.18, 01:12
36331-e61.zip	1.7 MB	03.04.18, 22:39
36331-e62.zip	1.7 MB	04.04.18, 09:36
36331-e70.zip	1.7 MB	10.07.18, 13:43
36331-e80.zip	1.7 MB	27.09.18, 21:50
36331-e90.zip	1.7 MB	16.01.19, 21:07
36331-ea0.zip	2.0 MB	11.04.19, 02:08

85. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of “13. July 2017”, as shown in the screen shot below:

Page 1

3GPP TS 36.331 V14.3.0 (2017-06)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Radio Resource Control (RRC);
Protocol specification
(Release 14)



The present document has been developed within the 3rd Generation Partnership Project (3GPPTM) and may be further enhanced for the purposes of 3GPP.
The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented.
This Specification is provided for future development and, unless 3GPP says, The Organizational Partners accept no liability for any use of this Specification.
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3GPP TS 36.331 V14.3.0 (2017-06)

337

Release 14

Keywords

UMTS, radio

3GPP

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Contents

36331-e30.doc

9,6 MB

Information [Show Less](#)

Created

13. July 2017 at 02:09

Modified

13. July 2017 at 02:09

86. Thus, based on my personal knowledge and experience with ETSI’s and 3GPP’s standard business practices, this information tells me that this document

52

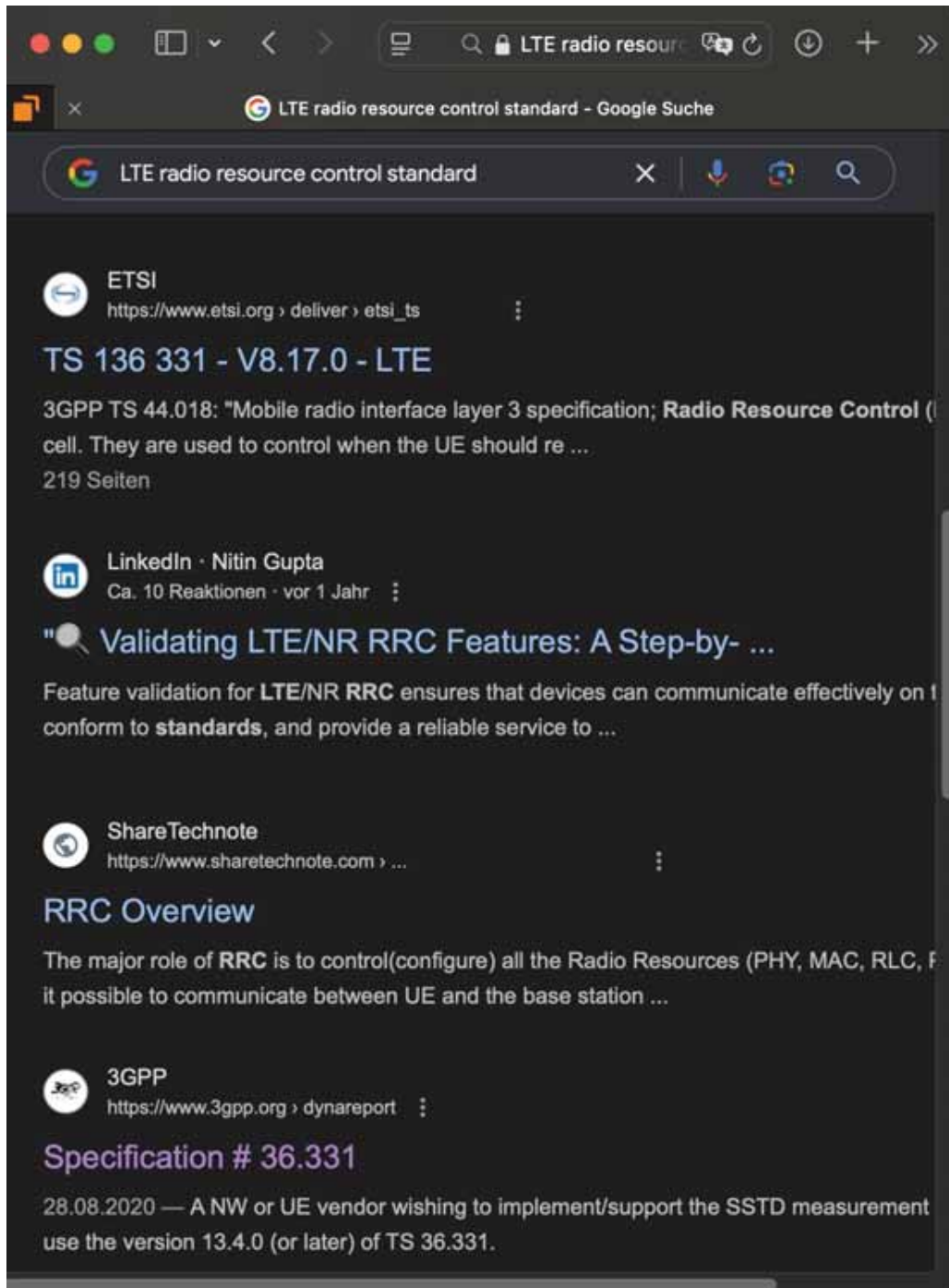
55

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was available to all 3GPP members and the general public by July 13, 2017, at the latest.

87. Furthermore, the availability of the new RAN2 specification versions which included TS 36.331 v14.3.0 was announced by the RAN WG2 secretary via the public 3GPP_TSG_RAN_WG2 email exploder on July 13, 2017, as shown in Appendix D. As of today, the 3GPP_TSG_RAN_WG2 email exploder has 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.

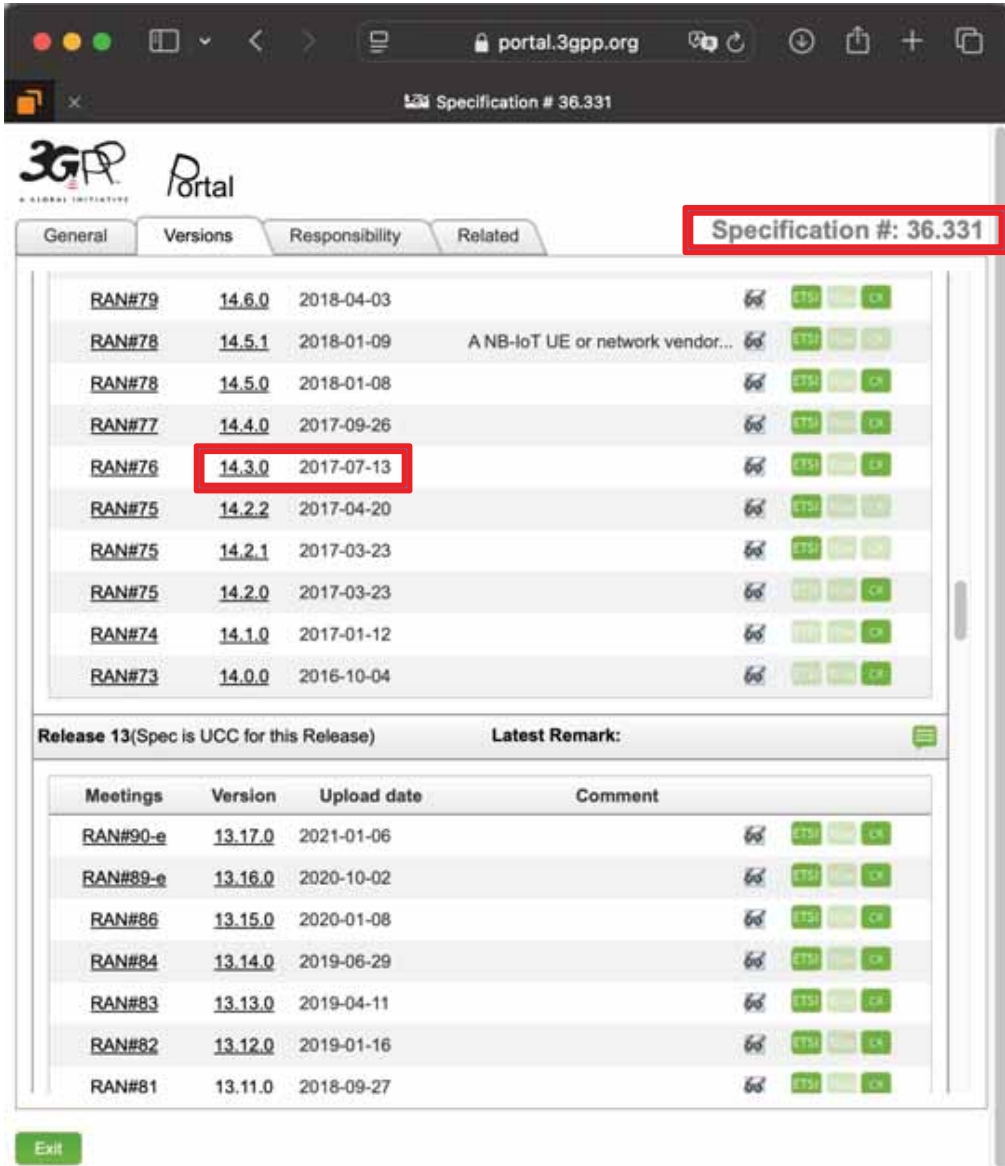
88. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for “LTE radio resource control standard” provides the TS number “36.331” as one of the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



89. Following the provided search result link “Specification # 36.331 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links

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to all versions of TS 36.331 including version 14.3.0, as shown by the screenshot below:



90. 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

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without prior knowledge of 3GPP to locate any version of TS 36.331, including version 14.3.0, for download.

91. The above search was performed at the time of writing this report. According to my personal experience, similar searches done in July 2017 or around that timeframe would have similarly provided the path to download version 14.3.0 of TS 36.331.

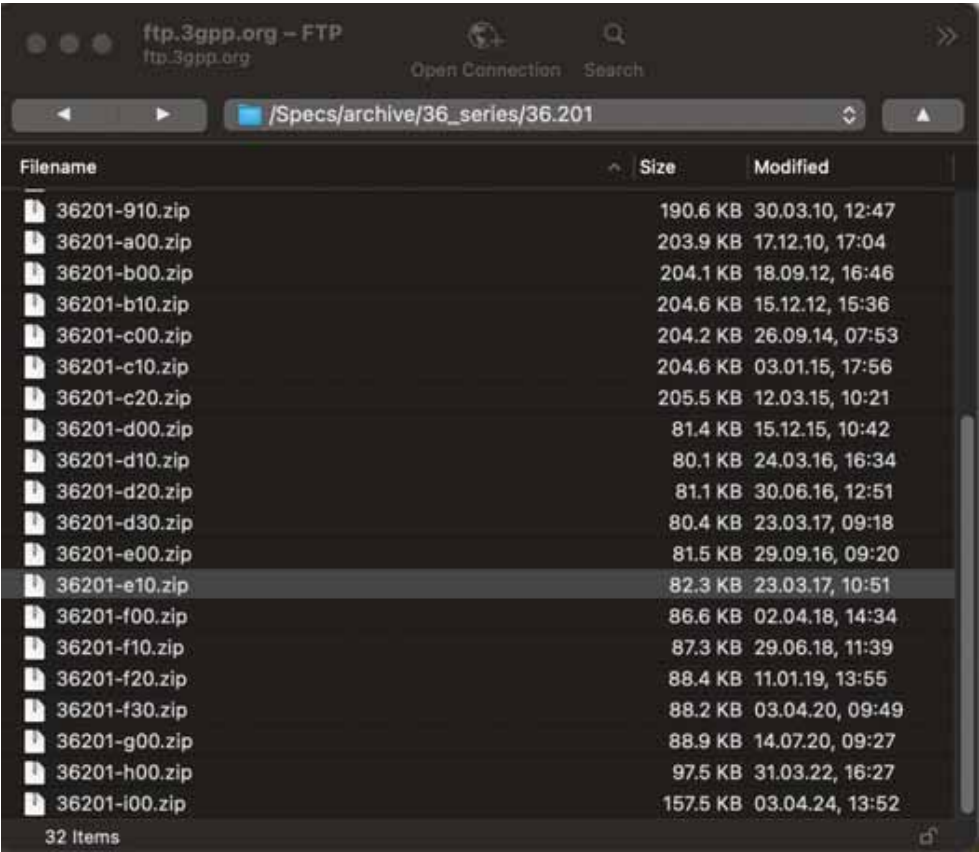
6. TS 36.201 V14.1.0

92. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1028 as a true and correct copy of version 14.1.0 of technical specification 3GPP TS 36.201 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); LTE physical layer (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. The document was published and freely available on 3GPP's ftp server by March 23, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36201-e10.zip"), as maintained by the Internet Archive at

https://web.archive.org/web/20171103153312/http://www.3gpp.org/ftp/specs/archive/36_series/36.201/. This information is also shown on the date stamp for the

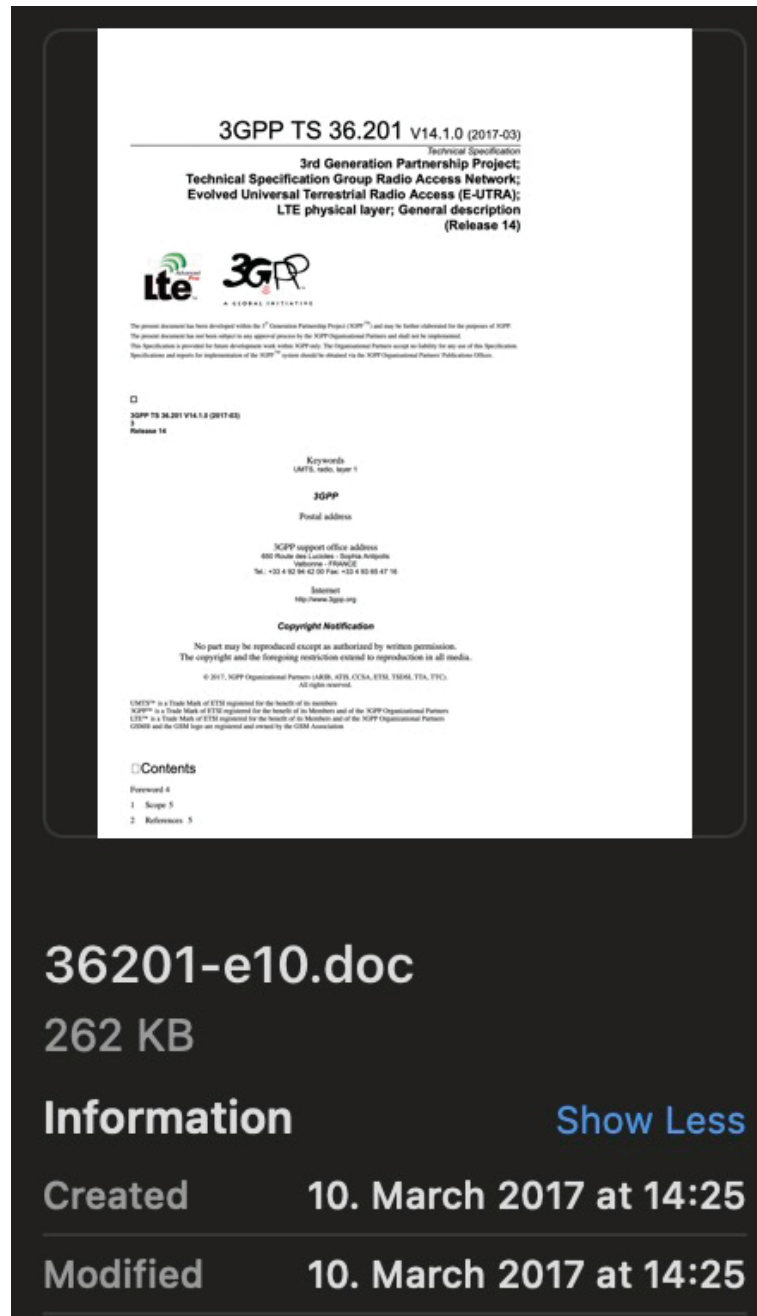
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present-day listing of the same document on the 3GPP ftp server at https://www.3gpp.org/ftp/Specs/archive/36_series/36.201, as shown by the screen shot below:



93. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of “10. March 2017”, as shown in the screenshot below:

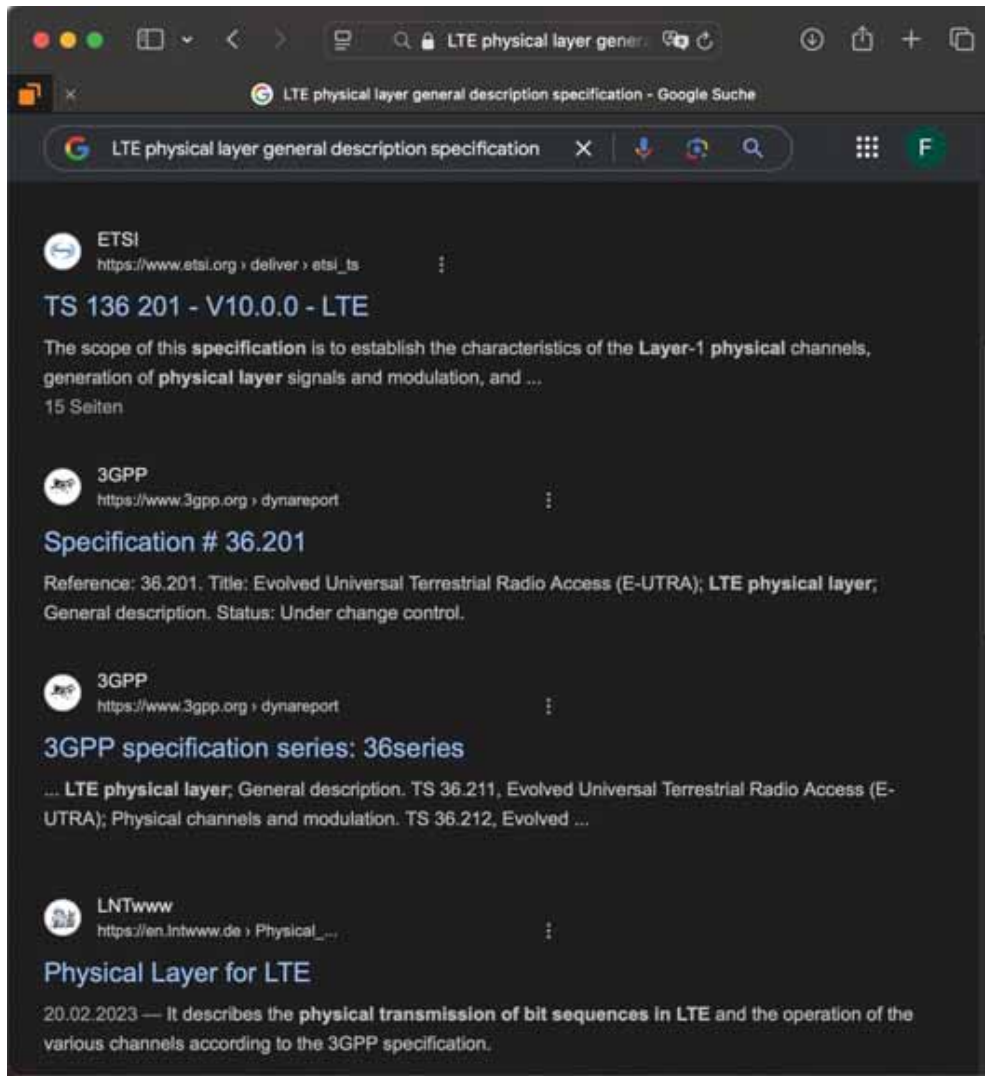
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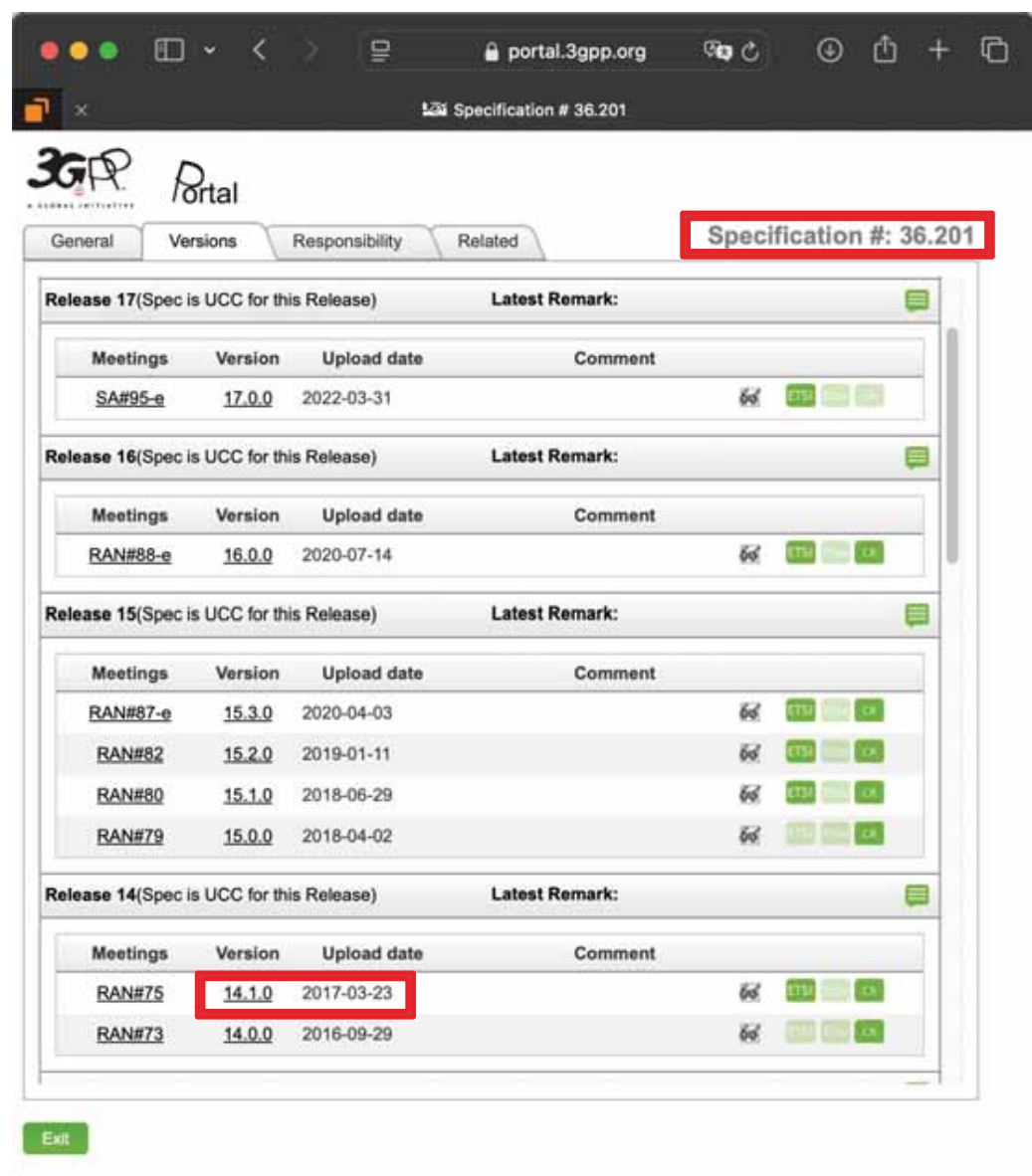
94. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that this document was available to all 3GPP members and the general public by March 23, 2017, at the latest.

95. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for "LTE physical layer general description specification" provides the TS number "36.201" as one of the top results as can be seen in the screenshot below:



96. Following the provided search result link “Specification # 36.201 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.321 including version 14.1.0, as shown by the screenshot below:

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97. 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 36.201, including version 14.1.0, for download.

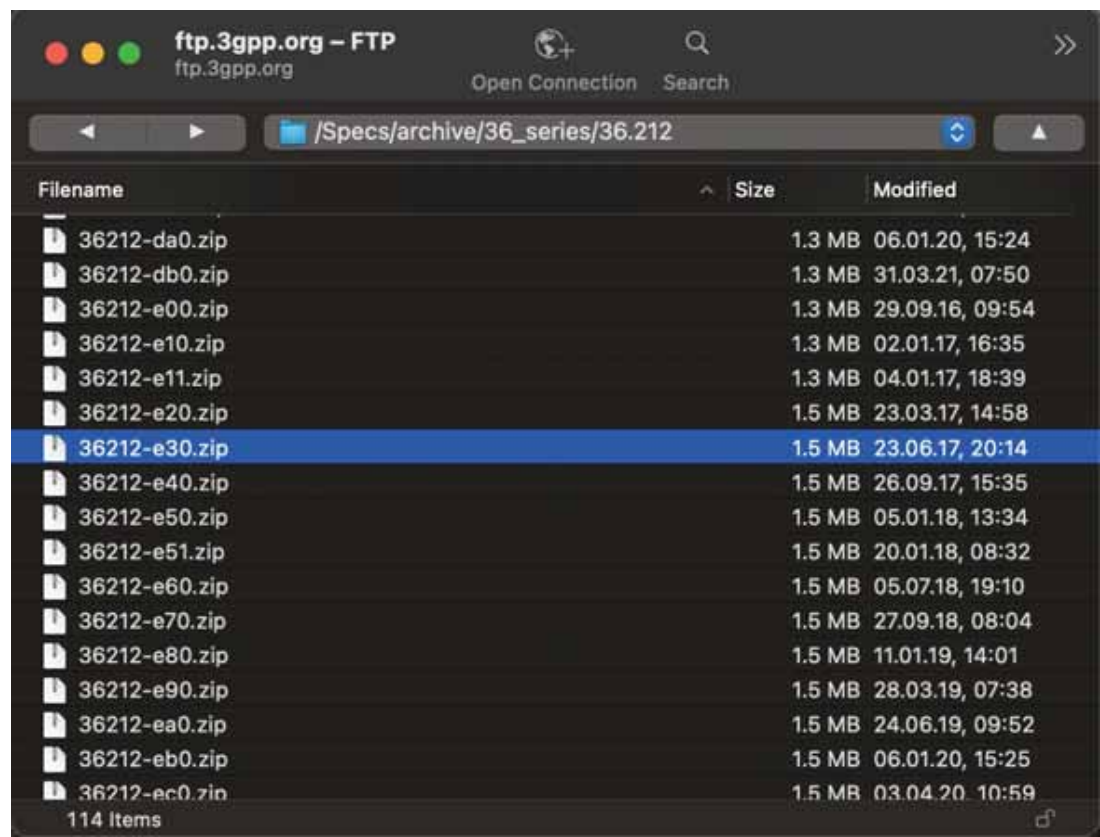
98. The above search was performed at the time of writing this report. According to my personal experience, similar searches done in March 2017 or around that timeframe would have similarly provided the path to download version 14.1.0 of TS 36.201.

7. TS 36.212 V14.3.0

99. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1029 as a true and correct copy of version 14.3.0 of technical specification 3GPP TS 36.212 ("Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (Release 14)"), which shows on its cover page "2017-06" as the year (2017) and month (June) during which this document was released by 3GPP. The document was published and freely available on 3GPP's ftp server by June 23, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36212-e30.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20170703035257/http://www.3gpp.org:80/ftp/Specs/archive/36_series/36.212. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at

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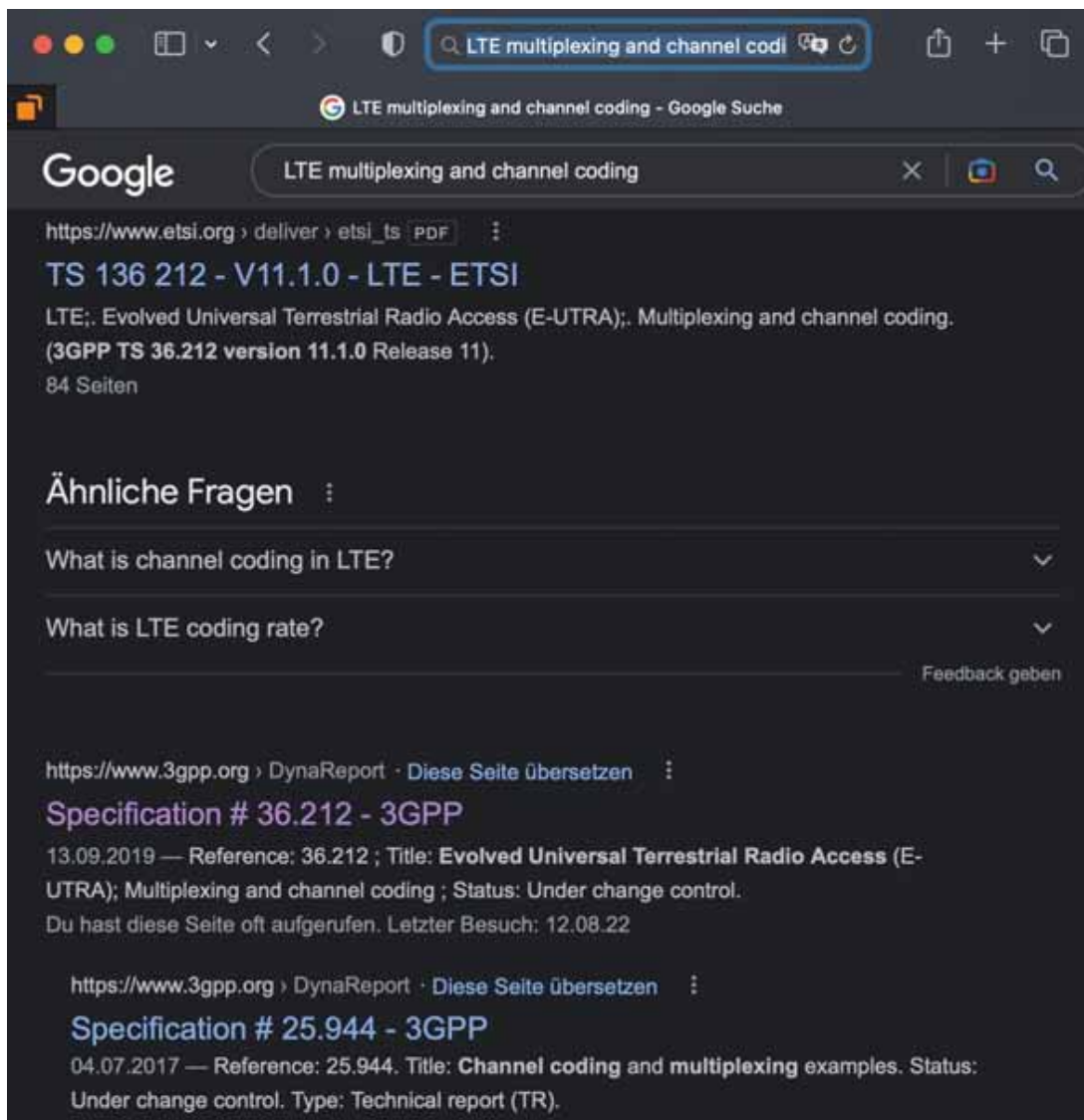
https://www.3gpp.org/ftp/Specs/archive/36_series/36.212, as shown by the screen shot below:



100. In addition, metadata information for the downloaded and extracted specification file states a last Modified date of “20. June 2017”, as shown in the screenshot below:

The image shows a document viewer interface. The top section displays a document titled "3GPP TS 36.212 V14.3.0 (2017-06)". The document content includes the title "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (Release 14)", logos for "lte" and "3GPP A GLOBAL INITIATIVE", a copyright notice, and a table of contents. Below the document preview, a dark blue box contains the filename "36212-e30.doc", the size "6,5 MB", and the creation/modification date "20. June 2017 at 15:09". A "Show Less" link is also visible.

102. I believe that a person without prior knowledge of 3GPP and/or the technical specification (TS) number would have been able to easily find the TS for download via internet search. For instance, a Google search for “LTE multiplexing and channel coding” provides the TS number “36.212” as one of the top results as can be seen in the screenshot below:



103. Following the provided search result link “Specification # 36.212 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.212 including version 14.3.0, as shown by the screenshot below:

portal.3gpp.org

Specification # 36.212

3GPP Portal

General Versions Responsibility Related

Specification #: 36.212

Release 14(Spec is UCC for this Release) Latest Remark:

Meetings	Version	Upload date	Comment
RAN#92-e	14.16.0	2021-06-30	
RAN#91-e	14.15.0	2021-03-31	
RAN#89-e	14.14.0	2020-10-01	
RAN#88-e	14.13.0	2020-07-14	
RAN#87-e	14.12.0	2020-04-03	
RAN#86	14.11.0	2020-01-06	
RAN#84	14.10.0	2019-06-24	
RAN#83	14.9.0	2019-03-28	
RAN#82	14.8.0	2019-01-11	
RAN#81	14.7.0	2018-09-27	
RAN#80	14.6.0	2018-07-05	
RAN#78	14.5.1	2018-01-20	Clean-up fixing indent issues
RAN#78	14.5.0	2018-01-05	
RAN#77	14.4.0	2017-09-26	
RAN#76	14.3.0	2017-06-23	
RAN#75	14.2.0	2017-03-23	
RAN#74	14.1.1	2017-01-04	MCC clean-up to correct corru...

Exit

104. 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 36.212, including version 14.3.0, for download.

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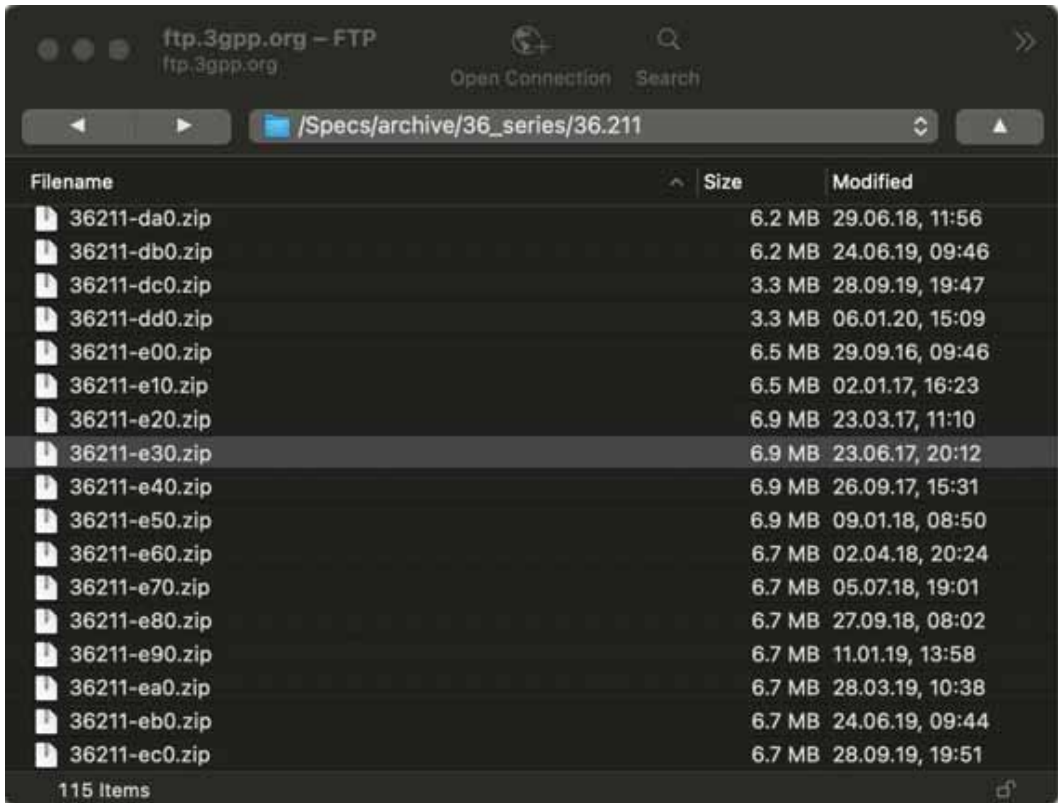
105. The above search was performed at the time of writing this report. According to my personal experience, similar searches done in 2017 or around that timeframe would have similarly provided the path to download version 14.3.0 of TS 36.212.

8. TS 36.211 V14.3.0

106. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1035 as a true and correct copy of version 14.3.0 of technical specification 3GPP TS 36.211 ("3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 14)"), which shows on its cover page "2017-06" as the year (2017) and month (June) during which this document was released by 3GPP.

107. The document was published and freely available on 3GPP's ftp server by June 23, 2017. This is confirmed by the date stamp shown on the historic 3GPP ftp server for the corresponding downloadable file ("36211-e30.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20170703035425/http://www.3gpp.org:80/ftp/Specs/archive/36_series/36.211. This information is also shown on the date stamp for the present-day listing of the same document on the 3GPP ftp server at

https://www.3gpp.org/ftp/Specs/archive/36_series/36.211, as shown by the screenshot below:



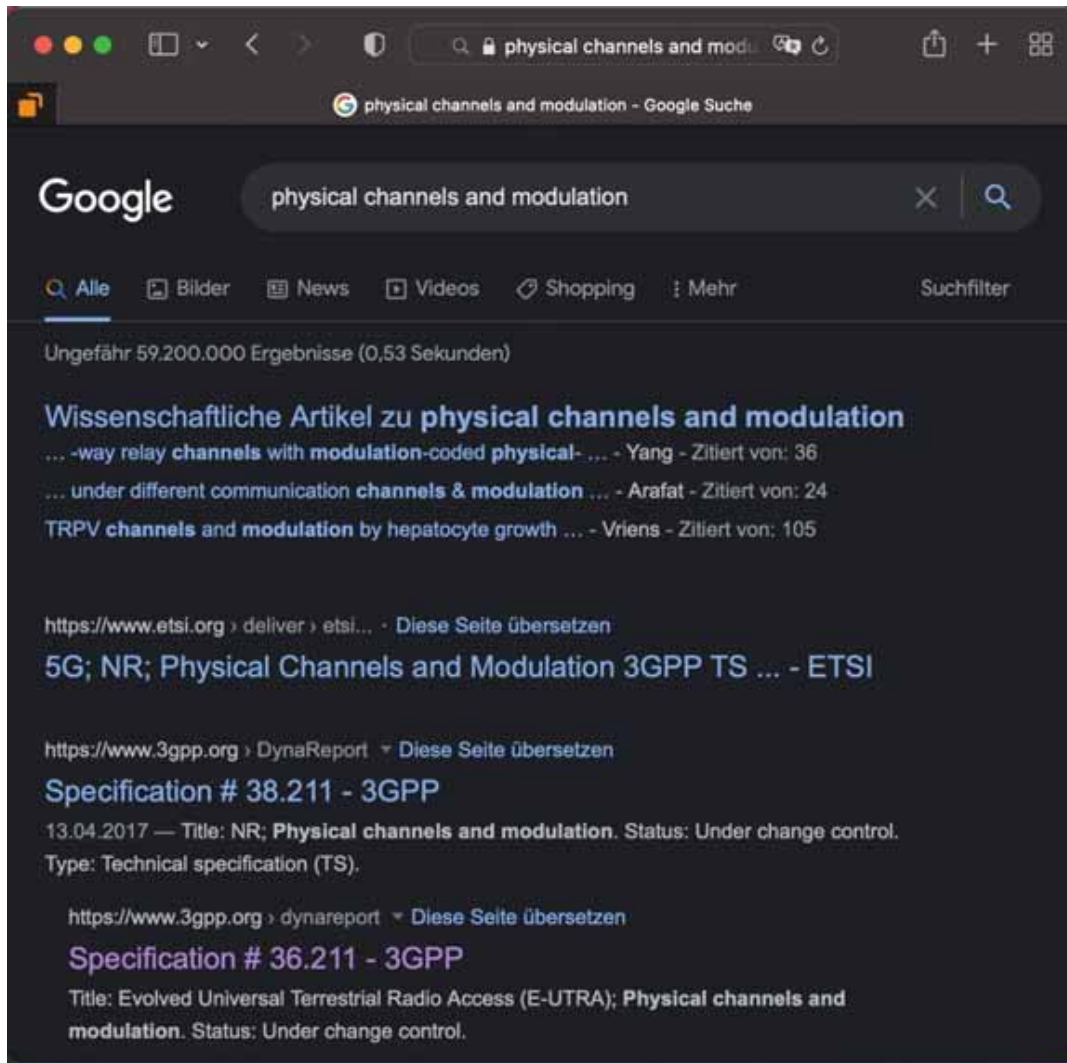
108. In addition, metadata information for the downloaded and extracted specification files states a last Modified dates of “20. June 2017”, as shown in the screenshot below:

The image shows a document cover page for 3GPP TS 36.211 V14.3.0 (2017-06). The page is titled "3GPP TS 36.211 V14.3.0 (2017-06)" and "Technical Specification". It is part of the "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 14)". The logos for "lte" and "3GPP" are visible. The document is 96 KB and was created and modified on 20. June 2017 at 12:11. The document is titled "36211-e30_cover.doc". The page also includes a "Contents" section with a table of contents for the document.

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110. 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 June 23, 2017, at the latest.

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



112. Following the provided search result link “Specification # 36.211 – 3GPP” leads to a 3GPP web page offering under the tab “Versions” download links to all versions of TS 36.211 including version 14.3.0, as shown by the screenshot below:

portal.3gpp.org

Specification # 36.211

3GPP Portal

General Versions Responsibility Related

Specification #: 36.211

Release 14(Spec is UCC for this Release) Latest Remark:

Meetings	Version	Upload date	Comment
RAN#88-e	14.15.0	2020-07-14	
RAN#87-e	14.14.0	2020-04-03	
RAN#86	14.13.1	2020-01-15	MCC clean-up to fix clause nu...
RAN#86	14.13.0	2020-01-06	
RAN#85	14.12.0	2019-09-28	
RAN#84	14.11.0	2019-06-24	
RAN#83	14.10.0	2019-03-28	
RAN#82	14.9.0	2019-01-11	
RAN#81	14.8.0	2018-09-27	
RAN#80	14.7.0	2018-07-05	
RAN#79	14.6.0	2018-04-02	
RAN#78	14.5.0	2018-01-09	
RAN#77	14.4.0	2017-09-26	
RAN#76	14.3.0	2017-06-23	
RAN#75	14.2.0	2017-03-23	
RAN#74	14.1.0	2017-01-02	
RAN#73	14.0.0	2016-09-29	

Exit

113. The above example search illustrates that it is very easy for an interested member of the public without prior knowledge of the TS number and even without prior knowledge of 3GPP to locate any version of TS 36.211, including version 14.3.0, for download.

114. The above search was performed near the time of writing this report. According to my personal experience, similar searches done in June 2017 or around that timeframe would have similarly provided the path to download version 14.3.0 of TS 36.211.

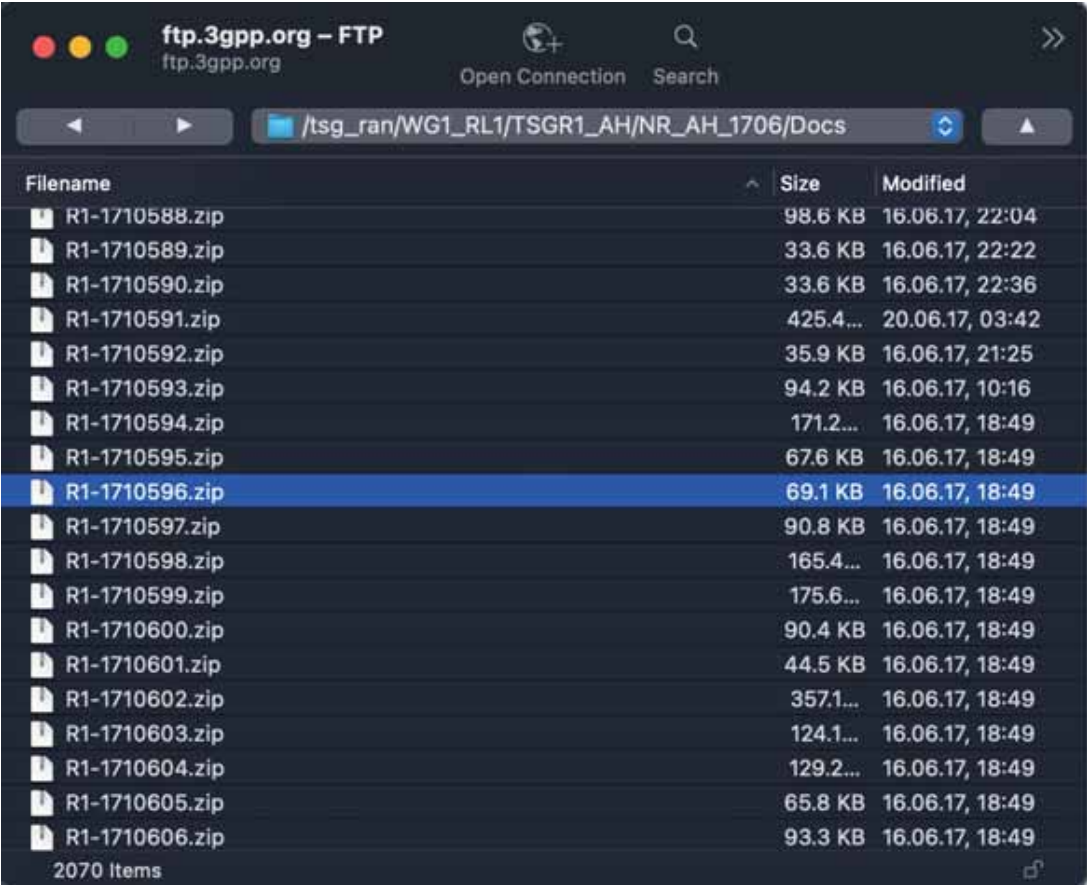
9. T-doc R1-1710596

115. Based on my personal knowledge and my review of 3GPP's business records, I recognize APPLE-1006 as a true and correct copy of 3GPP T-doc R1-1710596, which represents a 3GPP document with the title "Discussion of beam recovery procedure." The document was authored by Lenovo and Motorola Mobility and it covered agreements, open issues and proposals related to recovery from beam failure. On its face, R1-1710596 refers to the RAN WG1 NR (New Radio) Ad-Hoc meeting #2 held on June 27-30, 2017, in Qingdao, China. Thus, based on my personal knowledge and experience with ETSI's and 3GPP's standard business practices, this information tells me that R1-1710596 was available either prior to or during that meeting to at least all attending 3GPP members.

116. The public availability of the document is confirmed by the date stamp, June 16, 2017, shown on the historic 3GPP ftp server for the corresponding downloadable file ("R1-1710596.zip"), as maintained by the Internet Archive at https://web.archive.org/web/20170629164646/http://www.3gpp.org:80/ftp/TSG_R

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AN/WG1_RL1/TSGR1_AH/NR_AH_1706/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_AH/NR_AH_1706/Docs/ as shown in the screenshot below:



117. In addition, metadata information for the downloaded and extracted T-doc file states a last Modified date of “17. June 2017,” as shown in the screenshot below. The reason why the upload seems to have occurred earlier than the last modification is because this may have happened across different time zones. E.g.

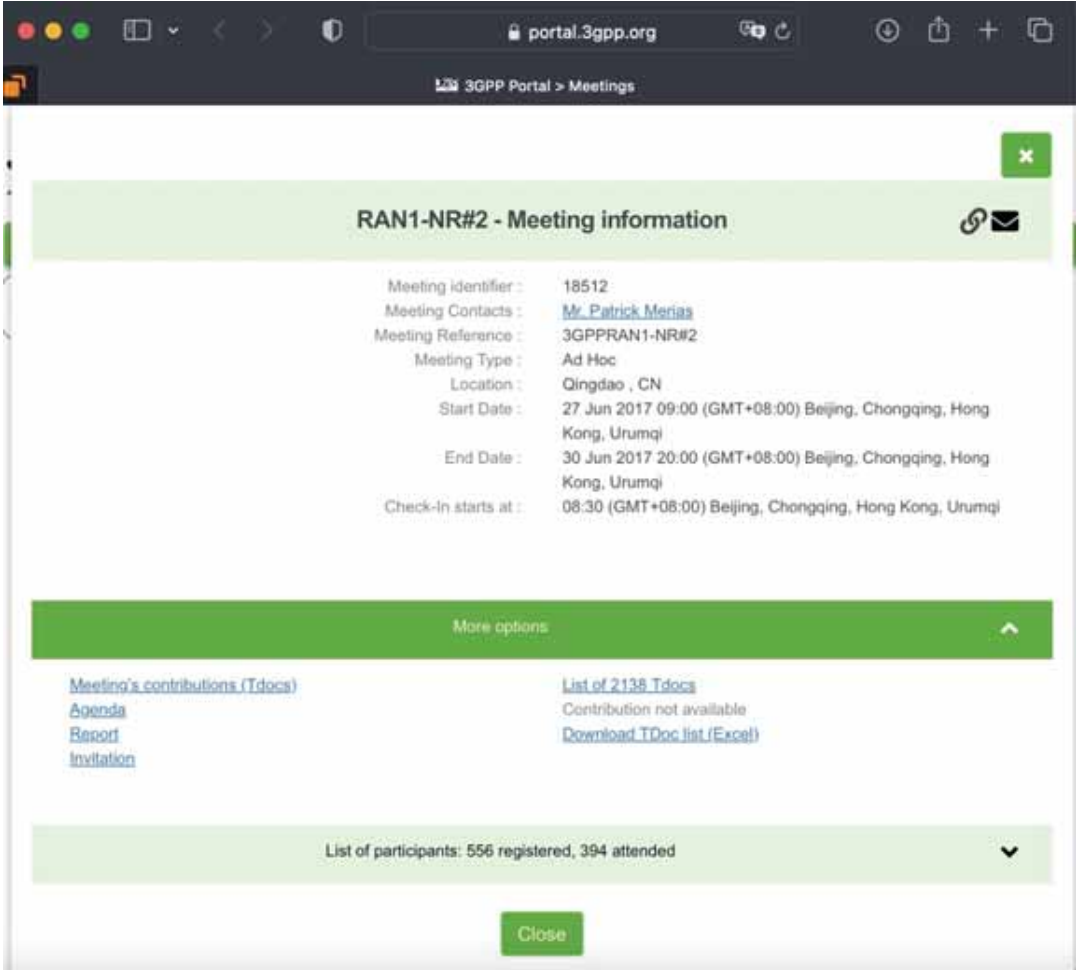
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modification and upload might have been performed early on June 17 in Asia whereas in Europe (where ETSI's FTP server is located) it was still June 16.

118. The meeting report of the RAN WG1 NR (New Radio) Ad-Hoc #2 held on June 27-30, 2017, can be found in Appendix E. The meeting report shows R1-1710596 on page 41 in a list of documents which were “Not treated”, probably due to lack of meeting time. According to the 3GPP website at



<https://portal.3gpp.org/Meetings.aspx#/> which is shown by the screenshot below, that meeting was attended by 394 individuals (out of 556 registered participants):



119. The meeting report includes in the zip file the meeting’s document list of which an excerpt can be found in Appendix F⁵. R1-1710596 is listed in row 718 and is tagged as “available”. Furthermore, the “Upload” date is shown as “2017-06-16” as can be seen by the screenshot below:

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.

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	A	B	N	O	P
	TDoc	Title	TDoc Status	Reservation date	Uploaded
1					
718	R1-1710596	Discussion of beam recovery procedure	available	2017-06-15 02:53:58	2017-06-16 18:49:37

120. 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 via the public 3GPP ftp server by June 16, 2017, at the latest.

V. AVAILABILITY FOR CROSS-EXAMINATION

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

A. Right To Supplement

122. 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

Declaration of Friedhelm Rodermund

123. 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.

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

Dated: May 1, 2025

A handwritten signature in black ink, appearing to read 'F. Rodermund', written over a horizontal line.

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

- o IoT standards development and introduction of new IoT services

01/2011 – 10/2014	Vodafone Germany / Vodafone Group R&D	Düsseldorf, Germany
	<u>Senior Standards Strategist</u> - o Representing Vodafone in various standardisation bodies - o Creating technical standards for the Internet of Things - o Work item lead, technical editor and key contributor of Open Mobile Alliance (OMA) "Lightweight M2M (LwM2M)" – the new standard for the Internet of Things - o Advising and supporting various IoT/M2M projects related to e.g. smart metering - o Advising on the introduction of new IoT/M2M technologies and services - o Leading Proof of Concepts of emerging technologies - o Involved in innovation projects - o Supporting the creation and protection of Intellectual Property	
01/2009 – 12/2010	Vodafone Germany	Düsseldorf, Germany
	<u>Vice Chairman Open Mobile Alliance (OMA) Device Management (DM)</u> - o Responsible for Vodafone's Device Management standardisation - o 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 - o Editor of several specifications, rapporteur of various work items - o Support of projects for the introduction of device management - o Delegate to 3GPP SA1 with responsibility for the introduction of MTC (machine type communications) related service/network requirements	
01/2005 – 12/2008	Vodafone Germany	Düsseldorf, Germany
	<u>Project Manager Mobile Broadcast Standards</u> - o Responsible for Mobile Broadcast standardisation across different broadcast systems/standards bodies and across all Vodafone local operations - o Responsible for Mobile Broadcast standardisation strategy development and implementation - o Delegation Lead for the Open Mobile Alliance (OMA) BCAST working group - o Initiated and managed the BCAST device profile development in the BMCO Forum - o Leading the "Service Protection" (pay-TV) stream of the German DVB-H Consortium - o Filed several patents - o Supporting patent litigations and patent portfolio evaluation (various technical areas)	
04/2003 – 12/2003	GSM Association	London, United Kingdom
	<u>Member of the MMS Task Force</u> - o Verification of the MMS operator interworking framework - o Supporting the definition and specification of the MMS functional evolution - o 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: <u>Secretary 3GPP Technical Specifications Group "Terminals" and Terminals Working Group 2 "Terminal Services and Capabilities"</u>		

CURRICULUM VITAE

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” responsible 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

CURRICULUM VITAE

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

CURRICULUM VITAE

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

CURRICULUM VITAE

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

AEIGS 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

CURRICULUM VITAE

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

CURRICULUM VITAE

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

CURRICULUM VITAE

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 Partes 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 |
| | <u>Graduate of Electrical Engineering with a focus on telecommunications technologies (Dipl.-Ing. TH)</u> | |
| 10/1992 – 04/1993 | University of Technology Trondheim | Trondheim, Norway |
| | <u>Diploma Thesis "Design of a dual processor computer for digital signal processing in power electronics"</u> | |

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



3GPP_TSG_RAN_WG2 Archives

June 2017, Week 4

New in LISTSERV 17.0

3GPP_TSG_RAN_WG2@LIST.ETSI.ORG

Options: [Use Proportional Font](#)
[Show Text Part by Default](#)
[Show All Mail Headers](#)

Message: [[First](#)] [[Prev](#)] [[Next](#)] [[Last](#) >]
Topic: [[First](#)] [[Prev](#)] [[Next](#)] [[Last](#) >]
Author: [[First](#)] [[Prev](#)] [[Next](#)] [[Last](#) >]

Subject: [RAN2 CR implementation status, v5](#)
From: Juha Korhonen <Juha.Korhonen@ETSI.ORG>
Reply To: Juha Korhonen <Juha.Korhonen@ETSI.ORG>
Date: Sat, 24 Jun 2017 22:03:57 +0000
Content-Type: multipart/alternative
Parts/Attachments: [text/plain](#) (1304 bytes) , [text/html](#) (29 kB)

Dear All,

I have uploaded the final versions of all updated post-RAN#76 specifications, except 36.331 (Rel-14). This specification is still under work.

I am leaving for Qingdao early on Sunday but I am aiming to release the 36.331 (Rel-14) draft version for review on Monday evening.

BR,
Juha

Overview of RAN2 CR implementation status after RAN#76 - 24.06.2017

spec	REL-12	REL-13	REL-14	CRs	rapporteur
25.300	0	0	1	1	Amaan Ali (Nokia)
25.306	1	1	1	3	Cecilia Eklof (Ericsson)
25.331	0	0	5 (v2)	5	Ritesh Shreevastav (Ericsson)
36.300	0	4 (2)	19 (v3)	23	Tero Henttonen (Nokia)
36.302	0	1	4 (v2)	5	Chunli Wu (Nokia)
36.304	0	1	4	5	Jarkko Koskela (Nokia)
36.305	0	0	1	1	Masato Kitazoe (Qualcomm)
36.306	2	3	23	28	Ravi Kuchibhotla (Motorola)
36.321	0	5 (v2)	18 (v2)	23	Mats Folke (Ericsson)
36.323	0	1	2	4	Seung June Yi (LGE)
36.331	2 (v2)	21 (v3)	80	103	Hinke van der Velde (Samsung)
36.355	0	0	9 (v3)	9	Masato Kitazoe (Qualcomm)
36.361	0	0	1	1	Tero Henttonen (Nokia)
total	5	37	169	211	

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 and ftp.

The draft specifications for review are available here:
ftp://ftp.3gpp.org/tsg_ran/WG2_RL2/Specifications/201706_draft_specs_after_RAN_76/

All draft specs will be implemented with revision marks.

ATOM RSS1 RSS2

Appendix C

Subscriber Options

LISTSERV Archives

Search Archives

Subscriptions

Preferences

Change Password

Log Out

SCPP_TSG_RAN_WG4 Archives

July 2017, Week 1

Join to LISTSERV 17.0

SCPP_TSG_RAN_WG4@LIST.ETS.ORG

Options

Use Proportional Font

Show First Post By Default

Show All Mail Headers

Message

[v] [Fwd] [v] [Print] [v] [List] [v] [v]

Topic

[v] [Fwd] [v] [Print] [v] [List] [v] [v]

Author

[v] [Fwd] [v] [Print] [v] [List] [v] [v]

Subject

CR Implementation status after RAN #76 (3)

From

Kyryngskiy OI <mailto:kyryngskiy.OI@ETS.ORG>

Reply To

Kyryngskiy OI <mailto:kyryngskiy.OI@ETS.ORG>

Date

Sun, 2 Jul 2017 20:36:11 +0000

Content-Type

multipart/mime

Part(s) Attachment(s)

image/png (4 KB)

image/txt (238 KB)

Dear All,

I have updated all draft spec and created spec for review:
(25.800, 25.801, 27.100, 27.101, 27.102, 27.103, 27.104, 27.105, 27.106, 27.107, 27.108, 27.109, 27.110 and 27.111)
(*Note: new draft spec 27.101, 27.102, 27.103, 27.104, 27.105, 27.106, 27.107, 27.108, 27.109, 27.110 and 27.111 draft spec because all CRs for these RANs are CRs A
(CRs)
So, the new draft spec 27.101, 27.102, 27.103, 27.104, 27.105, 27.106, 27.107, 27.108, 27.109, 27.110 and 27.111 draft spec because all CRs for these RANs are CRs A
(CRs)
Please send your comments as soon as possible.

Best regards,
Kyryngskiy

Overview of RANs CR Implementation after RAN #76

RAN	25.800	25.801	25.802	25.803	25.804	25.805	25.806	25.807	25.808	25.809	25.810	25.811	25.812	25.813	25.814	25.815	25.816	25.817	25.818	25.819	25.820	25.821	25.822	25.823	25.824	25.825	25.826	25.827	25.828	25.829	25.830	25.831	25.832	25.833	25.834	25.835	25.836	25.837	25.838	25.839	25.840	25.841	25.842	25.843	25.844	25.845	25.846	25.847	25.848	25.849	25.850	25.851	25.852	25.853	25.854	25.855	25.856	25.857	25.858	25.859	25.860	25.861	25.862	25.863	25.864	25.865	25.866	25.867	25.868	25.869	25.870	25.871	25.872	25.873	25.874	25.875	25.876	25.877	25.878	25.879	25.880	25.881	25.882	25.883	25.884	25.885	25.886	25.887	25.888	25.889	25.890	25.891	25.892	25.893	25.894	25.895	25.896	25.897	25.898	25.899	25.900	25.901	25.902	25.903	25.904	25.905	25.906	25.907	25.908	25.909	25.910	25.911	25.912	25.913	25.914	25.915	25.916	25.917	25.918	25.919	25.920	25.921	25.922	25.923	25.924	25.925	25.926	25.927	25.928	25.929	25.930	25.931	25.932	25.933	25.934	25.935	25.936	25.937	25.938	25.939	25.940	25.941	25.942	25.943	25.944	25.945	25.946	25.947	25.948	25.949	25.950	25.951	25.952	25.953	25.954	25.955	25.956	25.957	25.958	25.959	25.960	25.961	25.962	25.963	25.964	25.965	25.966	25.967	25.968	25.969	25.970	25.971	25.972	25.973	25.974	25.975	25.976	25.977	25.978	25.979	25.980	25.981	25.982	25.983	25.984	25.985	25.986	25.987	25.988	25.989	25.990	25.991	25.992	25.993	25.994	25.995	25.996	25.997	25.998	25.999	26.000	26.001	26.002	26.003	26.004	26.005	26.006	26.007	26.008	26.009	26.010	26.011	26.012	26.013	26.014	26.015	26.016	26.017	26.018	26.019	26.020	26.021	26.022	26.023	26.024	26.025	26.026	26.027	26.028	26.029	26.030	26.031	26.032	26.033	26.034	26.035	26.036	26.037	26.038	26.039	26.040	26.041	26.042	26.043	26.044	26.045	26.046	26.047	26.048	26.049	26.050	26.051	26.052	26.053	26.054	26.055	26.056	26.057	26.058	26.059	26.060	26.061	26.062	26.063	26.064	26.065	26.066	26.067	26.068	26.069	26.070	26.071	26.072	26.073	26.074	26.075	26.076	26.077	26.078	26.079	26.080	26.081	26.082	26.083	26.084	26.085	26.086	26.087	26.088	26.089	26.090	26.091	26.092	26.093	26.094	26.095	26.096	26.097	26.098	26.099	26.100	26.101	26.102	26.103	26.104	26.105	26.106	26.107	26.108	26.109	26.110	26.111	26.112	26.113	26.114	26.115	26.116	26.117	26.118	26.119	26.120	26.121	26.122	26.123	26.124	26.125	26.126	26.127	26.128	26.129	26.130	26.131	26.132	26.133	26.134	26.135	26.136	26.137	26.138	26.139	26.140	26.141	26.142	26.143	26.144	26.145	26.146	26.147	26.148	26.149	26.150	26.151	26.152	26.153	26.154	26.155	26.156	26.157	26.158	26.159	26.160	26.161	26.162	26.163	26.164	26.165	26.166	26.167	26.168	26.169	26.170	26.171	26.172	26.173	26.174	26.175	26.176	26.177	26.178	26.179	26.180	26.181	26.182	26.183	26.184	26.185	26.186	26.187	26.188	26.189	26.190	26.191	26.192	26.193	26.194	26.195	26.196	26.197	26.198	26.199	26.200	26.201	26.202	26.203	26.204	26.205	26.206	26.207	26.208	26.209	26.210	26.211	26.212	26.213	26.214	26.215	26.216	26.217	26.218	26.219	26.220	26.221	26.222	26.223	26.224	26.225	26.226	26.227	26.228	26.229	26.230	26.231	26.232	26.233	26.234	26.235	26.236	26.237	26.238	26.239	26.240	26.241	26.242	26.243	26.244	26.245	26.246	26.247	26.248	26.249	26.250	26.251	26.252	26.253	26.254	26.255	26.256	26.257	26.258	26.259	26.260	26.261	26.262	26.263	26.264	26.265	26.266	26.267	26.268	26.269	26.270	26.271	26.272	26.273	26.274	26.275	26.276	26.277	26.278	26.279	26.280	26.281	26.282	26.283	26.284	26.285	26.286	26.287	26.288	26.289	26.290	26.291	26.292	26.293	26.294	26.295	26.296	26.297	26.298	26.299	26.300	26.301	26.302	26.303	26.304	26.305	26.306	26.307	26.308	26.309	26.310	26.311	26.312	26.313	26.314	26.315	26.316	26.317	26.318	26.319	26.320	26.321	26.322	26.323	26.324	26.325	26.326	26.327	26.328	26.329	26.330	26.331	26.332	26.333	26.334	26.335	26.336	26.337	26.338	26.339	26.340	26.341	26.342	26.343	26.344	26.345	26.346	26.347	26.348	26.349	26.350	26.351	26.352	26.353	26.354	26.355	26.356	26.357	26.358	26.359	26.360	26.361	26.362	26.363	26.364	26.365	26.366	26.367	26.368	26.369	26.370	26.371	26.372	26.373	26.374	26.375	26.376	26.377	26.378	26.379	26.380	26.381	26.382	26.383	26.384	26.385	26.386	26.387	26.388	26.389	26.390	26.391	26.392	26.393	26.394	26.395	26.396	26.397	26.398	26.399	26.400	26.401	26.402	26.403	26.404	26.405	26.406	26.407	26.408	26.409	26.410	26.411	26.412	26.413	26.414	26.415	26.416	26.417	26.418	26.419	26.420	26.421	26.422	26.423	26.424	26.425	26.426	26.427	26.428	26.429	26.430	26.431	26.432	26.433	26.434	26.435	26.436	26.437	26.438	26.439	26.440	26.441	26.442	26.443	26.444	26.445	26.446	26.447	26.448	26.449	26.450	26.451	26.452	26.453	26.454	26.455	26.456	26.457	26.458	26.459	26.460	26.461	26.462	26.463	26.464	26.465	26.466	26.467	26.468	26.469	26.470	26.471	26.472	26.473	26.474	26.475	26.476	26.477	26.478	26.479	26.480	26.481	26.482	26.483	26.484	26.485	26.486	26.487	26.488	26.489	26.490	26.491	26.492	26.493	26.494	26.495	26.496	26.497	26.498	26.499	26.500	26.501	26.502	26.503	26.504	26.505	26.506	26.507	26.508	26.509	26.510	26.511	26.512	26.513	26.514	26.515	26.516	26.517	26.518	26.519	26.520	26.521	26.522	26.523	26.524	26.525	26.526	26.527	26.528	26.529	26.530	26.531	26.532	26.533	26.534	26.535	26.536	26.537	26.538	26.539	26.540	26.541	26.542	26.543	26.544	26.545	26.546	26.547	26.548	26.549	26.550	26.551	26.552	26.553	26.554	26.555	26.556	26.557	26.558	26.559	26.560	26.561	26.562	26.563	26.564	26.565	26.566	26.567	26.568	26.569	26.570	26.571	26.572	26.573	26.574	26.575	26.576	26.577	26.578	26.579	26.580	26.581	26.582	26.583	26.584	26.585	26.586	26.587	26.588	26.589	26.590	26.591	26.592	26.593	26.594	26.595	26.596	26.597	26.598	26.599	26.600	26.601	26.602	26.603	26.604	26.605	26.606	26.607	26.608	26.609	26.610	26.611	26.612	26.613	26.614	26.615	26.616	26.617	26.618	26.619	26.620	26.621	26.622	26.623	26.624	26.625	26.626	26.627	26.628	26.629	26.630	26.631	26.632	26.633	26.634	26.635	26.636	26.637	26.638	26.639	26.640	26.641	26.642	26.643	26.644	26.645	26.646	26.647	26.648	26.649	26.650	26.651	26.652	26.653	26.654	26.655	26.656	26.657	26.658	26.659	26.660	26.661	26.662	26.663	26.664	26.665	26.666	26.667	26.668	26.669	26.670	26.671	26.672	26.673	26.674	26.675	26.676	26.677	26.678	26.679	26.680	26.681	26.682	26.683	26.684	26.685	26.686	26.687	26.688	26.689	26.690	26.691	26.692	26.693	26.694	26.695	26.696	26.697	26.698	26.699	26.700	26.701	26.702	26.703	26.704	26.705	26.706	26.707	26.708	26.709	26.710	26.711	26.712	26.713	26.714	26.715	26.716	26.717	26.718	26.719	26.720	26.721	26.722	26.723	26.724	26.725	26.726	26.727	26.728	26.729	26.730	26.731	26.732	26.733	26.734	26.735	26.736	26.737	26.738	26.739	26.740	26.741	26.742	26.743	26.744	26.745	26.746	26.747	26.748	26.749	26.750	26.751	26.752	26.753	26.754	26.755	26.756	26.757	26.758	26.759	26.760	26.761	26.762	26.763	26.764	26.765	26.766	26.767	26.768	26.769	26.770	26.771	26.772	26.773	26.774	26.775	26.776	26.777	26.778	26.779	26.780	26.781	26.782	26.783	26.784	26.785	26.786	26.787	26.788	26.789	26.790	26.791	26.792	26.793	26.794	26.795	26.796	26.797	26.798	26.799	26.800	26.801	26.802	26.803	26.804	26.805	26.806	26.807	26.808	26.809	26.810	26.811	26.812	26.813	26.814	26.815	26.816	26.817	26.818	26.819	26.820	26.821	26.822	26.823	26.824	26.825	26.826	26.827	26.828	26.829	26.830	26.831	26.832	26.833	26.834	26.835	26.836	26.837	26.838	26.839	26.840	26.841	26.842	26.
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Appendix D

Appendix E

2

Source: MCC Support

Title: Final Report of 3GPP TSG RAN WG1 #AH_NR2 v1.0.0
(Qingdao, China, 27th – 30th June 2017)

Document for: Approval



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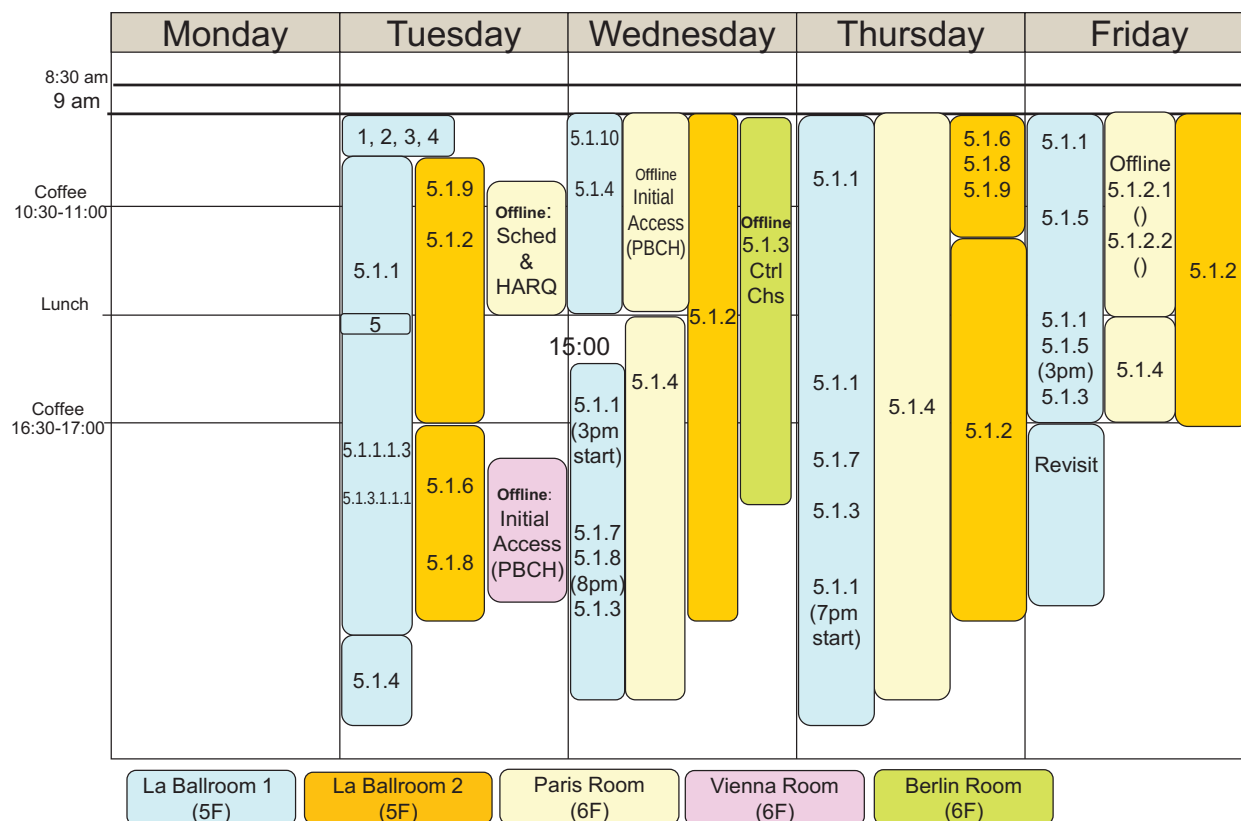
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The second 3GPP TSG WG RAN1 ad-hoc meeting on NR, hosted by ZTE Corporation, was held at the Meridien Qingdao, China. The meeting started at 9:00 on Tuesday 27th June and finished at 20:15 on Friday 30th June 2017. The number of attending delegates, having confirmed their participation through the electronic check-in application, was **394**. Note that the number of registered was 557.

The schedule of the week was as follows:



Note: The empty slots are devoted to offline sessions.

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

The number of contributions for this meeting was 2067.

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

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

1 Opening of the meeting

Mr Matthew Baker (Vice Chairman) welcomed the participants of the RAN WG1 ad-hoc meeting and opened the meeting at 09:00.

Mr Xinhui Wang on behalf of ZTE welcomed the delegates, and detailed the domestic arrangements for the full week.

1.1 Call for IPR

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

The members take note that they are hereby invited:

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

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

[R1-1711601](#) Draft Agenda of RAN1#AH_NR2 meeting RAN1 Chair

Matthew Baker (Vice Chairman) proposed the agenda for the meeting, as well the schedule of the week.

Decision: The agenda is approved.

3 Approval of Minutes from previous meetings

R1-1709881 Report of RAN1#89 meeting ETSI

The document was presented by Patrick Merias from MCC (ETSI Mobile Competence Center) and provides a draft of the report from last RAN1#89 meeting in Hangzhou.

Discussion: MCC recalled that the report is a draft for information, with focus on the NR part – final report will be presented for approval at the next ordinary meeting (RAN1#90).

Decision: The document is approved.

R1-1711586 Selected highlights from RAN#76 of relevance to RAN1 RAN1 Chair

The document (slide 3 relevant to NR) was presented by Matthew Baker (Vice Chairman) on behalf of RAN1 Chair and provides highlights relevant to RAN1 from the last plenary.

Discussion: Confirmation of one additional ad-hoc meeting in January 2018.

Panasonic understanding is that RAN1 works for eMBB low latency (December 2017), no need to work the solution satisfying URLLC at this meeting

Ericsson: the low latency part should be specified until December, independently of use cases (eMBB or URLLC). No need to limit our work to eMBB use case only for December. If clarification needed, should be a RAN discussion/decision

Decision: The document is noted.

4 Incoming Liaison Statements

NR Rel-15

R1-1710211 LS on SR design principles in NR RAN2, Samsung

The document was presented by ... from Samsung and informs RAN1 of RAN2 most recent agreements on SR design principles for NR. RAN2 would like to inform RAN1 that it does not see the need for multi-bit SR support and ask RAN1 to take all this information into account in its own work on SR design.

Decision: The document is noted.

R1-1710212 LS on UE measurement capabilities across LTE and NR RAN2, NTT DOCOMO

The document was presented by Hiroki Harada from NTT DOCOMO and asks RAN4 to investigate the UE measurement capabilities and answer the 5 questions listed in the LS.

Discussion: No action to RAN1.

Decision: The document is noted.

R1-1710215 Response LS on reading time index indication for RRM measurements RAN2, Intel

The document was presented by Daewon Lee from Intel and is a reply to [R1-1706707](#):

- From RAN2 point of view, the UE should be able to perform beam/cell measurement and identification quickly and reliably with minimal need for measurement gaps. Therefore, if there is considerable delay due to reading the time index from PBCH, RAN2 observes that this may impact handover performance and UE power consumption. RAN2 would like to ask RAN1 to consider the above information in RAN1 design.
- In addition, RAN2 would like to ask RAN1 if the time index indication needs to be acquired by the UE for every measurement sample and if the UE also need to acquire the time index indication in the idle/inactive mode.

Discussion: Suggested reply in [R1-1710500](#).

Decision: The document is noted.

R1-1710500 Draft Reply LS on reading time index indication for RRM measurements Intel Corporation

The document was presented by Daewon Lee from Intel and is a reply to R2-1706160 ([R1-1710215](#)).

- For UEs in CONNECTED mode, UE may be able to infer the SS block time index indication for detected NR PSS/SSS of neighbour cell, if the UE has successfully retrieve the SS block time index of any SS block from the neighbour cell. However, depending of network deployment scenario, configured SS burst set periodicity, and mobility situation of the UE, the UE may need to re-retrieve the SS block time index of neighbour cells time to time and possibly in every few measurement samples when SS burst set periodicity is configured to be very long (e.g. 160 msec). The frequency and instances in which the UE is required to read the SS block time index of the detected SS block is implementation specific. In case of inter-frequency RRM measurements, UE may be required to read the SS block time index within the measurement gap at least once.
- For UEs in IDLE/INACTIVE mode, UEs may not necessarily need the SS block time index for the cell re-selection process. UEs will be able to uniquely identify whether two SS blocks from a cell are from the same beam or not by interval between the two SS blocks. If the SS blocks are separately by integer multiple of the configured SS burst set periodicity, the two SS blocks are from the same beam. Otherwise, they are from different beam. Given that the UE is able to uniquely identify SS blocks (although it may not have the SS block time index information), it can perform per beam filtering of the measurements and ultimately derive the cell level quality. It should be noted that when the UE needs

to camp on a cell, it will be required to successfully read the SS block time index information (as well as SFN in NR PBCH) to derive the slot and radio frame boundaries.

Decision: The document is noted. To be treated under 5.1.1.1.3 for the preparation of the final answer.

Friday:

[R1-1711907](#) [DRAFT] Reply LS response on reading time index indication for RRM measurements Intel

Decision: The document is noted and final LS is approved in [R1-1711966](#).

[R1-1710216](#) LS on Emergency Support in NR SA2, Nokia

The document was presented by Karri Ranta-aho from Nokia and asks RAN to clarify and confirm the support for emergency services including regulatory requirements in NR for Rel-15.

Discussion: No action to RAN1.

Decision: The document is noted.

[R1-1710220](#) Reply LS on Emergency Support in NR RAN, T-Mobile

The document was presented by Scott Migaldi from T-Mobile and is the reply to [R1-1710216](#).

- RAN confirms that support for Emergency Services and the corresponding support for Location Services is included in the scope for release 15 work. Support for Emergency Services and the corresponding support for Location Services will be specified by June 2018, and will be applicable for both a non-standalone NR UE that is supported with a LTE PCell and for a standalone NR UE. This work will not delay the previously approved December 2017 completion goal deadline for non-standalone NR.
- The regulatory performance targets in any radio access technology are specified in the US by the FCC as shown below:

FCC BENCHMARK	ACCURACY REQUIREMENT
APRIL 2017	40% of all 911 Calls <= 50m
APRIL 2018	50% of all 911 Calls <= 50m
APRIL 2020	70% of all 911 Calls <= 50m
APRIL 2021	80% of all 911 Calls <= 50m

Decision: The document is noted.

[R1-1710217](#) LS on Support for fake gNB detection mechanisms SA3, Nokia

The document was presented by Karri Ranta-aho from Nokia.

Discussion: .Nokia suggested RAN1 looking at questions 4 and 5.

T-Mobile → make sure our reply won't have impact to roaming

Decision: The document is noted. Draft a reply in [R1-1711657](#) – (Nokia)

Friday:

[R1-1711657](#) [DRAFT] Response LS on Support for fake gNB detection mechanisms Nokia

Decision: The document is noted and final LS is approved in [R1-1711997](#).

[R1-1710213](#) LS on UE categories for NR and LTE-NR Dual Connectivity RAN2, NTT DOCOMO

The document was presented by Fred Takeda from NTT DOCOMO and asks RAN1 to provide input for Layer 1 parameter set today associated with UE category for LTE-NR DC and the NR standalone operation.

Decision: The document is noted.

[R1-1710221](#) Reply LS on UE categories for NR and LTE-NR Dual Connectivity RAN, NTT DOCOMO

The document was presented by Fred Takeda from NTT DOCOMO and is a preliminary reply to [R1-1710213](#).

Regarding item 1) The necessity of UE categories for UE in the LTE-NR DC (Opt. 3/4/7) as well as the NR standalone (Opt. 2)

RAN foresees industrial demand that LTE-NR DC (Option 3/4/7 series) enables operators to provide a certain peak data rate, as well as the NR standalone (Option 2). RAN would like to let RAN WGs to decide how the target peak data rate can be supported for LTE-NR DC and NR standalone in the specifications, e.g. whether the existing concept of UE category is inherited or a new concept in defining the target peak data rate is introduced. RAN sees that it is important that practical UE constraints are also taken into account in the UE capabilities and categories e.g. UE constraints due to hardware sharing during LTE – NR DC operations. It is also up to RAN WGs how the UE categories and capabilities are defined for LTE-NR DC as well as NR standalone.

Regarding item 2) The target peak data rate in DL and UL to be supported for Option 3 until December 2017 and item 3) The target peak data rate in DL and UL to be supported for the other options until June 2018.

RAN will discuss these items by email until TSG-RAN #77 and aim to decide the target value(s) at the #77 meeting.

Decision: The document is noted.

[R1-1710214](#) LS reply to SA2 on maximum data rate RAN2, MediaTek

The document was presented by ... from MediaTek and inform RAN1 of RAN2's conclusion that Options 3 also targets the same maximum data rate as NR SA, i.e. 20Gbps for downlink and 10Gbps for uplink per UE.

Decision: The document is noted.

[R1-1711055](#) Initial views on UE category NTT DOCOMO, INC.

The document was presented by Fred Takeda from NTT DOCOMO.

Proposal 1: Define UE category based on the maximum number of DL/UL-SCH transport block bits transmitted/received within a fixed/reference time duration (e.g., 1ms).

- Difference in subcarrier-spacing is not visible in the UE category.
- FFS: different capabilities of MIMO/MCS results in different UE categories or in the same UE category with different values on some parameters.

One list of UE category is used for the use-cases of eMBB, URLLC, and mMTC.

Proposal 2: Identify soft-buffer definition for the LTE-NR dual connectivity, and inform RAN1's understanding to RAN2.

- Option 1: Soft-buffer sizes are defined for LTE operation and NR operation, respectively.
- Option 2: Soft-buffer size is defined as the sum of LTE and NR, and the soft-buffer is shared by LTE and NR in semi-static or dynamic manner.

Discussion: Panasonic → hard to downselect between option 1 & 2 in a timely manner (likely not before Dec 17).

Qualcomm → RAN1 should not worry too much at this meeting, mainly RAN2 issues.

Ericsson → no sure whether different UE categories are needed for eMBB, URLLC, and mMTC

Decision: The document is noted.

[R1-1711476](#) On UE Categories/Capabilities Ericsson

The document was presented by Daniel Larsson from Ericsson.

- Proposal 1: In NR, the number of supported MIMO layers is signalled as explicit capability (possibly per band) and not part of a UE category.
- Proposal 2: In NR, the modulation schemes is signalled as explicit UE capability and not part of a UE category.
- Proposal 3: Discuss whether NR capability signalling should allow the UE to indicate a peak data rate being lower than the peak L1 data rate derived from the supported scheduling bandwidth and modulation and MIMO schemes.
- Proposal 4: If it is agreed that UEs should be able to indicate a baseband processing restriction (see Proposal 2), the UEs indicate the total number of supported code blocks separately for UL and DL instead of a L1-bit-rate.
- Proposal 5: If Proposal 3 is agreed, the NW derives the UE's amount of supported soft buffer from the total number of supported code blocks in DL (hence, there is no need to specify and signal the soft-buffer size explicitly).
- Proposal 6: NR UEs should be able to advertise also a maximum scheduling bandwidth. The details need to be further studied
- Proposal 7: Discuss whether the total number of code block does not need to be signalled and this property can be derived from the maximum scheduling BW in addition to the other throughput affecting capabilities that the UE indicates

Decision: The document is noted.

LSs received during the meeting from other WGs

[R1-1711892](#) Reply LS on PBCH content RAN2, Huawei

Decision: The document is noted.

[R1-1711940](#) LS to RAN1 on NR basic handover RAN2, Ericsson

Decision: The document is noted. Prepare draft LS to RAN2 in [R1-1711968](#) – Dhiraj (Samsung)

[R1-1711968](#) [DRAFT] Reply LS response on NR basic handover Samsung

Decision: The document is noted and final LS is approved in [R1-1711987](#) with the addition of the following sentence in Section 1

RAN1 will inform RAN2 when more details on RACH resources and the corresponding associations are available.

[R1-1711950](#) LS to RAN1 on Random Access RAN2, Samsung

Decision: The document is noted.

Not treated.

[R1-1711949](#) Reply LS to RAN1 on UL data transmission without UL grant for NR RAN2, Huawei

5 NR

5.1 New Radio Access Technology - WID in RP-171485

[R1-1711642](#) NR topics requiring coordination between RAN1 and RAN2 RAN2 Chair

The document was presented by RAN1 Vice Chair on behalf of RAN2.

1. Beam management / recovery procedures: RAN2 assume that RAN1 is leading this topic and RAN2 will wait for RAN1 to make progress before discussing in detail. Once RAN1 has started to make progress then RAN2 will look at implications to RAN2 specifications. Input from RAN1 before the August WG meeting is preferable.
2. Beam aspects of random access procedures: Input from RAN1 before the August WG meeting is preferable.
3. UL/DL HARQ: RAN2 would like to receive input on e.g. the impact due to multiple numerologies, HARQ retransmission across numerologies, any other differences compared to LTE, etc. Initial input from RAN1 before the August WG meeting is preferable
4. UL grant free transmission and relation to UL SPS: Based on LS [R1-1709805](#), RAN2 understands that discussion in RAN1 is still ongoing and expects to receive further information from a future meeting about any differences between UL SPS and grant free. Until such information is received RAN2 will continue to progress on RAN2 aspects of UL SPS, agreed to be as LTE as baseline. Additionally RAN2 will discuss some aspects of UL grant free and SPS, e.g. if any difference between them from RAN2 point of view, and will aim to provide input to RAN1 this meeting. Input from RAN1 before the August WG meeting is preferable
5. Impact of PDCCH design (e.g. 'core set') on PDCCH monitoring and DRX: RAN2 would like to receive input on e.g. the impact of the 'core set', beam related aspects, etc. Input from RAN1 before the August WG meeting is preferable.
6. PHR: RAN2 assume that RAN1 is leading this topic and we will implement any MAC signalling aspects as required (i.e. similar working arrangement as for LTE). Input from RAN1 before the October WG meeting is preferable.
7. UL power sharing between LTE/NR: RAN2 will need to be informed regarding the conclusions of RAN1 discussions on UL power sharing between LTE and NR.
8. Transport block sizes: RAN2 assume that RAN1 is leading this topic but that some coordination will be needed between RAN1 and RAN2.
9. L1 parameters to be configured by RRC: Initial input from RAN1 in advance of October WG meeting is preferable (in advance means enough time to enable the parameters to be analysed and contributions to be submitted to the October WG meeting). This implies the initial input should be available at the end of the September RAN1 ad hoc. It is acceptable if there is some degree of revision to the parameter set after the October WG meeting.
10. UE capabilities: RAN2 assume that we will lead the discussion of the UE category question delegated from RAN plenary (i.e. "RAN WGs to decide how the target peak data rate can be supported for LTE-NR DC and NR standalone in the specifications, e.g. whether the existing concept of UE category is inherited or a new concept in defining the target peak data rate is introduced" from LS RP-171480). RAN2 also has ongoing discussion on capability sharing and coordination between LTE and NR, where the exact capabilities for will require coordination with RAN1 and RAN4. RAN1 can begin discussions of the L1 capability parameters in parallel.

Discussion: Suggestion by VC to provide a reply per point (through an LS – at least for some of the bullets)

Ericsson: Make sure RAN1 is not starting email discussions during the upcoming summer period.

CATT: concern regarding RAN2's intention on point 4 (expecting info from RAN1, but has already decided to progress further).

CATT: also has concern of the impact to RAN2 if RAN1 cannot draw a clear answer to each of RAN2's questioning.

Huawei: let's continue RAN1 discussion on UL grant free transmission/UL SPS and later in the week liaise to RAN2.

Decision: The document is noted.

Coordinators for drafting reply LSs to RAN2 (review status on Friday):

1. Beam management: Sundar (Qualcomm) [R1-1711683](#)
2. Beam aspects of Random Access: Teck Hu (Huawei) [R1-1711684](#)
3. UL/DL HARQ: Karri Ranta-aho (Nokia) [R1-1711685](#)
4. UL SPS / grant free: Fred (NTT DOCOMO) [R1-1711686](#)
5. PDCCH monitoring and DRX: Tony (CATT) [R1-1711687](#) - see 5.1.3.1

Friday

[R1-1711879](#) [Draft] LS on Beam Aspects of NR RACH Huawei

Decision: The document is noted and final LS is [approved in R1-1711880](#) with following updates

NR RACH procedures support ~~multiple beams~~ using a PRACH preamble format (Option 1) whereby the CP is inserted at the beginning of the single or consecutive multiple/repeated RACH sequences, the CP/GT between RACH sequences is omitted and the GT is reserved at the end of the single or consecutive multiple/repeated RACH sequences e.g. potentially used for gNB R_{tx} beam sweeping.

A 4-step RACH procedure is supported in NR and; a RACH transmission occasion is defined as the time-frequency resource on which a PRACH message 1 is transmitted using the configured PRACH preamble format with a single particular tx beam. The random access configuration is included in the remaining minimum SI. In NR, the RACH configuration provides at least the RACH time/freq. information and the RACH preamble format. gNB can configure an association between one or multiple occasion for SS Block and a subset of RACH resources and/or a subset of preamble indices. Tx Beam for Msg 1 and Msg 3 transmissions (for UE in IDLE mode) is selected by the UE and downlink Tx beam for Msg 2 can be obtained by the detected preamble and/or the RACH resource.

Email approval of the LS on beam management until July 10th – Qualcomm

Email approval of the LS on UL/DL HARQ until July 6th – Nokia

[R1-1711318](#) Discussion on the options in NR design Panasonic

[R1-1711366](#) "TS38.211 v0.0.1 NR; Physical channels and modulation" Ericsson LM

[R1-1711886](#) "TS38.211 v0.0.2 NR; Physical channels and modulation" Ericsson LM

Discussion: Panasonic → as already commented earlier in the week, RAN1 should strive to endorse specs on day one of a meeting as the review of the specs during the meeting is very challenging and difficult.

Decision: The document is endorsed as v0.1.0 in R1-1712004 as basis for further updates.

Email discussion until August meeting about all specs

- 1st step: All spec editors will provide new draft specs (including all agreements and WA) until July 14th
- 2nd step: All spec editors will provide further updated specs (including all agreements and WA) until August 4th
- All companies are recommended checking these specs and comment via the reflector
- All spec editors will update specs via the reflector and submit them to the August meeting (RAN1#90)
- Objective is to get the updated specs endorsed on Monday on Monday (day 1 of RAN1#90)

Email discussion until the August meeting w.r.t the RRC parameters list for NR

- Daniel (Ericsson) will provide an initial RRC parameters list until August 9th
- All companies are recommended checking it and comment via the reflector
- Daniel (Ericsson) will update it via the reflector and submit it to the August meeting (RAN1#90)
- Objective is to get the (updated) RRC parameters list agreed on Monday (day 1 of RAN1#90)

5.1.1 Initial access and mobility

Refer to [R1-1709821](#) for work plan.

Friday

[R1-1711984](#) [Draft] LS on NR initial access and mobility NTT DOCOMO

Decision: The document is noted and final LS to RAN2 is approved in R1-1712001.

[R1-1711985](#) [Draft] LS on NR initial access and mobility NTT DOCOMO

Decision: The document is noted and final LS to RAN4 is approved in R1-1712002 with following updates

Confirm Working Assumption for NR-SSS design from RAN1#89, with following updates except for:

- Ordering of initial state:
 - o NR-SSS, initial value $x(0) = 1$, $x(1) = 0$, $x(2) = 0$, $x(3) = 0$, $x(4) = 0$, $x(5) = 0$, $x(6) = 0$

5.1.1.1 Synchronization signal and initial access procedure

5.1.1.1.1 Remaining details on SS sequence design

Include confirmation of WA of NR-SSS, and other details on NR-SSS such as sequence to RE mapping

Note that NR-PSS and NR-SSS sequence design and RE mapping need to be finalized in this meeting

[R1-1710501](#) NR PSS and SSS design Intel Corporation

- Proposal 1: Confirm the WA on NR-SSS made in RAN1#89 meeting.
- Proposal 2: Capture in the specification the text proposed in Section 3.

Decision: The document is noted.

R1-1710807 On the Robustness of NR SSS in Frequency Offset MediaTek Inc.

- Observation 1: Due to the selection of m_0 , current NR-SSS design is quite vulnerable to frequency offset.
- Proposal 1: NR-SSS should adopt the following m_0 and m_1 mapping:

$$m_0 = \left(3 \left\lfloor \frac{N_{ID}^{(1)}}{112} \right\rfloor + N_{ID}^{(2)} \right) \times 5; \quad m_1 = (N_{ID}^{(1)} \bmod 112) + 1$$

Discussion: Huawei → no evaluations have motivated this proposal

Decision: The document is noted.

Agreement: Confirm Working Assumption for NR-SSS design from RAN1#89, except for:

- Ordering of initial state:
 - NR-SSS, initial value $x(0) = 1, x(1) = 0, x(2) = 0, x(3) = 0, x(4) = 0, x(5) = 0, x(6) = 0$
- Cyclic shift values m_0 and m_1 :
 - FFS between formulae in the RAN1#89 working assumption and the following formulae, to be evaluated during this week and confirmed by Friday:

$$m_0 = \left(3 \left\lfloor \frac{N_{ID}^{(1)}}{112} \right\rfloor + N_{ID}^{(2)} \right) \times 5; \quad m_1 = (N_{ID}^{(1)} \bmod 112)$$

Thursday

Above agreement is modified as follows:

Agreement: Confirm Working Assumption for NR-SSS design from RAN1#89, with the following updates:

- Ordering of initial state:
 - NR-SSS, initial value $x(0) = 1, x(1) = 0, x(2) = 0, x(3) = 0, x(4) = 0, x(5) = 0, x(6) = 0$
- Cyclic shift values m_0 and m_1 (as defined in [R1-1711888](#))

R1-1711810 Analysis of SSS Proposals Intel Corporation

Decision: The document is noted.

R1-1711860 Evaluation of NR-SS Huawei, HiSilicon

Decision: The document is noted.

R1-1711888 WF on m_0 and m_1 for NR-SSS NTT DOCOMO, ITL, Intel, Samsung, InterDigital, Motorola Mobility, Lenovo

- The cyclic shift values m_0 and m_1 are jointly determined by the cell IDs carried by NR PSS (i.e., $N_{ID}^{(2)} = 0, 1, 2$) and NR SSS (i.e., $N_{ID}^{(1)} = 0, 1, \dots, 335$), where the cell ID is given by $N_{ID}^{cell} = 3N_{ID}^{(1)} + N_{ID}^{(2)}$
 - $m_0 = \left(3 \left\lfloor \frac{N_{ID}^{(1)}}{112} \right\rfloor + N_{ID}^{(2)} \right) 5$
 - $m_1 = (N_{ID}^{(1)} \bmod 112)$

Discussion: Also supported by Mediatek, LGE, ZTE.

Decision: The document is agreed.

Agreement: For NR-PSS:

- initial value $x(0) = 0, x(1) = 1, x(2) = 1, x(3) = 0, x(4) = 1, x(5) = 1, x(6) = 1$

R1-1711654 WF on NR-SS sequence design NTT DOCOMO, ZTE, InterDigital

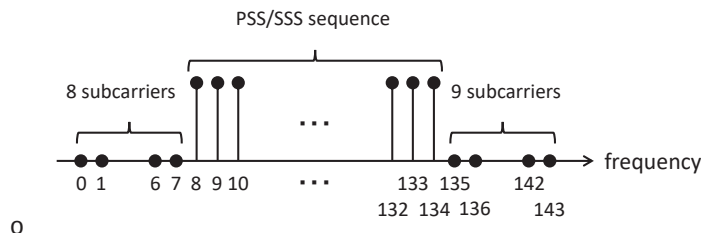
- Update agreements on NR-PSS with following change
 - Number of PSS sequences: 3
 - PSS sequence details:
 - Frequency domain-based pure BPSK M sequence (fixing the time/freq. offset ambiguity)
 - » 1 polynomial: Decimal 145 (i.e. $g(x) = x^7 + x^4 + 1$)
 - » In freq. domain 3 cyclic shifts (0, 43, 86) to get the 3 PSS signals
 - » Initial poly shift register value: $x(0) = 0, x(1) = 1, x(2) = 1, x(3) = 0, x(4) = 1, x(5) = 1, x(6) = 1$
- Confirm working assumptions on NR-SSS with following changes
 - NR-SSS sequence design is 1 polynomial with 127 cyclic shifts, and 1 another polynomial with 9 cyclic shifts

- » Two generator polynomials will be defined for m-sequences, and cyclic shift according to NR-cell ID is applied to each m-sequence
- » Two polynomials are generated by $g_0(x) = x^7 + x^4 + 1$ and $g_1(x) = x^7 + x + 1$
 - Initial poly shift register value: $x(0) = 1, x(1) = 0, x(2) = 0, x(3) = 0, x(4) = 0, x(5) = 0, x(6) = 0$
 - The cyclic shift values m_0 and m_1 are jointly determined by the cell IDs carried by NR PSS (i.e., $N_{ID}^{(2)} = 0, 1, 2$) and NR SSS (i.e., $N_{ID}^{(1)} = 0, 1, \dots, 335$), where the cell ID is given by $N_{ID}^{cell} = 3N_{ID}^{(1)} + N_{ID}^{(2)}$
 - Option 1
 - $m_0 = 3 \left\lfloor \frac{N_{ID}^{(1)}}{112} \right\rfloor + N_{ID}^{(2)}$
 - $m_1 = (N_{ID}^{(1)} \bmod 112) + m_0 + 1$
 - Option 2
 - $m_0 = \left(3 \left\lfloor \frac{N_{ID}^{(1)}}{112} \right\rfloor + N_{ID}^{(2)} \right) K$, where $K > 1$ (e.g., 5)
 - $m_1 = (N_{ID}^{(1)} \bmod 112)$
 - Down-selection of above options will be done within this meeting
- NR-SSS sequence is mapped to consecutive 127 subcarriers as well as NR-PSS
- Frequency center of NR-PSS/SSS is aligned with frequency center of NR-PBCH
- Update agreements on number of NR-SSS signals with following change
 - Number of SSS signals: 1008 post-scrambling
 - Note that number of NR physical cell IDs is 1008

Decision: The document is noted.

Agreements:

- NR-SSS sequence is mapped to consecutive 127 subcarriers as well as NR-PSS as follows:



- Centre frequency of NR-PSS/SSS is aligned with centre frequency of NR-PBCH
 - i.e. mapped on the 7th to 18th PRBs of the 24 PRBs used for the SS block
- Update agreements on number of NR-SSS signals with following change
 - Number of SSS signals: 1008 post-scrambling
- The number of NR physical cell IDs is 1008

Not treated.

R1-1709884	NR-SS sequence design	ZTE
R1-1709911	Finalization of the NR-SSS	Huawei, HiSilicon
R1-1710022	Remaining detail of NR-PSS and NR-SSS Sequence Design and RE mapping	CATT
R1-1710258	Remaining issue on SS Sequence Design	LG Electronics
R1-1710623	Remaining details on SS sequence design	Samsung
R1-1710913	On Design of Synchronization Signal Sequences in NR	InterDigital, Inc.
R1-1710975	Considerations and Evaluation on SS Sequence Design for New Radio	ITRI
R1-1711056	Discussion on remaining details on SS sequence design for NR	NTT DOCOMO, INC.
R1-1711135	Synchronization signal sequence design	Qualcomm Incorporated
R1-1711260	Remaining open issues on NR Synchronisation signal design	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711275	Discussion on NR-SSS working assumption	Motorola Mobility, Lenovo
R1-1711371	Remaining details on NR-SS sequence design	Ericsson

5.1.1.1.2 SS burst set composition

Include candidate locations of SS block within a slot

R1-1711372 SS burst set composition Ericsson

- Proposal 1: The network decides whether a SS block position should be allocated or not.
- Proposal 2: For compositions with two SS blocks per a slot, for 15, 30 and 120 kHz, the SS blocks start at the 3rd and 9th symbols.
- Proposal 3: For 15 kHz subcarrier spacing and below 3 GHz carrier frequency, an SS block may be initiated at the 3rd symbol in a 14 symbol slot. SS blocks are transmitted in consecutive slots.
- Proposal 4: For 15 kHz subcarrier spacing and between 3 and 6 GHz carrier frequency, an SS block may be initiated at the 3rd and 9th symbols per 14 symbol slot.
- Proposal 5: For 30 kHz subcarrier spacing, an SS block may be initiated at the 3rd and 9th symbols in a 14 symbol slot. SS blocks are transmitted in every 2nd slot.
- Proposal 6: For 120 kHz, an SS burst is composed by up to 8 SS blocks.
- Proposal 7: For 120 kHz, the SS burst set is composed by up to 8 SS bursts with 1 DL/UL slot in-between SS bursts.
- Proposal 8: For 240 kHz, an SS slot pair is composed by SS blocks every 5th symbol, starting at the 5th symbol.
- Proposal 9: For 240 kHz, an SS burst is composed by up to 16 SS blocks (4 SS slot pairs).
- Proposal 10: For 240 kHz, the SS burst set is composed by up to 4 SS bursts with 8 DL/UL slots in-between bursts.

Decision: The document is noted.

R1-1710412 NR SS block and burst set composition AT&T

- Proposal 1: For 15kHz, 30kHz, and 120kHz SS Block SCS, the two candidate SS Block positions within a 14 symbol slot are symbols 4-7 and 8-11.
- Proposal 2: For 240kHz SS Block SCS, the four candidate SS Block positions within two consecutive slots of 14 symbols are symbols 4-7 and 8-11 of the first slot, and symbols 2-5 and 6-9 of the second slot.
- Proposal 3: NR should support dedicated signalling for UE-specific indication of valid SS block time locations within a given SS burst set which accommodate different SS burst set periodicities.

Decision: The document is noted.

R1-1711580 SS burst set composition Samsung (Revision of [R1-1710624](#))

- Proposal 1: For each frequency band, the NR-SS block mapping pattern is fixed/predefined.
- Proposal 2: For below 6GHz NR, the SS block mapping patterns shown in FIGURE 1 should be considered for SS burst set composition.
- Proposal3: For above 6GHz NR, the SS block mapping patterns shown in FIGURE 3 should be considered for SS burst set composition.
- Proposal 4: SS blocks comprising an SS burst set shall be mapped in max 2~4ms duration, starting from a beginning of a frame or a half-frame.

Decision: The document is noted.

R1-1711645 SS burst set composition consideration Qualcomm Incorporated (Revision of [R1-1711136](#))

- Proposal 1: For burst-set with $L = 4$ SS blocks, the blocks start in OFDM symbols $\{2,8,17,21\}$. Burst-set pattern with $L \in \{8, 64\}$ SS blocks is obtained by further tiling the burst-set pattern for $L = 4$.
- Observation 1: For burst-set with $L = 4$ blocks, each pair of blocks has a unique inter-block distance. These 4-choose-2 unique distances are $\{4, 6, 9, 13, 15, 19\}$.
- Observation 2: In burst-set pattern with $L \leq 8$ blocks, for any two pairs of blocks $\{l_1, l_2\}$ and $\{l_3, l_4\}$ such that $\Delta(\{l_1, l_2\}) = \Delta(\{l_3, l_4\})$, we have that $l_1 + l_2 = l_3 + l_4$ and thus $\delta(\{l_1, l_2\}) = \delta(\{l_3, l_4\})$. In words, all blocks pairs with the same inter-block distance have the same bit-difference between their indices (and thus the same bit-difference between their PBCH payloads.)
- Proposal 2: When UE assumes SS burst set periodicity of x ms (e.g. $x = 20$ ms), UE assumes the same set of SS blocks within SS burst set are transmitted with periodicity of x ms
- Proposal 3: When UE assumes SS burst set periodicity of x ms (e.g. $x = 20$ ms), if NW transmits the SS burst set with a smaller periodicity y ms ($y < x$, e.g. $y = 10$ ms), UE can assume that the same set of SS blocks within SS burst set are transmitted with periodicity of y ms
- Proposal 4: UE assumes that the transmitted SS blocks in a SS burst set are always logically consecutive, i.e. between any two transmitted SS blocks in a SS burst set, there are no gaps of non-transmitted SS block(s)

Decision: The document is noted.

- FFS offline (Jorma Kaikkonen, Nokia):
 - a. 7 symbol slot is only considered for 15 kHz subcarrier spacing?
 - b. 1 or 2 SS blocks within a 14 symbol slot?

- c. If 2 SS blocks, is there a need for gaps between SS blocks in a 14 symbol slot?
- d. Which are the starting symbols for SS blocks for each subcarrier spacing?

Revisit on Wednesday afternoon - [R1-1711678](#)

Thursday

[R1-1711678](#)

Way forward on the mapping of SS blocks

Nokia

[R1-1711899](#)

Way forward on the mapping of SS blocks

Nokia

Agreements:

- Agree on pages 5, 7, 8 (30 kHz subcarrier spacing case) in [R1-1711899](#)
- **Working assumption** on pages 9, 10 (120, 240 kHz subcarrier spacing cases) in [R1-1711899](#)
 - Working assumption can be revisited if there are serious implications to UE AGC operation.

Agreements:

- For 15 kHz subcarrier spacing case,
 - Map two SS blocks candidate locations to the slot of 14 symbols as follows
 - First candidate location is at symbols 2-5
 - Second candidate location is at symbols 8-11

[R1-1711939](#)

Way forward on the mapping of SS blocks with 30kHz SCS

Huawei, HiSilicon, CATT, CATR,

OPPO, MediaTek, Vivo

Possible agreements:

- For 30 kHz subcarrier spacing case, try to agree on Option 1 or Option 3 until Friday, but if not, RAN1 will conclude that no consensus in RAN1 about the second SS block mapping pattern
- Option 1:
 - Map two SS blocks candidate locations to the slot of 14 symbols as follows
 - First candidate location is at symbols 2-5
 - Second candidate location is at symbols 8-11
 - Supported by Intel, LGE, Qualcomm, DCOMO, ETRI, Samsung, ZTE, Ericsson, IITL (9)
- Option 3:
 - For slot of 14 symbols, two SS blocks are mapped within 14 symbols
 - First candidate SS block location is at symbols 1-4
 - Second candidate SS block location is at symbols 8-11
 - For slot of 7 symbols, one SS block is mapped within 7 symbols
 - Candidate SS block location is at symbols 1-4
 - Supported by Huawei, HiSilicon, CATT, CATR, OPPO, MediaTek, vivo (7)

Friday

[R1-1711939](#)

Way forward on the mapping of SS blocks with 30kHz SCS

Huawei, HiSilicon, CATT, CATR,

OPPO, MediaTek, Vivo

Agreements:

- For 30 kHz subcarrier spacing case, the second SS block mapping pattern is
 - Map two SS blocks candidate locations to the slot of 14 symbols as follows
 - First candidate location is at symbols 2-5
 - Second candidate location is at symbols 8-11
- Note: In the case of NR-LTE coexistence, the first SS block mapping pattern (i.e., page 7 in [R1-1711899](#)) can be used
- Note: It is up to RAN4 to decide the SS block mapping pattern for each frequency band

[R1-1711854](#)

SS burst set composition LG Electronics, Nokia

Updated in [R1-1711906](#) WF on SS Burst set Composition LG Electronics, Nokia, InterDigital, British Telecom

Agreements:

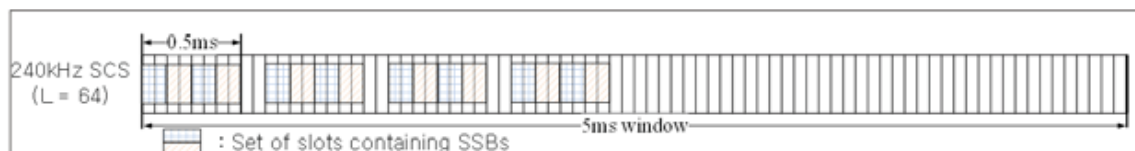
- For 15k Hz, 30 kHz, and 120 kHz subcarrier spacing, the following mapping to slots in a half radio frame is agreed

- Note: For NR and LTE coexistence, duplex direction alignment can be achieved by subframe offset



Agreement:

- For 240 kHz subcarrier spacing, the following mapping slot in a half radio frame is agreed



Not treated.

R1-1709885	The composition of SS burst sets	ZTE
R1-1709912	SS Burst Set and Block Composition	Huawei, HiSilicon
R1-1710023	SS Burst Set Composition and SS Block Configuration	CATT
R1-1710131	Discussion on design of SS block	Guangdong OPPO Mobile Telecom.
R1-1710259	Discussion on SS burst set composition	LG Electronics
R1-1710371	Remaining issues on the subcarrier spacing of SS block	Spreadtrum Communications
R1-1710372	Remaining issues on SS block and SS burst set composition	vivo
R1-1710502	SS Burst Set Composition	Intel Corporation
R1-1710798	Discussion on SS burst set composition	MediaTek Inc.
R1-1710914	On SS Burst Set Composition and Multiplexing	InterDigital, Inc.
R1-1711057	Discussion on SS burst set composition for NR	NTT DOCOMO, INC.
R1-1711232	Indication of actually transmitted SS blocks	Sharp
R1-1711261	On SS Burst Set Composition	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711394	Discussion on SS Burst Set Design	Convida Wireless LLC

5.1.1.1.3 Timing indication based on SS block

Include discussion and evaluation based on email discussion [89-15] such as SS block time index indication mechanism, identification of radio frame boundary and identification of SFN

Note that SS block time index indication mechanism needs to be finalized in this meeting

R1-1711646 **Timing indication based on SS block consideration** **Qualcomm Incorporated** (Revision of [R1-1711137](#))

- Proposal 1: PBCH payload carries the synchronization signal block index and 5ms timing boundary.
- Proposal 2: For 10-bit SFN ($s_9, s_8, \dots, s_2, s_1, s_0$), all bits except (s_2, s_1) are sent in PBCH payload. Furthermore, two bits (s_2, s_1) are signalled in PBCH scrambling or in SSS/DMRS.
- Observation 1: Multi-cell interference should be considered in deriving the number of bits that can be carried over PBCH DMRS, as cross-correlation between DMRS sequences across cells significantly impacts DMRS detection performance.
- Observation 2: For single-shot DMRS detection at -6dB SINR, only 2 bits are reliably delivered with 1/3 DMRS while less than 2 bits are reliably delivered with 1/4 DMRS for any PCI combinations.
- Observation 3: The capability of carrying information in DMRS reduces significantly if a high DMRS detection requirement is required e.g., 0.1% DMRS detection error.

Decision: The document is noted.

R1-1711589 **Timing indication based on SS block** **Samsung** (Revision of [R1-1710625](#))

Proposal 1: 7-bit MSB of SFN explicitly indicated in MIB and 3-bit LSB of SFN implicitly indicated by using scrambling.

Proposal 2: Multiple NR-DMRS sequences are introduced to indicate the SS block index within an SS burst set.

- 1st preference: DMRS to indicate SS block indices in order to avoid additional latency and power consumption of reading PBCH payload.
- 2nd preference: DMRS to indicate partial SS block indices and offload remaining SS block indices in explicit bits of PBCH payload, if this design can satisfy the reliability and latency issues addressed by LS R2-1706160.

Observations:

- NR-DMRS sequence detection for NR-SS block index identification is much more robust than PBCH explicit indication, even more robust against interference in multi-cell scenarios.
- NR-DMRS sequence detection has no impact on the channel estimation for NR-PBCH detection.
- NR-DMRS uneven RE mapping cannot improve PBCH detection but only results in DMRS performance loss, compared with even mapping assuming similar DMRS overhead.

Proposal 3: NR-DMRS with even RE mapping is preferred for SS block index indication.

Decision: The document is noted.

R1-1710905 **Signaling of SS block index** **Apple Inc.**

- Proposal 1: SS block should avoid the 1st symbol of every 0.5ms, which has longer duration compared to other OFDM symbols, to avoid ambiguity in UE detection.
- Proposal 2: nominal SS blocks are partitioned into SS bursts (or groups). Which SS blocks/bursts are actually transmitted can be configured by the network, although the indexing is based on the nominal SS blocks.
- Proposal 3: SS burst index is included in information bits of PBCH, while SS block index within a SS burst is signaled through PBCH implicitly, e.g., with different scrambling codes.
- Proposal 4: SS blocks within each SS burst can be combined to improve PBCH decoding reliability.
- Proposal 5: the set of K different scrambling codes can be selected from existing class of LFSR based sequences, such as M-sequence, Gold sequence, etc.
- Proposal 6: the number of SS blocks per SS burst (or group) K should be pre-determined, and can be band dependent.
- Observation 1: gNB beam mapping to SS blocks is transparent to UEs, regardless of the selection of K and M

Decision: The document is noted.

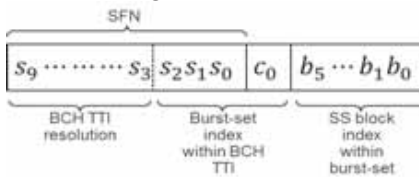
R1-1711373 **Timing indication based on SS block** **Ericsson**

- Proposal 1: The timing indication includes half-frame indication, slot/slot pair indication within a half-frame and the SS block indication within a slot/slot pair.
- Proposal 2: The slot group with consecutive or nonconsecutive slots to cover four possible SS block locations is proposed to unify the time indication design for all frequency ranges.
- Proposal 3: The half-frame specific scramble sequence is applied on the coded bits of NR-PBCH payload to indicate the half frame number $n_{\text{half sfm}} = \{0, \dots, 15\}$.
- Proposal 4: The explicit bits attached with the NR-PBCH MIB are used to indicate the slot group location.
- Proposal 5: The cover sequence can be used to implicitly indicate the four possible SS block positions within a slot group.

Decision: The document is noted.

Proposal:

- The timing information to be carried is as follows:



- This information is carried at least partly explicitly on the PBCH
- Options for a hybrid solution:
 - SS block index within burst set is carried by DMRS
 - 2 bits below 3 GHz, 3 bits for 3-6 GHz, 6 bits above 6 GHz
 - Achieves latency gain by enabling reception without decoding
 - Concerns on ability to carry so many bits on DMRS, and would require the DMRS to be invariant
 - SS block index (2/3 bits) within burst is carried by DMRS
 - 4/3 bits to indicate the burst in the burst set are carried in NR-PBCH payload
 - Can achieve latency gain below 3/6 GHz
 - Can enable the UE to obtain the beam index for inclusion in SS block measurement reporting without NR-PBCH decoding
 - But would still require the DMRS to be invariant
 - 2 bits of SFN carried by DMRS
 - Achieves complexity gain but not latency gain
 - SS block index (2 bits) within burst is carried by scrambling of both NR-PBCH and DMRS
 - 4 bits to indicate the burst in the burst set are carried in NR-PBCH payload
 - Achieves latency gain below 3 GHz
 - 3 bits of SFN carried by NR-PBCH payload scrambling

Agreement:

- One of the following two alternatives will be adopted (It is not precluded to adopt a different one of these alternatives below and above 6 GHz):
 - o Alt1: 3 bits of SS block index are carried by changing the DMRS sequence within each 5ms period
 - It can be further considered to limit the number of bits carried in this way to 2 if carrying 3 bits is shown to cause problems
 - o Alt2: 2 bits of SFN are carried by changing the DMRS sequence every 20ms
 - o Check on Friday whether a decision can already be made between Alt 1 and Alt 2
- It can be further considered whether, in addition to the above, 3 bits of the SFN can be carried by scrambling of the PBCH
- Remaining bits of the timing indication are carried explicitly in the NR-PBCH payload
- Note that it is suggested that the above 2 bullets are actually equivalent.

Thursday

Alt.1 supported by ZTE, Samsung, NTT DOCOMO, Intel, vivo, Fujitsu, Nokia, InterDigital, Sharp, LGE, Sony

- Objected by Motorola mobility, Mediatek, Qualcomm, Huawei, HiSilicon, OPPO, Lenovo

Alt.2 supported by Qualcomm, MotM, CATT, Huawei, HiSilicon, Ericsson, Lenovo, OPPO

- Objected by Samsung, LGE, NTT DOCOMO, vivo, Fujitsu, Interdigital, ZTE, Nokia

Conclusion: RAN1 will definitely select either Alt. 1 or Alt. 2 until Friday (11am), and all proponents are recommended to have following additional evaluations

- Individual pair of cell ID with the condition of worst case
- Random cell ID association with the separation of worst case DMRS pairs to different frequency shift position

Continue discussions until Friday – Samsung (Le)/Qualcomm (Peter)

Friday

Situation unchanged

Ericsson: Ok with either way – everyone should compromise, do not understand the companies objecting to these proposals

Qualcomm: decision should not be taken on counting the number of supporting companies and would like to see evaluation (asynchronous networks) and performance results of alternative 1. Suggested that the synchronization indication is included in the system information and RRM configuration.

Ericsson: could RAN1 decide first on synch indication and then make the choice between Alt 1 & 2?

Agreements:

- An indication related to the synchronization information is provided to the UE
 - When there is the indication for a carrier, UE can utilize serving cell timing to derive the index of SS block transmitted by neighbour cell (e.g., radio frame or SFN or symbol level synchronization)
 - Note that it is up to RAN2 how to provide this indication
 - Note that it is up to RAN4 about the feasibility of synchronization and its requirement

Chair : new round of show of hands

Alt.1 supported by ITL, vivo, Sony, Samsung, ZTE, DOCOMO, LGE, Sharp, ETRI, Fujitsu, Interdigital, Nokia, Intel (13)

- Objected by Qualcomm, Apple, Motorola Mobility (3)

Alt.2 supported by Qualcomm, Mediatek, OPPO, Huawei, HiSilicon, Xiaomi, Sequans, Motorola mobility, Lenovo, Apple, CATT (11)

- Objected by LGE, Samsung (2)

Qualcomm: still objecting to Alt.1 – has not got a technical answer showing the benefit of Alt 1 vs Alt 2

Samsung: RAN1 agreed synch indication, Alt 1 should be agreeable - very disappointed by Qualcomm

Let's revisit in the afternoon.

For sake of making progress, MotM and Apple withdrew their objection to Alt.1

Qualcomm could agree to take it as a working assumption

Agreements:

- **Working assumption:** 3 bits of SS block index are carried by changing the DMRS sequence within each 5ms period
 - It can be further considered to limit the number of bits carried in this way to 2 if carrying 3 bits is shown to cause problems
- FFS: details of scrambling of the PBCH which may or may not carry a part of timing information
- FFS: 5 ms half radio frame interval indication
- Remaining bits of the timing information are carried explicitly in the NR-PBCH payload

R1-1711868	WF on DMRS indication	Samsung
R1-1711946	WF on DMRS indication	Samsung
R1-1711967	Timing information indicated by DMRS	ZTE
R1-1711952	Performance evaluation of interference randomization	Qualcomm Incorporated

Not treated.

R1-1709886	Timing indication based on SS blocks	ZTE
R1-1709901	Scrambling pattern for timing indication over PBCH	Sequans Communications
R1-1709913	Time Index Indication	Huawei, HiSilicon
R1-1710024	SS-block time index indication	CATT
R1-1710132	Discussion on the timing indication of SS block	Guangdong OPPO Mobile Telecom.
R1-1710223	Discussion on timing indication based on SS block	Beijing Xinwei Telecom Techn.
R1-1710231	Consideration on timing indication based on SS block	Fujitsu
R1-1710260	Discussion on SS block time index indication	LG Electronics
R1-1710370	Discussion on time index indication	Spreadtrum Communications
R1-1710373	Discussion on SS block time index indication	vivo
R1-1710419	SS block time index indication	AT&T
R1-1710799	Further discussion on SS block index indication	MediaTek Inc.

R1-1710915	On SS Block Based Timing Indication in NR	InterDigital, Inc.
R1-1711058	Discussion on timing indication based on SS block for NR	NTT DOCOMO, INC.
R1-1711262	SS block time index indication	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711274	Discussion on location and timing indication of SS block	Xiaomi Technology
R1-1711276	Indication of SS block timing information	Motorola Mobility, Lenovo
R1-1711351	On timing indication for NR	ITL
R1-1711647	Time Index Signaling for SS Blocks	Intel Corporation
R1-1711659	Discussion on SS block time index indication	Sony

5.1.1.1.4 Remaining details on multiple SS block transmissions in wideband CC

Include number of SS blocks in wideband CC, RRM measurement with multiple SS blocks in wideband CC, and how to inform UE about presence/parameters of SS block(s)

R1-1709887	Multiple SS blocks in wideband CC	ZTE	
R1-1709973	On initial access for wideband carrier	Huawei, HiSilicon	
R1-1710025	Multiple SS block Transmission in wideband	CATT	
R1-1710133	Remaining details on multiple SS block transmissions in wideband CC		Guangdong OPPO Mobile Telecom.
R1-1710261	Remaining issues on Multiple SS block transmissions in wideband CC		LG Electronics
R1-1710374	SS block transmissions and RRM measurement in wideband CC		vivo
R1-1710420	SS block transmissions in a wideband CC	AT&T	
R1-1710504	SS Block(s) in Wideband Operation	Intel Corporation	
R1-1710626	Remaining details on multiple SS block transmissions in wideband CC		Samsung
R1-1710882	Multiple SS Blocks in wideband carrier	Ericsson AB	
R1-1711059	Discussion on remaining details on multiple SS block transmissions in wideband CC for NR		NTT DOCOMO, INC.
R1-1711138	Multiple SS block transmissions design in wideband CC	Qualcomm Incorporated	
R1-1711263	SS-block transmission in multi CC deployments	Nokia, Alcatel-Lucent Shanghai Bell	
R1-1711352	Multiple SS block indication in wideband CC	ITL	
R1-1711364	Multiple SS block transmissions in a wideband CC	ASUSTEK COMPUTER (SHANGHAI)	

5.1.1.2 Broadcast signal/channel

5.1.1.2.1 NR-PBCH contents and payload size

Include NR-PBCH contents, required number of bits for each content and corresponding payload size

R1-1709888	NR-PBCH contents	ZTE	
R1-1709914	NR-PBCH contents and payload size	Huawei, HiSilicon	
R1-1710026	NR PBCH Contents and Payload Size	CATT	
R1-1710262	Consideration on NR-PBCH contents and payload size		LG Electronics
R1-1710375	Views on NR-PBCH contents and payload size		vivo
R1-1710421	Details of NR-PBCH contents	AT&T	
R1-1710505	NR PBCH Design	Intel Corporation	
R1-1710627	NR-PBCH contents and payload size	Samsung	
R1-1710797	Discussion on PBCH Contents	MediaTek Inc.	
R1-1710916	On Physical Broadcast Channel in NR	InterDigital, Inc.	
R1-1711060	Discussion on NR-PBCH contents and payload size	NTT DOCOMO, INC.	
R1-1711139	PBCH contents and payload size consideration	Qualcomm Incorporated	
R1-1711277	Discussion on NR-PBCH contents	Motorola Mobility, Lenovo	
R1-1711374	NR-PBCH Content and payload size	Ericsson	
R1-1711650	NR-PBCH content	Nokia, Alcatel-Lucent Shanghai Bell	(Revision of R1-1711264)

5.1.1.2.2 NR-PBCH RE mapping and SS block composition

Include discussion and evaluation based on email discussion [89-15] such as SS block composition, NR-PBCH RE mapping, etc.

Note that SS block composition needs to be finalized in this meeting

From Wednesday morning offline

R1-1711140	SS block composition and PBCH RE mapping design	Qualcomm Incorporated
R1-1710376	NR-PBCH RE mapping and evaluation	vivo
R1-1710628	NR-PBCH RE mapping and SS block composition	Samsung
R1-1710800	Performance evaluation for RE mapping and SS block composition	MediaTek Inc.
R1-1710917	On NR-PBCH RE Mapping and SS Block Composition	InterDigital, Inc.
R1-1710369	NR-PBCH RE mapping and SS block composition	Spreadtrum Communications
R1-1711648	SS Block Composition	Intel Corporation (rev of R1-1710506)

Agreements:

- For the case of 2 PBCH symbols within the SS block: PSS-PBCH-SSS-PBCH
- PBCH RE mapping: Alt. 1, NR-PBCH coded bits of the NR-PBCH code block(s) are mapped across REs in N PBCH symbols, where N is the number of PBCH symbols in a NR-SS block

Not treated.

R1-1709889	NR-PBCH RE mapping and SS block composition	ZTE
R1-1710006	Discussion and evaluation on NR-PBCH design	Huawei, HiSilicon
R1-1710027	NR PBCH RE mapping in SS Block	CATT
R1-1710224	Discussion and evaluation on SS block composition	Beijing Xinwei Telecom Techn.
R1-1710263	Discussion on NR-PBCH RE mapping and SS block composition	LG Electronics
R1-1711265	SS block composition	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711278	NR-PBCH RE mapping	Motorola Mobility, Lenovo
R1-1711375	NR-PBCH RE mapping and SS block composition	Ericsson
R1-1711622	Discussion on NR-PBCH design and SS block composition	NTT DOCOMO, INC.
R1-1711658	Considerations on SS block compositions	Sony

5.1.1.2.3 Sequence design of DMRS for NR-PBCH

Include DMRS sequence generation, sequence to RE mapping, etc.

Note that DMRS sequence design and RE mapping need to be finalized in this meeting

From Wednesday morning offline

Proposed working assumption (from Wednesday morning offline):

- Sequence type: Gold sequence
 - o If cross correlation issues are found, other sequences can be considered
- Sequence initialization from cell ID, and 2 or 3 bits from time identification
- Different sequences in the N NR-PBCH symbols
 - o Using longer sequence, different mapping, different initialization etc.

Working assumption:

- Sequence type: Gold sequence
 - o If cross correlation issues are found, other sequences can be considered
- Sequence initialization from cell ID, and 2 or 3 bits from time identification
- Different sequences in the N NR-PBCH symbols
 - o FFS: Using longer sequence, different mapping, different initialization etc.

Conclusion: Discuss further until Thursday and downselect from:

- Alt 1: Equal DMRS density across NR-PBCH with 3 RE/PRB/Symbol
 - o Supported by NTT DOCOMO, Huawei, HiSilicon, vivo, ITL, LGE, OPPO, Intel, Mediatek, Ericsson, Fujitsu, ETRI, Samsung
- Alt 2: Equal DMRS density across NR-PBCH with 4 RE/PRB/Symbol
 - o Supported by Samsung, ZTE, CATT, LGE

- Alt 3: Unequal DMRS density with 4 RE/PRB/Symbol outside the NR-PSS/SSS bandwidth and 2 RE/PRB/symbol inside the NR-PSS/SSS bandwidth
 - o Supported by Qualcomm, Sony, Interdigital, Sierra

Thursday

CATT, ZTE (for compromise) also support Alt.1

Nokia can also go to Alt.1 although no evaluations have been performed (only Alt.2 and 3 were evaluated)

Agreement: Equal DMRS density across NR-PBCH with 3 RE/PRB/Symbol

Agreement: DMRS have the same RE position in all NR-PBCH symbols

Continue discussion on further details (Daewon, Intel)

Friday

[R1-1711943](#) **Discussion on DMRS sequence for NR PBCH** Intel

Conclusions:

- Companies are encouraged to provide the following information on NR PBCH DMRS sequence until 28th July in order to finalize the design – Daewon (Intel)
 - o Sequence generation related parameters
 - Gold Code LFSR size
 - Gold Code Polynomials
 - initial state configuration
 - output shift offset (e.g. Nc in LTE)
 - o Sequence Modulation
 - o Sequence mapping to NR PBCH DMRS RE positions
 - o Exact NR PBCH DMRS RE positions within the NR PBCH resource
 - o Some examples of the information are shown in [R1-1711943](#)

Not treated.

R1-1709890	NR-PBCH DMRS design	ZTE
R1-1710007	DMRS for NR-PBCH	Huawei, HiSilicon
R1-1710028	NR PBCH DM RS sequence design and RE mapping	CATT
R1-1710225	Discussion and evaluation on DMRS design for NR-PBCH	Beijing Xinwei Telecom Techn.
R1-1710232	Discussion on DMRS for NR-PBCH	Fujitsu
R1-1710264	Discussion on DMRS design for NR-PBCH	LG Electronics
R1-1710507	DMRS Sequence for NR PBCH	Intel Corporation
R1-1710629	Sequence design of DMRS for NR-PBCH	Samsung
R1-1710918	On DMRS Designs for NR-PBCH	InterDigital, Inc.
R1-1711062	Discussion on sequence design of DMRS for NR-PBCH	NTT DOCOMO, INC.
R1-1711141	DMRS design for NR-PBCH	Qualcomm Incorporated
R1-1711266	NR-PBCH DMRS design	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711353	DMRS sequence design for NR-PBCH	ITL
R1-1711376	NR-PBCH DMRS design	Ericsson

5.1.1.2.4 Remaining minimum system information delivery

Include numerology used for RMSI delivery

R1-1709891	RMSI delivery	ZTE
R1-1709915	Discussion on NR RMSI delivery	Huawei, HiSilicon
R1-1710029	RMSI Delivery	CATT
R1-1710134	Discussion on the numerology of the RMSI	Guangdong OPPO Mobile Telecom.
R1-1710233	Discussion on the CORESET for RMSI delivery	Fujitsu
R1-1710244	PRB indexing for RMSI in NR	NEC
R1-1710265	Remaining minimum system information delivery	LG Electronics

R1-1710508	RMSI Delivery Mechanisms	Intel Corporation
R1-1710608	Delivery of remaining minimum system information	ETRI
R1-1710630	Remaining minimum system information delivery	Samsung
R1-1710773	CORESET configuration for RMSI scheduling	CMCC
R1-1710801	Further discussion on Remaining minimum system information delivery	MediaTek Inc.
R1-1710841	Discussion on remaining system information delivery	Beijing Xinwei Telecom Techn.
R1-1710919	On Minimum System Information Delivery	InterDigital, Inc.
R1-1711063	Discussion on remaining minimum system information delivery for NR	NTT DOCOMO, INC.
R1-1711142	Remaining system information delivery consideration	Qualcomm Incorporated
R1-1711267	On Remaining System Information Delivery	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711319	Relation among NR-PBCH, SIBs and subcells	Panasonic
R1-1711377	NR delivery of remaining minimum system information	Ericsson

5.1.1.2.5 Other system information delivery

Include how to deliver other system information

R1-1709892	Other SI delivery	ZTE
R1-1710030	Delivery of Other System Information	CATT
R1-1710135	Discussion on the on-demand SI	Guangdong OPPO Mobile Telecom.
R1-1710379	Identification NSA mode during initial access	vivo
R1-1710477	Discussion on other system information delivery	Huawei, HiSilicon
R1-1710609	Delivery of other system information	ETRI
R1-1710631	Other system information delivery	Samsung
R1-1710802	Further discussion on OSI delivery	MediaTek Inc.
R1-1711143	Other system information delivery consideration	Qualcomm Incorporated
R1-1711378	NR delivery of other system information	Ericsson
R1-1711391	On Other System Information Delivery	Nokia, Alcatel-Lucent Shanghai Bell

5.1.1.3 Paging design

Include PO/PF definition, whether/how to multiplex paging DCI and/or message with other signal/channel, spatial QCL assumption with other signal/channel, and paging indication mechanism

R1-1709893	Paging design in NR	ZTE
R1-1709916	Multi-beam Paging for NR	Huawei, HiSilicon
R1-1710031	NR Paging Channel	CATT
R1-1710136	On NR paging design and transmission	Guangdong OPPO Mobile Telecom.
R1-1710267	Paging design in NR	LG Electronics
R1-1710509	NR Paging Design	Intel Corporation
R1-1710632	Paging design	Samsung
R1-1710803	Further discussion on paging design	MediaTek Inc.
R1-1711064	Discussion on paging design for NR	NTT DOCOMO, INC.
R1-1711144	Paging design consideration	Qualcomm Incorporated
R1-1711254	Discussion on Paging Design	III
R1-1711271	Paging in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711379	On NR paging design	Ericsson

5.1.1.4 Physical random access channel and random access procedure

5.1.1.4.1 PRACH preamble format details for long/short sequence length

Include discussion and evaluation based on email discussion [89-16], whether/how to support restricted set, etc.

From Wednesday morning offline

Agreements:

- Confirm the working assumption on supporting format 3
- For formats with L=839

- o Unrestricted sets are supported
- o For restricted sets
 - 1.25 kHz: Restricted set A supported, Restricted set B is FFS
 - 5 kHz: Restricted set is supported with FFS if Restricted set A, B or both are supported
- For L=127/139 with option 1, formats with 1,2,4,6, and 12 OFDM symbols are supported
 - o Discuss further until Friday actual format definitions with CP and GP (LGE)
 - Number of symbols can be adjusted if problems are identified

Thursday

[R1-1711875](#) WF on PRACH Preamble Format for Short sequence with Option 1 LG Electronics, NTT
DOCOMO

Also supported by ZTE, Ericsson

Possible agreements:

- For 15kHz subcarrier spacing,
 - Agree at least followings

Table 1: Parameters of the proposed scheme									
Preamble format		# of Sequence	TCP	TSEQ	TGP	Path profile (Ts)	Path profile (us)	Maximum Cell radius (meter)	Use case
A	0	1	144	2048	0	48	1.56	[469]	TA is already known or Very small cell
	1	2	288	4096	0	96	3.13	[469]	Small cell
	2	4	576	8192	0	144	4.69	[1,055]	Normal cell
	3	6	864	12288	0	144	4.69	[1,758]	Normal cell
B	4	12	936	24576	792	144	4.69	[3,867]	Normal cell

- Note 1: Unit is Ts, where $T_s = 1/30.72\text{MHz}$
- Note 2: PRACH preamble are aligned with OFDM symbol boundary for data with same numerology
- Note 3: Additional 16Ts for every 0.5ms should be included in T_{CP} when RACH preamble is transmitted across 0.5ms boundary or from 0.5ms boundary
- Note 4: Note that cell radius can be changed later
- Note 5: For format A, GP can be defined within the last RACH preamble among consecutively transmitted RACH preambles

Continue offline discussions until Friday – Hyunsoo (LGE)

Friday

Agreements:

- For 15 kHz subcarrier spacing,
 - o Agree on following preamble formats A2, A3, B4
 - o **Working assumption** on following preamble formats A0, A1, B0, B1, B2, B3, C0, C1

Preamble format		# of Sequence	TCP	TSEQ	TGP	Path profile (Ts)	Path profile (us)	Maximum Cell radius (meter)	Use case
A	0	1	144	2048	0	48	1.56	469	TA is already known or Very small cell
	1	2	288	4096	0	96	3.13	938	Small cell
	2	4	576	8192	0	144	4.69	2,109	Normal cell
	3	6	864	12288	0	144	4.69	3,516	Normal cell
B	0	1	144	2048	0	48	1.56	469	TA is already known or Very small cell
	1	2	192	4096	96	96	3.13	469	Small cell
	2	4	360	8192	216	144	4.69	1,055	Normal cell
	3	6	504	12288	360	144	4.69	1,758	Normal cell
	4	12	936	24576	792	144	4.69	3,867	Normal cell
C	0	1	1240	2048	0	144	4.69	5300	Normal cell
	1	2	1384	4096	0	144	4.69	6000	Normal cell

- o Note 1: Unit is Ts, where $T_s = 1/30.72\text{MHz}$
- o Note 2: PRACH preamble are aligned with OFDM symbol boundary for data with same numerology
- o Note 3: Additional 16Ts for every 0.5ms should be included in TCP when RACH preamble is transmitted across 0.5ms boundary or from 0.5ms boundary
- o Note 4: For format A, GP can be defined within the last RACH preamble among consecutively transmitted RACH preambles
- For 30/60/120 kHz subcarrier spacing, preamble format can be scaled according to subcarrier spacing.
 - o $T_s = 1/(2 \times 30720)$ ms for 30 kHz subcarrier spacing

- o $T_s = 1/(4 \cdot 30720)$ ms for 60 kHz subcarrier spacing
- o $T_s = 1/(8 \cdot 30720)$ ms for 120 kHz subcarrier spacing
- o Note that some of the formats may not be applicable to all subcarrier spacings

Not treated.

R1-1709894	NR-PRACH formats for long/short sequences	ZTE
R1-1710008	PRACH preamble format details for long/short sequence length	Huawei, HiSilicon
R1-1710032	NR RACH Long and Short Preamble Sequence Length	CATT
R1-1710268	Discussion on PRACH preamble format details	LG Electronics
R1-1710510	NR PRACH Preamble design	Intel Corporation
R1-1710633	PRACH preamble format details for long/short sequence length	Samsung
R1-1710889	NR Physical Random Access Channel	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711065	Discussion on PRACH preamble format details for long/short sequence length for NR	NTT DOCOMO, INC.
R1-1711145	PRACH preamble format design for long/short sequence length	Qualcomm Incorporated
R1-1711270	[89-16] Email discussion on NR-PRACH preamble formats based on short sequence length	ZTE Corporation
R1-1711380	NR-RACH preamble format details	Ericsson
R1-1711527	PRACH Preamble Format Design	Cohere Technologies
R1-1711547	Discussion on PRACH designs for short sequence	Sequans Communications
R1-1711970	WF on RACH preamble format for short sequence with 1 and 2 OFDM symbols	Nokia, Alcatel-Lucent Shanghai Bell

5.1.1.4.2 PRACH preamble format details for capacity enhancement and beam management

Include necessity and detailed solution for PRACH capacity enhancement, and PRACH design for beam management/recovery

R1-1711865	Multiple/Repeated PRACH Preamble Transmission with OCC across Preambles	Qualcomm, Interdigital, Samsung, AT&T, Verizon
R1-1711827	WF on Capacity Enhancement for option 1 of PRACH preamble	LGE, ITL
R1-1711849	WF on Preamble sequence for capacity enhancement	Huawei, HiSilicon

Possible agreements:

- NR should support PRACH preambles with ZC sequences of length $L=127$
- NR should support at least 64 PRACH preamble sequences per cell constructed from a single-root ZC sequence with m-sequence cover sequences.
 - The m-sequence cover sequences have length $L=127$ and are obtained by cyclic-shifts of a single m-sequence generated from the generator polynomial $g(D) = D^7 + D^3 + 1$.

Friday

R1-1711870	WF on NR PRACH capacity enhancement	CATT, Huawei, TCL
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- *Support RACH format design for Option 4.*

Discussion: Also supported by Nokia.

Decision: The document is noted.

R1-1710890	NR Physical Random Access Channel Capacity	Nokia, Alcatel-Lucent Shanghai Bell
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- Proposal 1: RACH sequence capacity should consider the on-demand SI RACH requests.
- Proposal 2: Use the same PRACH preamble format for FDM multiplexed PRACH resources for initial access and PRACH resources for beam recovery requests.
- Proposal 3: In multiplexing resources for beam recovery requests in TDM manner with RACH slots, support SR like resource of PUCCH for beam recovery requests.
- Proposal 4: As capacity need to due handovers depend on network load and deployment, the NR should support flexible PRACH resource allocation both in time and frequency domain.
- Proposal 5: NR to consider dedicated PRACH preamble sequences for paging driven response.
- Proposal 6: RACH sequence capacity should consider paging indicator response.

- Proposal 7: Support 139 sequence length for short PRACH preamble sequence.
- Proposal 8: Consider preamble format 4 as a method to increase the PRACH preamble sequence capacity.
- Proposal 9: RACH configuration supports both option 1 and option 4.

Decision: The document is noted.

R1-1711600 PRACH preamble sequences and formats for capacity enhancement and beam management Huawei, HiSilicon (Revision of [R1-1709917](#))

- Proposal 1: NR should support PRACH preambles with ZC sequences of length $L=127$.
- Proposal 2: NR should support at least 64 PRACH preamble sequences per cell constructed from a single-root ZC sequence with m-sequence cover sequences.
 - The m-sequence cover sequences have length $L=127$ and are obtained by cyclic-shifts of a single m-sequence generated from the generator polynomial $g(D) = D^7 + D^3 + 1$.
- Proposal 3: 2-stage PRACH with proper UE grouping should be supported as an option to reduce detection complexity for the much higher PRACH spectral efficiency in NR.
- Proposal 4: NR supports option 4 for gNB sweeping.

Decision: The document is noted.

Not treated.

R1-1709895	NR-PRACH formats: capacity enhancements and other use cases	ZTE
R1-1710269	Discussion on PRACH preamble for capacity enhancement	LG Electronics
R1-1710511	Discussions on PRACH Capacity	Intel Corporation
R1-1710610	NR-PRACH for various use cases	ETRI
R1-1710634	PRACH preamble format details for capacity enhancement and beam management	Samsung
R1-1710822	On PRACH design to support uplink requests	MediaTek Inc.
R1-1711066	Discussion on PRACH preamble format details for capacity enhancement and beam management for NR	NTT DOCOMO, INC.
R1-1711146	PRACH preamble design for capacity enhancement	Qualcomm Incorporated
R1-1711381	NR-RACH preamble format details for capacity enhancement and beam management	Ericsson
R1-1711569	PRACH Design	TCL Communication Ltd.
R1-1711618	NR RACH Preamble Format for capacity enhancement,	CATT

5.1.1.4.3 Power ramping and power control during RA procedure

Include remaining details on PRACH power ramping and Msg.3 power control mechanism

Note that all remaining aspects related to power ramping/control during RA procedure need to be finalized in this meeting

From Wednesday evening offline

Agreements:

- The UE calculates the PRACH transmit power for the retransmission at least based on the most recent estimate pathloss and power ramping
 - The pathloss is measured at least on the SS block associated with the PRACH resources/preamble subset
- UE behavior when reaching the maximum power
 - If the recalculated power is still at or above the $P_{c,max}$
 - The UE can transmit at maximum power even if it changes its TX beam

To be discussed further:

- Is the UE required to select the PRACH resources based on the SS block received with the highest SS block RSRP?
- Is the UE allowed to change SS block used for the pathloss estimate for retransmission?

Thursday: Above questions should not have an impact to RAN4 progress.

Continue discussion until Friday – Nazmul (Qualcomm)

Friday: Continue discussions at the next meeting.

R1-1711861 WF on RACH Power Control Mechanism for Msg.1 Transmission LGE, NTT DOCOMO

Also supported by Huawei, HiSilicon

Possible agreements:

- Configure the number of beam switching N for power ramping in Msg.1 (re)transmission, where,
 - when UE conducts beam switching and the number of beam switching is equal to or lower than the number N
 - The counter of power ramping remains unchanged,
 - when UE conducts beam switching and the number of beam switching is N+1
 - If UE doesn't reaches maximum power, the counter of power ramping increases
 - Otherwise, UE reports random access problem to upper layer
 - when the counter of power ramping increases
 - The number of beam switching is reset.
- Configure the maximum count of continuously increasing power ramping in a certain beam, where,
 - when the configured number is exceeded,
 - UE should change its beam for PRACH preamble retransmission.

Not treated.

R1-1709896	Power control during random access procedure	ZTE	
R1-1709918	Discussion on power ramping and power control during RA procedure		Huawei, HiSilicon
R1-1710137	Discussion on Power ramping and power control during RA procedure		Guangdong OPPO Mobile Telecom.
R1-1710270	Discussion on Power Control issue for Message 1 and 3	LG Electronics	
R1-1710512	PRACH Power ramping procedure	Intel Corporation	
R1-1710635	Power ramping and power control during RA procedure	Samsung	
R1-1710870	Power ramping for Msg1 preamble re-transmission	InterDigital, Inc.	
R1-1710891	Preamble Power Ramping and RACH Message 3 Power Control	Nokia, Alcatel-Lucent Shanghai Bell	
R1-1711067	Discussion on power ramping and power control during RA procedure for NR	NTT DOCOMO, INC.	
R1-1711147	Power ramping and power control for RA procedure	Qualcomm Incorporated	
R1-1711233	Remaining issues on power ramping in NR	Sharp	
R1-1711382	Power ramping and power control during RA procedure	Ericsson	
R1-1711617	RACH power control and power ramping procedure	CATT	
R1-1711625	PRACH Msg1 retransmission	MediaTek Inc.	
R1-1711828	WF on RACH power control	LG Electronics, ETRI	

5.1.1.4.4 4-step RA procedure

Include Msg.2/3/4 channel design, RACH configuration, non-contention based random access procedure, etc.

[R1-1711866](#) WF on RACH configuration in RMSI Huawei, HiSilicon

Agreement:

- All random access configuration information is broadcasted in all beams used for RMSI within a cell
 - o i.e, RMSI information is common for all beams

[R1-1711936](#) WF on CSI-RS based RACH Configuration Samsung, Ericsson, ZTE, Mediatek Mitsubishi, MTI
 Also supported by Nokia, Huawei, HiSilicon

Agreements:

- At least for handover case, a source cell can indicate in the handover command,
 - o Association between RACH resources and CSI-RS configuration(s)
 - o Association between RACH resources and SS blocks
 - o A set of dedicated RACH resources (FFS: time/frequency/sequence)
 - o Note that above CSI-RS configuration is UE-specifically configured

[R1-1711876](#) WF on multiple Msg.1 transmission for contention free case Samsung, Huawei, HiSilicon, MediaTek, ZTE

Possible agreements:

- For contention free case, a UE can be configured to transmit multiple Msg.1 over multiple RACH transmission occasions before the end of a monitored RAR window

Friday

Agreements:

- For contention free case, a UE can be configured to transmit multiple Msg.1 over dedicated multiple RACH transmission occasions in time domain before the end of a monitored RAR window if the configuration of dedicated multiple RACH transmission occasions in time domain is supported.
 - o Note: The time resource used for 'dedicated RACH in time domain' is different from the time resources of contention based random access
 - o Note: Multiple Msg1 can be transmitted with same or different UE TX beams

R1-1711799 WF on random access association configuration ZTE

Possible agreements:

- The subsets of PRACH resources/indices are defined using the following parameters
 - W: Number of preamble indices per subset of preamble indices
 - X: Number of preamble subsets per PRACH resource
 - Y: Number of associations per preamble subset per PRACH time instance
- The SS blocks are consecutively associated with the subsets of PRACH resources/indices using the following parameter
 - Z: Association time period
 - The number of PRACH time instances after which an association from an SS block occurs again

Friday

R1-1711945 WF on random access association configuration ZTE

Agreements:

- For contention-based random access, an association between an SS block in the SS burst set and a subset of RACH resources and/or preamble indices is configured by a set of parameters in RMSI.
 - o RAN1 strives to use the same set of parameters for different cases, e.g. analog/hybrid/digital beamforming at gNB, level of gNB beam correspondence, number of SS blocks, number of frequency multiplexed PRACH resources, PRACH resource density in time etc.
 - o RAN1 strives to minimize the set of parameters.
 - o FFS the set of parameters
 - o FFS the number of SS blocks (if indicated in RMSI or MIB), e.g. the actually transmitted SS blocks or the maximum number (L).

Not treated.

R1-1709897	4-step random access procedure	ZTE
R1-1710035	Further details on NR 4-step RA Procedure	CATT
R1-1710138	NR 4-Step Random Access Procedure	Guangdong OPPO Mobile Telecom.
R1-1710218	RACH transmission count	Mitsubishi Electric Co.
R1-1710234	Discussion on 4-step RA procedure	Fujitsu
R1-1710271	RACH Procedure	LG Electronics
R1-1710422	DL Tx beam reporting in msg. 3	AT&T
R1-1710478	RACH procedures and resource configuration	Huawei, HiSilicon
R1-1710513	4-step PRACH Procedures	Intel Corporation
R1-1710636	4-step RACH procedure	Samsung
R1-1710774	Discussion on RACH configuration	CMCC
R1-1710824	On 4-step RACH procedure	MediaTek Inc.
R1-1710860	Considerations on 4-step RA procedure	Sony
R1-1710871	Multiple Msg1 transmissions for one monitored RAR window	InterDigital, Inc.
R1-1710892	NR 4-step RACH procedure	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711068	Discussion on 4-step RA procedure for NR	NTT DOCOMO, INC.
R1-1711148	4-step RACH procedure consideration	Qualcomm Incorporated
R1-1711279	RACH configuration and procedure	Motorola Mobility, Lenovo

[R1-1711383](#) 4-step random access procedure Ericsson

5.1.1.5 Mobility procedure

5.1.1.5.1 Measurement based on SS block

Include whether/how to handle power offset between NR-SSS and PBCH-DMRS, one or multiple information on periodicity and timing for RRM measurement per carrier, etc.

[R1-1710977](#) Discussion on RRM measurement on SS blocks CMCC

Alt 1: Network indicates one single shortest periodicity for RRM measurement in the same carrier frequency.

Alt 2: Network indicates one single longest periodicity for RRM measurement in the same carrier frequency.

Alt 3: Network indicates two periodicities, one for the camping cell and the other for the neighboring cells in the same carrier frequency.

- Observation 1: For IDLE mode UE RRM measurement, one single indication of the *longest* SS burst set periodicity of all the cells in the same carrier frequency can work, as long as the SS block timing locations within the SS burst set with longer periodicity is a subset of SS block timing locations within the SS burst set with shorter periodicity, i.e., *subset alignment of all SS blocks in the same carrier frequency*.
- Observation 2: From network operating perspective, subset alignment of SS blocks is necessary since it ensures the simple indication of SSBS periodicity for RRM measurement and that UE can also detect cells that are not configured in the neighbor cell list.
- Observation 3: For IDLE mode UE, both Alt 2 and Alt 3 can work.
- Proposal 1: It is slightly preferred that Alt 2, i.e., one periodicities and one information regarding SS block timing locations is indicated to IDLE mode UE for intra-frequency measurement.
- Proposal 2: For CONNECTED mode UE, two SSBS periodicities and two information regarding SS block timing locations are indicated for intra-frequency measurement.
- Proposal 3: Only one SSBS periodicity regarding inter-frequency measurement is preferred to be indicated.

Decision: The document is noted.

[R1-1709919](#) SS Burst Periodicities and timing for UE RRM measurement Huawei, HiSilicon

- Proposal 1: In addition to NR-SSS, UE may optionally use DMRS for PBCH to derive SS block RSRP as cell level quality for L3 mobility. Whether and how to use DMRS for PBCH is up to UE implementation.
- Proposal 2: NR should support fixed power offset between NR-SSS and PBCH-DMRS to use PBCH-DMRS to derive SS block RSRP for L3 mobility.
- Proposal 3: NR should support to indicate multiple SS burst set periodicities and information regarding measurement timing/duration to connected mode UE.
- Proposal 4: NR should support to indicate one SS burst set periodicity and one information regarding measurement timing/duration for all cells or non-serving cells to idle mode UE.

Decision: The document is noted.

[R1-1710637](#) Measurement based on SS block Samsung

- Proposal 1: A fixed EPRE power ratio shall be adopted between SSS and PBCH DMRS. The fixed ratio shall be 3.5dB.
- Proposal 2: Only a single SS burst set periodicity value shall be configured per carrier

Decision: The document is noted.

[R1-1711761](#) WF on measurement based on SS block NTT DOCOMO, Ericsson, Huawei, HiSilicon, AT&T

- Regarding the measurement timing configuration i.e., SS burst set periodicity/timing/duration information for UE RRM measurement per frequency carrier,
 - Only single measurement timing configuration is configured per frequency carrier to UE for IDLE mode measurement.
 - Multiple measurement timing configurations can be configured to UE in CONNECTED mode.
 - Different measurement timing configurations are applied to different group of cells on the frequency carrier
 - FFS maximum number of measurement timing configurations per frequency carrier

Decision: The document is noted.

Agreements:

- Regarding the SS block based RRM measurement timing configuration (SMTC) i.e., measurement window periodicity/duration/offset information for UE RRM measurement per frequency carrier,

- o For intra-frequency CONNECTED mode measurement, up to two measurement window periodicities can be configured
 - UE can be informed of which cell(s) is associated with which measurement window periodicity
 - For cell(s) that is not listed, longer measurement window periodicity is used
 - Single measurement window offset and duration are configured per frequency carrier
- o For IDLE mode measurements, only single SMTC is configured per frequency carrier
- o For inter-frequency CONNECTED mode measurements, only single SMTC is configured at least per frequency carrier
- o RAN1 asks RAN4 if there is any concern for inter-frequency measurement based on single SMTC or multiple SMTCs across different frequency carriers

R1-1711801 **WF on power offset of NR-PBCH DMRS and NR-SSS** **MediaTek, Huawei, HiSilicon, NTT DOCOMO**

- A fixed power offset defined in the specification shall be adopted between SSS and PBCH DMRS.
 - FFS: 0 dB, 3 dB, or 3.5 dB power offset

Decision: The document is noted and the following is agreed:

Agreement: A fixed power offset defined in the specification shall be adopted between SSS and PBCH DMRS per frequency band

Not treated.

R1-1709898	RRM measurements on IDLE mode RS	ZTE
R1-1710036	IDLE and CONNECTED mode UE mobility based on SS-block measurements	CATT
R1-1710139	On RRM measurement based on SS block	Guangdong OPPO Mobile Telecom.
R1-1710272	SS block based RRM Measurement	LG Electronics
R1-1710423	Measurement based on SS block	AT&T
R1-1710514	SS Block based RRM Measurements	Intel Corporation
R1-1710804	Discussion on measurement based on SS block	MediaTek Inc.
R1-1711069	Discussion on NR RRM measurement based on SS block	NTT DOCOMO, INC.
R1-1711149	Measurement based on SS block consideration	Qualcomm Incorporated
R1-1711268	SS block measurements and procedures	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711384	Mobility measurements based on SS block	Ericsson
R1-1711800	WF on SS block repetition	ZTE, Sierra Wireless

5.1.1.5.2 Measurement based on CSI-RS for L3 mobility

Include candidate periodicity values, whether/how transmission and/or measurement bandwidth is indicated, numerology of CSI-RS for L3 mobility, spatial QCL assumption, methods to obtain parameters of CSI-RS for L3 mobility, etc.

Note that CSI-RS configuration parameters for L3 mobility need to be finalized in this meeting

R1-1710273 **CSI-RS based RRM Measurement for L3 Mobility** **LG Electronics**

- Proposal 1: Considering the UE behaviour of L3 mobility, CSI-RS for L3 mobility should be transmitted periodically, and the periodicity of CSI-RS is configured to be at least less than 20ms.
- Proposal 2: Transmission bandwidth of CSI-RS is signalled by UE-dedicated RRC message and how much part is used as measurement bandwidth is an implementation issue.
- Proposal 3: Symbol duration of CSI-RS is based on SCS of data channel and it is configured per frequency through UE-dedicated RRC configuration message. IFDMA is proposed for sub-time unit transmission within an OFDM symbol.
- Proposal 4: A part of spatial information can be exploited from a SS block if the beam width of SS block is super set but limited set of the beam width of CSI-RS.
- Proposal 5: When a UE detects SS block of a cell, which is not in the neighbour cell list or whose CSI-RS configuration is not given to the UE, UE may request CSI-RS configuration for that cell using measurement report.

Decision: The document is noted.

R1-1710805 **Discussion on CSI-RS for L3 mobility** **MediaTek Inc.**

- Proposal 1: Candidate periodicity values of CSI-RS for L3 mobility is 5, 10, 20, 40, 80, 160 ms.
- Proposal 2: CSI-RS for L3 mobility and SS block burst are transmitted in TDM manner.
- Proposal 3: The CSI-RS for L3 mobility and the measurement gap should be aligned, and the entire CSI-RS for L3 mobility should be contained in the measurement gap.
- Proposal 4: NR supports measurement configuration of CSI-RS for L3 mobility, including
 - o measurement bandwidth per carrier frequency
 - o numerology
 - o QCL assumption
- Observation 1: The numerologies of CSI-RS from different cells could be different, so it is unlikely all configuration parameters are valid for all CSI-RS resources on a carrier frequency (Method 2).
- Proposal 5: As a baseline, configuration parameters of CSI-RS for L3 mobility are valid for one CSI-RS resource. Certain parameters can be cell-specific/frequency-specific, e.g. periodicity.
- Observation 2: If the configuration parameters can be obtained from detected cell-ID (e.g. Method 3 & Method 5), then it is cell-specific configuration, and RAN1 does not see the need to support cell-specific configuration for CSI-RS for RRM measurement.
- Observation 3: Measuring CSI-RS with parameters derived from detected cells will increase UE complexity.

Decision: The document is noted.

R1-1711762 WF on measurement based on CSI-RS NTT DOCOMO, Ericsson, AT&T

- Following CSI-RS properties for RRM measurement for L3 mobility are supported in NR
 - Configurable periodicity (as already agreed)
 - {5, 10, 20, 40, [80, 160]} ms are supported
 - Configurable transmission bandwidth (as already agreed)
 - FFS candidate values
 - Configurable measurement bandwidth (as already agreed) and frequency location
 - At least minimum carrier bandwidth for each frequency band/range and at least one additional wider bandwidth for each SCS (e.g., maximum UE bandwidth) are supported
 - FFS other candidate values for wider bandwidth for each SCS
 - Measurement of CSI-RS in subband/bandwidth part which may or may not contain SS Blocks is supported
 - Configurable parameters for sequence generation
 - Configurable numerology
 - For each frequency range, subcarrier spacing values applicable to data, CSI-RS for beam management and SS block in the frequency range are supported
 - FFS: Configurable spatial QCL with SS block
 - It is assumed that property of spatial QCL between SS block and CSI-RS for beam management will be reused
 - Configurable CSI-RS time/frequency resource (as already agreed)
 - CSI-RS design including RE mapping and density for beam management is assumed as baseline

Decision: The document is noted, modified and agreed as follows:

Agreements:

- Following CSI-RS properties for RRM measurement for L3 mobility are supported in NR
 - o Configurable periodicity (as already agreed)
 - {5, 10, 20, 40, [80, 160]} ms are supported
 - This does not mean periodicity will be configured per CSI-RS resource
 - o Configurable transmission bandwidth (as already agreed)
 - FFS candidate values
 - o Configurable measurement bandwidth (as already agreed) and frequency location
 - At least minimum carrier bandwidth for each frequency band/range and at least one additional wider bandwidth for each SCS (e.g., maximum UE bandwidth) are supported
 - FFS other candidate values for wider bandwidth for each SCS
 - Measurement of CSI-RS in subband/bandwidth part which may or may not contain SS Blocks is supported
 - o Configurable parameters for sequence generation
 - o Configurable numerology
 - For each frequency range, subcarrier spacing values applicable to data, CSI-RS for beam management and SS block in the frequency range are supported
 - o Association between CSI-RS for RRM measurement and SS block

- It is assumed that property of spatial QCL between SS block and CSI-RS for beam management will be reused
- o Configurable CSI-RS time/frequency resource (as already agreed)
 - CSI-RS design including RE mapping and density for beam management is assumed as baseline
- o Note that above properties are relevant for RAN4 RRM measurement evaluations and not intended to be an exhaustive list of properties

R1-1711864 Measurement window periodicity, duration and offset of CSI-RS for L3 mobility Qualcomm

Possible agreements:

- For DRX operation,
 - For the CSI-RS based RRM measurement timing configuration (i.e., measurement window periodicity/duration/offset information), only a single measurement window periodicity, duration and offset for all CSI-RS resources are configured per frequency carrier
 - This applies to both intra-frequency and inter-frequency measurements

Not treated.

R1-1709899	RRM measurements on CSI-RS for L3 mobility	ZTE
R1-1709920	CSI-RS configuration parameters for L3 mobility	Huawei, HiSilicon
R1-1710378	CSI-RS configuration for L3 mobility	vivo
R1-1710424	Measurement based on CSI-RS for L3 mobility	AT&T
R1-1710515	CSI-RS based RRM Measurements	Intel Corporation
R1-1711070	Discussion on NR RRM measurement based on CSI-RS for L3 mobility	NTT DOCOMO, INC.
R1-1711150	Measurement based on CSI-RS for L3 mobility consideration	Qualcomm Incorporated
R1-1711385	Measurements based on CSI-RS for L3 mobility	Ericsson
R1-1711392	CSI-RS configuration for L3 mobility purposes	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711576	L3 Mobility based on CSI-RS based measurements	CATT
R1-1711581	Measurement based on CSI-RS for L3 mobility	Samsung
R1-1711900	WF on remaining issues on CSI-RS for mobility with RAN4 impact	Ericsson
R1-1711902	WF on CSI-RS resources for L3 mobility	Ericsson

5.1.1.5.3 Radio link monitoring

Include RS used to derive SINR like metric for RLM

Note that RS used for radio link monitoring needs to be finalized in this meeting

R1-1711151 Radio link monitoring consideration Qualcomm Incorporated

- Proposal 1: In Idle/RRC connected inactive/RRC connected active states, cell detection and measurements are based on cell-specific PSS and SSS for both the serving cell and neighboring cells.
- Proposal 2: Choice of RLM RS should consider the following aspects
 - o RLM RS should be QCL with NR-PDCCH to reflect the channel experienced by NR-PDCCH
 - o UE should be able to estimate the interference level experienced by NR-PDCCH
 - o RLM RS should have guaranteed existence with lower enough periodicity, i.e. 10-20ms or DRX cycle if DRX cycle is longer than 10-200ms
 - o Consider reuse RLM RS for other purposes to reduce overhead, i.e. beam management, tracking RS, etc.
- Proposal 3: LTE Radio Link Failure triggering procedure can be a starting point for NR radio link monitoring design
- Proposal 4: In addition to RLM based IS/OOS, beam failure recovery procedure can provide periodic/aperiodic IS and OOS indications to upper layers for the RLF procedure.

Decision: The document is noted.

R1-1711763 WF on radio link monitoring NTT DOCOMO, Ericsson, AT&T

- The RS used for RLM should have following properties
 - Periodic transmission with short enough periodicity
 - Wideband transmission relative to bandwidth of active bandwidth part
 - Supporting both single beam and multi-beam operations
 - Representing control channel quality, e.g., by QCL with PDCCH
- CSI-RS can be periodic and can be transmitted in wideband. CSI-RS has enough flexibility not only on periodicity and bandwidth but also on transmission beam/scheme to represent control channel quality and so on. Therefore, at least

periodic CSI-RS can be used for RLM. In some case, CSI-RS for RLM and CSI-RS for RRM measurement and/or for beam management may share the same physical resources to reduce RS overhead.

- SS block can be also considered for RLM as SS block is the always-on signal to provide cell coverage. But there may be a case where SS block cannot provide some properties required for RLM, e.g., QCL with PDCCH.

Decision: The document is noted, modified as follows:

Agreements:

- The RS used for RLM should have following properties
 - o Periodic transmission with short enough periodicity
 - o Wideband transmission relative to bandwidth of active bandwidth part
 - o Supporting both single beam and multi-beam operations
 - o Representing control channel quality
- Both CSI-RS based RLM and SS block based RLM are supported
 - o FFS: whether or not only a single type of RS is configured to UE for RLM at a time

R1-1711806 WF on radio link monitoring in NR Huawei, HiSilicon, Qualcomm, ATT

- NR should support aperiodic indication from beam failure recovery to assist RLF procedure.
 - Example 1: aperiodic IS indication(s) from beam failure recovery can stop/reset T310
 - RAN2 can decide specific procedure
 - Example 2: aperiodic OOS indication from failure of beam recovery procedure
 - How to use aperiodic OOS indication can be decided in RAN2

Decision: The document is noted.

Thursday

- NR should strive to provide aperiodic indication based on beam failure recovery procedure to assist RLF procedure if the same RS is used for beam failure recovery and RLM procedure
 - Example 1: aperiodic IS indication(s) from beam failure recovery can stop/reset T310
 - RAN2 can decide specific procedure
 - Example 2: aperiodic OOS indication from failure of beam recovery procedure
 - How to use aperiodic OOS indication can be decided in RAN2

Friday

R1-1711889 WF on Radio Link Monitoring in NR Huawei, HiSilicon, Qualcomm, ATT, NTT DOCOMO, Intel, Vivo, LGE

Agreements:

- NR should strive to provide aperiodic indication(s) based on beam failure recovery procedure to assist radio link failure (RLF) procedure, if same RS is used for beam failure recovery and RLM procedures.
 - o Example 1: aperiodic indication(s) based on beam failure recovery procedure can reset/stop T310
 - RAN2 can decide specific procedure
 - o Example 2: aperiodic indication(s) based on failure of beam recovery procedure
 - How to use aperiodic indication can be decided in RAN2
 - o FFS: aperiodic indication(s) based on beam failure recovery procedure to assist RLF procedure if different RS is used

R1-1711850 WF on RLM CATT

Not treated.

R1-1709900	Radio link monitoring in NR	ZTE	
R1-1709921	Discussion on remaining issues of radio link monitoring		Huawei, HiSilicon
R1-1710038	NR Radio Link Monitoring	CATT	
R1-1710274	Discussion on Radio Link Monitoring in NR		LG Electronics
R1-1710425	Radio link monitoring	AT&T	
R1-1710516	NR Radio Link Monitoring		Intel Corporation
R1-1710639	Radio link monitoring	Samsung	
R1-1710806	Discussion on Radio Link Monitoring		MediaTek Inc.
R1-1711071	Discussion on NR RLM and RLF		NTT DOCOMO, INC.

R1-1711269	NR Radio link monitoring	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711386	Radio link monitoring	Ericsson
R1-1711901	WF on remaining RLM issues with RAN4 impact	Ericsson

5.1.1.6 Other

R1-1709922	On numerology determination during initial access	Huawei, HiSilicon
R1-1710445	Minimum UE bandwidth in NR	Huawei, HiSilicon
R1-1710640	Discussion on SS periodicity and PBCH TTI	Samsung
R1-1710641	Considerations on PRACH design in high-mobility scenario	Samsung
R1-1711387	Consideration of PRACH Configuration in NR	Ericsson
R1-1711388	Additional synchronization provision	Ericsson
R1-1711598	On numerology for NR RACH	Samsung
R1-1711619	Discussion on msg.3 tx timing determination	Samsung
R1-1711620	Discussion on RACH design	Samsung
R1-1711621	Assisted information for Msg.3 tx beam determination	Samsung
R1-1711626	RRM for wider bandwidth operations	Samsung

5.1.2 MIMO

[R1-1711916](#) **Chairman's notes of AI 5.1.2 MIMO** **Ad-Hoc chair (Qualcomm)**

The document was presented by Wanshi Chen from Qualcomm.

Decision: The document is endorsed and content is incorporated as below, with the add-on regarding the conclusion on beam management details (see 5.1.2.2.1).

5.1.2.1 Multi-antenna scheme

Physical control channel related issues are to be discussed in the agenda item for scheduling/HARQ aspects.

5.1.2.1.1 Codeword mapping

Including codeword-to-layer mapping, codeword to resource mapping and interleaving

R1-1710642	Finalizing Layer Mapping	Samsung
R1-1710446	Codeword to layer mapping in NR	Huawei, HiSilicon
R1-1711007	Codeword to layer mapping for DL and UL	Ericsson
R1-1711152	CW to layer mapping and frequency domain interleaving	Qualcomm Incorporated
R1-1710426	Remaining details of codeword mapping for NR MIMO	AT&T
R1-1710517	Remaining details on CW to MIMO layer mapping	Intel Corporation

Continue discussion offline – Youngwoo (Samsung)/Leiming (Huawei)

[R1-1711935](#) **Summary of Open Issues on Layer Mapping** **Samsung**

Agreements:

- Companies are encouraged to provide evaluation results especially for URLLC, intra-slot frequency hopping, dynamic TDD and high speed train scenarios
 - Practical simulation assumptions e.g. CBG based HARQ, pre-emption indication, DMRS, interleaver should be considered.
 - For both CP-OFDM and DFT-S waveforms
 - Evaluation should be done considering both slot and mini-slot.

Agreements:

- NR supports higher layer signalling for the maximum number of MCS/RV/NDI in DCI for PDSCH
 - FFS HARQ ID
 - Unless indicated otherwise, UE assumes single MCS/RV/NDI in DCI, i.e. up to four MIMO layers
- NR supports higher layer signalling for the maximum number of CQIs in UCI
 - Unless indicated otherwise, UE assumes single CQI in UCI, i.e. up to four MIMO layers in RI report
 - FFS subband CQI
 - FFS Whether or not the actual number of CQIs is also RI dependent
 - Note: This higher layer signalling can be the other signalling related to RI/PMI reporting (e.g. RI restriction)
 - FFS applicability on single/multi TRP

Not treated.

[R1-1709904](#) Discussion on Remaining Details of Codeword Mapping Beijing Xinwei Telecom Techn.
[R1-1710050](#) On codeword mapping CATT
[R1-1710255](#) Remaining details on DMRS ports and number of layers indication NEC Corporation
[R1-1710275](#) Discussion on codeword mapping LG Electronics
[R1-1710594](#) On codeword to RE mapping scheme Lenovo, Motorola Mobility
[R1-1710611](#) Discussion on codeword mapping ETRI
[R1-1710815](#) codeword mapping in NRMEDIA Tek Inc.
[R1-1711072](#) Discussion on codeword mapping NTT DOCOMO, INC.
[R1-1711606](#) Codeword mapping and interleaving ZTE
[R1-1711662](#) WF on CW to layer mapping Huawei, HiSilicon, ZTE, Xinwei, China Unicom, ETRI, Softbank, NTT DOCOMO, LGE, Deutsche Telekom, CATR
[R1-1711664](#) WF on number of MCS and CQI configuration Intel, Samsung
[R1-1711665](#) WF on MIMO layer to CW correspondence Intel, AT&T
[R1-1711777](#) WF on CW to layer mapping scheme for data channels Qualcomm, ATT, Ericsson, Samsung, Nokia, ASB, CATT, Interdigital, Intel, Sharp, Verizon, BT, CHTTL, Panasonic, NEC, KDDI
[R1-1711793](#) WF on codeword mapping MediaTek Inc.

5.1.2.1.2 Codebook based transmission for UL

[R1-1710643](#) Codebook-Based UL Transmission Samsung
[R1-1710518](#) On codebook based UL transmission Intel Corporation
[R1-1710051](#) Considerations on codebook based UL transmission CATT
[R1-1711610](#) UL MIMO for codebook based transmission Ericsson (Revision of [R1-1711008](#))
[R1-1711073](#) Codebook design for uplink NTT DOCOMO, INC.

Continue discussion offline – Yushu (Intel)

[R1-1711674](#) Summary of Issues and WFs on Codebook based transmission for UL Intel
[R1-1711881](#) Summary of Issues and WFs on Codebook based transmission for UL Intel

Conclusion:

- To better understand the tradeoff of uplink cell throughput gain vs. the overhead of control signalling for down-selection, determine the control signalling for frequency-selective precoding after the codebook is defined

[R1-1711874](#) NR UL MIMO Signaling Mechanism Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Qualcomm, CATT, ZTE
[R1-1711792](#) WF on codebook based UL transmission MediaTek, Nokia, Alcatel-Lucent Shanghai Bell

Not treated.

[R1-1710140](#) On uplink codebook design Guangdong OPPO Mobile Telecom.
[R1-1710176](#) Codebook based UL transmission ZTE
[R1-1710276](#) Discussion on codebook based transmission for UL LG Electronics
[R1-1710447](#) Codebook based transmission for UL MIMO Huawei, HiSilicon
[R1-1710816](#) Codebook based transmission in UL MediaTek Inc.
[R1-1710920](#) TPMI Indication for Frequency Selective UL Precoding InterDigital, Inc.
[R1-1711153](#) Codebook based UL transmission Qualcomm Incorporated
[R1-1711284](#) Codebook Based Transmission and Codebook Design for UL MIMO Nokia, Alcatel-Lucent Shanghai Bell

5.1.2.1.3 Non-codebook based transmission for UL

[R1-1709923](#) Non-codebook based transmission for UL MIMO Huawei, HiSilicon
[R1-1710177](#) Non-Codebook based and Hybrid based UL transmission ZTE
[R1-1710644](#) Discussion on Non-Codebook-Based UL Transmission Samsung
[R1-1711154](#) Non-codebook based UL transmission Qualcomm Incorporated

Continue discussion offline – Jun (Nokia)

[R1-1711884](#) **Summary of issues on UL non-codebook based transmissions** Nokia, ASB

[R1-1711750](#) **WF on UL non-codebook based transmission** Huawei, HiSilicon, DCOMO, Sharp, LGE, Ericsson, China Telecom, Deutsche Telekom, Xinwei, Vodafone, CeWiT, China Unicom, Tejas Networks, CATR, IITH, IITM, Panasonic, ZTE, InterDigital, AT&T, SoftBank, KDDI

Also supported by Fujitsu, Mitsubishi

Agreements:

- For PUSCH precoder determination in non-codebook-based UL MIMO, support at least one of the followings:
 - o Alt.1: Signalling of SRI(s) only, without TPMI indication in the UL grant
 - o Alt.2: Signalling of TRI only, without TPMI indication in the UL grant
 - o Alt.3: Signalling of TRI and a single SRI, without TPMI indication in the UL grant
 - o Alt. 4: signalling of a single TRI, a single CRI without TPMI indication in the UL grant
 - o To down-select in the next meeting considering single- vs. multi-panel (companies are encouraged to perform more evaluations)
 - o Note: this may depend UE's capability in terms of calibration

Not treated.

[R1-1710052](#) On non-codebook based UL transmission CATT

[R1-1710277](#) Discussion on non-codebook based transmission for UL LG Electronics

[R1-1710519](#) On non-codebook based UL transmission Intel Corporation

[R1-1711009](#) UL MIMO for non-codebook based transmission Ericsson

[R1-1711074](#) Beam determination for non-codebook based transmission for uplinkNTT DCOMO, INC.

[R1-1711285](#) Non-codebook based UL-MIMO transmission Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711890](#) WF on UL frequency selective precoding in UL non-codebook based transmission Huawei, HiSilicon, LG Electronics

5.1.2.1.4 Diversity transmission for UL

[R1-1710427](#) **UL diversity transmission for NR AT&T**

[R1-1710178](#) **Diversity based uplink transmission schemes** ZTE

Continue offline discussion – Cristina (Mitsubishi)

[R1-1711845](#) **Summary of AI 5.1.2.1.4 Diversity transmission for UL** Mitsubishi

Conclusion:

- Companies are strongly encouraged to perform analysis and simulations for diversity transmission for both CP-OFDM and DFT-s-OFDM based UL considering various scenarios
- Aim to conclude in the next meeting

Not treated.

[R1-1710053](#) Considerations on transmission diversity scheme in UL CATT

[R1-1710278](#) Discussion on diversity transmission for UL LG Electronics

[R1-1710448](#) Diversity-based transmission for UL Huawei, HiSilicon

[R1-1710520](#) On diversity based UL transmission Intel Corporation

[R1-1710645](#) Diversity transmission for UL Samsung

[R1-1710886](#) UL diversity transmission for DFTsOFDM Mitsubishi Electric RCE

[R1-1710921](#) STBC-based Transmission for Uplink Transmit Diversity InterDigital, Inc.

[R1-1711010](#) Robust Transmission Scheme for PUSCH Ericsson

[R1-1711155](#) On UL diversity transmission scheme Qualcomm Incorporated

[R1-1711286](#) UL-MIMO diversity-based transmission Nokia, Alcatel-Lucent Shanghai Bell

5.1.2.1.5 PRB bundling for DL

[R1-1709905](#) **Further Discussion on DL PRB Bundling** Beijing Xinwei Telecom Techn.

[R1-1711287](#) **On details of PRB Bundling** Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711156](#) Discussion on PRB bundling for DL Qualcomm Incorporated

Continue offline discussion – Peng (Xinwei)

[R1-1711960](#) Summary of Issues on DL PRB bundling Xinwei

[R1-1711990](#) WF on DL PRB Bundling Xinwei, Huawei, HiSilicon, Qualcomm

Agreements:

- For DL data transmission:
 - o PRB bundling size values include
 - Case 1: one or more values down-selected from the following set
 - {[1], 2, 4, 8 and 16};
 - FFS the relationship with RBG size;
 - Case 2: values equal to consecutively scheduled bandwidth in frequency;
 - o For UE-specific PRB bundling size indication, support dynamically indicated PRB bundling size with up to 1 bit overhead;
 - FFS implicit indication to reduce configuration overhead, e.g., based on DMRS configuration etc;
 - FFS the usage of above 1 bit, e.g. whether to switch between Case 1 and Case 2 or between two configured Case 1 values;
 - FFS other aspects related to MU-MIMO pairing and higher-layer signaling

Not treated.

[R1-1710521](#) On PRB bundling for DL Intel Corporation

[R1-1709925](#) PRB bundling size for DL data precoding Huawei, HiSilicon

[R1-1710054](#) PRB bundling for DL transmission CATT

[R1-1710179](#) On PRB Bundling ZTE

[R1-1710360](#) Discussion on PRB bundling size for NR DL Spreadtrum Communications

[R1-1710646](#) PRB bundling for NR DMRS Samsung

[R1-1710922](#) PRG Size Indication in NR InterDigital, Inc.

[R1-1711011](#) PRB bundling Ericsson

5.1.2.1.6 Multi-TRP and Multi-panel transmission

DL

[R1-1711013](#) DL multi-TRP and multi-panel transmission Ericsson

Agreements:

- The maximum supported number of unicast and dynamically scheduled NR-PDSCHs a UE can be expected to simultaneously receive is 2 on a per component carrier basis in case of one bandwidth part for the component carrier
 - o FFS in case of two or more bandwidth parts for the component carrier
 - o FFS the max number of corresponding NR-PDCCHs

[R1-1710180](#) Multi-TRP Transmission and interference coordination ZTE

UL

[R1-1710648](#) Discussions on NR UL multi-panel/multi-TRP Samsung

[R1-1710522](#) Discussion on uplink multi-panel and multi-TRP operation Intel Corporation

[R1-1711667](#) WF on multiple PDSCH approach of supporting NC-JT Intel

Agreements:

- Send LS to RAN2 (cc RAN3) to inform about RAN1 agreement from RAN1#89 on the support of multiple PDSCHs transmission to the UE to support NC-JT operation
- Include in the LS the following content
 - o RAN1 agreement from RAN1#89
 - o RAN1 is considering different scenarios including TRPs connected with ideal and non-ideal backhaul link, TRPs with same and different cell IDs, etc. to provide an increased throughput for users covered by different TRPs, and greater radio link reliability through dual connectivity-like operation

- o RAN1 thinks that the above agreement may have impact on RAN2 specification
- o Actions: RAN1 asks RAN2 to take into account the above agreement in RAN2's work and provide any information that may be relevant for future RAN1's work on this topic

Draft LS is **endorsed** in [R1-1711820](#). Final LS is **approved** in [R1-1712000](#).

Continue discussion offline – Xin (CATT)

[R1-1711857](#) **Summary of views on multi-TRP & multi-panel transmission** CATT

Not treated.

[R1-1709924](#) Multiple NR-PDCCH for Multiple TRP transmission Huawei, HiSilicon
[R1-1710055](#) Considerations on multi-panel/multi-TRP transmission CATT
[R1-1710141](#) Considerations on the multi-TRP/Multi-panel design to support the reception of multiple PDCCH
Guangdong OPPO Mobile Telecom.
[R1-1710235](#) Discussion on multiple NR-PDCCHs in NC-JT scheme Fujitsu
[R1-1710279](#) Discussion on cooperative transmission LG Electronics
[R1-1710428](#) On the details of multi-TRP and multi-panel transmission AT&T
[R1-1710451](#) CSI acquisition details for NCJT Huawei, HiSilicon
[R1-1710523](#) Support of downlink NC-JT in NR Intel Corporation
[R1-1710647](#) Discussions on NR DL network coordination Samsung
[R1-1710814](#) Multi-TRP and panel transmission MediaTek Inc.
[R1-1710923](#) DCI Design for Multi-TRP/Panel Transmission for DL InterDigital, Inc.
[R1-1710969](#) NR-PDCCH for multi-TRP transmission China Telecommunications
[R1-1711012](#) UL multi-panel transmission Ericsson
[R1-1711157](#) On multi-TRP and multi-panel transmission Qualcomm Incorporated
[R1-1711288](#) On the maximum number of PDSCH/PDSCHs to be supported for multi-TRP transmission Nokia,
Alcatel-Lucent Shanghai Bell
[R1-1711769](#) WF on CSI feedback for NCJT LG Electronics, Ericsson, Intel
[R1-1711805](#) WF on Single DCI based NCJT LG Electronics, Intel Corporation, ZTE

5.1.2.1.7 **Rate matching**

[R1-1710649](#) **On PDSCH rate matching for NR Samsung**

[R1-1711014](#) **On rate matching** Ericsson

Agreements:

- A UE is configured with resources for PDSCH rate matching
 - o FFS details
- A UE is configured with resources for PUSCH rate matching
 - o FFS details

Continue discussion offline – Kunil (LGE)

[R1-1711841](#) **Summary of views on resource for PDSCH and PUSCH rate matching** LGE

Not treated.

[R1-1709933](#) Rate matching for data channel Huawei, HiSilicon
[R1-1710181](#) Discussion on rate matching ZTE
[R1-1710280](#) Discussion on rate matching LG Electronics
[R1-1710429](#) On the need of per RE level PDSCH rate-matching and RE mapping signalling AT&T
[R1-1710524](#) Rate matching for NR Intel Corporation
[R1-1711158](#) On PDSCH and PUSCH RE mapping Qualcomm Incorporated
[R1-1711808](#) WF on PDSCH rate matching LG Electronics, Panasonic, NTT DOCOMO, InterDigital, Intel

5.1.2.1.8 **Other**

[R1-1711159](#) **Transmission scheme for broadcast PDSCH** Qualcomm Incorporated

Agreement: For NR in Rel-15, DL transmission scheme 2 is not explicitly supported for broadcast PDSCH in specification

Not treated.

[R1-1709926](#) Discussion on transmission parameter sets Huawei, HiSilicon
[R1-1710182](#) On transmission setting ZTE
[R1-1710650](#) Discussion on transmission parameter sets Samsung
[R1-1710651](#) Discussion of number of PDSCHs in NR-CoMP Samsung
[R1-1710652](#) Multi-TA procedures for Multi-TRP Samsung
[R1-1711441](#) On the feedback overhead reduction for multi-subband UL MIMO Huawei, HiSilicon
[R1-1711444](#) Continuous precoding for NR DMRS in time domain Samsung
[R1-1711638](#) Discussion on transition between NR network coordination schemes Samsung

5.1.2.2 Beam management

5.1.2.2.1 Beam management details

[R1-1710654](#) DL beam management for NR Samsung
[R1-1711160](#) Beam management for NR Qualcomm Incorporated
[R1-1710183](#) DL beam management for NR MIMO ZTE
[R1-1709928](#) UL beam management Huawei, HiSilicon
[R1-1711016](#) UL beam management details Ericsson

Continue offline discussion – Sundar (Qualcomm)

[R1-1711965](#) Beam management offline summary Qualcomm

Agreements:

- RAN1 to study the relation (if any) between a measurement and/or reporting on a reference signal and a subsequent beam indication for beam management purposes
 - o Study the indicator(s) used for PDCCH and PDSCH
 - o Study whether there is a relationship between the indicator types e.g. same type of indicator or different types
- Study L1-RSRP reporting of multiple beams considering
 - o Differential L1-RSRP for multiple beams
 - Reference RSRP for L1-RSRP differential report, e.g., predefined or configurable
 - o Bit-width of reporting,
 - o Number of groups/beams per group
 - o UCI design of the beam reporting,
 - o FFS: Other issues

Agreements:

- RAN1 agrees that the certain number of beam failure recovery request transmissions is NW configurable by using some parameters
 - o Parameters used by the NW could be:
 - Number of transmissions
 - Solely based on timer
 - Combination of above
- FFS: whether beam failure recovery procedure is influenced by the RLF event

Agreements:

- In case of unsuccessful recovery from beam failure, UE sends an indication to higher layers, and refrains from further beam failure recovery
 - o Relationship between RLF and unsuccessful beam failure recovery indication (if any) e.g. whether beam failure recovery procedure influences or is influenced by the RLF event
 - o Send LS to inform RAN2 – to be done next meeting

Proposals:

- Support L1-RSRP reporting of measurements on SS block for beam management procedures

- Supported by: Qualcomm, Samsung, Ericsson, vivo, NTT DOCOMO, Lenovo, MotM, OPPO, Spreadtrum, LGE, Sharp, Nokia, ASB, MediaTek, ZTE, AT&T, CEWiT, Panasonic
- Objected by: InterDigital, Intel, Huawei, HiSilicon, CATT

Conclusion:

No consensus to support L1-RSRP reporting of measurements on SS block for beam management procedures in Rel-15

Friday:

Qualcomm: strongly requested to remove the above conclusion – and suggested to leave the topic opened for the next meeting

Intel: concern with the process of deleting what was already agreed during the MIMO session – RAN1 spent a lot of time to reach and write down that conclusion

InterDigital: similar view as Intel

Samsung/Ericsson/Panasonic: ok to delete it

Qualcomm: Can “in Rel-15” be replaced by “in this meeting”

Ericsson: do not agree – it has a complete different meaning

Final conclusion:

- No consensus at this meeting to support L1-RSRP reporting of measurements on SS block for beam management procedures in Rel-15

Note: Any company/university/organization is free to contribute to this topic in future meetings

Not treated.

R1-1709906	Discussion on DL Beam Management	Beijing Xinwei Telecom Techn.
R1-1710056	Further consideration on downlink beam management	CATT
R1-1710057	Considerations on UL beam management	CATT
R1-1710142	Discussion on the DL Beam Management	Guangdong OPPO Mobile Telecom.
R1-1710143	Discussion on the UL Beam Management	Guangdong OPPO Mobile Telecom.
R1-1710184	UL beam management for NR MIMO	ZTE
R1-1710281	Discussion on DL beam management	LG Electronics
R1-1710282	Discussion on UL beam management	LG Electronics
R1-1710361	Differential RSRP report for beam management	Spreadtrum Communications
R1-1710399	Beam management and beam reporting	vivo
R1-1710430	DL beam management details	AT&T
R1-1710525	Details for UL Beam Management	Intel Corporation
R1-1710526	Details for DL Beam Management	Intel Corporation
R1-1710595	Discussion of RS for DL beam management	Lenovo, Motorola Mobility
R1-1710653	UL beam management	Samsung
R1-1710776	Comparisons on Beam Reporting in NR	CMCC
R1-1710808	Discussions on NR DL beam management	MediaTek Inc.
R1-1710809	Efficient UL beam management with imperfect beam correspondence	MediaTek Inc.
R1-1710851	Considerations on DL beam management	Sony
R1-1710852	Considerations on UL beam management	Sony
R1-1710924	On Beam Management for DL Control and Data Channels	InterDigital, Inc.
R1-1710925	On Efficient UL Beam Management	InterDigital, Inc.
R1-1711015	On DL beam indication	Ericsson
R1-1711075	View on Beam Management Details	NTT DOCOMO, INC.
R1-1711289	On the utilization of SS block for beam management	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711290	SRS transmission for beam management	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711334	Considerations on UE Beamforming Management	ASUSTEK COMPUTER (SHANGHAI)
R1-1711336	Discussion on group based beam reporting	China Unicom
R1-1711473	View on Multi-Beam Management	KT Corp.
R1-1711636	General views on DL beam management	Huawei, HiSilicon

[R1-1711712](#) WF on group-based beam reporting ZTE, ASTRI, Nokia, ASB, NTT DOCOMO, Intel, Qualcomm, Samsung, AT&T
[R1-1711838](#) WF on Beam Reporting Intel, Huawei, HiSilicon, InterDigital, CATT
[R1-1711859](#) WF on SRS beam sweeping behavior LG Electronics, Huawei, HiSilicon, Samsung, Ericsson
[R1-1711896](#) WF on UE assistance information for UL beam mangement MediaTek, Samsung, Intel
[R1-1711903](#) WF on SRS for UL beam management OPPO, Intel, Samsung, Xinwei
[R1-1711929](#) WF on Beam Reporting Huawei, HiSilicon, Samsung, Intel, Nokia, Oppo, National Instruments

5.1.2.2.2 Mechanism to recover from beam failure

[R1-1710810](#) Mechanism for flexible beam failure recovery MediaTek Inc.
[R1-1710527](#) Discussion for Mechanism to Recover from Beam Failure Intel Corporation
[R1-1711291](#) Beam Recovery in NR Nokia, Alcatel-Lucent Shanghai Bell
[R1-1710283](#) Discussion on beam failure recovery LG Electronics
[R1-1711076](#) Further views on mechanism to recover from beam failure NTT DOCOMO, INC.

Discuss discussion offline – Chia-Hao (MTK)

[R1-1711897](#) Offline Discussion Summary on Beam Recovery MediaTek
[R1-1711717](#) WF on using SS block for beam recovery ZTE, Ericsson, NTT DOCOMO, MediaTek, Spreadtrum, vivo, OPPO, Qualcomm, Xinwei, LG Electronics, AT&T, Lenovo, CMCC, China Unicom, China Telecom, ASTRI, Samsung, Nokia, ASB, III, MTI, Sharp, National Instruments

Proposals:

- In addition to periodic CSI-RS, SS-block within the serving cell can be used for new candidate beam identification
- Supported by: ZTE, Ericsson, NTT DOCOMO, MediaTek, Spreadtrum, vivo, OPPO, Qualcomm, Xinwei, LG Electronics, AT&T, Lenovo, CMCC, China Unicom, China Telecom, ASTRI, Samsung, Nokia, ASB, III, MTI, Sharp, National Instruments
- Objected by: IDC, HW, HiSi, Intel

Continue discussion next meeting

Not treated.

[R1-1709907](#) Discussion on Beam Failure Recovery Beijing Xinwei Telecom Techn.
[R1-1709929](#) General views on beam failure recovery Huawei, HiSilicon
[R1-1710058](#) Consideration on DL beam failure and recovery CATT
[R1-1710144](#) On Beam Recovery Mechanism Guangdong OPPO Mobile Telecom.
[R1-1710185](#) Discussion on beam recovery mechanism ZTE
[R1-1710236](#) Discussion on beam failure recovery procedure Fujitsu
[R1-1710251](#) Discussion on beam failure recovery request NEC Corporation
[R1-1710364](#) Discussion on beam failure recovery Spreadtrum Communications
[R1-1710400](#) Beam failure recovery procedure vivo
[R1-1710431](#) Considerations on beam failure recovery mechanism AT&T
[R1-1710596](#) Discussion of beam recovery procedure Lenovo, Motorola Mobility
[R1-1710655](#) Beam failure recovery Samsung
[R1-1710926](#) On Remaining Details of Beam Failure Recovery InterDigital, Inc.
[R1-1711017](#) Mechanism to recover from beam failure Ericsson
[R1-1711161](#) Beam recovery procedures Qualcomm Incorporated
[R1-1711234](#) Discussion on mechanisms for beam failure recovery Sharp
[R1-1711858](#) WF on beam failure recovery request LG Electronics, Intel, Huawei, HiSilicon, vivo
[R1-1711927](#) WF on gNB response for beam failure request Huawei, HiSilicon, LG Electronics, Intel
[R1-1711928](#) WF on PRACH for beam failure recovery request transmission Huawei, HiSilicon, LG Electronics, Ericsson, CATT, NTT DOCOMO

5.1.2.2.3 Other

[R1-1710186](#) Beam grouping evaluation for beam management ZTE
[R1-1710662](#) On SS-block based beam management Samsung

[R1-1711292](#) **BPL definition and Spatial QCL time indication** Nokia, Alcatel-Lucent Shanghai Bell

Not treated.

[R1-1709927](#) Beam indication for DL control channel Huawei, HiSilicon
[R1-1709930](#) Procedure details for beam failure recovery Huawei, HiSilicon
[R1-1710005](#) Considerations on timing advance design in NR Huawei, HiSilicon
[R1-1710145](#) Beam association relationship between data and control channels Guangdong OPPO Mobile Telecom.
[R1-1710228](#) Further discussion on channel reciprocity and beam correspondence MTI
[R1-1710450](#) Multi-beam transmission for DL control channel Huawei, HiSilicon
[R1-1710459](#) Discussion on UL SRS transmission power Huawei, HiSilicon
[R1-1710473](#) Network-based mechanism for millimeter-wave link recovery Huawei, HiSilicon
[R1-1710528](#) On Timing Advance for multi-beam operation Intel Corporation
[R1-1710656](#) Measurement and reporting for beam management Samsung
[R1-1710657](#) Discussion on Group based reporting Samsung
[R1-1710658](#) Discussion on Tx beam grouping configuration Samsung
[R1-1710659](#) Discussion on beam indication for PDSCH Samsung
[R1-1710660](#) L1 RSRP reporting for beam management Samsung
[R1-1710661](#) L1-RSRP measurement duration Samsung
[R1-1710663](#) DL beam management configuration Samsung
[R1-1710664](#) QCL associations for beam management RS Samsung
[R1-1710665](#) Aperiodic BSI reporting Samsung
[R1-1711018](#) Beam management in C-DRX Ericsson
[R1-1711019](#) On the use of SS for beam management Ericsson
[R1-1711020](#) Further results on beam management without beam indication Ericsson
[R1-1711021](#) Performance of beam grouping Ericsson
[R1-1711022](#) On beam grouping Ericsson
[R1-1711023](#) Analysis of beam indication signalling options Ericsson
[R1-1711293](#) On beam grouping and reporting Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711294](#) On Multi-beam Downlink Control Channel Operation Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711295](#) Multi-beam Uplink Control Channel Operation Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711401](#) Measurement RS for beam management Huawei, HiSilicon
[R1-1711402](#) Relationship between beam failure recovery and RLF Huawei, HiSilicon
[R1-1711403](#) Robust transmission for UL control channel Huawei, HiSilicon
[R1-1711410](#) Cross-carrier beam management Huawei, HiSilicon
[R1-1711445](#) System level evaluation results for beam management Samsung
[R1-1711446](#) Link level evaluation results for beam management Samsung
[R1-1711447](#) Link level simulation assumptions for beam management Samsung
[R1-1711448](#) System level simulation assumptions for beam management Samsung
[R1-1711592](#) Composite beam transmission for SS blocks Samsung
[R1-1711604](#) Beam management for PDCCCH Samsung
[R1-1711962](#) Way Forward on network-based beam failure recovery Huawei, HiSilicon
[R1-1711988](#) WF on beam indication for PDCCCH Samsung

5.1.2.3 CSI acquisition

5.1.2.3.1 CSI framework

Including beam management framework

[R1-1709931](#) **Discussion on CSI Framework Design** Huawei, HiSilicon
[R1-1711024](#) **Further details of CSI framework** Ericsson
[R1-1710059](#) **Summary of email discussion [89-17] NR CSI framework** CATT
Offline to come up with overhead numbers based on [R1-1710059](#) – Rakesh (CATT)

Continue offline discussion – Xiaoyi (AT&T)

[R1-1711893](#) **Offline discussion summary on CSI framework** AT&T

Agreements:

- For aperiodic CSI-RS triggering offset X, X is fixed to zero.
- For aperiodic CSI reporting on PUSCH, Y is indicated by DCI.
 - o DCI to be used for indicating the timing for PUSCH is also used to indicate Y.
 - This applies to both UCI only and UCI+Data PUSCH
 - o The set of values is configured by higher layer
 - The candidate set of values of Y is selected according to restricted conditions inferred from configuration of CSI related settings.
 - The condition include at least;
 - CSI parameter
 - Number of CSI-RS antenna ports if PMI is included
 - CSI-RS location
 - Frequency granularity of CSI
 - FFS: number of simultaneous CSI calculations
 - FFS on mechanisms to relax CSI report timing according to number of simultaneous CSI calculations
 - FFS different or same candidate Y value for the cases of UCI multiplexed with data and UCI only

Not treated.

[R1-1709908](#) Discussion on CSI Framework and Semi-persistent CSI-RS Resources and Reports Activation Beijing
Xinwei Telecom Techn.

[R1-1710060](#) Views on CSI framework CATT

[R1-1710284](#) Discussion on CSI framework LG Electronics

[R1-1710432](#) Discussion on the channels to carry CSI report AT&T

[R1-1710529](#) On NR CSI framework Intel Corporation

[R1-1710667](#) CSI Acquisition and Beam Management Framework Samsung

[R1-1710927](#) On CSI framework for NR InterDigital, Inc.

[R1-1711077](#) Discussion on CSI framework NTT DOCOMO, INC.

[R1-1711162](#) Details of CSI framework Qualcomm Incorporated

[R1-1711296](#) On the CRI definition and usability in NR Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711607](#) On CSI framework details ZTE

5.1.2.3.2 Details of CSI acquisition

Including channel and interference measurement and reporting

[R1-1710530](#) **On Details of CSI acquisition** Intel Corporation

[R1-1711297](#) **Remaining aspects on interference estimation options and configuration** Nokia, Alcatel-Lucent
Shanghai Bell

Continue discussion offline – Yuichi (DCM)

[R1-1711924](#) **Summary of CSI Acquisition Details** NTT DoCoMo

Not treated.

[R1-1710061](#) Discussion on details of CSI acquisition CATT

[R1-1710188](#) Details of CSI acquisition ZTE

[R1-1710285](#) Discussion on interference measurement LG Electronics

[R1-1710433](#) On the details of CSI acquisition AT&T

[R1-1710668](#) Discussions on CSI measurements and reporting for NR Samsung

[R1-1710854](#) Considerations on interference measurement Sony

[R1-1710928](#) On CSI acquisition for NR InterDigital, Inc.

[R1-1711025](#) On CSI acquisition and reporting Ericsson

[R1-1711078](#) On CSI measurement for NR NTT DOCOMO, INC.

[R1-1711163](#) Details of CSI acquisition Qualcomm Incorporated

[R1-1711632](#) Channel and interference measurement for CSI acquisition Huawei, HiSilicon

[R1-1711811](#) WF on CSI measurement details NTT DOCOMO, ZTE, Nokia, ASB, NEC

5.1.2.3.3 CSI acquisition for reciprocity based operation

[R1-1710669](#) CSI Reporting for Reciprocity Operation Samsung

[R1-1711298](#) On the channel reciprocity support for CSI acquisition Nokia, Alcatel-Lucent Shanghai Bell

Continue offline discussion – Ruyue (ZTE)

[R1-1711725](#) Summary of CSI acquisition for reciprocity based operation ZTE

Not treated.

[R1-1710062](#) Views on reciprocity based CSI acquisition CATT

[R1-1710286](#) Discussion on CSI acquisition for reciprocity based operation LG Electronics

[R1-1710812](#) CSI acquisition for reciprocity based operation MediaTek Inc.

[R1-1711164](#) CSI acquisition for reciprocity based operation Qualcomm Incorporated

[R1-1711404](#) Discussion on reciprocity based CSI acquisition mechanism Huawei, HiSilicon

[R1-1711608](#) On reciprocity based CSI acquisition ZTE

[R1-1711609](#) Further discussion on CSI acquisition for reciprocity-based operation Ericsson

[R1-1711715](#) WF on channel reciprocity based CSI ZTE, Nokia, ASB, LG Electronics, ASTRI, Ericsson, NTT

DOCOMO

[R1-1711716](#) WF on partial channel reciprocity based CSI ZTE, CMCC, China Telecom, China Unicom, ASTRI

5.1.2.3.4 CSI feedback

Including type I/II codebook based scheme and other potential use cases, e.g., semi-open-loop

[R1-1710190](#) CSI feedback mechanism on PUCCH ZTE

[R1-1710672](#) CSI parameters and multiplexing Samsung

Continue discussion offline – Mark (Ericsson)

[R1-1711904](#) Summary of views on CSI feedback for Type I and Type II Ericsson

Agreement:

- Periodic CSI reporting is carried at least on
 - o Short PUCCH
 - o Long PUCCH
 - o FFS whether in single-slot only or in multiple slots

Agreements:

- Type I CSI feedback is supported for P/SP/A-CSI and can be carried on either one of PUCCH and PUSCH
- Type I subband CSI can be carried on either one of PUSCH and long PUCCH
- Type II CSI is carried at least on PUSCH
 - o FFS CSI on PUCCH

CSF for TS2

[R1-1711300](#) CSI feedback in support of semi-open loop transmission Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711405](#) CSI acquisition for DL robust transmission Huawei, HiSilicon

Continue discussion offline – Mark (Ericsson)

[R1-1711905](#) Summary of CSI Feedback for Open-loop/Semi-open-loop Ericsson

Not treated.

[R1-1710063](#) Discussion on periodic and aperiodic CSI feedback CATT

[R1-1710191](#) CSI feedback mechanism on PUSCH ZTE

R1-1710192	Overhead reduction for Type II CSI	ZTE
R1-1710287	Discussion on overhead reduction for Type II codebook	LG Electronics
R1-1710288	Discussions on CSI reporting contents	LG Electronics
R1-1710289	CSI feedback for OL and semi-OL MIMO	LG Electronics
R1-1710290	UL channel utilization for CSI reporting	LG Electronics
R1-1710434	CSI feedback for closed loop and semi open loop transmission schemes	AT&T
R1-1710452	CSI acquisition details for hybrid CSI	Huawei, HiSilicon
R1-1710453	The remaining issues for Type I codebook	Huawei, HiSilicon
R1-1710454	The remaining issues for Type II codebook	Huawei, HiSilicon
R1-1710670	Remaining details of Type I and Type II CSI codebooks	Samsung
R1-1710671	CSI support for transparent precoder cycling	Samsung
R1-1710673	Differential reporting of Type II CSI	Samsung
R1-1710674	On higher rank (3 and 4) Type II CSI	Samsung
R1-1710813	Remaining issues in NR CSI feedback	MediaTek Inc.
R1-1711027	CSI feedback and Transparent PDSCH Tx/D	Ericsson
R1-1711028	Codebook subset restriction	Ericsson
R1-1711029	Type I & II CSI reporting	Ericsson
R1-1711030	Encoding and mapping of CSI parameters	Ericsson
R1-1711031	CSI feedback for multi-TRP	Ericsson
R1-1711079	CSI Feedback Design for NR MIMO	NTT DOCOMO, INC.
R1-1711080	Feedback Design for CSI Type I	NTT DOCOMO, INC.
R1-1711081	Feedback Design for CSI Type II	NTT DOCOMO, INC.
R1-1711165	On Type I and Type II CSI feedback using PUCCH	Qualcomm Incorporated
R1-1711166	On CSI feedback for open- or semi-open-loop transmission	Qualcomm Incorporated
R1-1711407	Multiple-panel codebook	Huawei, HiSilicon
R1-1711408	Category 2 codebook design for type II codebook	Huawei, HiSilicon
R1-1711409	Codebook design for beamformed CSI-RS	Huawei, HiSilicon
R1-1711566	On semi-persistent CSI reporting on PUSCH	Ericsson
R1-1711590	Feedback transmission of type II codebook	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711719	WF on CSI in PUCCH	ZTE, NTT DOCOMO
R1-1711720	WF on Type II CSI	ZTE, MediaTek
R1-1711785	WF on periodic CSI reporting on short PUCCH	Ericsson, Samsung, Huawei, HiSilicon, CATT
R1-1711786	WF on unifying wideband and partial band definitions	Ericsson, LGE, Samsung
R1-1711942	WF on periodic CSI reporting on short PUCCH	Ericsson, Samsung, Huawei, HiSilicon, CATT

5.1.2.3.5 Other

R1-1710675	Discussion on CSI-RS Resource Activation	Samsung
R1-1710676	Discussions on channel and interference measurements for NR	Samsung
R1-1710677	Discussions on CSI Feedback Signalling Overhead Reduction	Samsung
R1-1711032	On Dynamic Triggering for CSI Reports and CSI-RS	Ericsson
R1-1711033	A comparison of CSI-RS activation schemes based on MAC CE and DCI	Ericsson
R1-1711034	Identifying bounds on parameters in CSI framework	Ericsson
R1-1711035	Frequency parametrization for Type II CSI codebook	Ericsson
R1-1711036	Further details of measurement restriction configuration	Ericsson
R1-1711038	On partial bands and CSI acquisition	Ericsson
R1-1711039	NR CSI Computation Capability	Ericsson
R1-1711301	On the CSI timing relationships	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711406	Other remaining issues for CSI framework	Huawei, HiSilicon
R1-1711449	Discussions on service specific CSI for NR	Samsung
R1-1711671	Performance impact of inactive antenna ports	Ericsson

5.1.2.4 Reference signals and QCL

5.1.2.4.1 Multiplexing of different types of RSs

Including multiplexing and RE mapping of RSs

- [R1-1710193](#) Discussion on multiplexing of different RSs ZTE
[R1-1710064](#) Discussion on RS multiplexing CATT
[R1-1710435](#) Multiplexing of CSI-RS with PDSCH in mixed numerology scenarios AT&T

Agreement:

- In NR, for a given BWP, support the case where CSI-RS for CSI acquisition and beam management is always transmitted with the same numerology as the PDSCH of the UE if PDSCH is present
 - o FFS the case when PDSCH is not present

- [R1-1710678](#) Discussions on multiplexing of different types of RSs for DL Samsung

Discuss further offline – Leiming (Huawei)

- [R1-1711974](#) Summary of views on multiplexing of different types of RS Huawei, HiSilicon

Not treated.

- [R1-1710009](#) Multiplexing different types of DL RS Huawei, HiSilicon
[R1-1710010](#) Multiplexing different types of UL RS Huawei, HiSilicon
[R1-1710291](#) On collision avoidance for PTRS and other RSs LG Electronics
[R1-1710531](#) On multiplexing of different RS types Intel Corporation
[R1-1710679](#) Discussions on multiplexing of different types of RSs for UL Samsung
[R1-1711040](#) On Multiplexing of RS types for downlink Ericsson
[R1-1711167](#) On multiplexing of different types of RSs Qualcomm Incorporated
[R1-1711302](#) On multiplexing of different RS types Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711558](#) Multiplexing of different types of RS for uplink Ericsson
[R1-1711986](#) WF on PTRS multiplexing with other RSs for CP-OFDM ZTE

5.1.2.4.2 CSI-RS

- [R1-1711041](#) On CSI-RS for CSI-acquisition Ericsson
[R1-1711759](#) Summary of offline discussion on CSI-RS Samsung

Agreements:

- At least for CSI acquisition, for N=4 OFDM symbols,
 - o Support two pairs of adjacent OFDM symbols for one CSI-RS resource where the two pairs can be adjacent or non-adjacent
 - For each pair, support a uniform RE mapping pattern in the time domain wherein the same sub-carriers are occupied in the two adjacent OFDM symbols
 - Note: CDM pattern will be discussed separately

Agreements:

- Support for CSI-RS sequence design:
 - o (Working assumption) PN sequence at least for CSI-RS for CSI acquisition
 - o UE specifically configured CSI-RS sequence seed
 - o FFS, sequence design, e.g. PN sequence, ZC sequence, M sequence, etc., for other use cases such as beam management and fine time/frequency tracking

Agreements:

- For beam management, CSI-RS with sub-time units smaller than an OFDM symbol in a reference numerology is not supported in Rel-15

Continue discussion offline – Lu (Huawei)

- [R1-1711922](#) WF on CSI-RS for BM Intel, Ericsson, CATT, Samsung, MediaTek, AT&T, NTT Docomo, KT
Also supported by Spreadtrum, Qualcomm

R1-1711923 **WF on CSI-RS for BM** **Samsung, Intel, AT&T, NTT DOCOMO, ZTE**

R1-1711787 **WF on CSI-RS** **Samsung, Ericsson, NTT DOCOMO, CATT, LGE**

Agreements:

- Regarding CSI-RS RE Patterns for CSI Acquisition, support at least the following CSI-RS RE patterns for CSI acquisition for OCC based CDM

X	Density [RE/RB/port]	N	(Y,Z)	CDM	Remark
1	>1, 1	1	N.A.	No CDM	
2	1	1	(2,1)	FD-CDM2	
4	1	2	(2,2)	FD-CDM2, CDM4(FD2,TD2)	
8	1	2	(2,2)	FD-CDM2, CDM4(FD2,TD2)	
16	1	2	(2,2)	FD-CDM2, CDM4(FD2,TD2)	
32	1, 1/2	4	(2,2)	FD-CDM2, CDM4(FD2,TD2)	FFS, CDM8 details

- Note: The RE pattern for an X-port CSI-RS resource spans $N \geq 1$ OFDM symbols in the same slot and is comprised of one or multiple component CSI-RS RE patterns, where a component CSI-RS RE pattern is defined within a single PRB as Y adjacent REs in the frequency domain and Z adjacent REs in the time domain (agreements in RAN1#88)
- Note: Density 1/2 is based on a PRB-level comb with the same comb offset value for all ports.
- Note: REs for CDM2 and CDM4(FD2,TD2) comprise adjacent REs
- Note: RAN1 will continue discussing adding more entries to the above table

Agreement:

- For partial-band CSI-RS, partial-band can be the same as bandwidth part
 - FFS whether or not to have small values than the bandwidth of bandwidth part

Agreements:

- Confirm the WA with the following revision
 - Support PN sequence for CSI-RS for CSI acquisition and beam management
- FFS detailed sequence generation and initialization methods
 - E.g. function of slot number, OFDM symbol number, CP length, UE ID, cell ID, virtual cell ID, function of PRB position of configured CSI-RS resource, etc.

Agreement:

- Down-select among the following two options in the next meeting
 - Option 1-1: From a UE perspective, CSI-RS is not multiplexed on SS block OFDM symbol(s)
 - Option 1-2: From a UE perspective, CSI-RS can be multiplexed on SS block symbol(s)

Agreements:

- Down-select among the following two options in the next meeting:
 - Option 2-1: From a UE perspective, CSI-RS is not multiplexed on PDCCH OFDM symbol(s) for a slot
 - Option 2-2: From a UE perspective, CSI-RS can be multiplexed on PDCCH OFDM symbol(s) for a slot
 - Note: PDCCH decoding behavior at UE side will not be changed by Option 2-2.
 - Note: up to each company to define PDCCH OFDM symbols based on the max possible number of symbols or the configured PDCCH OFDM symbols for the slot

R1-1711804 **WF on CDM-8 in CSI-RS for CSI acquisition** **LG Electronics, Samsung, CATT, NTT DOCOMO**

Agreements:

- For CDM-8 in CSI-RS for CSI acquisition, support at least one of the following:
 - Alt 1: Distributed across multiple of the component CSI-RS RE patterns
 - Alt 2: Fully contained within one component CSI-RS RE pattern
- For CDM-4, study further whether to support the ports being distributed across multiple of the component CSI-RS RE patterns

R1-1711803 **WF on configuration of CSI-RS for CSI acquisition** **LG Electronics, Samsung**

Agreements:

- For CSI acquisition, at least the following parameters associated with a CSI-RS resource can be indicated to be a UE based on higher-layer configuration:
 - o Number of CSI-RS ports
 - o Density (RE/PRB/port)
 - For density = 1/2, comb offset
 - o CDM (Length, Type)
 - o Locations of the component RE patterns for the corresponding CSI-RS resource
 - FFS on signaling details
 - o Scrambling ID
- Note: the detailed approach for the above signaling is FFS

[R1-1711976](#) **WF on CSI-RS for beam management** **NTT DOCOMO, Ericsson, Samsung**
[R1-1711973](#) WF on CSI-RS for BM Intel, Ericsson, Spreadtrum, MediaTek, Samsung, Verizon

Agreements:

- CSI-RS resource with 1-port and 2-port for one OFDM symbol can be used for beam management
 - o Value of $D \geq 1$ represents RE/RB/port within a OFDM symbol.
 - o For the case of 1-port
 - No CDM
 - Subcarrier spacing within a PRB for $D > 1$
 - o Even spacing
 - Constant subcarrier spacing across PRB(s)
 - Constant subcarrier spacing within a BWP
 - FFS the values of D
 - o For the case of 2-port:
 - Reuse the same pattern as that of for CSI acquisition at least for $D=1$ (if supported)
- FFS: the potential number of CSI-RS OFDM symbols for beam management
- FFS: other values of X and D for beam management
- In the LS to RAN4, add “RAN1 are discussing the respective possible limited set values of D for 1-port and 2-port CSI-RS resource, e.g., taking from {1, 2, 3, 4, 6}. RAN4 is also welcome to provide inputs to select the values of D for 1-port and 2-port CSI-RS resources, respectively”

LS to be prepared in [R1-1712003](#) (Yuichi, DCM)

Email approval for the LS in [R1-1712003](#) until 7/7 (Yuichi, NTT DOCOMO)

[R1-1710532](#) **On CSI-RS for beam management** **Intel Corporation**
[R1-1710811](#) **IFDMA Based Beam Management CSI-RS for Flexible TX/RX Beam Sweeping** **MediaTek Inc.**
[R1-1710931](#) **CSI-RS Design for Beam Management** **InterDigital, Inc.**
[R1-1711042](#) **On CSI-RS for beam management** **Ericsson**

Not treated.

[R1-1709946](#) CSI-RS design in NR Huawei, HiSilicon
[R1-1709947](#) CSI-RS design for beam management Huawei, HiSilicon
[R1-1710065](#) Design of CSI-RS for CSI acquisition CATT
[R1-1710066](#) Design of CSI-RS for beam management CATT
[R1-1710146](#) Discussion on CSI-RS design for beam management Guangdong OPPO Mobile Telecom.
[R1-1710194](#) On CSI-RS for beam management ZTE
[R1-1710195](#) On CSI-RS for CSI acquisition ZTE
[R1-1710256](#) CSI-RS design for beam management and interference measurement NEC Corporation
[R1-1710292](#) On CSI-RS design for beam management LG Electronics
[R1-1710293](#) On CSI-RS design for CSI acquisition LG Electronics
[R1-1710365](#) Discussion on CSI-RS design for CSI acquisition Spreadtrum Communications
[R1-1710401](#) On CSI-RS design for beam management vivo
[R1-1710436](#) Remaining details of CSI-RS AT&T

R1-1710533	On CSI-RS for CSI acquisition	Intel Corporation
R1-1710680	Discussions on CSI-RS design for NR MIMO	Samsung
R1-1710681	CSI-RS for beam management	Samsung
R1-1710833	On CSI-RS configuration for fine time and frequency tracking support	MediaTek Inc.
R1-1710974	Discussion on using sub-time unit for CSI-RS of beam management	ITRI
R1-1711082	CSI-RS for beam management	NTT DOCOMO, INC.
R1-1711083	CSI-RS for CSI acquisition	NTT DOCOMO, INC.
R1-1711303	On the CSI-RS configurations for NR CSI acquisition	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711304	On CSI-RS Design for DL Beam Management	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711339	Consideration on the CSI-RS design for NR	CATR
R1-1711468	On CSI-RS design for DL beam management	KT Corp.
R1-1711168	Discussion on CSI-RS design	Qualcomm Incorporated
R1-1711660	WF on CSI-RS	Samsung, Ericsson, NTT DOCOMO, CATT
R1-1711661	Summary of views on NR CSI-RS	Huawei, HiSilicon
R1-1711723	WF on CSI-RS CDM pattern	ZTE

5.1.2.4.3 DMRS

R1-1709909	Further Evaluation and Discussion on DMRS Design Details	Beijing Xinwei Telecom Techn.
R1-1710196	Discussion on downlink DMRS design	ZTE
R1-1711043	On DL DMRS design	Ericsson
R1-1710831	On downlink DMRS design	MediaTek Inc.

Continue discussion offline – Alex (Qualcomm)

[R1-1711778](#) Remaining issues on NR DM-RS Qualcomm
[R1-1711797](#) WF on DMRS sequence Samsung, Ericsson, Qualcomm Incorporated, CATT, Nokia, Alcatel-Lucent Shanghai Bell, Intel, AT&T, NTT DOCOMO, INC., LG Electronics, KT Corp., MediaTek Inc., Mitsubishi Electric Co., Spreadtrum, Fujitsu, Xinwei, KDDI, Panasonic, ITL
Also supported SONY, KRRI

Agreement: Both in DL and UL DMRS for CP-OFDM, only PN sequence is supported

[R1-1711784](#) WF on DMRS design MediaTek, Huawei, HiSilicon, China Telecom, ZTE, ASUSTek, CeWiT, Spreadtrum, Tejas Networks, CATR, Deutsche Telekom, IITH, Xinwei, MTI, CHTTL, China Unicom, IITM, ITRI

Agreements:

- The working assumption made in RAN1#89 for DM-RS is updated and agreed as follows for CP-OFDM:
 - A UE is configured by higher layers with DMRS pattern either from the front-loaded DMRS Configuration type 1 or from the front-loaded DMRS Configuration type 2 for DL/UL:
 - Configuration type 1:
 - One symbol:
 - Comb 2 + 2 CS, up to 4 ports
 - Two symbols:
 - Comb 2 + 2 CS + TD-OCC ($\{1, 1\}$ and $\{1, -1\}$), up to 8 ports
 - Note: It should be possible to schedule up to 4 ports without using both $\{1, 1\}$ and $\{1, -1\}$.
 - Configuration type 2:
 - One symbol:
 - 2-FD-OCC across adjacent REs in the frequency domain, up to 6 ports
 - Two symbols:
 - 2-FD-OCC across adjacent REs in the frequency domain + TD-OCC (both $\{1, 1\}$ and $\{1, -1\}$) up to 12 ports
 - Note: It should be possible to schedule up to 6 ports without using both $\{1, 1\}$ and $\{1, -1\}$.
 - From UE perspective, frequency domain CDMed DMRS ports are QCLeD.
 - FFS: Whether the front-load DMRS configuration type for a UE for UL and DL can be different or not.
 - Note: If there are significant complexity/performance issues involved in the above agreements, down-selection can still be discussed

R1-1711813 WF on DM-RS NTT DOCOMO, Ericsson, Nokia, ASB, ZTE, KT Corp, Sharp, Qualcomm

Proposals:

- In configuration 1 for DL, at least for SU-MIMO,
 - For 1-symbol, DM-RS $N \leq 2$ layer reception are multiplexed without any CDM in frequency for a UE
 - For 2-symbol, DM-RS $N \leq 4$ layer reception are multiplexed without any CDM in frequency for a UE
- FFS the case of UL MU-MIMO

Discuss till next meeting

R1-1711783 WF on UL DMRS pattern for DFT-S-OFDM LG Electronics, ZTE, Ericsson, NEC, NTT DOCOMO

Agreements:

- For DFT-S-OFDM based PUSCH DMRS
 - o DMRS are mapped to resource elements using a comb structure (IFDMA).
 - DMRS and associated PUSCH are multiplexed in time domain
 - At least the following (repetition factor, CS) combinations is supported
 - (2, 2)
 - o Front load DMRS is allocated to 1 or 2 OFDM symbols
 - When 2 OFDM symbols are allocated, TD-OCC ($\{1 \ 1\}$ and $\{1 \ -1\}$) are supported for orthogonal DMRS port multiplexing.
 - FFS the detailed applicability of 1 vs. 2 OFDM symbols
 - FFS the location of the DMRS symbol(s)

R1-1711816 WF on front-loaded DMRS design for slot aggregation vivo, Huawei, HiSilicon

Further discussion till next meeting

R1-1711770 WF on DL DMRS for broadcast/multicast PDSCH LG Electronics, Qualcomm

Agreements:

- For broadcast/multicast PDSCH (other than PBCH), the PDSCH is transmitted with a single DMRS port:
 - o Support using only one front-load DMRS Configuration from Configuration 1 and Configuration 2. To down-select from:
 - Alt 1: Configuration 1 (FFS 1 or 2 symbols)
 - Alt 2: Configuration 2 with 2 symbols
 - o Support additional DM-RS. To down-select from:
 - Alt 1: Additional DMRS is always present
 - Alt 2: Additional DMRS is configurable
 - FFS the number of additional DMRS symbol(s)

R1-1711722 WF on multiplexing between DMRS and data ZTE, Qualcomm, KT Corp., NTT DOCOMO

Agreements:

- Study further aspects related to DMRS and data multiplexing in DL and UL considering 14 and 7 symbol slots/mini-slots, 1 vs. 2 front loaded DM-RS symbols, additional DM-RS, etc.
- Study further aspects related to possibly power boosting DM-RS (performance, complexity, spec impact)

R1-1711714 WF on DMRS multiplexing scheme in time domain ZTE, Xinwei, ASTRI, Spreadtrum

R1-1711666 WF on SS block and DM-RS collision handling Intel

Agreements:

- Study further how to handle DM-RS and SS block collision (if any)
 - o E.g., changing DM-RS symbol(s) position in time domain, no PDSCH transmission on the collided PRBs, dropping the DM-RS symbol in collision, etc.

[R1-1711771](#) **WF on signalling DMRS configuration** **LG Electronics, ZTE**

Agreements:

- The number of front-load DMRS symbols can be 1 or 2 when the number of DMRS ports allocated to UE is equal or less than N
 - o N is 4 for Configuration 1 and 6 for Configuration 2.
 - o FFS the details to determine 1 or 2 symbols

Not treated.

R1-1709941	Design of DL DMRS for data transmission	Huawei, HiSilicon
R1-1709942	Evaluation results of DMRS design for DL data channel	Huawei, HiSilicon
R1-1709943	UL DMRS design for data transmission	Huawei, HiSilicon
R1-1709944	Evaluation results of DMRS design for UL data channel	Huawei, HiSilicon
R1-1710067	On DMRS design for DL CATT	
R1-1710068	On DMRS design for UL CATT	
R1-1710197	Evaluation results on DL DMRS	ZTE
R1-1710198	Discussion on uplink DMRS design	ZTE
R1-1710257	Considerations on the design of DMRS	NEC Corporation
R1-1710294	On DL DMRS design	LG Electronics
R1-1710295	On UL DMRS design	LG Electronics
R1-1710362	DMRS configurations for CP-OFDM.	Spreadtrum Communications
R1-1710402	On DL DMRS design	vivo
R1-1710410	Evaluation of DL DMRS designs	Mitsubishi Electric Co.
R1-1710411	Views on DL DMRS designs	Mitsubishi Electric Co.
R1-1710534	On the remaining details of DM-RS design	Intel Corporation
R1-1710607	On DM-RS for NR	Intel Corporation
R1-1710612	Discussion on downlink DMRS design	ETRI
R1-1710613	Discussion on uplink DMRS design	ETRI
R1-1710682	Discussion on DL DMRS design for NR	Samsung
R1-1710683	Evaluation results on DL DMRS for NR	Samsung
R1-1710684	Discussion on UL DMRS design for NR	Samsung
R1-1710685	Evaluation results on UL DMRS for NR	Samsung
R1-1710933	On DM-RS design for NR	InterDigital, Inc.
R1-1710970	On front-load DMRS design	China Telecommunications
R1-1711044	On DL DMRS evaluations	Ericsson
R1-1711045	On UL DMRS design	Ericsson
R1-1711046	On UL DMRS evaluations	Ericsson
R1-1711084	Evaluation results of DM-RS	NTT DOCOMO, INC.
R1-1711085	Discussion on DM-RS design	NTT DOCOMO, INC.
R1-1711169	Discussion on UL DMRS design	Qualcomm Incorporated
R1-1711170	Discussion on DL DMRS design	Qualcomm Incorporated
R1-1711171	Evaluation of UL DMRS design	Qualcomm Incorporated
R1-1711172	Evaluation of DL DMRS design	Qualcomm Incorporated
R1-1711305	On design of DL DM-RS for NR physical data channels	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711306	DL DM-RS patterns link performance evaluation	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711307	On design of UL DM-RS for NR physical data channels	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711340	Consideration on the font loaded DM RS design for NR	CATR
R1-1711350	DMRS pattern configuration for NR	ITL

5.1.2.4.4 PT-RS

R1-1710296	On DL PT-RS design	LG Electronics
R1-1709940	PTRS for DFT-s-OFDM	Huawei, HiSilicon
R1-1710936	Remaining Issues on PTRS for NR	InterDigital, Inc.

Continue offline discussion – Mattias (Ericsson)

[R1-1711914](#) Overview of WFs on PTRS Ericsson

[R1-1711815](#) WF on PT-RS for DFT-S-OFDM NTT DOCOMO, Mitsubishi Electric, Huawei, HiSilicon, Nokia, ASB

Agreements:

- For PT-RS insertion for UL DFT-S-OFDM
 - o Companies are encouraged to perform simulations with realistic simulation assumptions comparing pre-DFT vs. post-DFT PT-RS insertion
 - For pre-DFT, companies are encouraged to compare chunk-based distribution vs. non-chunk based distribution

Agreements:

- Support at least full symbol-level time density for time-domain PT-RS for DFT-S-OFDM (every PUSCH carrying symbol)
 - o FFS: whether to support configurable symbol-level time density for time-domain PT-RS density reduction for DFT-S-OFDM
 - Note: If supported, the configuration can be implicit (associated with scheduled MCS and/or BW and/or DM-RS port(s)/position) or explicit, which is to be decided in next meeting

[R1-1711891](#) WF on PT-RS for DFT-S-OFDM Samsung, Intel, CATT

[R1-1711814](#) WF on PT-RS for CP-OFDM NTT DOCOMO, Ericsson, Nokia, ASB, Panasonic, Spreadtrum, ZTE

Agreements:

- If one DL PT-RS port is configured for a DL DM-RS port group, the DL PT-RS port and one DL DM-RS port in the DL DM-RS port group are associated for phase tracking, the association is determined in the specification
 - o FFS details for the association
- If one DL PT-RS port is configured for a DL DM-RS port group, the DL PT-RS port is associated with:
 - o Alt 1: the lowest DL DM-RS port in the DL DM-RS port group.
 - o Alt 2: one DL DM-RS port in the DL DM-RS port group in a RB, where the one DL DM-RS port may vary across RBs
 - o Other alternatives are not precluded
 - o To conclude with one alternative next meeting
- FFS the case of two codewords

[R1-1711688](#) Way Forward on PTRS Intel, Huawei, HiSilicon, National Instruments, MediaTek

[R1-1711941](#) Way Forward on PTRS Intel, Huawei, HiSilicon, National Instruments, MediaTek

Agreements:

- Study further whether or not to support power boosting for PT-RS considering different or same number of ports compared with DM-RS
- Down-selection among the following for CP-OFDM DL & UL for PTRS:
 - o Opt-1: a single association table pair per subcarrier spacing
 - o Opt-2: UE recommends the preferred thresholds in tables and/or gNB to update/confirm
 - o Opt-3: multiple association tables for each subcarrier spacing, to reflect different phase noise models resulting from different carrier frequencies, subcarrier spacings, UE implementations
 - o Opt-4: a single association table pair per subcarrier spacing based on UE capability

[R1-1711895](#) WF on Remaining Issues on PTRS for CP-OFDM – Part II Huawei, HiSilicon, InterDigital, Xinwei, Intel, NI, Panasonic, Spreadtrum

[R1-1711932](#) WF on PT-RS pattern in frequency domain LG Electronics

Agreements:

- For PTRS for CP-OFDM, study further how to handle mapping PTRS in case of non-consecutive scheduling
 - o Alt 1: based on PRBs
 - o Alt 2: based on VRBs
 - o Other alternatives are not precluded
 - o Note: consecutive scheduling can be considered as a special case

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R1-1712032

- For PTRS for CP-OFDM, study further whether or not there is need for interference randomization for PT-RS and if so, how
 - Companies are encouraged to provide simulation results
- To continue study to finalize the PT-RS density tables w.r.t. to MCS and scheduled bandwidth

[R1-1711773](#) **WF on PT-RS collision avoidance** **LG Electronics, Huawei, CATT, ZTE**

Agreement: Study further how to handle PT-RS collision with CSI-RS

[R1-1711894](#) **WF on Remaining Issues on PTRS for CP-OFDM – Part I** **Huawei, HiSilicon, InterDigital, Xinwei, NI, Panasonic**

Agreements:

- For PTRS for CP-OFDM, NR supports
 - Information related to UE to facilitate PTRS port configuration
 - FFS details, e.g., UE to report information (if so, details), or re-using UE information available for other purposes

[R1-1710230](#) **UL PTRS for DFTsOFDM waveform** **Mitsubishi Electric RCE**

[R1-1710535](#) **On PT-RS for CP-OFDM** **Intel Corporation**

[R1-1710536](#) **On PT-RS for DFT-s-OFDM** **Intel Corporation**

Not treated.

[R1-1709939](#) PTRS for CP-OFDM Huawei, HiSilicon

[R1-1710069](#) Considerations on RS for phase tracking CATT

[R1-1710199](#) Discussion on RS for phase tracking ZTE

[R1-1710359](#) PT-RS design Panasonic Corporation

[R1-1710363](#) Considerations on PT-RS for CP-OFDM Spreadtrum Communications

[R1-1710403](#) On PT-RS design for CP-OFDM vivo

[R1-1710686](#) On DL PTRS design Samsung

[R1-1710687](#) On UL PTRS for DFT-s-OFDM Samsung

[R1-1710777](#) Discussion on PT-RS design CMCC

[R1-1711047](#) On PTRS DL design Ericsson

[R1-1711048](#) On PTRS UL design Ericsson

[R1-1711086](#) Discussion on PT-RS design NTT DOCOMO, INC.

[R1-1711173](#) Phase and frequency tracking reference signal considerations Qualcomm Incorporated

[R1-1711308](#) Discussion on PT-RS design for CP-OFDM Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711631](#) On Details of the PT-RS Design for DFT-s-OFDM Nokia, Alcatel-Lucent Shanghai Bell

[R1-1710297](#) On UL PT-RS design LG Electronics

5.1.2.4.5 SRS

[R1-1710855](#) **Considerations on SRS design** **Sony**

[R1-1711049](#) **On SRS design** **Ericsson**

[R1-1711087](#) **Discussions on NR SRS Design** **NTT DOCOMO, INC.**

[R1-1711174](#) **Discussion on SRS design** **Qualcomm Incorporated**

Agreement: For NR SRS, support sounding bandwidth in multiple of 4 PRBs

- FFS the detailed set of SRS sounding bandwidths to be supported
- At least 4 PRBs as SRS sounding bandwidth is supported

Continue offline discussion – Takano (SONY)

[R1-1711951](#) **Open issues on SRS design** **SONY**

[R1-1711791](#) Way Forward on SRS Switching Huawei, HiSilicon, Softbank, CMCC, Deutsche Telekom, CATR, Tejas Networks, OPPO, Qualcomm, CeWiT, Sony, ZTE, Xinwei, IITM, China Unicom, IITH, Ericsson, InterDigital, China Telecom, MediaTek

Agreement: Support antenna switching for SRS transmission within a carrier:

- FFS: Support at least [2Tx, 4Tx] switching

[R1-1711869](#) WF_config_collision_SRS_PUCCH_L Mitsubishi Electric, AT&T, Panasonic, Samsung, Huawei, HiSilicon, ZTE

Agreements:

- From a UE perspective, NR supports one or both of the following options on a given carrier:
 - o Option 1 : Support only one of the following options for avoiding collisions between NR-SRS and short PUCCH
 - Option 1-1 : symbol level TDM
 - Option 1-2 : FDM
 - Option 1-3 : both symbol level TDM and FDM
 - FFS : details
 - Note : other options are not precluded
 - o Option 2: Prioritize SRS or short PUCCH transmission, i.e., drop SRS or short PUCCH in case of collision
 - FFS whether to have one prioritization rule, or configurable prioritization

[R1-1711852](#) WF on SRS Sequence Design Ericsson, Huawei, HiSilicon, Nokia, ASB, Panasonic, NTT DOCOMO

[R1-1711668](#) WF on SRS sequence for NR Intel, Samsung, Qualcomm

Also supported by LGE, KT, CATT

[R1-1711767](#) WF on SRS sequence generation for partial overlapping LG Electronics, Intel Corporation, ZTE

Agreements:

- NR supports at least the following SRS sequences
 - o LTE SRS sequences
- Study further whether or not to additionally support the following for NR SRS sequence design:
 - o Opt-1: Truncated ZC design
 - Set of [60] long ZC sequences designed for each of [5] different reference carrier bandwidths where the sequence length exceeds the carrier bandwidth before truncation
 - The portion of the truncated sequence corresponds to the SRS PRB location assigned to the UE
 - Ports on the same comb are separated by cyclic shifts which are repeated every n SRS REs, e.g. n=[8,12]
 - o Opt-2: block-wise concatenation based ZC sequence generation.
 - The number of blocks (e.g. 1, 2, ...) and/or block length (e.g. 4RBs, 8RBs, ...) per each block is informed to UE
 - Alt1. the number of blocks and/or block length are configured by network. If 1 block is configured, SRS sequence for NR is the same as LTE SRS sequence
 - Alt2. Implicit signaling e.g. the number of blocks and block length are dependent on waveform. When DFT-S-OFDM is configured to UE, the number of block is one and the block length is equal to SRS BW; When CP-OFDM is configured, the number of blocks can be larger than 1.
 - o Opt-3: Same LTE SRS sequence generation mechanism with additional roots
- To conclude during the next meeting
 - o Evaluations to consider at least CM/PAPR and sequence cross-correlation for the case of fully and partially overlapping SRS allocations
 - o Evaluations to further consider CM/PAPR for carrier bandwidths different than the reference ones

[R1-1711920](#) WF on SRS design in NR LG Electronics, CATT, Intel Corp., KT Corp., Qualcomm

[R1-1711930](#) WF on SRS Configuration Huawei, HiSilicon, OPPO

- Agreement:** Support gNB to configure one or more groups where each group contains one or more SRS resource(s) to UE
- Note: different groups may be for different purposes, e.g., one or more groups for beam management, one for DL CSI acquisition, one for UL CSI acquisition, etc.

Not treated.

R1-1709936	UL SRS design for beam management and CSI acquisition	Huawei, HiSilicon
R1-1710070	Further considerations on SRS design	CATT
R1-1710147	On SRS design for NR	Guangdong OPPO Mobile Telecom.
R1-1710200	Discussion on SRS design for NR	ZTE
R1-1710298	On SRS design and related operations	LG Electronics
R1-1710409	Views on SRS designs	Mitsubishi Electric Co.
R1-1710537	Discussion on SRS for NR	Intel Corporation
R1-1710688	SRS design for NR	Samsung
R1-1710817	SRS design in NR	MediaTek Inc.
R1-1710929	Discussion on SRS sequence generation for NR	Panasonic Corporation
R1-1710938	On SRS for NR	InterDigital, Inc.
R1-1711310	UL SRS design considerations in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711643	Views on SRS designs	Mitsubishi Electric

5.1.2.4.6 TRS

R1-1709934	Reference signal for fine time and frequency tracking	Huawei, HiSilicon
R1-1710832	On TRS design requirement	MediaTek Inc.
R1-1711175	Further analysis on fine time/frequency tracking RS design	Qualcomm Incorporated

Further discussion offline, especially to narrow-down (possibly selecting) the possible range/set of values for the following parameters for TRS:

- X**: the length of TRS burst in terms of number of slots
- Y**: the TRS burst periodicity in terms of number of slots
- S_r**: TRS subcarrier spacing
- S_c**: TRS symbol spacing within a slot
- N**: Number of OFDM symbols per TRS within a slot
- B**: TRS bandwidth in terms of number of RBs

Revisit later this week – Chiao-yao (MTK) (including possible other aspects for TRS)

R1-1711765	Summary of views on TRS	MediaTek
R1-1711766	WF on TRS	MediaTek, Huawei, HiSilicon, Ericsson, Qualcomm

Agreements:

- Slide 3 and slide 4 in [R1-1711766](#) are agreed with the following updates:
 - N: add value of 1
 - B: 50 RBs assuming SCS=15KHz (FFS, for other SCS values)

Agreements:

- TRS is UE-specifically managed
- NR supports TRS for multi-TRP transmission
 - Details FFS
- FFS how to handle the case of initial access and idle mode (e.g., the necessity of TRS or not, default value if TRS is necessary, etc)
- FFS how to handle multi-beam transmission
- FFS: whether the tracking performance enhancement is needed for long DRX

Not treated.

R1-1710201	Discussion on fine time/frequency tracking of channel	ZTE
R1-1710299	Discussion on fine time/frequency tracking of channel	LG Electronics

R1-1710538	Discussion on TRS	Intel Corporation
R1-1710689	Discussions on fine time/frequency tracking for NR	Samsung
R1-1710853	Considerations on fine time/frequency tracking	Sony
R1-1711613	On time and frequency tracking of the channel	Ericsson (rev of R1-1711050)
R1-1711311	Views on the fTFT-RS in NR	Nokia, Alcatel-Lucent Shanghai Bell

5.1.2.4.7 QCL

R1-1710202	QCL design for UL and DL MIMO	ZTE
R1-1710539	On QCL for different BW parts and other QCL details	Intel Corporation
R1-1711176	Discussion on QCL	Qualcomm Incorporated
R1-1711312	On QCL Framework and Configurations in NR	Nokia, Alcatel-Lucent Shanghai Bell

Agreements:

- For QCL, NR supports:
 - o At least one or two DM-RS antenna port groups per PDSCH
 - FFS other number of groups
 - o QCL assumption across carriers and bandwidth parts for DL
 - FFS details for indication, the applicable RS(s), the applicable QCL parameters, and configurability
 - FFS whether or not to have UE assisted management

Continue offline discussion – Mihai (Nokia)

Not treated.

R1-1709935	Details of QCL assumptions and related RS design considerations	Huawei, HiSilicon
R1-1710071	On QCL for NR	CATT
R1-1710300	Discussion on QCL for NR	LG Electronics
R1-1710690	On QCL for NR	Samsung
R1-1710941	On QCL for NR	InterDigital, Inc.
R1-1711051	The QCL framework in NR	Ericsson
R1-1711672	Summary of QCL	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711971	WF on QCL assumption in NR	ZTE, ASTRI, Nokia, ASB

5.1.2.4.8 Other

R1-1709937	UL SRS sequence design in NR	Huawei, HiSilicon
R1-1709945	Common UL/DL DMRS design	Huawei, HiSilicon
R1-1710455	Signaling of DMRS ports for SU/MU-MIMO	Huawei, HiSilicon
R1-1710456	DMRS design for URLLC	Huawei, HiSilicon
R1-1710457	Considerations on UE-specific RS Sequence Design	Huawei, HiSilicon
R1-1710458	Discussion on UL DMRS power boosting	Huawei, HiSilicon
R1-1711052	On the number of antenna ports for CSI-RS	Ericsson
R1-1711053	On the collision between DMRS and DC subcarrier	Ericsson
R1-1711246	Discussion on Bursty Interference Measurement Resources	Qualcomm Incorporated
R1-1711591	Link level performance evaluation for mobility scenario	Samsung
R1-1711599	Remaining issues on PT-RS density in CP-OFDM	Samsung

5.1.2.5 Other

Including MIMO calibration

R1-1709910	NR MIMO System Level Phase 3 Calibration Results	Beijing Xinwei Telecom Techn.
R1-1709938	SRS antenna switching	Huawei, HiSilicon
R1-1710072	System level calibration results for NR MIMO	CATT
R1-1710073	Link level calibration results for NR MIMO	CATT
R1-1710206	Calibration results for Phase 2 NR MIMO system level calibration	ZTE
R1-1710207	Calibration results for Phase 3 NR MIMO calibration	ZTE

R1-1710208	Further clarification on Phase 3 NR MIMO calibration	ZTE
R1-1710301	Phase 3 SLS Calibration Results for NR MIMO	LG Electronics
R1-1710302	Phase 2 LLS Calibration Results for NR MIMO	LG Electronics
R1-1710540	Calibration results for Phase 2 NR MIMO system level calibration	Intel Corporation
R1-1711393	Calibration results for Phase 1 NR MIMO system level calibration	MOTOROLA MOBILITY LLC
R1-1711450	MIMO Phase-2 SLS calibration results on 30GHz frequency band	Samsung
R1-1711451	MIMO Phase-2 LLS calibration results on 30GHz frequency band	Samsung
R1-1711452	Evaluation results for dense urban on 30GHz frequency band	Samsung
R1-1711579	Calibration results for Phase 1 and Phase 2 NR MIMO system level calibration	vivo
R1-1711593	System level evaluation on effect of penetration loss in sub-6GHz and above-6GHz frequency bands	Samsung
R1-1711594	Analysis on random cluster effect in map-based hybrid channel model	Samsung

5.1.3 Scheduling/HARQ aspects

5.1.3.1 Physical downlink control channel

[R1-1711567](#) Summary of e-mail discussion on DCI content Ericsson LM

[R1-1711910](#) [DRAFT] Reply LS on PDCCH design Ericsson

[R1-1711972](#) [DRAFT] Reply LS on PDCCH design Ericsson, CATT

[R1-1711992](#) [DRAFT] Reply LS on PDCCH design Ericsson, CATT

Decision: The document is noted and final LS is approved in [R1-1712005](#) by deleting a sentence “RAN1 may downselect between 7 and 14 symbols in the future.” and capture past agreements related to it in RAN1 #86bis (in Lisbon) as it is in Section 1.

5.1.3.1.1 PDCCH structure

[R1-1712006](#) WF on UE behaviour for reserved resource Samsung

5.1.3.1.1.1 CCE-to-REG mapping and PDCCH-to-CCE mapping

Including REG bundle size/structure.

[R1-1711411](#) Evaluation on REG bundle sizes for 1-symbol CORESET duration Huawei, HiSilicon

Observation 1: For 1-symbol CORESET configured with REG-to-CCE mapping without interleaving, same precoder across multiple CCEs, i.e., higher REG bundling size such as 12 REGs, will improve PDCCH performance.

Observation 2: for 1-symbol CORESET configured with REG-to-CCE mapping with interleaving,

- using smaller REG bundling size hence finer cycling granularity, precoder cycling can obtain more diversity gain, i.e., the performance curve of BLER vs SNR will have a steeper slope, especially for the case of low Delay spread(hence low frequency selectivity)and in high SNR region, where channel estimation performance can be ensured with smaller REG bundling size, e.g.,2;
- using larger REG bundling size such as 3 or 6, channel estimation performance can be improved, especially for the case of high Delay spread(hence high frequency selectivity)and in low SNR region, where PDCCH performance will be ensured by high PDCCH aggregation level;
- higher PDCCH aggregation level will benefit from larger bundling size;

Proposal: Configurable REG bundling size should be supported for 1-symbol CORESE configured with REG-to-CCE mapping with interleaving, and bundle size 2, 3 or 6 can be configured.

Decision: The document is noted.

[R1-1711412](#) Evaluation on REG bundle sizes for more than 1 symbol CORESET duration Huawei, HiSilicon

Observation 1: for 2- or 3-symbol CORESET configured with REG-to-CCE mapping without interleaving, same precoder across multiple CCEs, i.e., higher REG bundling size such as 12 REGs, will improve PDCCH performance.

Observation 2: for 2- or 3-symbol CORESET configured with REG-to-CCE mapping with interleaving:

- using lower REG bundling size (REG bundle pattern 0) have finer cycling granularity, precoder cycling can obtain more diversity gain, especially for the case high SNR region;
- using higher REG bundling size (REG bundle pattern 1), channel estimation performance can be improved, especially for the case of low SNR region;

- higher PDCCH aggregation level will benefit from larger bundling size;

Proposal: For Option2 in 2 and 3 OFDM symbol CORESET, the following REG bundle patterns can be configured:

- 1 symbol in time domain and {3,6} consecutive REGs in frequency domain;
- 1 symbol in time domain and {2,6} consecutive REGs in frequency domain;
- 2 symbols in time domain and 1 REG per symbol in frequency domain;
- 2 symbols in time domain and 3 consecutive REGs per symbol in frequency domain; Or
- 3 symbols in time domain and 1 REG per symbol in frequency domain;
- 3 symbols in time domain and 2 consecutive REGs per symbol in frequency domain.

Decision: The document is noted.

R1-1710541 NR PDCCH physical structure Intel Corporation

- Observation 1: In case of CORESET of 1 OS and 48 RBs, REGs of 3 and 6 REGs exhibit similar performance. While REG of 6 REGs shows slightly better performance than REG of 3 REGs for high AL NR-PDCCH in low SNR, the performance of REG of 3 REGs is slightly better than that of REG of 6 REGs for low AL NR-PDCCH in high SNR.
- Observation 2: In case of CORESET of 2(3) OS and 24(16) RBs, REGs of 2(3) and 6 REGs exhibit similar performance. Specifically REG of 6 REGs shows slightly better performance than REG of 2(3) REGs for high AL NR-PDCCH in low SNR.
- Proposal 1: For non-interleaved REG-to-CCE mapping in 1-symbol CORESET, UE assumption of same precoding over multiple REG bundles can be configured by the gNB.
- Proposal 2: For interleaved REG-to-CCE mapping in 1-symbol CORESET, REG bundle size is 3REGs and UE assumption of same precoding over multiple REG bundles can be configured by the gNB.
- Proposal 3: For non-interleaved REG-to-CCE mapping in CORESET of more than 1 symbol with time-first mapping of REG-to-CCE, UE assumption of same precoding over multiple REG bundles can be configured by the gNB.
- Proposal 4: For interleaved REG-to-CCE mapping in CORESET of more than 1-symbol with time-first mapping of REG-to-CCE, REG bundle size is 2 REGs and 3 REGs for 2-symbol and 3-symbol CORESETs respectively, and UE assumption of same precoding over multiple REG bundles can be configured by the gNB.
- Proposal 5: At least for interleaved REG-to-CCE mapping in 1-symbol and multi-symbol CORESETs with time-first mapping, when configured, the same precoding may be assumed across no more than [2] REG bundles.
- Proposal 6: For multi-symbol PDCCH CORESET, adopt the following additional REG-to-CCE mapping option:
 - o (Option 2) Support of frequency-first mapping such that:
 - REG-to-CCE mapping is exactly same as the case where a CORESET with 1 symbol
 - A PDCCH candidate can be mapped across OFDM symbols.

Decision: The document is noted.

R1-1711708 WF on REG bundle size in a CORESET with interleaving LG Electronics, ETRI, NTT DOCOMO, Ericsson, InterDigital

- The REG bundle size in a CORESET with interleaving is
 - [2 or 3] for 1-symbol CORESET
 - 2 for 2-symbol CORESET when time-first REG-to-CCE mapping is applied
 - 3 for 3-symbol CORESET when time-first REG-to-CCE mapping is applied

Decision: The document is noted.

Proposed agreement

- The REG bundle size in a CORESET with interleaving is
 - Configurable between 2 and 6 for 1-symbol CORESET
 - Configurable between 2 and 6 for 2-symbol CORESET when time-first REG-to-CCE mapping is applied
 - Configurable between 3 and 6 for 3-symbol CORESET when time-first REG-to-CCE mapping is applied

For 2 and 3 symbols CORESET

- Option 1 REG bundle size = CORESET length
 - o Supported by Samsung, LGE, Panasonic, NTT DOCOMO, Ericsson, ETRI, OPPO, ZTE, InterDigital
- Option 2 REG bundle size = 6
 - o Nokia, ASB, Qualcomm

Agreements:

For a 1-symbol CORESET with interleaving,

- At least REG bundle size = 2 is supported
- Working assumption:
 - o REG bundle size = 6 is also supported

- o FFS whether configuration between 2 and 6 is explicit or implicit
- o Precoder granularity in frequency domain is equal to the REG bundle size in the frequency domain

For a 2 or 3 symbol CORESET with interleaving,

- At least REG bundle size = CORESET length is supported
- **Working assumption:**
 - o REG bundle size = 6 is also supported
 - o FFS whether configuration between CORESET length and 6 is explicit or implicit
 - o Precoder granularity in frequency domain is equal to the REG bundle size in the frequency domain

(Note: REG bundle size = REGs in frequency domain x symbols in time domain)

Not treated.

R1-1710011	Overview of PDCCH-CCE-REG mapping and REG bundling	Huawei, HiSilicon
R1-1710074	NR-PDCCH mapping structure	CATT
R1-1710104	CCE mapping with REG bundling	ZTE
R1-1710148	NR-PDCCH CCE-to-REG mapping with REG bundling	Guangdong OPPO Mobile Telecom.
R1-1710303	Discussion on NR-PDCCH structure	LG Electronics
R1-1710366	Discussion on NR-REG to NR-CCE time-/frequency mapping	Spreadtrum Communications
R1-1710390	Discussion on REG bundling size/structure	vivo
R1-1710614	NR-PDCCH mapping structure and REG bundle size	ETRI
R1-1710691	Resource Mapping for PDCCH	Samsung
R1-1710788	Discussions on NR-PDCCH Structure	MediaTek Inc.
R1-1710903	PDCCH structure for NR	NEC
R1-1710944	On the impact of multi-beam operation on PDCCH structure	InterDigital, Inc.
R1-1710973	Discussion on REG bundle size	ITRI
R1-1710978	On the PDCCH construction for NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711088	Views on remaining issues of resource mapping for NR-PDCCH	NTT DOCOMO, INC.
R1-1711235	REG bundling for NR PDCCH	Sharp
R1-1711273	Design of resource mapping and NR-PDCCH	HTC Corporation
R1-1711280	On CCE and PDCCH mapping	Motorola Mobility, Lenovo
R1-1711327	The relation among REG, CCE, and CORESET	Panasonic
R1-1711475	Views on CCE-to-REG mapping	KT Corp.
R1-1711477	On NR-PDCCH Structure	Ericsson
R1-1711633	PDCCH structure	Qualcomm Incorporated

5.1.3.1.1.2 RS structure/mapping

Including possible wideband RS.

DMRS mapping

- Option 1: DMRS is mapped on all REGs on all the OFDM symbols of a given PDCCH candidate
 - o Supported by Ericsson, Nokia, ASB, ITRI, Huawei, HiSilicon, OPPO, Intel, ETRI, KT, Lenovo, MotM, Panasonic, NTT DOCOMO, CATT, MediaTek, CMCC, Sony, Spectrum
- Option 2 DMRS is mapped on all REGs on the first OFDM symbol of a given PDCCH candidate
 - o Samsung, ZTE, Huawei, HiSilicon, vivo, InterDigital, LGE, Qualcomm, Sharp, Intel, NEC, Panasonic
- Option 3 DMRS is mapped on all REGs on the first and last OFDM symbols of a given PDCCH candidate
 - o DOCOMO, CATT, MediaTek, CMCC, vivo, Sony, Spectrum

Agreement

- DMRS is mapped on all REGs on all the OFDM symbols of a given PDCCH candidate
 - o The DMRS density is the same on all REGs

Not treated.

R1-1709950	DMRS for NR-PDCCH	Huawei, HiSilicon
R1-1710075	Further details of NR-PDCCH RS structure	CATT
R1-1710105	Issues regarding DMRS structure and mapping	ZTE
R1-1710149	On NR PDCCH RS design	Guangdong OPPO Mobile Telecom.
R1-1710304	Discussion on reference signal for NR-PDCCH	LG Electronics
R1-1710389	DMRS design for NR-PDCCH	vivo
R1-1710542	On DM-RS design for NR PDCCH	Intel Corporation

R1-1710615	DMRS design for NR-PDCCH	ETRI	
R1-1710778	On DMRS Design for NR-PDCCH	CMCC	
R1-1710789	RS structures for NR-PDCCH	MediaTek Inc.	
R1-1710945	On REG bundling and associated DMRS	InterDigital, Inc.	
R1-1710979	On the remaining details of PDCCH reference signal structure		Nokia, Alcatel-Lucent Shanghai Bell
R1-1711089	Views on DM-RS design for NR-PDCCH	NTT DOCOMO, INC.	
R1-1711328	RS mapping of NR-PDCCH	Panasonic	
R1-1711478	On DM-RS for NR-PDCCH	Ericsson	
R1-1711583	DMRS Structure for PDCCH	Samsung	
R1-1711634	RS for DL control channel	Qualcomm Incorporated	

5.1.3.1.2 Search space

5.1.3.1.2.1 CORESET configuration

Including relationship between CORESET and search space.

From offline discussion...

Agreements:

- For a CORESET which is configured by UE-specific higher-layer signalling, at least following are configured.
 - o Frequency-domain resources, which may or may not be contiguous
 - Each contiguous part of a CORESET is equal to or more than the size of REG-bundle in frequency
 - FFS: exact size and number of contiguous parts for a CORESET
 - o Starting OFDM symbol
 - o Time duration
 - o REG bundle size if the configuration is explicit
 - o Transmission type (i.e., interleaved or non-interleaved)
 - o More parameters may be added if agreed
- For a CORESET which is configured by UE-specific higher-layer signalling, at least following is configured.
 - o Monitoring periodicity
 - FFS: it is a configuration per CORESET or per one or a set of PDCCH candidates
 - FFS: relation with DRX
 - FFS: default/fallback value

Not treated.

R1-1709951	Configuration of control resource set	Huawei, HiSilicon	
R1-1710076	Configuration aspects of the NR-PDCCH	CATT	
R1-1710106	NR-PDCCH CORESET configuration	ZTE	
R1-1710150	PDCCH CORESET configuration and UE procedure on NR-PDCCH monitoring		Guangdong OPPO Mobile Telecom.
R1-1710305	Discussion on CORESET configuration	LG Electronics	
R1-1710543	CORESETs for NR PDCCH	Intel Corporation	
R1-1710693	CORESET Configurations	Samsung	
R1-1710779	Discussion on CORESET duration	CMCC	
R1-1710790	Discussions on CORESET configurations	MediaTek Inc.	
R1-1710872	CORESET Monitoring Under Dynamic Change of BWP	InterDigital, Inc.	
R1-1710980	On the PDCCH control resource set and its connection to the search space for NR		Nokia, Alcatel-Lucent Shanghai Bell
R1-1711090	Views on control resource set configuration for NR-PDCCH	NTT DOCOMO, INC.	
R1-1711179	Control resource set and search space	Qualcomm Incorporated	
R1-1711272	Configuration for control resource sets and search spaces	HTC Corporation	
R1-1711329	Configuration of CORESET	Panasonic	
R1-1711368	Discussion on the search space design	Xiaomi technology	
R1-1711479	On Configuration of Control Resource Sets	Ericsson	

5.1.3.1.2.2 Search space design

Including possible nested search space. Both common search space and UE-specific search space should be considered.

[R1-1711754](#) WF on NR PDCCH Blind decodes vivo, Samsung

Agreements:

- For PDCCH blind decoding, at least for the non-initial access, at least the following can be configured:
 - o Number of PDCCH candidates per CCE aggregation level, per DCI format size that the UE monitors
 - o Set of aggregation levels
 - FFS explicit or implicit configuration
 - o Set of DCI format sizes
 - FFS explicit or implicit configuration
 - o FFS: per CORESET not used for initial access or search space
 - o FFS: Signalling details
 - o Note that the number of candidates can be zero
- UE blind decoding capability is known by NW
 - o FFS: How the capability is derived

Possible proposals from offline:

- FFS: UE PDCCH blind decoding capability is defined in NR
 - FFS: The capability can be defined as the maximum number of blind decodes that a UE can support within a time unit.
 - FFS: the value of the time unit

Not treated.

R1-1709952	Search space design	Huawei, HiSilicon
R1-1710077	Search space design for NR-PDCCH	CATT
R1-1710107	Search space design for NR-PDCCH	ZTE
R1-1710151	NR PDCCH search space design with nested structure	Guangdong OPPO Mobile Telecom.
R1-1710306	Discussion on hierarchical search space structure	LG Electronics
R1-1710393	Discussion on search space design supporting dynamic DCI size	vivo
R1-1710544	NR PDCCH: Search spaces and monitoring behavior	Intel Corporation
R1-1710694	Search Space Design	Samsung
R1-1710780	Discussion on NR-PDCCH search space design	CMCC
R1-1710946	Search space design for eMBB-URLLC Multiplexing	InterDigital, Inc.
R1-1710981	On the search space design and UE blind detection	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711091	Views on search space design for NR-PDCCH	NTT DOCOMO, INC.
R1-1711180	Nested search space design	Qualcomm Incorporated
R1-1711321	PDCCH BD reduction	Panasonic
R1-1711330	Search space design	Panasonic
R1-1711480	On Search Space and Blind Decoding Design	Ericsson

5.1.3.1.2.3 Multi-beam operation for PDCCH

R1-1710012	Multi-beam operation for PDCCH	Huawei, HiSilicon
R1-1710078	Discussion on multi-beam operation for NR-PDCCH	CATT
R1-1710108	Supporting Multi-beam in NR-PDCCH	ZTE
R1-1710152	Search space design consideration for NR PDCCH with BF	Guangdong OPPO Mobile Telecom.
R1-1710307	Discussion on multi-beam operation for NR-PDCCH	LG Electronics
R1-1710437	Control channel configuration for multi-TRP and multi-panel transmission	AT&T
R1-1710545	Multi-beam operation for NR PDCCH	Intel Corporation
R1-1710616	NR-PDCCH for broadcast information delivery	ETRI
R1-1710695	Multibeam Transmission for PDCCH	Samsung
R1-1710982	PDCCH support for multi-beam system	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711092	Views on multi-beam based NR-PDCCH	NTT DOCOMO, INC.
R1-1711395	Discussion on Multi-beam Operation for PDCCH	Convida Wireless LLC
R1-1711481	On Multi-beam and Multi-TRP Operation for PDCCH	Ericsson

5.1.3.1.3 Resource sharing between PDCCH and PDSCH

[R1-1711921](#) WF on PDCCH /PDSCH resource sharing ZTE, Nokia, Ericsson, LG, Panasonic, Qualcomm, Sharp

- The following is supported for dynamic resource reuse for PDSCH
 - RRC signaling to indicate the time and frequency resources for which the dynamic signaling below indicates resources for which PDSCH may or may not be mapped
 - FFS whether the time and frequency resources can correspond to resources used for purposes other than CORESETs configured for monitoring PDCCH by the UE or by other UEs
 - Dynamic signaling that
 - Indicates which of the time and frequency resources configured by the RRC signaling can be mapped to PDSCH (Details FFS) and
 - Can additionally indicate which of the time and frequency resources not indicated by the above RRC signaling and that are part of the CORESETs configured to the UE for PDCCH monitoring are mapped to PDSCH (Details FFS)
 - Note: Dynamic signaling overhead will limit the number of resources that can be dynamically indicated for reuse of resources. FFS the limit on the overhead.
 - UE can assume that the reused resources shall be within the frequency domain spanned by the resources allocated for the PDSCH
 - UE assumes that resources used for reception of PDCCH scheduling PDSCH are not reused
 - FFS: Reuse of resources used for other control signaling, e.g., common search space, group common PDCCH, broadcast PDCCH, UL grant

Decision: The document is noted.

Not treated.

R1-1709956	Resource multiplexing of downlink control and data	Huawei, HiSilicon
R1-1710079	Flexible reuse of DL control resources for data transmission	CATT
R1-1710109	Resource sharing between PDCCH and PDSCH	ZTE
R1-1710153	On resource sharing between PDCCH and PDSCH	Guangdong OPPO Mobile Telecom.
R1-1710308	Discussion on multiplexing between control and data	LG Electronics
R1-1710546	Dynamic resource sharing between control and data	Intel Corporation
R1-1710617	Discussion on dynamic indication of PDSCH start symbol	ETRI
R1-1710696	Multiplexing NR-PDCCH and PDSCH	Samsung
R1-1710791	Resource sharing between PDCCH and PDSCH	MediaTek Inc.
R1-1710873	PDSCH starting position in NR	InterDigital, Inc.
R1-1710983	Resource sharing between PDCCH and PDSCH in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711093	Resource sharing between data and control channels	NTT DOCOMO, INC.
R1-1711182	Resource reuse for data in DL control region	Qualcomm Incorporated
R1-1711236	Indication of PDSCH starting position for NR	Sharp
R1-1711320	Resource sharing between PDCCH and PDSCH	Panasonic
R1-1711354	PDSCH starting position indication for NR	WILUS Inc.
R1-1711482	On Data Transmission in Control Resource Sets	Ericsson

5.1.3.1.4 Group-common PDCCH

[R1-1710968](#) Summary of [89-20] email discussion on Group-common PDCCH for NR CATT

Agreements:

- In ‘Slot format related information’, ‘Empty’ is not indicated explicitly.
- Note: RAN1 specification ensures that UE(s) is/are aware of which resources can be for ‘gap for DL-UL switching’ and/or ‘gap’
- Note: RAN1 specification ensures that UE(s) is/are aware of which resources are for ‘CSI/interference measurement’.

Agreements:

- UE is configured with a CORESET to monitor group-common PDCCH.
- When configured, the group-common PDCCH follows the same CORESET configuration (e.g., REG-to-CCE mapping) of the CORESET.

- o A group-common PDCCH is formed by an integer number of CCEs.
- The CORESET for the monitored group-common PDCCH carrying SFI can be the same or different from the CORESET for the monitored PDCCH for other types of control signalling.

Friday

[R1-1711991](#) **WF on contents of the group-common PDCCH** CATT, NEC

Agreement: Prioritize discussion of SFI functionality of a group-common PDCCH.

- Further work will be on group-common PDCCH carrying the SFI at least in August meeting.

5.1.3.1.4.1 Structure of group-common PDCCH

[R1-1709954](#) Structure of group-common PDCCH Huawei, HiSilicon
[R1-1710080](#) Channel structure for group-common PDCCH CATT
[R1-1710309](#) Discussion on the structure of group common PDCCH LG Electronics
[R1-1710438](#) Group common PDCCH Structure for NR AT&T
[R1-1710547](#) Group-common PDCCH: Physical structure Intel Corporation
[R1-1710697](#) UE-Group Common PDCCH Structure Samsung
[R1-1710792](#) Structure of group-common PDCCH MediaTek Inc.
[R1-1710857](#) On structure of group-common PDCCH Sony
[R1-1710947](#) Group-common PDCCH design considerations InterDigital, Inc.
[R1-1710984](#) On the structure of group common PDCCH in NR Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711094](#) Views on structure of group-common PDCCH NTT DOCOMO, INC.
[R1-1711183](#) Structure of group common PDCCH Qualcomm Incorporated
[R1-1711237](#) Group common PDCCH structure for NR Sharp
[R1-1711331](#) Discussion on structure of group common PDCCH Panasonic
[R1-1711355](#) Discussion on structure for group-common PDCCH for NR WILUS Inc.
[R1-1711390](#) Discussion on the structure of group common PDCCH Xiaomi Technology
[R1-1711483](#) On Group-Common PDCCH Structure and Configuration Ericsson

5.1.3.1.4.2 Contents of group-common PDCCH

[R1-1709953](#) Contents of group-common PDCCH Huawei, HiSilicon
[R1-1710081](#) Contents of the group-common PDCCH CATT
[R1-1710110](#) Group-common PDCCH design consideration ZTE
[R1-1710310](#) Discussion on the contents of group common PDCCH LG Electronics
[R1-1710391](#) Discussion on group common PDCCH and BD vivo
[R1-1710439](#) On the contents of group common PDCCH AT&T
[R1-1710548](#) Group-common PDCCH: Contents Intel Corporation
[R1-1710698](#) Functionalities of UE-Common PDCCH Samsung
[R1-1710793](#) Contents of group-common PDCCH MediaTek Inc.
[R1-1710856](#) On contents of group-common PDCCH Sony
[R1-1710907](#) Control indicator in group-common PDCCH for UE power saving Apple Inc.
[R1-1710985](#) On the contents of group common PDCCH in NR Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711095](#) Views on contents of group-common PDCCH NTT DOCOMO, INC.
[R1-1711238](#) Group common PDCCH contents for NR Sharp
[R1-1711247](#) Contents of group common PDCCH Qualcomm Incorporated
[R1-1711281](#) NR Group-common PDCCH contents and structure Motorola Mobility, Lenovo
[R1-1711332](#) Discussion on contents of group common PDCCH Panasonic
[R1-1711356](#) Discussion on contents for group-common PDCCH for NR WILUS Inc.
[R1-1711369](#) Discussion on the content of group common PDCCH Xiaomi technology
[R1-1711484](#) On the Content of Group-Common PDCCH Ericsson
[R1-1711809](#) WF on slot format indication with group common PDCCH LG Electronics, InterDigital, ...

5.1.3.1.4.3 UE behaviour related to group-common PDCCH

[R1-1710082](#) Configuration and monitoring of the group-common PDCCH CATT
[R1-1710154](#) Impact on common channel reception to PDCCH design Guangdong OPPO Mobile Telecom.

R1-1710311	Discussion on UE behavior for the group common PDCCH	LG Electronics
R1-1710368	The relation among UE-specific DCI, GC-PDCCH, and semi-static signaling	Spreadtrum Communications
R1-1710440	UE behaviour for group common PDCCH	AT&T
R1-1710476	UE behavior related to group-common PDCCH	Huawei, HiSilicon
R1-1710549	Group-common PDCCH: UE behavior	Intel Corporation
R1-1710699	UE Behavior for UE-Group Common PDCCH Detection	Samsung
R1-1710781	UE behaviour related to dynamic and semi-static configured resources	CMCC
R1-1710794	UE behaviour for group-common PDCCH	MediaTek Inc.
R1-1710906	UE behavior on UL/DL transmission direction determination in NR TDD	Apple Inc.
R1-1710948	UE behaviour related to CORESET(s) configured by PBCH	InterDigital, Inc.
R1-1710986	On the UE behaviour related to group common PDCCH in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711096	Views on UE behavior for group-common PDCCH	NTT DOCOMO, INC.
R1-1711185	UE behaviour related to group common PDCCH	Qualcomm Incorporated
R1-1711239	Group common PDCCH monitoring for NR	Sharp
R1-1711333	Discussion on DL/UL transmission direction	Panasonic
R1-1711357	Discussion on UE behavior for group-common PDCCH for NR	WILUS Inc.
R1-1711485	On UE Procedures Related to Group-Common PDCCH	Ericsson

5.1.3.1.5 Ultra-reliable part of URLLC for DL control

Identify necessary techniques for physical downlink control channel to meet the URLLC requirements set forth by TR38.913.

R1-1709993	UE procedure of PDCCH monitoring for URLLC	Huawei, HiSilicon
R1-1710111	NR-PDCCH for supporting URLLC	ZTE
R1-1710155	DL control channel design for URLLC	Guangdong OPPO Mobile Telecom.
R1-1710312	Discussion on DL control with ultra-reliability	LG Electronics
R1-1710550	Satisfying ultra-reliability targets for NR PDCCH	Intel Corporation
R1-1710700	PDCCH Design for URLLC	Samsung
R1-1710862	Reliable PDCCH operation for URLLC	Sony
R1-1710874	Considerations for ultra-reliable DCI transmission	InterDigital, Inc.
R1-1710949	On Ultra-reliable and low-latency PDCCH	InterDigital, Inc.
R1-1710987	On the URLLC specific aspects for DL control channel	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711097	DL control channel design for URLLC	NTT DOCOMO, INC.
R1-1711338	Consideration on physical downlink control channel for URLLC	CATR
R1-1711486	On PDCCH for Ultra-Reliable Transmission	Ericsson
R1-1711487	On the Performance Evaluation of PDCCH for Ultra-Reliable Transmission	Ericsson
R1-1711552	Management of URLLC DL control channel efficiency and reliability	Qualcomm Incorporated

5.1.3.1.6 Other

R1-1709955	UE-specific DCI contents in NR	Huawei, HiSilicon
R1-1709957	Dynamic and semi-static DL/UL resource partition	Huawei, HiSilicon
R1-1709986	PDCCH reliability for URLLC	Huawei, HiSilicon
R1-1710395	DCI content size and compression	vivo
R1-1710460	Resource sharing between NR-PDCCH and data	Huawei, HiSilicon
R1-1710467	DCI design for URLLC	Huawei, HiSilicon
R1-1710701	Transmit Diversity for PDCCH	Samsung
R1-1710702	Bandwidth Part Hopping for CORESETS	Samsung
R1-1710988	On the usage of PDCCH DMRS as a complementary synchronization signal in DL	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711186	Common control resource set signaling in MIB	Qualcomm Incorporated
R1-1711187	Advanced Grant Indication for UE Power Saving	Qualcomm Incorporated
R1-1711413	CCE-to-REG mapping	Huawei, HiSilicon
R1-1711414	PDCCH-to-CCE mapping	Huawei, HiSilicon
R1-1711415	NR DL control capacity and blocking probability	Huawei, HiSilicon
R1-1711423	PDCCH monitoring for slot-aggregation and cross-slot scheduling	Huawei, HiSilicon

R1-1711431	HARQ feedback indication design for UL grant-free transmission	Huawei, HiSilicon
R1-1711433	Discussion on remaining frequency resources on symbol carrying CORESET	Huawei, HiSilicon
R1-1711453	DL and UL Assignment for NR TDD	Samsung
R1-1711454	Slot Reconfiguration for Low Latency in TDD	Samsung
R1-1711455	Indication of Reserved Resources	Samsung
R1-1711994	WF on UE power saving with PDCCH monitoring in CDRX	Qualcomm

5.1.3.2 Physical uplink control channel

5.1.3.2.1 PUCCH in short-duration

Wednesday offline summary:

Discussions:

- Companies supporting option 4 (sequence selection)
 - Qualcomm, Ericsson, MediaTek, ZTE, LG, Interdigital, Motorola mobility, Lenovo, DOCOMO
 - For SR only case: Intel, ZTE
- Companies supporting option 1 (FDM RS and UCI)
 - Option 1-1: FDM two sequences, one sequence is modulated with UCI
 - Option 1-2: based on single sequence, modulate even tone of a single sequence.
 - Modulate can be BPSK or QPSK
 - Samsung (Option 1-1), ZTE (option 1-2), Huawei, HiSilicon (Option 1-2), intel (option 1-1), Nokia (option 1-1), CATT (?)
- Advantages of option 4 (sequence selection)
 - Lower PAPR than option 1
 - With 2 bits payload, better link level performance for 1 UE
 - For 3 UEs, one company provided link level simulation showing option 4 has better performance than option 1. ([R1-1711649](#))
 - MUX capacity is 6 UEs for 1 bit UCI, MUX capacity 3 UEs for 2 bits UCI
 - If multiplex with DMRS other UEs short PUCCH, can achieve flexible PUCCH allocation and higher multiplexing capacity.
 - Better MUX capacity for SR than 1-2.
- Advantages of option 1 (FDM RS and UCI)
 - Lower PAPR than LTE is only for option 1-2, but with worse cross-correlation than LTE.
 - MUX capacity of 6 UEs for 1 bit
 - Potential MUX capacity of 6 UEs for 2 bits

Qualcomm and Ericsson comment maximizing UE MUX capacity is not main design target for short PUCCH. Single UE performance is more important.

Thursday

Agreements:

- **Working assumption:**
 - o For short-PUCCH with UCI of up to 2 bits (with/without SR), option 4 is supported.
- No more short-PUCCH format is supported for short-PUCCH in the WID scope.

5.1.3.2.1.1 Short-PUCCH for UCI of up to 2 bits

R1-1709958	Short PUCCH for up to 2 UCI bits	Huawei, HiSilicon
R1-1710112	On short PUCCH for up to 2 bits UCI	ZTE
R1-1710156	Discussion on short PUCCH for up to 2 UCI bits	Guangdong OPPO Mobile Telecom.
R1-1710313	Design of short NR-PUCCH for up to 2 UCI bits	LG Electronics
R1-1710551	Performance of short PUCCH format for 1~2 bits HARQ-ACK	Intel Corporation
R1-1710588	Results for short PUCCH for UCI of up to 2 bits	IITH
R1-1710618	Short-PUCCH for UCI of up to 2 bits	ETRI
R1-1710703	Short PUCCH for UCI of 1 or 2 Bits	Samsung
R1-1710819	Performance evaluation on channel structure of short PUCCH for 1 or 2 bits UCI	MediaTek Inc.
R1-1710893	On the short PUCCH design for small UCI payloads	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710950	Evaluations of 1-symbol short-PUCCH with 1 or 2 bit(s)	InterDigital, Inc.

R1-1711098	Sequence-based PUCCH for UCI of up to 2 bits	NTT DOCOMO, INC.
R1-1711188	Channelization of 1-symbol short PUCCH with 1 or 2 bits payload	Qualcomm Incorporated
R1-1711242	Short PUCCH structure for UCI of up to 2 bits	Sharp
R1-1711282	Short PUCCH for up to 2 bit UCI	Motorola Mobility, Lenovo
R1-1711358	Short PUCCH structure for UCI of up to 2 bits	WILUS Inc.
R1-1711488	On the Design of Short PUCCH for 1-2 UCI bits	Ericsson
R1-1711603	Short PUCCH for small UCI payloads	CATT
R1-1711649	Discussion on 1-symbol NR-PUCCH for UCI of up to 2 bits	Panasonic Corporation
R1-1711796	1-symbol short PUCCH with 1 or 2 bits UCI	Qualcomm

5.1.3.2.1.2 Short-PUCCH for UCI of more than 2 bits

R1-1709959	Short PUCCH with more than 2 UCI bits	Huawei, HiSilicon
R1-1710084	Short PUCCH for moderate and large UCI payloads	CATT
R1-1710113	On short-PUCCH for more than 2 bits	ZTE
R1-1710157	Discussion on short PUCCH for more than 2 UCI bits	Guangdong OPPO Mobile Telecom.
R1-1710226	Discussion on 2-symbol Short PUCCH with More Than 2 Bits	Beijing Xinwei Telecom Techn.
R1-1710314	Design of short NR-PUCCH for more than 2 UCI bits	LG Electronics
R1-1710367	Discussion on 1-symbol PUCCH design	Spreadtrum Communications
R1-1710408	On pre-DFT RS/UCI multiplexing for PUCCH in short duration	Mitsubishi Electric RCE
R1-1710552	2-symbol NR PUCCH	Intel Corporation
R1-1710589	Further discussion on pre-DFT multiplexing for short PUCCH	IITH
R1-1710619	Short-PUCCH for UCI of more than 2 bits	ETRI
R1-1710704	Short PUCCH for UCI of more than 2 Bits	Samsung
R1-1710894	Short PUCCH design for UCI of more than 2 bits	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711099	FDM-based PUCCH for UCI of more than 2 bits	NTT DOCOMO, INC.
R1-1711189	Channelization of 1-symbol short PUCCH with more than 2 bits payload	Qualcomm Incorporated
R1-1711243	Short PUCCH structure for UCI of more than 2 bits	Sharp
R1-1711489	On the Design of Short PUCCH for more than 2 UCI bits	Ericsson
R1-1711655	Discussion on short-PUCCH more than 2-bit	vivo
R1-1711832	WF on Pre-DFT Multiplexing of RS and UCI in short duration PUCCH	IITH
R1-1711887	WF on 2-symbol NR-PUCCH	LG Electronics

5.1.3.2.2 PUCCH in long-duration

R1-1711677	Summary of the E-mail Discussion [89-21]: On Long PUCCH for NR	Ericsson
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[R1-1711834](#) **WF on Long PUCCH Format with 1-2 UCI bits** Ericsson, Huawei, HiSilicon, LG, ZTE, MediaTek, Panasonic, WILUS Inc., Intel, Vivo, Cohere Technologies, ETRI, Motorola mobility, Lenovo, CATT

Possible agreements:

- For a long PUCCH with up to 2 bits UCI:
 - For location of DMRS select from one of the following alternative in the next meeting:
 - Alt 1: DMRS always occurs in even [or odd] symbols in the long PUCCH
 - Alt 2: DMRS always occurs in even [or odd] symbols in the slot
 - Alt 3: DMRS occurs in one or more sets of consecutive symbols within the long PUCCH. The occasion of DMRS symbols depends on the duration of long PUCCH.
 - Alt 4: DMRS occurs in one or more sets of consecutive symbols within the long PUCCH. The occasion of DMRS symbols depends on the duration of long PUCCH but fixed within the slot

Possible agreements:

- For a long PUCCH with up to 2 bits UCI:
 - The DM-RS symbol(s) are formed as follows:
 - DMRS for a PUCCH is a cyclic shift of a base sequence (e.g. a CAZAC or computer generated sequence) in frequency domain with Orthogonal Cover Code (OCC) in time.
 - The data symbols are formed as the following:
 - The modulated UCI bit(s) is multiplied with a cyclic shift of a base sequence (e.g. a CAZAC or computer generated sequence) in frequency domain with Orthogonal Cover Code (OCC) in time.
 - Note: BPSK and QPSK modulations for 1 and 2 UCI bits, respectively.

Thursday (offline)

[R1-1711912](#) WF on Long PUCCH Format with 1-2 UCI bits Ericsson, Huawei, HiSilicon, LG, ZTE, MediaTek, Panasonic, WILUS Inc., Intel, Vivo, Cohere Technologies, ETRI, Motorola mobility, Lenovo, CATT, Qualcomm

Agreements:

- For a long PUCCH with up to 2 bits UCI:
 - o **Working assumption:**
 - DMRS always occurs in every other symbols in the long PUCCH
 - FFS: even or odd symbols
 - The working assumption can be revisited if an issue is found in terms of transient period.

Agreements:

- o The DMRS symbol(s) are formed as follows:
 - DMRS for a PUCCH is a sequence (e.g. a cyclic shift of a CAZAC or computer generated sequence) in frequency domain with Orthogonal Cover Code (OCC) in time.
 - o Note: The data symbols are formed as the following:
 - The modulated UCI bit(s) is multiplied with a sequence (e.g. a cyclic shift of a CAZAC or computer generated sequence) in frequency domain with Orthogonal Cover Code (OCC) in time.
 - BPSK and QPSK modulations for 1 and 2 UCI bits, respectively.
 - o Note: The usage of OCC for DMRS and UCI symbols is effectively disabled for differentiation of the users that are assigned with the same OCC.
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[R1-1711835](#) WF on Frequency Hopping for Long PUCCH Ericsson, MediaTek, Qualcomm, Panasonic, Intel, LG, NTT DOCOMO, Cohere Technologies, WILUS Inc., Huawei, HiSilicon, Samsung

Possible agreements:

- For a long PUCCH with N symbols in a slot
 - At most one hop within a slot is supported.
 - FFS on how to enable or disable frequency hopping
 - In case of frequency hopping, the hop occurs at the end of the X-th symbol where
 - FFS between $X = \text{floor}(N/2)$ or $\text{ceil}(N/2)$

Friday offline

Agreements:

- For a PUCCH format for UCI with large payload with no multiplexing capacity within a slot:
 - o The DMRS and UCI are mapped to different symbols.
 - o For intra-slot frequency-hopping, one or two DMRS symbol(s) is/are mapped on each frequency-hop of the long-PUCCH.
 - Opt.1: one DMRS per frequency-hop
 - The location is around the middle of the frequency-hop
 - Opt.2: one or two DMRS per frequency-hop
 - FFS: the location of the DMRS symbol(s)
 - o The DMRS symbol(s) are formed as follows:
 - DMRS for a PUCCH is a sequence (e.g. a cyclic shift of a CAZAC or computer generated sequence) in frequency domain.
 - o **Working assumption:**
 - The symbols carrying UCI are formed as follows:
 - The UCI bits are encoded and scrambled, QPSK modulated and DFT pre-coded and mapped to the REs for the symbols carrying UCI of the long PUCCH

Friday: IITH commented during offline “Pi/2 BPSK modulation should be used for long duration PUCCH “, not captured due to concern from others

[R1-1711996](#) WF on Long PUCCH Format for more than 2 UCI bits with Multi-user Multiplexing Ericsson

[R1-1709960](#) Overview of long PUCCH design Huawei, HiSilicon

[R1-1710590](#) Views on long-duration PUCCH IITH

[R1-1711201](#) Uplink Resource for SR Qualcomm Incorporated

5.1.3.2.2.1 Long-PUCCH for UCI of up to 2 bits

Focus on long-PUCCH within a slot.

[R1-1709961](#) Long PUCCH structure for up to 2 bits with high multiplexing capacity Huawei, HiSilicon
[R1-1710085](#) Long PUCCH for small UCI payloads CATT
[R1-1710114](#) On long-PUCCH for up to 2 bits ZTE
[R1-1710158](#) Discussion on long PUCCH for up to 2 UCI bits Guangdong OPPO Mobile Telecom.
[R1-1710315](#) Design of long NR-PUCCH for up to 2 UCI bits LG Electronics
[R1-1710553](#) Structure of 1~2 bits HARQ-ACK long PUCCH with TDM DMRS Intel Corporation
[R1-1710598](#) Long PUCCH design for UCI of up to 2 bits Lenovo, Motorola Mobility
[R1-1710705](#) Long PUCCH for UCI of 1 or 2 Bits Samsung
[R1-1710895](#) On long PUCCH design for small payloads Nokia, Alcatel-Lucent Shanghai Bell
[R1-1710932](#) Discussion on channel structure of long-duration NR-PUCCH for UCI of up to 2 bits Panasonic Corporation
[R1-1711100](#) Long-PUCCH for UCI of up to 2 bits NTT DOCOMO, INC.
[R1-1711190](#) Long PUCCH design with 1 or 2 bits UCI payload Qualcomm Incorporated
[R1-1711490](#) On the Design of Long PUCCH for 1-2 UCI bits Ericsson

5.1.3.2.2.2 Long-PUCCH for UCI of more than 2 bits

Focus on long-PUCCH within a slot.

[R1-1709962](#) Long PUCCH structure for moderate payload with some multiplexing capacity Huawei, HiSilicon
[R1-1710086](#) Long PUCCH for moderate and large UCI payloads CATT
[R1-1710115](#) On long-PUCCH for more than 2 bits ZTE
[R1-1710316](#) Design of long NR-PUCCH for more than 2 UCI bits LG Electronics
[R1-1710554](#) Long PUCCH for moderate and large payload Intel Corporation
[R1-1710599](#) Long PUCCH design for UCI of more than 2 bits Lenovo, Motorola Mobility
[R1-1710706](#) Long PUCCH for UCI of more than 2 Bits Samsung
[R1-1710896](#) Long PUCCH design for UCI more than 2 bits Nokia, Alcatel-Lucent Shanghai Bell
[R1-1710934](#) Discussion on channel design of long-duration NR-PUCCH for UCI of more than 2 bits Panasonic Corporation
[R1-1711101](#) Long-PUCCH for UCI of more than 2 bits NTT DOCOMO, INC.
[R1-1711191](#) Long PUCCH design with more than 2 bits UCI payload Qualcomm Incorporated
[R1-1711240](#) Slot structure of NR long PUCCH for more than 2 bits Sharp
[R1-1711251](#) Design of Long-PUCCH for UCI of more than 2 bits Cohere Technologies
[R1-1711491](#) On the Design of Long PUCCH for more than 2 UCI bits Ericsson
[R1-1711833](#) WF on waveform for long duration PUCCH IITH, ATT, Deutsche Telekom, IITM, Reliance Jio, DISH, Thales, CEWiT, Tejas Networks, Sony, INL

5.1.3.2.2.3 Support of long-PUCCH over multiple slots

[R1-1710013](#) Support of long-PUCCH over multiple slots Huawei, HiSilicon
[R1-1710087](#) Design of multi-slot PUCCH transmission CATT
[R1-1710116](#) Consideration on long-PUCCH over slots ZTE
[R1-1710159](#) Slot aggregation and configuration for NR long PUCCH Guangdong OPPO Mobile Telecom.
[R1-1710317](#) Support of long NR-PUCCH over multiple slots LG Electronics
[R1-1710555](#) Long PUCCH over multiple slots Intel Corporation
[R1-1710600](#) Long PUCCH over multiple slots Lenovo, Motorola Mobility
[R1-1710620](#) Long-PUCCH over multiple slots ETRI
[R1-1710707](#) Multi-Slot Long PUCCH Transmission Samsung
[R1-1710935](#) Discussion on support of long-duration NR-PUCCH over multiple slots Panasonic Corporation
[R1-1710976](#) NR Long PUCCH Requirements CMCC
[R1-1711102](#) Long-PUCCH for more than one slot NTT DOCOMO, INC.
[R1-1711192](#) Long PUCCH over multiple slots Qualcomm Incorporated

R1-1711241	Structure of NR long PUCCH over multiple slots	Sharp
R1-1711252	Support of long-PUCCH over multiple slots	Cohere Technologies
R1-1711492	On support of Long PUCCH over multiple slots	Ericsson
R1-1711840	WF on Frequency Hopping for Multi-slot Long PUCCH	LG Electronics

5.1.3.2.3 Transmit diversity for PUCCH

R1-1710160	Design of NR PUCCH with long duration	Guangdong OPPO Mobile Telecom.
R1-1710222	Transmit diversity for DFTsOFDM-based PUCCH in long duration	Mitsubishi Electric RCE
R1-1710318	Consideration on transmit diversity for NR-PUCCH	LG Electronics
R1-1710463	Transmit diversity for PUCCH	Huawei, HiSilicon
R1-1710556	Transmit diversity for PUCCH	Intel Corporation
R1-1710708	Transmit Diversity for PUCCH	Samsung
R1-1710897	Transmit Diversity for PUCCH	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710951	On transmit diversity for Long PUCCH	InterDigital, Inc.
R1-1711193	Transmit diversity for PUCCH	Qualcomm Incorporated
R1-1711493	On Transmit Diversity Schemes for PUCCH	Ericsson

5.1.3.2.4 Resource allocation for PUCCH

R1-1710088	Further discussion on PUCCH resource allocation	CATT
R1-1710117	NR PUCCH resource allocation	ZTE
R1-1710161	Resource indication for UL control channel	Guangdong OPPO Mobile Telecom.
R1-1710237	PUCCH resource allocation	Fujitsu
R1-1710319	Consideration on resource allocation for NR-PUCCH	LG Electronics
R1-1710461	PUCCH resource allocation for HARQ-ACK and SR	Huawei, HiSilicon
R1-1710557	Resource allocation for PUCCH during initial access	Intel Corporation
R1-1710709	Resource Allocation for PUCCH with HARQ-ACK	Samsung
R1-1710782	Discussion on subband-based PUCCH resource allocation and indication	CMCC
R1-1710898	On the resource allocation for PUCCH	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710937	Discussion on resource allocation for uplink control channel	Panasonic Corporation
R1-1711103	PUCCH resource allocation	NTT DOCOMO, INC.
R1-1711194	Resource allocation for PUCCH	Qualcomm Incorporated
R1-1711283	PUCCH resource allocation for HARQ-ACK feedback to Msg4	Motorola Mobility, Lenovo
R1-1711494	On Resource Allocation for PUCCH and Multiplexing PUCCH Formats	Ericsson
R1-1711776	WF on PUCCH resource allocation	LG Electronics
R1-1711995	WF on the content of the long PUCCH resource configuration	Ericsson

5.1.3.2.5 UCI multiplexing

R1-1709989	Discussion on UCI feedback for URLLC	Huawei, HiSilicon
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5.1.3.2.5.1 UCI piggyback on PUSCH

For both PUSCH with CP-OFDM waveform and PUSCH with DFT-s-OFDM waveform

R1-1709963	UCI piggyback on PUSCH	Huawei, HiSilicon
R1-1710089	Multiplexing of UCI and UL data on PUSCH	CATT
R1-1710118	UCI multiplexing on PUSCH	ZTE
R1-1710162	On UCI and data multiplexing in PUSCH	Guangdong OPPO Mobile Telecom.
R1-1710320	Support of UCI piggyback on PUSCH for NR	LG Electronics
R1-1710558	UCI multiplexing onto PUSCH	Intel Corporation
R1-1710710	On UCI Multiplexing in PUSCH	Samsung
R1-1710820	Discussion on UCI on PUSCH	MediaTek Inc.
R1-1710899	UCI multiplexing on PUSCH	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710939	Discussion on UCI on PUSCH	Panasonic Corporation
R1-1710952	Considerations on UCI transmission on PUSCH	InterDigital, Inc.
R1-1711104	UCI on PUSCH	NTT DOCOMO, INC.
R1-1711195	UCI piggyback on PUSCH	Qualcomm Incorporated

[R1-1711359](#) Discussion on UCI piggyback on PUSCH WILUS Inc.

[R1-1711495](#) On UCI on PUSCH Ericsson

5.1.3.2.5.2 PUCCH-PUSCH multiplexing

[R1-1710090](#) Simultaneous PUCCH-PUSCH transmission in NR CATT

[R1-1710119](#) Multiplexing of PUSCH and short PUCCH ZTE

[R1-1710163](#) Multiplexing of short PUCCH and long PUCCH Guangdong OPPO Mobile Telecom.

[R1-1710321](#) Support of uplink channel multiplexing for NR LG Electronics

[R1-1710464](#) Multiplexing of PUCCH and PUSCH Huawei, HiSilicon

[R1-1710559](#) PUCCH-PUSCH multiplexing Intel Corporation

[R1-1710711](#) On Simultaneous PUSCH and PUCCH Transmissions Samsung

[R1-1710821](#) Discussion on PUCCH and PUSCH multiplexing MediaTek Inc.

[R1-1710900](#) On the multiplexing between PUCCHs and PUSCH Nokia, Alcatel-Lucent Shanghai Bell

[R1-1710940](#) Discussion on UCI and data multiplexing Panasonic Corporation

[R1-1711105](#) Multiplexing of PUCCH and PUSCH NTT DOCOMO, INC.

[R1-1711196](#) Multiplexing of PUCCH and PUSCH Qualcomm Incorporated

[R1-1711244](#) PUCCH and PUSCH multiplexing methods Sharp

[R1-1711360](#) Simultaneous transmission for long-PUCCH and PUSCH WILUS Inc.

[R1-1711496](#) On Simultaneous Transmission of PUSCH and PUCCH Ericsson

5.1.3.2.6 Ultra-reliable part of URLLC for UL control

Identify necessary techniques for physical uplink control channel to meet the URLLC requirements set forth by TR38.913.

[R1-1710120](#) Analysis of URLLC reliability for uplink control channel ZTE

[R1-1710322](#) Discussion on UL control with ultra-reliability LG Electronics

[R1-1710560](#) On UL control channel design aspects for URLLC Intel Corporation

[R1-1710597](#) Enhanced SR carried in UL control channel Lenovo, Motorola Mobility

[R1-1710712](#) PUCCH Design for URLLC Samsung

[R1-1710875](#) Considerations for ultra-reliable UCI transmission InterDigital, Inc.

[R1-1710901](#) On URLLC UCI transmission Nokia, Alcatel-Lucent Shanghai Bell

[R1-1710942](#) Discussion on SR for URLLC and multiplexing with HARQ-ACK Panasonic Corporation

[R1-1711106](#) UL control channel design for URLLC NTT DOCOMO, INC.

[R1-1711497](#) On PUCCH for Ultra-Reliable Transmission Ericsson

[R1-1711498](#) On the Performance Evaluation of PUCCH for Ultra-Reliable Transmission Ericsson

[R1-1711548](#) Resource allocation for PUCCH to support URLLC Sequans Communications

[R1-1711553](#) The necessity of reliable SR design for GF/GB UL URLLC transmission Qualcomm Incorporated

5.1.3.2.7 Other

[R1-1710561](#) Configurations of various long PUCCH lengths Intel Corporation

[R1-1710562](#) Short PUCCH formats for 1~2 bits UCI Intel Corporation

[R1-1710563](#) Cyclic shift assignment and CM for FDM DMRS and UCI Intel Corporation

[R1-1710564](#) Short UL control channel early in a slot Intel Corporation

[R1-1710713](#) Performance Results for Long PUCCH Samsung

[R1-1710714](#) Performance Results for UCI and Data Multiplexing Samsung

[R1-1710716](#) Multiplexing PUSCH with Short PUCCH or SRS Samsung

[R1-1710717](#) BSI/CSI Transmission on PUCCH Samsung

[R1-1710902](#) CP-OFDM waveform for NR long PUCCH Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711416](#) Performance evaluations on 1-symbol PUCCH for up to 2 UCI bits Huawei, HiSilicon

[R1-1711417](#) Long PUCCH structure for large payload with no multiplexing capacity Huawei, HiSilicon

[R1-1711418](#) On CSI feedback in NR Huawei, HiSilicon

[R1-1711419](#) Transmit diversity for short duration PUCCH Huawei, HiSilicon

[R1-1711420](#) Multiplexing between PUCCHs Huawei, HiSilicon

[R1-1711421](#) Multiplexing of UL control channel and SRS in NR Huawei, HiSilicon

5.1.3.3 DL/UL data scheduling and HARQ procedure

From Thursday offline...

Agreements:

- RAN1 advises based on the current understanding that RAN2 can make progress without taking into account the progress of CBG retransmissions and pre-emption indication.
- RAN1 will strive for making CBG retransmissions and pre-emption indication being not be visible in the MAC spec.

Agreements:

- For HARQ,
 - The retransmissions can occupy a different frequency allocation than the initial transmission (Note, this is supported in LTE)
 - For downlink, the transmission durations for a given TB may not be the same in some cases.
 - Among initial transmission and retransmissions for a data having fixed DMRS position relative to the start of the slot
 - Among initial transmission and retransmissions for a data having fixed DMRS position relative to the start of the data
 - FFS: other cases
 - For uplink at least scheduled by a UL grant, the transmission durations for a given TB may not be the same in some cases.

Agreements:

- One TB is mapped to one DL/UL carrier.
- Re-transmission of a TB cannot take place on different carrier than the initial transmission.
- **Working assumption:**
 - Re-transmission of a TB cannot take place on different numerology than the initial transmission in Rel. 15.
- When uplink CBG-based (re)transmission is configured, the UL grant indicates which CBG(s) of a TB is/are retransmitted

Email approval of the LS capturing the above agreements/WA until 6th of July – Karri (Nokia)

R1-1711681 WF on the structure of a data channel including DMRS Panasonic, OPPO, NTT DOCOMO

5.1.3.3.1 DL/UL resource allocation

[R1-1711322](#) Frequency/time resource assignment of the operation modes Panasonic

From Wednesday offline...

Agreements:

- For downlink, UE can be informed about the first DMRS position of the PDSCH between the following:
 - Fixed on the 3rd or 4th symbol of the slot (for, a.k.a, slot-based scheduling)
 - 1st symbol of the scheduled data (for a.k.a non-slot-based scheduling)
 - FFS: if special handling is needed for the case where some of the PRBs of the symbol of the scheduled data is overlapped with the other signals/channels
- FFS: When the UE is configured both slot-based scheduling and non-slot-based scheduling, the first DMRS position of the PDSCH can be changed between the 3rd or 4th symbol of the slot and 1st symbol of the scheduled data

Agreements:

- For uplink, the first DMRS position of the PUSCH is fixed relative to the start of the scheduled data.
 - FFS: Additional possibility of the another fixed position relative to the start of slot
 - The exact fixed position can be changed depending on the duration of the scheduled data

Conclusion:

- For both downlink and uplink, the second or later or additional DMRS is up to MIMO discussion.

5.1.3.3.1.1 Frequency-domain resource allocation

Including resource allocation for PDSCH/PUSCH with CP-OFDM waveform and PUSCH with DFT-s-OFDM waveform.

[R1-1710164](#) Bandwidth part configuration and frequency resource allocation Guangdong OPPO Mobile Telecom.

R1-1711689 Outputs of offline discussion on RBG size/number determination OPPO

RBG size/number determination, following options are discussed:

- Option 1:
 - Semi-statically configure a size of Type0 RA bitmap in DCI.
 - Then determine the number and size of RBGs for a RA based on size of BWP and the size of the bitmap.
- Option 2:
 - RBG size can be semi-statically configured per BWP.
 - FFS: Dynamic switching of RBG size.
 - Then number of RBGs in the BWP is determined by size of the BWP and the configured/indicated RBG size.
- Option 3:
 - RBG size is determined by the BW of the BWP and/or PDCCH monitoring periodicity
 - FFS: Necessity of signaling

Friday

R1-1711843 Outputs of offline discussion on RBG size/number determination OPPO, Nokia, LGE, Samsung, vivo, ZTE, CATR

Agreements:

- For PDSCH/PUSCH, the RBG size/number can be changed along with the change of the BWP used for resource allocation.
 - FFS: If one or multiple of following option(s) is/are also used for RBG size/number determination:
 - Opt. 1: Semi-statically configured size of Type0 RA bitmap.
 - o Number and size of RBGs for a RA is determined based on size of BWP and the size of the bitmap.
 - Opt. 2: Semi-statically configured RBG size(s) per BWP for deriving number of RBGs.
 - o Number of RBGs in the BWP is determined by size of the BWP and the configured/indicated RBG size(s).
 - o FFS: Dynamic switching of RBG size(s).
 - Opt. 3: DCI format/DCI format size (e.g. a compact DCI may be with a larger RBG size than a normal DCI).
 - Opt. 4: Transmission durations (e.g. a shorter-duration transmission may be with a larger RBG size than a longer one).
 - Opt. 5: RBG size is determined depending on the size of the BWP.
 - Other options are not precluded.
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R1-1711753 WF on UL Resource Allocation for PUSCH with DFT-s-OFDM waveform in NR NEC, NTT DOCOMO, Panasonic, OPPO, Ericsson, Nokia, ASB

Agreements:

- In frequency-domain, for PUSCH with DFT-s-OFDM waveform in NR, contiguous resource allocation scheme based on LTE UL RA Type 0 is adopted in Rel. 15.
 - o FFS:
 - A coarser granularity (i.e. more than 1RB) of resource assignment in order to reduce the overhead further
 - BW parts
- In frequency-domain, for PDSCH in NR, a resource allocation scheme based on LTE DL RA Type 2 is supported in Rel. 15.
 - o FFS:
 - A coarser granularity (i.e. more than 1RB) of resource assignment in order to reduce the overhead further
 - BW parts
- In frequency-domain, for PUSCH with CP-OFDM waveform in NR, contiguous resource allocation scheme based on LTE UL RA Type 0 is supported in Rel. 15
 - o FFS:
 - A coarser granularity (i.e. more than 1RB) of resource assignment in order to reduce the overhead further
 - BW parts
- A DCI format with resource allocation based on LTE DL RA type 0 (i.e., bit-map) is supported for PDSCH.

- A DCI format with resource allocation based on LTE DL RA type 0 (i.e., bit-map) is supported for PUSCH with CP-OFDM waveform.
- A DCI format with resource allocation based on LTE DL RA type 2 is supported for PDSCH.
- A DCI format with resource allocation based on LTE UL RA type 0 is supported for PUSCH with CP-OFDM waveform and with DFT-s-OFDM waveform.
- FFS: some or all of the above DCI formats have the same DCI payload size.

Proposals from offline

- FFS: for PUSCH transmission, the waveform is either dynamically indicated by the scheduling DCI or is semi-statically configured by higher-layer signalling.
 - This will be discussed in scheduling/HARQ agenda.
- FFS: whether to conform the following working assumption
 - In frequency-domain, for PUSCH with DFT-s-OFDM waveform, only contiguous resource allocation is supported in Rel. 15.

Not treated

R1-1709974	Scheduling and resource allocation mechanism for active bandwidth parts	Huawei, HiSilicon
R1-1710091	NR DL/UL frequency domain resource allocation	CATT
R1-1710121	Resource allocation in frequency domain	ZTE
R1-1710164	Bandwidth part configuration and frequency resource allocation	Guangdong OPPO Mobile Telecom.
R1-1710245	Frequency-domain resource allocation schemes for NR	NEC
R1-1710323	Discussion on frequency-domain resource allocation	LG Electronics
R1-1710392	Discussion on downlink RA	vivo
R1-1710413	Further details on forward compatible resources in NR	AT&T
R1-1710565	DL/UL data frequency-domain resource allocation	Intel Corporation
R1-1710718	DL/UL Frequency Resource Allocation	Samsung
R1-1710787	On default bandwidth part	PANASONIC
R1-1710953	On frequency-domain resource allocation for NR	InterDigital, Inc.
R1-1710989	On resource allocation in frequency domain for PDSCH and PUSCH in NR	Nokia, Alcatel-Lucent
Shanghai Bell		
R1-1711107	Frequency-domain resource allocation	NTT DOCOMO, INC.
R1-1711197	MPR issue with distributed RB allocation in UL	Qualcomm Incorporated
R1-1711198	Short PUSCH transmission in UL short duration	Qualcomm Incorporated
R1-1711363	Two-step resource allocation for data channel in NR	ASUSTEK COMPUTER (SHANGHAI)
R1-1711499	On Resource Allocation in the Frequency Domain	Ericsson

5.1.3.3.1.2 Time-domain resource allocation

Timing/duration determination for symbol-level/slot-level/multi-slot-level scheduling.

R1-1709994	Discussion on data transmission duration	Huawei, HiSilicon
R1-1710092	NR DL/UL time domain resource allocation	CATT
R1-1710165	Time-domain resource allocation for NR	Guangdong OPPO Mobile Telecom.
R1-1710238	Discussion on time domain resource allocation	Fujitsu
R1-1710246	Time-domain resource allocation schemes for NR	NEC
R1-1710324	Discussion on time-domain resource allocation	LG Electronics
R1-1710397	Discussion on flexible length scheduling	vivo
R1-1710414	Transmission duration indication for symbol-level/slot-level/multi-slot-level scheduling	AT&T
R1-1710566	Time-domain resource allocation for DL and UL data	Intel Corporation
R1-1710719	DL/UL Time Resource Allocation	Samsung
R1-1710838	Cross-slot scheduling for UE power saving	MediaTek Inc.
R1-1710990	Time-domain resource allocation for NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711108	Time-domain resource allocation	NTT DOCOMO, INC.
R1-1711471	Discussions on Transmission Duration	KT Corp.
R1-1711500	On Resource Allocation in the Time Domain	Ericsson

5.1.3.3.1.3 Transport block size determination

R1-1709978	TB mapping and TB size determination	Huawei, HiSilicon
R1-1710325	Discussion on TB size determination for NR	LG Electronics
R1-1710720	Transport Block Size Determination	Samsung
R1-1710991	Transport block size determination and the support of slot aggregation in NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711109	Transport block size determination	NTT DOCOMO, INC.
R1-1711199	Discussion TB size determination	Qualcomm Incorporated
R1-1711501	On MCS/transport Block Size Determination	Ericsson

5.1.3.3.2 UL data transmission procedure with grant

Including details for single/multiple SR configurations.

R1-1710021	Advantages of Underlay Scheduling Request method over PUCCH-based SR	Idaho National Laboratory
R1-1710093	Further details of grant-based UL transmission	CATT
R1-1710122	On scheduling request in NR	ZTE
R1-1710166	Discussion on the UL waveform indication	Guangdong OPPO Mobile Telecom.
R1-1710247	Frequency hopping for NR UL PUSCH	NEC
R1-1710326	Discussion on scheduling request for UL transmission with grant	LG Electronics
R1-1710465	On uplink data scheduling	Huawei, HiSilicon
R1-1710567	SR configuration and UL data scheduling	Intel Corporation
R1-1710721	SR Transmission for Multiple Configurations	Samsung
R1-1710722	Procedures for Grant-Based UL Transmissions	Samsung
R1-1710834	On support of Grant-free and Grant-based transmission for UL URLLC	MediaTek Inc.
R1-1710992	Discussion on multiple SR configuration	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711110	Scheduling request design in NR system	NTT DOCOMO, INC.
R1-1711200	Simultaneous UL SR channel	Qualcomm Incorporated
R1-1711502	On UL Data Scheduling Grant in NR	Ericsson
R1-1711503	On Scheduling Request Enhancements	Ericsson
R1-1711836	WF on scheduling request for NR	Idaho National Laboratory, KDDI, Lenovo, Motorola Mobility, IITH, CEWIT, IITM, Tejas Networks, Qualcomm

5.1.3.3.3 UL data transmission procedure without grant

Including HARQ/re-transmission, UE identification, relation b/w UL grant-free and UL SPS, etc.

R1-1710328	Summary of [89-22] Email discussion about UL data transmission without UL grant	LG Electronics
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Agreements:

- In addition to the RS parameters, time and frequency resource are configured in a UE-specific manner.
 - Note: it is common understanding that the time and frequency resources configured for a UE may or may not collide with those for another UE (to be captured in the LS).
- WA: Both DFT-S-OFDM and CP-OFDM are supported for UL transmission without grant.
- NR supports more than 1 HARQ process for UL transmission without grant

Offline summary (on-going):

R1-1711829	Offline discussions on UL data transmission without grant	NTT DOCOMO
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- Function of L1 signalling
 - At least following functionality of the L1 signalling is supported
 - Activation/Deactivation
 - Modification of parameters configured by RRC
 - For example at least following parameters are common in the RRC configuration and L1 signaling
 - One physical resource including following
 - Time domain resource allocation for one transmission

- Frequency domain resource allocation in terms of RB(s) or RBG(s)
 - UE-specific DMRS configuration
- MCS/TBS
- o Switch to grant-based re-transmission for the same TB
 - Companies are encouraged to provide detailed methods to determine the grant is for the same TB
- o Companies are encouraged to provide analysis to prove the benefits of supporting an acknowledgement/indication of successful receiving of that TB from gNB in next meeting
- Formats of L1 signalling
 - o Select from following two options to achieve each of the L1 signalling functionalities in next meeting
 - Option 1: UE-specific DCI (UL grant)
 - Option 2: Group common DCI
 - o FFS the monitoring occasions for the L1 signalling
- RRC configurations
 - o At least for UL transmission without UL grant and without L1 activation/deactivation signalling, the RRC (re-)configuration for a set of resource and parameters includes at least the following
 - o Transmission interval, where the minimum value can be one slot or one mini-slot
 - o One physical resource including following
 - Time domain resource allocation for one transmission
 - Frequency domain resource allocation in terms of RB(s) or RBG(s)
 - UE-specific DMRS configuration
 - o At least one physical resource can be configured for one UE within the transmission interval
 - o FFS multiple physical resources can be configured for one UE within the transmission interval
 - o Note:
 - At least repetition can be performed on the same physical resource defined above
 - FFS multiple physical resources can be configured for the K repetitions, where $K > 1$
 - o Other transmission related parameters:
 - An MCS/TBS value
 - Number of repetitions K
 - Power control related parameters
 - FFS: HARQ process related parameters
 - FFS: Possible RVs related parameters for repetitions
 - FFS: Possible hopping related parameters including enable/disable configurability
 - FFS: Possible ACK feedback related parameters
 - FFS other parameters
 - o Multiple sets of resource and parameters can be (re-)configured for each UE

Friday

Agreements:

- The same TA adjustment procedure/mechanism (including expiration of TA timer) is applied to UL transmission with and without UL grant
- For UL transmission without UL grant,
 - o Open-loop power control based on pathloss estimate is supported.
 - o FFS: Closed-loop power control is supported, which is based on NW signaling.
- A UE shall not transmit anything on configured resources for UL transmission without UL grant when there is no transport block to transmit.
- FFS: UCI piggybacking with transport block is supported for UL transmission without UL grant.

Agreement: RAN1 considers that UE transmitting UL transmission without UL grant can be identified based on time/frequency resources and RS parameter(s).

R1-1711969

Offline discussions on UL data transmission without grant

NTT DOCOMO

Agreements:

- Type of UL data transmission without grant

- o Type 1: UL data transmission without grant is only based on RRC (re-)configuration without any L1 signalling
- o Type 2: UL data transmission without grant is based on both RRC configuration and L1 signalling to activation/deactivation for UL data transmission without grant
 - Note: functionality of modification is achieved the L1 signalling by activation
- o Type 3: UL data transmission without grant is based on RRC configuration, and allows L1 signalling to modify some parameters configured by RRC but no L1 signalling for activation
- For UL data transmission without grant, type 1 and type 2 have already been agreed, FFS type 3.
- FFS the reliability issues for L1 signalling.
- For Type 1 UL transmission without UL grant, the RRC (re-)configuration includes at least the following
 - o Periodicity and offset of a resource with respect to SFN=0
 - o Time domain resource allocation
 - o Frequency domain resource allocation
 - o UE-specific DMRS configuration
 - o Note:
 - one TB is mapped to a resource at least consisting of time/frequency-domain resource
 - RAN1 will not introduce specific resource allocation and DMRS configuration for UL data transmission without grant separate from UL data transmission with UL grant within the Rel.15 WI
 - o An MCS/TBS value
 - o Number of repetitions K
 - o Power control related parameters
 - o FFS HARQ related parameters
 - o FFS if multiple resources can be configured
- For Type 2 UL transmission without UL grant
 - o The RRC (re-) configuration for resource and parameters includes at least the following
 - Periodicity of a resource
 - Power control related parameters
 - o At least the following additional parameters for the resource are given by L1 signalling
 - Offset associated with the periodicity with respect to a timing reference indicated by L1 signalling for activation
 - FFS: the timing reference
 - Time domain resource allocation
 - Frequency domain resource allocation
 - UE-specific DMRS configuration
 - An MCS/TBS value
 - Note:
 - one TB is mapped to one resource
 - RAN1 will not introduce specific resource allocation and DMRS configuration for UL data transmission without grant separate from UL data transmission with UL grant within the Rel.15 WI
 - o FFS multiple resources can be configured
 - o FFS HARQ related parameters
 - o FFS whether number of repetitions K is configured by RRC signalling and/or indicated by L1 signalling

Email approval of the LS to RAN2 until 6th of July to explain RAN1 understandings based on above agreements – Lihui (NTT DOCOMO)

Not treated.

R1-1709991	Resource configuration on UL transmission without grant	Huawei, HiSilicon
R1-1709992	UE identification and HARQ combining for grant-free transmissions	Huawei, HiSilicon
R1-1710014	Evaluation of UE identification for UL transmission without grant	ZTE
R1-1710015	Considerations on the procedures of UL data transmission without grant	ZTE
R1-1710094	Grant-free UL transmission procedure	CATT
R1-1710167	HARQ for uplink grant-free transmission	Guangdong OPPO Mobile Telecom.
R1-1710239	Discussions on HARQ for grant-free transmission	Fujitsu
R1-1710248	UL data transmission without grant	NEC
R1-1710327	Discussion on UL transmission without grant	LG Electronics
R1-1710328	Summary of [89-22] Email discussion about UL data transmission without UL grant	LG Electronics
R1-1710380	Discussion on UL grant-free transmission	vivo

R1-1710568	UL grant-free transmissions: Resource configuration	Intel Corporation
R1-1710601	UL grant-free transmission for URLLC	Lenovo, Motorola Mobility
R1-1710621	Resource allocation and transmission scheme for URLLC grant-free transmission	ETRI
R1-1710723	Procedures for Grant-Free UL Transmissions	Samsung
R1-1710724	Grant-Free and Grant-Based UL Transmissions	Samsung
R1-1710835	Grant-free Scheduling and retransmission schemes for UL URLLC	MediaTek Inc.
R1-1710836	On use of scrambling for UL Grant-free URLLC transmission	MediaTek Inc.
R1-1710861	Pre-emption in UL grant free resource	Sony
R1-1710863	Discussion on the retransmission of UL transmission without grant	Sony
R1-1710887	UL grant-free transmissions: Physical layer procedures	Intel Corporation
R1-1710963	On network resources and UE transmission configurations for grant-free access	NEC
R1-1710971	UL grant-free transmission for URLLC	China Telecommunications
R1-1710993	Unified framework for UL grant-free and UL SPS	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710994	UE identification and HARQ for URLLC UL grant-free	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711006	Issues and Control Design for UL Grant-free URLLC	III
R1-1711111	Overall solutions for UL grant free transmission	NTT DOCOMO, INC.
R1-1711253	Resource configuration for UL transmission without grant	NICT
R1-1711323	UL data transmission without grant	Panasonic
R1-1711504	On SPS/Grant-Free Transmission	Ericsson
R1-1711505	On HARQ Retransmission for SPS/Grant-free	Ericsson
R1-1711782	WF on UL transmission without grant	NEC

5.1.3.3.4 CBG-based (re)transmission

[R1-1711883](#) **WF on CBG retransmission** **Samsung**

Possible proposal from offline:

- CBG formation remains the same in retransmission as initial transmission

Possible agreement:

- Each CBG is the same set of CB(s) between initial transmission and retransmission

Friday

[R1-1711958](#) **WF on CBG retransmission** **Samsung, ZTE**

Working assumption: For initial transmission and retransmission, each CBG of a TB has the same set of CB(s).

Agreement: For CBG-based (re)transmission, the DCI scheduling CBG-based (re)transmission carries single RV field for the transport block.

Email approval until July 13th for downselection between the following – Jeongho (Samsung)

- For the indicated number of CBGs per TB where “indicated” is realized by RRC, MAC, L1 signalling, the following options are considered for down-selection in RAN1#90.
 - o Option 1. RRC signaling (for bit-field size)
 - o Option 2. L1 signaling (for indication the number of CBGs per TB) + RRC signaling (for bit-field size)
 - o Option 3. both Option 1 and Option 2
- To determine the number of CBG HARQ-ACK bits per TB, the following options are considered for down-selection in RAN1#90.
 - o Option 1. A UE transmits HARQ-ACK bits only for scheduled CBGs.
 - “scheduled CBGs” means the CBGs scheduled in a (re)transmission
 - o Option 2. A UE transmits HARQ-ACK bits for indicated CBGs.
 - FFS: “indicated” is realized by RRC, MAC, L1 signalling
 - o Option 3. both Option 1 and Option 2 by configuration
- For DL CBG-based (re)transmission, when information on which CBG(s) is/are (re)transmitted is configured to be included in the DCI, the following options are considered for down-selection in RAN#90.
 - o Option 1. TB-level NDI is jointly encoded with the information on which CBG(s) is/are (re)transmitted
 - o Option 2. There is separate 1-bit bit-field for TB-level NDI.
- When CBG-based retransmission is configured, TB-level HARQ-A/N is supported and at least following options can be considered for down-selection in RAN1#90.

- o Option 1. Add 1 bit upon CBG-level HARQ-ACK bits
- o Option 2. Use all NACK of CBG-level HARQ-ACK bits
- o Option 3. Use different PUCCH format or PUCCH resource
- For HARQ-ACK codebook for CBG-based retransmission, the following options are considered for down-selection in RAN1#90.
 - o Option 1. Dynamic codebook determination for multiple PDSCHs
 - o Option 2. Semi-static codebook determination for multiple PDSCHs
 - o Option 3. both Option 1 and Option 2 by configuration

5.1.3.3.4.1 CBG construction

R1-1709968	Discussion on CBG construction	Huawei, HiSilicon
R1-1710017	CBG construction	ZTE
R1-1710095	Details of CBG construction	CATT
R1-1710329	Consideration on CBG construction for NR HARQ	LG Electronics
R1-1710396	Discussion on CB grouping	vivo
R1-1710442	On CBG construction for NR PDSCH and PUSCH	AT&T
R1-1710569	On CBG construction	Intel Corporation
R1-1710593	Discussion on CBG grouping	Guangdong OPPO Mobile Telecom.
R1-1710602	CBG construction for CBG-based retransmission	Lenovo, Motorola Mobility
R1-1710725	CBG Construction	Samsung
R1-1710830	Discussion on CBG construction for CBG-based (re)transmission	MediaTek Inc.
R1-1710876	CBG based HARQ for NR InterDigital, Inc.	
R1-1710995	Mapping code blocks to code block groups	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711112	CBG construction	NTT DOCOMO, INC.
R1-1711202	CBG Construction Principles for CBG-based Transmission with Multi-Bit HARQ feedback	Qualcomm
Incorporated		
R1-1711506	On Code Block Group Formation and CRC Attachment	Ericsson
R1-1711690	WF on the number of CBGs	OPPO
R1-1711844	WF on the number of CBGs	OPPO

5.1.3.3.4.2 DL control signalling for CBG-based (re)transmission

Including CBG information by the DCI.

R1-1709967	Scheduling mechanisms for CBG-based re-transmission	Huawei, HiSilicon
R1-1710018	DL control for CBG	ZTE
R1-1710096	DL control signaling design for CBG-based operation	CATT
R1-1710168	Discussion on CBG indication in DCI	Guangdong OPPO Mobile Telecom.
R1-1710240	Discussion on DL control signaling related to CBG based (re)-transmission	Fujitsu
R1-1710330	Consideration on DCI signaling for CBG based HARQ	LG Electronics
R1-1710443	DCI design for CBG based re transmission	AT&T
R1-1710570	DCI design and scheduling of CBG-based (re)transmissions	Intel Corporation
R1-1710603	DL control signalling for CBG-based retransmission	Lenovo, Motorola Mobility
R1-1710726	Scheduling for CBG Retransmissions	Samsung
R1-1710864	Discussion on the CBG index indication by DCI	Sony
R1-1710908	DL control signal for CBG-based transmission	Apple Inc.
R1-1710972	Control signalling for CBG-based (re)transmission	China Telecommunications
R1-1710996	DL control signalling for CBG-based transmissions	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711113	DL control signalling for CBG-based (re)transmission	NTT DOCOMO, INC.
R1-1711203	DCI considerations for CBG-based (re)-Transmissions	Qualcomm Incorporated
R1-1711245	Pardon the Interruption: Downlink Control Signaling to Enable Preemption and CBG-based (Re) Transmission	Sharp
R1-1711257	Discussion on DL control signalling for CBG-based retransmission	HTC Corporation
R1-1711316	DL control signaling for CBG-based (re)transmission	Shenzhen Coolpad Technologies
R1-1711324	DL control signalling for CBG-based (re)transmission	Panasonic
R1-1711341	Discussions on the indication for CBG	CATR
R1-1711507	On Retransmission Decoder Throughput Issues and CBG-based Retransmission Control	Ericsson

[R1-1711531](#) CBG based retransmission Sequans Communications

5.1.3.3.4.3 UL control signalling for CBG-based (re)transmission

Including CBG-level HARQ-ACK feedback.

[R1-1709969](#) Discussion on CBG-based feedback Huawei, HiSilicon
[R1-1710019](#) UL control for CBG ZTE
[R1-1710097](#) UL control signaling design for CBG-based operation CATT
[R1-1710169](#) Discussion on HARQ-ACK feedback for CBG-based transmission Guangdong OPPO Mobile Telecom.
[R1-1710241](#) Discussion on CBG based HARQ-ACK Design Fujitsu
[R1-1710331](#) Consideration on UCI signaling for CBG based HARQ LG Electronics
[R1-1710444](#) Uplink control channel design for CBG based re transmission AT&T
[R1-1710571](#) HARQ-ACK feedback for CBG-based (re)transmissions Intel Corporation
[R1-1710604](#) UL HARQ-ACK feedback for CBG-based retransmission Lenovo, Motorola Mobility
[R1-1710727](#) HARQ-ACK Feedback for CBG-Based Retransmissions Samsung
[R1-1710954](#) HARQ feedback design considerations for CBG based transmission InterDigital, Inc.
[R1-1710997](#) HARQ-ACK feedback for CBG-based (re-)transmission in NR Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711114](#) UL control signalling for CBG-based (re)transmission NTT DOCOMO, INC.
[R1-1711204](#) UCI considerations for CBG-based (re-)Transmissions Qualcomm Incorporated
[R1-1711258](#) Discussion on UL control signalling for CBG-based retransmission HTC Corporation
[R1-1711361](#) Discussion on UL HARQ-ACK feedback for CBG-based retransmission WILUS Inc.
[R1-1711472](#) Considerations on TB-CRC Failure KT Corp.
[R1-1711508](#) On Design of CBG HARQ-ACK Feedback Schemes Ericsson
[R1-1711530](#) CBG based HARQ-Ack/Nack Sequans Communications

5.1.3.3.5 HARQ-ACK feedback

5.1.3.3.5.1 HARQ-ACK feedback timing

[R1-1709970](#) HARQ feedback timing for NR Huawei, HiSilicon
[R1-1710332](#) Consideration on HARQ-ACK feedback timing for NR LG Electronics
[R1-1710418](#) HARQ-ACK feedback timing for FDD, semi-static TDD and mini-slot based transmissions AT&T
[R1-1710728](#) HARQ-ACK Feedback Timing Samsung
[R1-1710783](#) Discussion on timing design for semi-static DL/UL assignment CMCC
[R1-1710795](#) Timing of HARQ-ACK for PDSCH MediaTek Inc.
[R1-1710877](#) DL HARQ Feedback suppression InterDigital, Inc.
[R1-1710998](#) Timing aspects for HARQ-ACK feedback Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711115](#) HARQ-ACK timing NTT DOCOMO, INC.
[R1-1711205](#) Low latency impact analysis on user plane and control plane Qualcomm Incorporated
[R1-1711509](#) On HARQ Feedback Timing Ericsson

5.1.3.3.5.2 HARQ-ACK multiplexing/bundling

Including solutions to address single/multiple TBs/CBGs over single/multiple carriers/TTIs.

[R1-1710098](#) NR HARQ-ACK multiplexing CATT
[R1-1710242](#) Discussion on HARQ-ACK codebook Fujitsu
[R1-1710333](#) Support of HARQ-ACK multiplexing/bundling for NR LG Electronics
[R1-1710462](#) On HARQ-ACK multiplexing and/or bundling Huawei, HiSilicon
[R1-1710572](#) HARQ-ACK multiplexing and bundling Intel Corporation
[R1-1710605](#) HARQ-ACK codebook design for CBG-based transmission Lenovo, Motorola Mobility
[R1-1710729](#) HARQ-ACK Codeword Determination Samsung
[R1-1710999](#) On HARQ feedback determination Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711116](#) HARQ-ACK multiplexing NTT DOCOMO, INC.
[R1-1711259](#) Discussion on CBG-based HARQ feedback multiplexing HTC Corporation
[R1-1711510](#) On HARQ Codebook Ericsson
[R1-1711933](#) WF on HARQ-ACK multiplexing for NR LG Electronics

[R1-1711934](#) WF on HARQ-ACK bundling for NR LG Electronics

5.1.3.3.6 Processing time and HARQ process number

[R1-17111856](#) WF on Processing Time Requirements Qualcomm, ZTE, Deutsche Telekom, Vodafone, Panasonic, Ericsson

Agreements:

- For NR, RAN1 should consider the UE processing time(s) in terms of symbols (N1, N2) together with absolute time (in us), instead of slots (K)
 - o N1: the number of OFDM symbols required for UE processing from the end of NR-PDSCH reception to the earliest possible start of the corresponding ACK/NACK transmission from UE perspective.
 - o N2: the number of OFDM symbols required for UE processing from the end of NR-PDCCH containing the UL grant reception to the earliest possible start of the corresponding NR-PUSCH transmission from UE perspective.
 - o Note the timing advance is not included in N1 and N2
 - FFS whether other aspects, e.g. UE UL/DL switching time, etc. are included in N1 and N2
 - o FFS between the following for each combination defined in the next slide
 - Opt 1: UE reports N1 and N2 as UE capability
 - Opt 2: Fixed values of N1 and N2
 - o UE is not expected transmit anything in uplink if the network set the values of K1 and/or K2 without leaving sufficient time for UE processing

Friday

[R1-1711957](#) WF on Processing Time Requirements Qualcomm

Conclusions:

- Email discussion about followings – Joseph (Qualcomm)
 - o Step 1: identify the candidate factors for processing time (until 4th Aug.)
 - o Step 2: identify the table (until 4th Aug.)
- Based on the proponents' input for step 1 and step 2, following work will be done:
 - o Step 3: fill-in the table
 - o Targeting finishing step 3 until September meeting.
 - Note: companies are encouraged to bring up initial numbers for the table to the August meeting
 - o Note: fill-in the table does not necessarily results in defining some UE capabilities or exact values of K1 and K2 in the specification.

5.1.3.3.6.1 Number of HARQ processes and HARQ RTT

[R1-1709965](#) Number of HARQ processes and HARQ RTT Huawei, HiSilicon
[R1-1710099](#) Discussion on number of HARQ processes and HARQ RTT CATT
[R1-1710334](#) Discussion on HARQ process number for NR LG Electronics
[R1-1710394](#) Discussion on NR UE supporting self-contained operation vivo
[R1-1710415](#) Remaining details on the number of HARQ processes in NR AT&T
[R1-1710573](#) On HARQ processes and HARQ RTT Intel Corporation
[R1-1710730](#) On Number of HARQ Processes and HARQ RTT Samsung
[R1-1710967](#) Number of HARQ processes for co-existence with TD-LTE NEC Corporation
[R1-1711000](#) On the number of HARQ processes Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711117](#) Processing time and HARQ process number for NR NTT DOCOMO, INC.
[R1-1711206](#) UE processing time Qualcomm Incorporated
[R1-1711511](#) On Minimum Processing Time and Number of HARQ Processes in NR Ericsson

5.1.3.3.6.2 Soft-buffer management

[R1-1709966](#) Soft buffer handling Huawei, HiSilicon
[R1-1710020](#) Consideration about CBG soft-buffer management ZTE
[R1-1710100](#) Soft buffer management for NR CATT
[R1-1710335](#) Discussion on soft buffer management for NR LG Electronics
[R1-1710574](#) Soft-buffer requirements in NR Intel Corporation
[R1-1710731](#) Soft Buffer Partitioning Samsung
[R1-1711001](#) On the HARQ soft buffer handling Nokia, Alcatel-Lucent Shanghai Bell

R1-1711118	Soft-buffer size and management	NTT DOCOMO, INC.
R1-1711207	Considerations for soft buffer management	Qualcomm Incorporated
R1-1711325	UE category modelling and soft buffer	Panasonic
R1-1711512	On HARQ and Soft Buffer Handling	Ericsson

5.1.3.3.7 Multiplexing data with different transmission durations

5.1.3.3.7.1 Pre-emption indication for downlink

Including signalling details and UE behaviour when it is indicated.

R1-1711342	Discussion on the granularity of preemption indication	CATR
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Offline summary (on-going):

[R1-1711823](#) **WF on pre-emption indication** Huawei, HiSilicon, MediaTek, Sequans, NTT DOCOMO, Sony, vivo, ZTE, InterDigital, III

Proposals:

- For downlink preemption indication
 - It is transmitted using a group common DCI in PDCCH
 - Working Assumption: This group common DCI is separate from group common PDCCH for SFI
 - Group common DCI addresses a time duration and frequency band
 - Whether a UE needs to monitor preemption indication is configured by RRC signaling
 - The granularity of preemption indication in time domain can be configured
 - The granularity of preemption indication in frequency domain will be down selected from
 - Option 1: RBG(s) in a common frequency band addressed by group common DCI with a given numerology
 - Option 2: 1/N of a common frequency band addressed by group common DCI with a given numerology
 - FFS: the value of N.
 - Details of group common DCI for pre-emption indication
 - FFS CORESET configuration and monitoring interval for the group common DCI
 - FFS details of contents for the group common DCI (E.g. the time/freq of pre-emption, number of pre-emption)

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[R1-1711911](#) **WF on pre-emption indication** Huawei, HiSilicon, MediaTek, Sequans, NTT DOCOMO, Sony, vivo, ZTE, InterDigital, III, Intel, LGE, Samsung

Agreements:

- For downlink preemption indication
 - It is transmitted using a group common DCI in PDCCH
 - FFS: This group common DCI is transmitted separately from SFI
 - Whether a UE needs to monitor preemption indication is configured by RRC signaling
 - The granularity of preemption indication in time domain can be configured
 - Details of granularity are FFS

R1-1711981	WF on group common pre-emption indication	Huawei, HiSilicon, Sharp, ZTE, LGE, Sony, Panasonic, MediaTek, InterDigital
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Not treated.

R1-1709984	On pre-emption indication for DL multiplexing of URLLC and eMBB	Huawei, HiSilicon
R1-1710101	Further design considerations for DL pre-emption indication	CATT
R1-1710123	DL pre-emption indication	ZTE
R1-1710170	Symbol-level resource allocation and pre-emption indication	Guangdong OPPO Mobile Telecom.
R1-1710336	Discussion on pre-emption indication for downlink LG Electronics	
R1-1710382	Discussion on pre-emption indication for downlink vivo	

R1-1710575	Remaining details of DL pre-emption indication	Intel Corporation
R1-1710732	Indication of Preempted Resources in DL	Samsung
R1-1710865	Remaining issues on using pre-emption indicator for DL URLLC/eMBB multiplexing	Sony
R1-1710955	Signalling design considerations for DL pre-emption indication	InterDigital, Inc.
R1-1711002	On pre-emption indication	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711119	Pre-emption indication for downlink	NTT DOCOMO, INC.
R1-1711362	Discussion on UE behavior by pre-emption indication	WILUS Inc.
R1-1711474	Views on preemption indication for DL	KT Corp.
R1-1711513	On Pre-emption Indication for Downlink	Ericsson
R1-1711551	Considerations on multiplexing with different transmission durations	KDDI Corporation
R1-1711554	URLLC DL pre-emption and UL suspension indication channel design	Qualcomm Incorporated

5.1.3.3.7.2 Possible enhancements for uplink

R1-1709988	Discussion on UL multiplexing of grant-based eMBB and grant-free URLLC	Huawei, HiSilicon
R1-1710124	Uplink multiplexing for different transmission durations	ZTE
R1-1710243	On eMBB and URLLC multiplexing for Uplink	Fujitsu
R1-1710337	Discussion on eMBB and URLLC multiplexing for uplink	LG Electronics
R1-1710383	Discussion on UL multiplexing data with different transmission durations	vivo
R1-1710576	Multiplexing of UL transmissions with different data durations and latency requirements	Intel Corporation
R1-1710606	On eMBB/URLLC multiplexing for uplink transmission	Lenovo, Motorola Mobility
R1-1710733	On Indication of Preempted Resources in UL	Samsung
R1-1710867	Multiplexing data with different transmission durations for Uplink	Sony
R1-1710956	Multiplexing of low-latency traffic and non-latency sensitive traffic in UL	InterDigital, Inc.
R1-1711003	Pause-Resume Scheduling for Low Latency Uplink Transmissions	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711120	Multiplexing of different data durations for uplink	NTT DOCOMO, INC.
R1-1711208	Timing advance for different numerology	Qualcomm Incorporated
R1-1711514	On Pre-emption Indication for Uplink	Ericsson

5.1.3.3.8 Ultra-reliable part of URLLC for scheduling/HARQ procedure

Identify necessary techniques for scheduling/HARQ procedure to meet the URLLC requirements set forth by TR38.913.

R1-1709985	PDSCH reliability for URLLC	Huawei, HiSilicon
R1-1709987	Discussion on URLLC numerology	Huawei, HiSilicon
R1-1709990	Link adaption for URLLC transmission	Huawei, HiSilicon
R1-1710016	Repetition/hopping related design and reliability evaluations for grant-free URLLC	ZTE
R1-1710125	Supporting Ultra reliability in scheduling	ZTE
R1-1710338	Discussion on scheduling and HARQ procedure for URLLC	LG Electronics
R1-1710381	Scheduling and HARQ aspects for URLLC reliability	vivo
R1-1710466	Consideration on subsequent transmission after pre-emption	Huawei, HiSilicon
R1-1710468	Discussion on Multi-TRP cooperation for URLLC	Huawei, HiSilicon
R1-1710469	Support of URLLC for TDD	Huawei, HiSilicon
R1-1710577	On link adaptation enhancements to support URLLC	Intel Corporation
R1-1710734	Scheduling/HARQ Procedures for URLLC	Samsung
R1-1710837	HARQ procedure for DL URLLC	MediaTek Inc.
R1-1710866	Feedback for improving URLLC reliability	Sony
R1-1711004	Discussion on scheduling based URLLC transmission	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711005	CSI measuring and reporting procedure for URLLC	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711121	Scheduling and HARQ procedures for URLLC	NTT DOCOMO, INC.
R1-1711343	Discussion on URLLC transmitted in same or different numerology resources	ASUSTEK COMPUTER (SHANGHAI)
R1-1711432	Discussion on over-the-air time synchronization for URLLC	Huawei, HiSilicon
R1-1711515	On Supporting High Reliability for Data Transmissions	Ericsson
R1-1711555	UL URLLC Capacity Based on URLLC and eMBB dynamic multiplexing	Qualcomm Incorporated
R1-1711556	Ultra reliable HARQ design with async CSI feedback	Qualcomm Incorporated

[R1-1711560](#) Discussion on wireless time synchronization for URLLC SIA

5.1.3.3.9 Other

[R1-1709964](#) HARQ processing time Huawei, HiSilicon
[R1-1710735](#) Remaining Aspects for Short Scheduling Durations Samsung
[R1-1710736](#) Triggered UCI Transmissions Samsung
[R1-1710737](#) DL Resource Allocation for Multiplexing Data with Different Transmissions Durations Samsung
[R1-1710738](#) Average User Plane Latency for Preemption based Multiplexing Samsung
[R1-1711367](#) On UE processing time Ericsson LM
[R1-1711422](#) Resource allocation for data channels Huawei, HiSilicon
[R1-1711426](#) CBG-based transmission/retransmission for DL multiplexing of eMBB and URLLC Huawei, HiSilicon
[R1-1711427](#) Discussion on group common pre-emption indication Huawei, HiSilicon
[R1-1711428](#) Superposed transmission of pre-emption indication with eMBB data Huawei, HiSilicon
[R1-1711429](#) Consideration on ACK/NACK error in CBG-based retransmission Huawei, HiSilicon
[R1-1711430](#) Discussion on UL multiplexing of grant-based eMBB and URLLC Huawei, HiSilicon
[R1-1711434](#) Discussion on TB size determination Huawei, HiSilicon
[R1-1711435](#) Unified design for slot and mini-slot Huawei, HiSilicon
[R1-1711456](#) HARQ Process Management in NR Samsung
[R1-1711457](#) Indication of Preempted Resources Prior to HARQ-ACK Feedback Samsung
[R1-1711458](#) Considerations on Signaling for Indicating Preempted Resources Samsung
[R1-1711516](#) On Mixed Numerology Ericsson
[R1-1711585](#) Partial pre-emption based multiplexing data with different transmission durations in DL Samsung
[R1-1711596](#) Indication of Preempted Resources for TB-based re-transmission Samsung

5.1.3.4 Scheduling/HARQ aspects for carrier aggregation and dual connectivity

[R1-1711425](#) Summary of LTE CA/DC and remaining issues for NR Huawei, HiSilicon

5.1.3.4.1 Carrier aggregation

[R1-1711846](#) Way Forward on NR Carrier Aggregation Huawei, HiSilicon, KT, CATR, MediaTek, Nokia, ASB, Ericsson, Intel
 Also supported by LGE

Conclusions:

Email approval on the following until July 10th – Zhenfei (Huawei):

- NR support Primary Component Carrier (PCC) and Secondary Component Carrier (SCC)
 - o A UE monitors PDCCH candidates in common search space(s) and UE specific search space(s) on PCC
 - o A UE monitors PDCCH candidates on UE-specific search space(s) for an SCC
- Support cross carrier scheduling with CIF
 - o A carrier is scheduled by one and only one carrier
 - o FFS: the number of CIF bits and possible connection to BWPs
- NR Supports at least 2 cell groups for PUCCH
 - o Carrier transmitting the PUCCH can be configured within the cell group
 - FFS The PUCCH configuration can be done by the UL PCC reconfiguration or PUCCH reconfiguration
- For scheduling with different and the same numerologies:
 - o For self-scheduling
 - PDCCH and the scheduled PDSCH have the same numerologies
 - PDCCH and the scheduled PUSCH can have the same or different numerologies
 - The time granularity indicated in the DCI for the timing relationship between DCI and the corresponding PUSCH follows the numerology of the PUSCH transmission
 - o For cross-carrier scheduling
 - PDCCH and the scheduled PDSCH/PUSCH can have different or the same numerologies
 - The time granularity indicated in the DCI for the timing relationship between DCI and the corresponding PDSCH/PUSCH follows the numerology of the PDSCH/PUSCH transmission
 - UE is not expected to support faster processing for the case of cross-carrier scheduled PDSCH/PUSCH transmission scheduled by a DCI requiring than the case of self-scheduled PDSCH/PUSCH transmission scheduled by the DCI.

- UCI feedback related to multiple DL component carriers is supported for DL component carriers operating with the same and different numerology
 - o The time granularity indicated in the DCI for PDSCH and the corresponding HARQ-ACK follows the numerology for HARQ-ACK transmission
 - o UE is not expected to support faster processing for the case when PDSCH and the corresponding HARQ-ACK use a different numerology than the case of the case when PDSCH and HARQ-ACK use the same numerology
- NR support 4 timing advance groups including Primary Timing Advance Group and Secondary Timing Advance Group(s)
 - o Support PRACH transmission for timing advance acquisition on SCC

5.1.3.4.1.1 Self-/cross-carrier scheduling and joint/separate UCI feedback

For carriers with the same and different numerology

R1-1709975	On NR carrier aggregation	Huawei, HiSilicon
R1-1710102	Scheduling and HARQ support for NR CA	CATT
R1-1710171	Bandwidth part based resource scheduling for carrier aggregation	Guangdong OPPO Mobile Telecom.
R1-1710339	Support of cross-CC DCI/UCI transmission for NR CA	LG Electronics
R1-1710578	Scheduling and UCI feedback for carrier aggregation	Intel Corporation
R1-1710739	Cross-Carrier Scheduling and HARQ-ACK Feedback	Samsung
R1-1710885	On cross-carrier scheduling and joint UCI design	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710964	On UE-to-UE measurement for CLI management	NEC
R1-1711122	NR carrier aggregation	NTT DOCOMO, INC.
R1-1711209	CA with mixed numerology	Qualcomm Incorporated
R1-1711517	On Scheduling and UCI Handling in Carrier Aggregation	Ericsson

5.1.3.4.1.2 SRS fast switching

For carriers with the same and different numerology

R1-1711847	Way Forward on SRS Switching	Huawei, HiSilicon, MediaTek, Intel
R1-1709976	SRS switching among CCs and bandwidth parts	Huawei, HiSilicon
R1-1710579	On SRS fast switching	Intel Corporation
R1-1710740	Fast Carrier Switching for SRS Transmissions	Samsung
R1-1711518	On SRS Fast Switching in NR	Ericsson

5.1.3.4.2 Dual connectivity

R1-1709977	On NR dual connectivity	Huawei, HiSilicon
R1-1710103	Scheduling and HARQ support for NR DC	CATT
R1-1710340	Discussion on dual connectivity with single active UL at a given time	LG Electronics
R1-1710580	On Dual Connectivity for NR	Intel Corporation
R1-1710741	DC for UE with Single UL Carrier Capability	Samsung
R1-1710884	On NR CA/DC configuration	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711123	LTE-NR Dual connectivity	NTT DOCOMO, INC.
R1-1711519	On Dual Connectivity for NR	Ericsson

5.1.4 Channel coding

[R1-1711917](#) **Chairman's notes of AI 5.1.4 Channel coding** Ad-Hoc chair (Nokia)

The document was presented by Matthew Baker from Nokia.

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

5.1.4.1 LDPC code

5.1.4.1.1 Coding chain

R1-1711344	LDPC Coding chain	Intel Corporation
R1-1710844	Consideration on coding chain for eMBB data channel	ZTE

5.1.4.1.1.1 CRC attachment

- [R1-1710482](#) Study of Number of CRC Bits for Small Transport Blocks Ericsson
[R1-1711533](#) CRC attachment for Smaller TBs Nokia, Alcatel-Lucent Shanghai Bell
[R1-1710827](#) On CRC attachment for TB and CB MediaTek Inc.
Note: proposal is for $L_{TB-CRC}=14$ for TBs less than e.g. 512 (or higher?)
[R1-1710957](#) Data channel processing and CRC attachment InterDigital, Inc.
[R1-1711210](#) CRC attachment Qualcomm Incorporated

Proposal to be checked until RAN1#90 after LDPC design is complete:

- $L_{TB-CRC} = 16$ bits for TBs smaller than e.g. 1008 or 8432 bits
- $L_{CB-CRC} = 8$ bits
- Checking other values is not precluded

Agreement: CBG-level CRC is not adopted

Not treated.

- [R1-1710044](#) Consideration on CRC attachment for eMBB data CATT
[R1-1710341](#) Discussion on CRC reduction and attachment for eMBB data LG Electronics
[R1-1710480](#) CRC Attachment for Code Block Group Ericsson
[R1-1710481](#) Study of Number of CRC Bits for Code Blocks Ericsson
[R1-1711532](#) CRC attachment for CBG Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711728](#) WF on CRC Attachment for CBGs Ericsson

5.1.4.1.1.2 Segmentation

- [R1-1710342](#) Code block segmentation for eMBB LG Electronics
[R1-1710742](#) CB segmentation on data channel Samsung
[R1-1711534](#) Code block segmentation of eMBB Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711211](#) LDPC segmentation Qualcomm Incorporated
[R1-1711439](#) Segmentation for eMBB data Huawei, HiSilicon

Agreement: Same value of Z for code blocks within a TB

- [R1-1711535](#) Padding for LDPC Nokia, Alcatel-Lucent Shanghai Bell

Agreement: Working assumption from RAN1-NRAH#1 is confirmed that filler bits F are attached at the end of info block B

Not treated.

- [R1-1710743](#) UE operation for two different base graphs Samsung
[R1-1710958](#) Code block segmentation for eMBB data channel InterDigital, Inc.

5.1.4.1.1.3 Rate matching

- [R1-1710344](#) Discussion on bit level interleaver LG Electronics
[R1-1710484](#) Bit Ordering for Circular Buffer of LDPC Codes Ericsson
[R1-1711538](#) Interleaving for LDPC Nokia, Alcatel-Lucent Shanghai Bell
[R1-1710828](#) On interleaver for NR LDPC code MediaTek Inc.
[R1-1711212](#) LDPC rate matching Qualcomm Incorporated

Conclusion for bit-level interleaving: Revisit after the decision on modulation symbol interleaving in the MIMO session.

- [R1-1710045](#) IR-HARQ scheme for NR LDPC codes CATT
[R1-1710485](#) Rate Matching for NR LDPC codes Ericsson
[R1-1711438](#) Rate matching for LDPC codes Huawei, HiSilicon

Agreement:

- The number of RVs is 4.
- The RVs are at fixed locations in the circular buffer
- RV#0 is self-decodable
- **Working assumption** (to be confirmed after selection of the BGs): The first 2Z punctured systematic bits are not entered into the circular buffer

Not treated

R1-1711536	Rate matching for LDPC	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710343	On rate matching with LDPC code for eMBB	LG Electronics
R1-1710483	LDPC Code Performance at High Code Rate	Ericsson

5.1.4.1.1.4 Other

R1-1710486	Throughput Requirements of LDPC Decoder	Ericsson
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5.1.4.1.2 LDPC code design

Finalise number of base graphs, compact vs. extended design, and other design details

R1-1711944	Observations on LDPC Shift Coefficients	Qualcomm, Intel, Ericsson
R1-1711692	WF on final parity check matrix selection	Nokia

Agreements: Down selection of PCMs are facilitated as follows:

- Considering the priority given to certain merged proposals in BG1 and BG2, the following ranking is used to facilitate the selection of parity check matrices in more fairer manner.
- The proponent(s) who are not selected for BG1 or BG2 are ranked above.
- The proponent(s) who are only in one selected solution of BG1 and BG2 are ranked next.
- The proponent(s) who are selected for both BG1 and BG2 are ranked below.
- Any PCMs with significant overlaps with previous PCM designs are ranked below.
- If there are several proponents end up with the same rank, mutual understanding may use to rank the companies.
 - Previous proposals on BG1 and BG2 and the effort put in there shall be considered when ranking.
 - Higher ranking may provide to proponents who were not in the BG1.
- Ranking changes from top to bottom when the proponent's proposal selected for a shift coefficient design.

Selection of final parity check matrices for BG1 is facilitated as below.

For Set $i = 1:8$

- Step 1: Cross check BLER performance at 10⁻² and 10⁻⁴ for the block sizes related to the Set i (within 512-to-8448) and code rates 8/9-to-1/3.
- Step 2: Identify the candidates which are within 0.1 dB BLER performance across most block sizes related to the Set i (within 512-to-8448) and code rates 8/9-to-1/3.
- Step 3: Higher ranked identified candidate which is proven to satisfy the selection criteria as below, the proposal is selected as shift coefficient design for Set i .
- Step 4: the selected proponent is ranked below others.

End

Selection criteria for a ranked high proposal as candidate X:

- A candidate among existing candidates which has better (>0.1dB) BLER performance for block sizes related to the Set i (within 512-to-8448) and code rates 8/9-to-1/3 is selected as candidate Y.
- Error floor should be checked by examining slope of BLER curves at BLER=10⁻⁴.
- Denote P1 as the number of simulation cases for which the required SNR of candidate X is smaller than the required SNR of candidate Y for more than 0.1dB
- Denote P2 as the number of simulation cases for which the required SNR of candidate Y is smaller than the required SNR of candidate X for more than 0.1dB
- If $P2 - P1 \leq 2\%$ of all simulation cases (QPSK, block sizes related to the Set i (within 512-to-8448) and code rates 8/9-to-1/3, BLER targets), and satisfies the error floor requirement, candidate X is deemed to satisfy the selection criteria.

Selection of final parity check matrices for BG2 is facilitated as below.

For Set $i = 1:8$

- Step 1: Cross check BLER performance at 10-2 and 10-4 for the block sizes related to the Set **i** (within 40-to-2560) and code rates 2/3-to-1/5.
- Step 2: Identify the candidates which are within 0.1 dB BLER performance across most block sizes related to the Set **i** (within 40-to-2560) and code rates 2/3-to-1/5.
- Step 3: Higher ranked identified candidate which is proven to satisfy the selection criteria as below, the proposal is selected as shift coefficient design for Set **i**.
- Step 4: the selected proponent is ranked below others.

End

Selection criteria for a ranked high proposal as candidate X:

- A candidate among existing candidates which has better ($>0.1\text{dB}$) BLER performance for block sizes related to the Set **i** (within 40-to-2560) and code rates 2/3-to-1/5 is selected as candidate Y.
- Error floor should be checked by examining slope of BLER curves at BLER=10-4.
- Denote P1 as the number of simulation cases for which the required SNR of candidate X is smaller than the required SNR of candidate Y for more than 0.1dB
- Denote P2 as the number of simulation cases for which the required SNR of candidate Y is smaller than the required SNR of candidate X for more than 0.1dB
- If $P2 - P1 \leq 2\%$ of all simulation cases (QPSK, block sizes related to the Set **i** (within 40-to-2560) and code rates 2/3-to-1/5, BLER targets), and satisfies the error floor requirement, candidate X is deemed to satisfy the selection criteria.

R1-1711545 Shanghai Bell	Summary of [89-24] Email discussion LDPC code base graph #1 for NR	Nokia, Alcatel-Lucent
R1-1711546 Shanghai Bell	Summary of [89-25] Email discussion on LDPC code base graph #2 for NR	Nokia, Alcatel-Lucent

Not treated.

R1-1710047	Offset optimization for NR LDPC CATT	
R1-1710487	LDPC Code Design for Base Graph #1	Ericsson
R1-1710488	LDPC Code Design for Base Graph #2	Ericsson
R1-1710489	Application of Two Base Graphs for NR Data Channels	Ericsson
R1-1710744	LDPC Code for BG#1	Samsung
R1-1710745	LDPC Code for BG#2	Samsung
R1-1710746	Modulo Lifting for Length-Flexible QC LDPC Codes	Samsung
R1-1711437	LDPC design for base graph 2	Huawei, HiSilicon
R1-1711537	LDPC designs for base graph 1 and base graph 2	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711627	LDPC shift coefficients design for BG1	Samsung
R1-1711628	LDPC shift coefficients design for BG2	Samsung
R1-1711629	Performance evaluation of LDPC shift coefficients design for BG1	Samsung
R1-1711630	Performance evaluation of LDPC shift coefficients design for BG2	Samsung
R1-1711693	Base Graph 1 lifting and evaluations	Intel Corporation
R1-1711694	Base Graph 2 lifting and evaluations	Intel Corporation
R1-1711711	LDPC design for eMBB data	CATT
R1-1711727	LDPC design for base graph 1	Huawei, HiSilicon
R1-1711747	Shift coefficients design for base graph 1	ZTE
R1-1711748	Shift coefficients design for base graph 2	ZTE
R1-1711790	On NR LDPC design and performance	MediaTek Inc.
R1-1711963	Crosscheck Results for PCM of BG1	Samsung
R1-1711964	Crosscheck Results for PCM of BG2	Samsung
R1-1711978	LDPC rate compatible design	Qualcomm Incorporated

[R1-1711731](#) **WF on LDPC code usage scenarios** **MediaTek, Qualcomm, InterDigital, ZTE**

[R1-1711982](#) **WF on LDPC parity check matrices** **Nokia**

Agreement: Final parity check matrices for NR LDPC base graph #1 and #2 are agreed as in excel files [R1-1711982_BG1.xlsx](#) and [R1-1711982_BG2.xlsx](#) in [R1-1711982](#).

Agreements:

- Base graph #1 is used for the initial transmission and subsequent re-transmissions of the same TB when
 - $CBS > X$ or code rate of the initial transmission $> Y$
- Base graph #2 is used for the initial transmission and subsequent re-transmissions of the same TB when
 - $CBS \leq X$ and code rate of the initial transmission $\leq Y$
- **Working assumption:** $X = 2560$ and $Y = 0.67$
 - FFS after PCM decisions if X can be extended to 3840 and/or Y can be extended to 0.75

To be checked how the receiver knows in each case the code rate of the initial transmission, and how exactly it is defined. FFS whether some UE capabilities may be possible that do not require the implementation of both base graphs.

5.1.4.2 Polar code

5.1.4.2.1 Code construction

[R1-1711443](#) Summary of [89-26] Polar code for NR -- alignment of latency/complexity calculation for early termination Huawei

The document was presented by Zukang Shen from Huawei.

Decision: The document is noted.

[R1-1711442](#) Summary of [89-27] Polar code proposal for NR Huawei

Decision: The document is noted.

[R1-1711644](#) Study of Split-CRC Polar Code Construction for Early Termination Tsofun Algorithm

(Revision of [R1-1709883](#))

- Proposal 1: Use $J+J' = n_{\text{FAR}} + 3$ for polar code construction.
- Proposal 2: If some of the $J+J'$ bits are distributed to allow ET, a relaxed requirement for FAR due to undetectable decoding errors should be agreed.

Decision: The document is noted.

[R1-1711347](#) Simple distributed CRC design for Polar codes Intel Corporation

- Any assistance bits (if distributed) are based on CRC and are distributed in a controlled and simple way as proposed in the companion document [\[R1-1711348\]](#).

Decision: The document is noted.

[R1-1711215](#) Evaluation of early termination for Polar codes Qualcomm Incorporated

- Proposal: Adopt CRC-aided successive-cancellation list decoding (CA-SCL) (with one long CRC) solution of Polar codes for control channel for robust performance, lower complexity and latency.

Decision: The document is noted.

[R1-1710490](#) CRC-based Polar Code Construction Ericsson

- Proposal 1: Adopt CA-Polar for both DL and UL of NR.
- Proposal 2: Recursive and non-recursive distributed CRC (D-CRC) can be considered as alternative choices, if early termination is required to be supported via modified code construction.

Decision: The document is noted.

[R1-1711764](#) WF on Polar codes construction NTT DOCOMO, Ericsson, Qualcomm, Intel, Tsofun Algorithm, CATT, AT&T

- Assume the input information sequence of channel coding is $(u_1, u_2, \dots, u_K)$
- If the i th assistant bit p_i of Polar codes are inserted after u_b ($b=1,2,\dots,K$), then p_i can only linearly generated from information bits $(u_1, u_2, \dots, u_b)$ without any interleaving,
 - That is, no interleaver is used before the basic Polar encoder, and the information bits are mapped into the encoder by keeping the same input order and no de-interleaver is used after the basic Polar decoder
 - i.e., $p_i = a_1 u_1 \oplus a_2 u_2 \oplus \dots \oplus a_b u_b \oplus \dots \oplus a_K u_K$, where

$$a_j = \begin{cases} 0 \text{ or } 1, & \text{if } j \leq b \\ 0, & \text{if } j > b \end{cases}$$

Decision: The document is noted.

[R1-1711730](#) WF on the Number of Assistant Bits for Polar Construction
Qualcomm, Intel, Tsofun Algorithm, Samsung, LG, Fujitsu

Ericsson, NTT DOCOMO,

- The number of assistant bits of Polar codes is
 - $J+J' = n_{\text{FAR}} + 3$

Decision: The document is noted.

Questions:

- $J' = 3$ or 6?
- How are the $J+J'$ bits generated?
- Which bits are distributed (if any) and how?

Proposal for further consideration over lunch:

- For DL and UL for $K \geq 22$:
 - The number of assistant bits of Polar codes is
 - $J+J' = n_{\text{FAR}} + 3$
 - The $J+J'$ bits are generated from a single CRC polynomial
 - Working assumption that 3 bits are distributed
 - 6 distributed bits can be further considered if 3 is shown to be insufficient
- (FFS?) For UL for $K < 22$:
 - The number of assistant bits of Polar codes is
 - $J' = 6$
 - The J' bits comprise 3 CRC bits and 3 parity bits
 - 6 bits are distributed

Alternative proposal (Nokia)

- The number of assistant bits of Polar codes is
 - $J+J' = n_{\text{FAR}} + 6$
- The $J+J'$ bits are generated from a single CRC polynomial plus at least 3 parity bits
- 9 of the $J+J'$ bits are distributed

Possible compromise:

- The number of assistant bits of Polar codes is
 - $J+J' = n_{\text{FAR}} + 6$
- The $J+J'$ bits are generated from a single CRC polynomial
- Confirm working assumption that some (9?) of the $J+J'$ bits are distributed

Proposal:

- For DL & UL, at least for $K > 22$:
 - The number of assistant bits of Polar codes is
 - $J+J' = n_{\text{FAR}} + 3$
 - The $J+J'$ bits are generated from:
 - Working assumption a single CRC polynomial with no interleaver
 - If it turns out that the FAR target cannot be satisfied, then FFS between:
 - Single CRC with interleaver, or
 - Two CRCs
 - Working assumption that 3 bits are distributed
 - 6 distributed bits can be further considered if 3 is shown to be insufficient
- FFS: For UL for $K \leq 22$:
 - The number of assistant bits of Polar codes is
 - $J' = 6$
 - The J' bits comprise 3 CRC bits and 3 parity bits
 - 6 bits are distributed

Question: Can the FAR target be satisfied using a single CRC polynomial with no interleaver, while achieving early termination benefits?

Yes: Intel, NTT DOCOMO, Ericsson, CATT, Qualcomm, ~~Tsfun~~, NEC

No: Nokia, LG, Huawei, CohLog, MediaTek, ZTE, Accelercomm, NEC, Tsfun

Question: Are the achievable early termination benefits (while achieving the FAR and BLER targets) worthwhile compared to the complexity of adding an interleaver?

Yes: LG, Nokia, MediaTek, Huawei, Accelercomm, ITRI, CohLog, NEC, Spreadtrum, InterDigital

No: Ericsson, NTT DOCOMO, Qualcomm, Intel, CATT, Fujitsu, Tsfun

Question: Should we work on a code construction based solution to deliver early termination benefits while achieving the FAR and BLER targets with acceptable complexity?

a) Downlink

Yes: Samsung, Nokia, LG, Huawei, MediaTek, Intel, InterDigital, ZTE, ITRI, Spreadtrum, Tsfun, Coherent Logix, Accelercomm, NEC, Qualcomm (if there is a plan B), NTT DOCOMO (if there is a plan B)

No: Ericsson

b) Uplink

Yes: Nokia, Huawei, Accelercomm, LG, NEC, Intel (if same scheme as for DL)

No: Ericsson, Qualcomm, Samsung, Fujitsu

Conclusion:

- RAN1 will work on a code construction based solution to deliver early termination benefits while achieving the FAR and BLER targets with acceptable complexity at least for the DL
- Revisit UL after designing the DL solution.

Possible solutions for code construction based solution to deliver early termination benefits while achieving the FAR and BLER targets with acceptable complexity for downselection:

- Single CRC + interleaver
 - o LG, Huawei, HiSilicon, Nokia, ASB, Coherent Logix, ZTE, Accelercomm, Spreadtrum, MediaTek
- Multiple segment CRCs
 - o Tsfun, NTT DOCOMO, Qualcomm, CATT, Intel, Ericsson

Agreement:

- All companies work together to design for the DL a Single CRC polynomial + Interleaver scheme to deliver early termination benefits while achieving the FAR (in presence of AWGN, and in presence of random QPSK, and undetected errors in intended user's codeword), and BLER targets with acceptable complexity and latency.
 - o **Working assumption** that the CRC length is 19 bits, to be finalised as part of the design, taking into account the number of blind decodes or hypotheses to be tested.
 - Longer CRCs will be considered if required to meet the FAR target
- For DL for $K+nFAR \geq 12$, and for UL where $K+nFAR > 22$, $J+J' = nFAR + 3$
- For UL, where $12 \leq K+nFAR \leq 22$, $J+J' = nFAR + 6$, comprising 3 parity bits and $nFAR + 3$ additional CRC bits

Note: K is the number of payload information bits without CRC or parity bits

Note: nFAR may be zero in some circumstances.

Note: UE specific scrambling is not precluded and will be considered separately.

From [R1-1708833](#) (submitted to RAN1#89):

Proposal: The interleaver is determined from the CRC generator matrix

[R1-1711980](#) Performance with L1 CRC polynomial Qualcomm

[R1-1709996](#) Parity check bits for Polar code Huawei, HiSilicon

[R1-1709997](#) Early termination for Polar code Huawei, HiSilicon

[R1-1710048](#) Polar codes construction for NR control channel CATT

[R1-1711125](#) Performance evaluation of DSPC-Polar codes NTT DOCOMO, INC.
[R1-1709998](#) Polar code for very small block length Huawei, HiSilicon
[R1-1711216](#) Decoding and encoding latency for polar codes with PC frozen bits or distributed CRC bits Qualcomm Incorporated

[R1-1711983](#) WF on Polar Code Construction With PC bits Huawei, Hilisicon, CATT, MTK,ZTE, Accelercomm, Coherent Logix, LG, Spreadtrum, Interdigital, Nokia

Agreement: For UL, where $12 \leq K+nFAR \leq 22$, $J+J' = nFAR + 6$, 3 PC bits are generated according to the following steps:

1. Encode K info bits to $K+nFAR+3$ CRC encoded bits,
 - o FFS the $nFAR+3$ CRC bit locations
2. Select $K' = K+nFAR+6$ most reliable bit positions
3. Select 3 PC bits from the K' reliable positions
 - o The most reliable n positions with w_{min} , where
 - w_{min} is the minimum row weight (as defined in [R1-1706193](#)) of the $K+nFAR+3$ most reliable positions within the K' reliable positions, where n is given by:
 - $n=1$ if $M-K-nFAR > 192$
 - $n=0$ otherwise
 - o 3- n positions selected in least reliable positions within the K' reliable positions.
4. **Working Assumption:** The value of the PC bits is obtained from a length-5 cycle shift register as in [R1-1706193](#)

Not treated.

[R1-1709882](#) Enhancement of Early Termination of Polar Codes by placing UE-ID on Frozen Symbols Tsofun
 Algorithm
[R1-1709902](#) Enhancements for Polar code construction Sequans Communications
[R1-1709995](#) Polar code construction Huawei, HiSilicon
[R1-1710346](#) Early termination effect of polar codes LG Electronics
[R1-1710479](#) Evaluation of PM based early termination for Polar code Huawei, HiSilicon
[R1-1710491](#) Study of Early Termination for DCI Ericsson
[R1-1710587](#) Polar code construction for NR control channel NEC Corporation
[R1-1710747](#) Polar code construction Samsung
[R1-1710748](#) Scrambling for polar codes Samsung
[R1-1710770](#) Discussion on Polar code construction Spreadtrum Communications
[R1-1710847](#) Performance evaluations on Polar codes ZTE
[R1-1711124](#) Distributed simple parity check Polar codes NTT DOCOMO, INC.
[R1-1711214](#) Early termination scheme for Polar codes Qualcomm Incorporated
[R1-1711217](#) Performance comparison between CA-polar and PC-polar Qualcomm Incorporated
[R1-1711348](#) Evaluations of Polar code designs Intel Corporation
[R1-1711539](#) Distributed CRC Polar code construction Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711540](#) Early termination benefits of CRC distribution Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711541](#) Performance evaluation of polar code constructions Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711557](#) Performance of polar code for very small block length Qualcomm Incorporated
[R1-1711570](#) UE_ID Insertion for Early Block Discrimination on DCI Blind Detection Coherent Logix
[R1-1711571](#) Scrambling Sequence Design for Early Block Discrimination on DCI Blind Detection Coherent Logix
[R1-1711573](#) Early Block Discrimination on DCI Blind Detection Coherent Logix
[R1-1711582](#) Analysis of the benefits of PC bits for Polar code Huawei, HiSilicon

5.1.4.2.2 Sequence design

[R1-1710470](#) Necessity of multiple sequence for Polar code Huawei, HiSilicon

Agreement:

- Channel bit interleaving is applied
 - o The interleaving is either performed as part of the rate matching and/or after rate matching
 - To be confirmed after the rate matching discussion whether the interleaving is a separate function
 - o FFS whether the interleaver is a function of the modulation
- The same sequence for each mother code size is used for all modulations

- The UL sequence for a given mother code size is also used for the DL

R1-1710348	Design of polar codes with high order modulations	LG Electronics
R1-1710961	Interleaver design for polar codes with high order modulation	InterDigital, Inc.
R1-1710000	Nested sequence for Polar code	Huawei, HiSilicon
R1-1710843	On the storage of polar code sequences	AccelerComm Ltd
R1-1711126	Sequence design of Polar codes	NTT DOCOMO, INC.
R1-1711218	Sequence construction of Polar codes for control channel	Qualcomm Incorporated
R1-1711542	Sequence design for Polar codes	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711822	Design of combined-and-Nested polar code sequences	Samsung (Revision of R1-1710749)
R1-1711781	Performance comparison of sequences for Polar code	Huawei
R1-1711794	WF on Polar Code Sequence evaluation criteria	Samsung

Current support for each sequence:

- Polarization Weight (PW): Huawei, MediaTek, Nokia, LG, InterDigital, ZTE, Spreadtrum, CATT, Accel., [Tsofun](#)
- Optimized- combined-and-nested (CN): Samsung, Qualcomm, NTT DOCOMO, Ericsson, [Tsofun](#)
- mutual information density evolution (MI-DE): Qualcomm, Samsung, NTT DOCOMO, Ericsson, Tsofun,
- Intel: Intel, Samsung, Qualcomm, NTT DOCOMO, Ericsson, [Tsofun](#)
- Docomo: NTT DOCOMO, Ericsson, Samsung, Qualcomm, [Tsofun](#)

Proposal:

- PW is adopted up to N=512
- Companies work together to design the sequence for N>512

Objected by Samsung, Qualcomm, NTT DOCOMO, Ericsson, Tsofun

Agreement for Next Steps:

- Polar code sequence candidates, including any merged solutions, should be provided by Wed 2nd Aug – Zukang (Huawei)
- Identify candidates of polar code sequence according to the procedure below by Wed 9th Aug– Zukang (Huawei)
- Rate matching proposals for any sequence that has been selected as a winner by at least one company to be provided by Wed 16th Aug. – Zukang (Huawei)

Decision procedure:

Candidate sequences shall have the property of simple nestedness, i.e. one sequence of length N/2 is nested with the sequence of length N

- Presence or absence of any other property (including symmetry, arithmetic describability, down-nestedness (i.e. a sequence of length N/2 is nested within the lower half of the sequence of length N), up-and-down-nestedness (i.e. a sequence of length N/2 is nested in both the upper and lower halves of the sequence of length N)) shall not be used as a decision criterion.
- Performance metric
 - SNR to achieve 10^{-2} and 10^{-3} BLER
- Simulation assumptions
 - Evaluate the block error rate (BLER) performance versus SNR

Channel	AWGN Channel
Modulation	QPSK
Info. Block length (=K bits w/o CRC)	$K = 8 \cdot \min(200, K_{\max, N})$, where $K_{\max, N} = \lfloor 5N/6 - (J + J') \rfloor$

	$K = \min(200, K_{\max,N}):24:K_{\max,N}$, where $K_{\max,N} = \lfloor 5N/6 - (J + J') \rfloor$ excluding any code rates below 1/8
Codeword length (=N)	{64, 128, 256, 512, 1024}
Decoding algorithm	List-X with LLR-based min-sum
List sizes	1,2,4,8,16 (pruned to 8 best paths for CRC check)
Code construction for evaluation	CA polar
Number of $(J+J')$ bits	19 bits (0b10100010101101111001 where the last bit is d19)

PerfThresh_K = 0.1dB for lower range of K, 0.3dB for higher range of K

PerfThresh_L = 0.4dB for L=1, 0.2dB for L=2, 0.1dB otherwise.

PerfThresh = max (PerfThresh_K, PerfThresh_L)

Each company selects a winning sequence by the following algorithm:

- For sequence A,
 - o compare with sequence Bat each simulation case.
 - For each simulation case:
 - if A's performance is worse than B – PerfThresh, increment FailCount_AB
 - if A's performance is better than B + PerfThresh, increment WinCount_AB
 - If (FailCount_AB – WinCountAB) / Total number of simulation cases > 2%, increment OverallFail_A
 - o compare with sequence Cat each simulation case.
 - For each simulation case:
 - if A's performance is worse than C – PerfThresh, increment FailCount_AC
 - if A's performance is better than C + PerfThresh, increment WinCount_AC
 - If (FailCount_AC – WinCountAC) / Total number of simulation cases > 2%, increment OverallFail_A
 - o repeat for sequences D...N
- For sequence B,
 - o compare with sequence A at each simulation case
 - o etc
- ...
- For sequence N,
 - o compare with sequence A
 - o etc
- Select sequence with smallest OverallFail

If multiple sequences A to M have the same smallest OverallFail,

- For sequence A,
 - o compare with sequence Bat each simulation case.
 - For each simulation case, if A's performance is better than B + PerfThresh, increment WinCount_AB
 - o compare with sequence C at each simulation case.
 - For each simulation case, if A's performance is better than C + PerfThresh, increment WinCount_AC
 - o WinCount A = $\sum \text{WinCount_AB...AM}$
 - o repeat for sequences up to M
- Repeat for sequences B to M.
- Select sequence with highest WinCount, referred to as sequence W.
- If any WinCount_xW > WinCount Wx, then sequence(s) x is/are also selected.

If more than 1 sequence is selected by at least one company, then the final sequence will be chosen from the sequences that were selected by at least one company according to the largest support in RAN1#90.

[R1-1711349](#) Discussion on Polar code rate-matching Intel Corporation

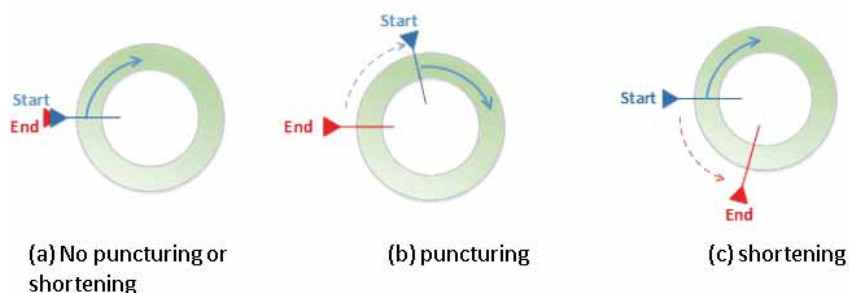
[R1-1711697](#) WF on rate matching for Polar codes Qualcomm

Agreement: $R_{\min} = 1/8$

[R1-1711729](#) WF on Circular buffer of Polar Code Ericsson, Qualcomm, MediaTek, LGE

Agreement:

- To support repetition, puncturing, and shortening of Polar code:
 - The $N=2^n$ coded bits at the output of Polar encoder is written into a length-N circular buffer in an order that is predefined for a given value of N
 - To obtain M coded bits for transmission
 - Puncturing is realized by selecting bits from position (N-M) to position (N-1) from the circular buffer
 - Shortening is realized by selecting bits from position 0 to position M-1 from the circular buffer
 - Repetition is realized by selecting all bits from the circular buffer, and additionally repeat (M-N) consecutive bits from the circular buffer
 - Exact set of repeated bits FFS till RAN1#90



[R1-1710751](#) Circular buffer management for polar code rate-matching Samsung

Not treated.

[R1-1710591](#) Sequence design evaluation for rate-matched polar codes NEC Corporation
[R1-1710750](#) Design of unified rate-matching for polar codes Samsung
[R1-1710825](#) Optimization and comparison of Polar code rate-matching design MediaTek Inc.
[R1-1710848](#) Rate matching scheme of Polar codes ZTE
[R1-1710959](#) Parameter selection for polar codes puncturing and shortening InterDigital, Inc.
[R1-1710960](#) Parameter selection for polar codes repetition InterDigital, Inc.
[R1-1711127](#) Rate matching of Polar codes NTT DOCOMO, INC.
[R1-1711219](#) Determination of the values for the parameters in rate-matching for control channel Qualcomm Incorporated
[R1-1711220](#) Rate-matching scheme for control channel Qualcomm Incorporated
[R1-1711543](#) Rate matching for Polar codes Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711641](#) Repetition scheme of polar codes LG Electronics
[R1-1711679](#) Impact of Puncturing on Bit-channel Capacities Ericsson
[R1-1711751](#) On Bit Mapping Design for Polar Codes Ericsson
[R1-1711752](#) Polar Code Performance in Fading Channel Ericsson
[R1-1711757](#) Optimization and comparison of Polar code rate-matching design MediaTek Inc.

5.1.4.2.3 Other

[R1-1709999](#) Interleaver design for Polar code Huawei, HiSilicon
[R1-1710003](#) Channel coding chain for control channel Huawei, HiSilicon

R1-1710752	Design of channel interleaver for polar codes	Samsung
R1-1710842	A flexible, low-latency, hardware-efficient SCL polar decoder	AccelerComm Ltd
R1-1711128	Interleaving design of Polar codes	NTT DOCOMO, INC.
R1-1711221	Design of Polar code for large UCI with segmentation	Qualcomm Incorporated
R1-1711222	Design and evaluation of Interleaver for Polar codes	Qualcomm Incorporated
R1-1711639	Performance comparison of interleaver designs	Qualcomm
R1-1711698	WF on interleaver design	Qualcomm
R1-1711702	Rate matching for Polar code	Huawei, HiSilicon
R1-1711749	Segmentation of Polar codes	ZTE

5.1.4.3 PBCH

R1-1710004	Channel coding for URLLC	Huawei, HiSilicon
R1-1710349	Details on PBCH coding	LG Electronics
R1-1710497	Study of Number of CRC Bits for PBCH	Ericsson
R1-1710498	Polar Code Design for NR-PBCH	Ericsson
R1-1710826	Polar coding design for NR-PBCH combining	MediaTek Inc.
R1-1710850	Considerations on Channel Coding for NR-PBCH	ZTE
R1-1711544	Implicit timing indication for PBCH	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711575	Discussion on Polar codes for PBCH	CATT
R1-1711605	PBCH channel coding	Qualcomm Incorporated

5.1.4.4 Other

R1-1709903	Discussion of LTE-RM decoding ambiguity	Sequans Communications
R1-1710471	CRC polynomial for L1 control information and MIB	Huawei, HiSilicon
R1-1710499	LDPC Code Performance for High Reliability Use Cases	Ericsson

5.1.5 Modulation

[R1-1711956](#) On $\pi/2$ -BPSK with spectrum shaping Ericsson

- Proposed agreement: Spectrum shaping is supported without RAN1 impact

Decision: The document is noted.

[R1-1711831](#) WF on $\pi/2$ BPSK with spectrum shaping IITH, ATT, Qualcomm, Deutsche Telekom, IITM, Reliance Jio, Samsung, Thales, INL, CEWiT, Tejas Networks, DISH, Sony

- $\pi/2$ BPSK DFT-s-OFDM supports spectrum shaping without spectrum expansion of $\pi/2$ BPSK data at least for uplink data for carrier frequencies below 6GHz
 - The spectrum shaping function shall be specified in RAN1

Discussion: Also supported by Interdigital

Ericsson is OK with main bullet, commented that RAN4 was expecting information by end of June meeting – if we proceed now with proposal, RAN1 will delay RAN4 progress

Decision: The document is noted.

[R1-1711909](#) [Draft] LS response on required NR parameters from RAN4 perspective Ericsson

Decision: The document is noted and final LS is [approved in R1-1711975](#) with following typo corrections

Based on this, RAN1 would like ~~the~~ to inform RAN4 that the RAN1 specifications will support the following modulation schemes in the uplink transmission direction: $\pi/2$ -BPSK, QPSK, 16QAM, 64QAM, and 256QAM.

RAN1 specifications will support both OFDM (without DFT precoding) and DFT-precoded OFDM (a.k.a. DFTS-OFDM) for the uplink transmission direction. All above modulation schemes are supported for both OFDM and DFTS-precoded OFDM.

Although indicated in the RAN4-sourced LS as information not being necessary until later, RAN1 would also like to inform RAN4 that the RAN1 specifications will support the following modulation schemes in the downlink transmission direction: QPSK, 16QAM, 64QAM, and 256QAM.

Not treated.

R1-1710474	Further consideration on pi/2 BPSK with FDSS	Huawei, HiSilicon
R1-1710592	Next steps for pi/2 BPSK with spectrum shaping	IITH
R1-1710753	Modulation Schemes for NR	Samsung
R1-1710881	On pi/2-BPSK DFTS-OFDM with spectrum shaping	Ericsson AB
R1-1711224	Consideration for MCS table	Qualcomm Incorporated
R1-1711398	On spectrum shaping for uplink Pi/2 BPSK with DFT-S-OFDM	Nokia, Alcatel-Lucent Shanghai Bell

5.1.6 Duplexing

Focus on cross-link interference management for duplexing flexibility

[R1-1711918](#) Chairman's notes of AI 5.1.6 Duplexing Ad-Hoc chair (Qualcomm)

The document was presented by RAN1 chair on behalf of Wanshi Chen (Vice Chair).

Decision: The document is endorsed. Content incorporated below.

[R1-1710127](#) Viewpoint on NR CLI Management for Duplexing Work Plan ZTE

5.1.6.1 Cross-link interference management

Note that potential schemes are listed in Section 10.1 of TR38.802

R1-1709982	UE-to-UE measurement for cross-link interference mitigation	Huawei, HiSilicon
R1-1710039	Support of interference management schemes in duplexing flexibility	CATT
R1-1710350	Discussion on CLI measurement for Duplexing Flexibility	LG Electronics
R1-1710581	Details on cross-link interference measurement	Intel Corporation
R1-1710755	Cross-link Interference Management based on Coordinated Beamforming	Samsung
R1-1710771	Discussions on UE-to-UE interference measurement and report	Panasonic
R1-1710784	Discussion on UE-to-UE cross-link interference management	CMCC
R1-1710818	CLI measurements in NR	MediaTek Inc.
R1-1710128	UE-to-UE measurement as an enabler for CLI mitigation schemes	ZTE
R1-1711129	Discussion on cross-link interference mitigation for duplexing flexibility	NTT DOCOMO, INC.
R1-1711314	On NR Cross-Link Symbol Alignment Scheme	Nokia, Alcatel-Lucent Shanghai Bell
R1-1711562	On Hybrid TDD and Signaling for Cross-link Interference Mitigation	Ericsson

Further revised in [R1-1711706](#)

[R1-1711682](#) WF on UE-to-UE measurement as an enabler for CLI mitigation schemes ZTE

Agreements:

- For CLI management, support UE-to-UE interference measurement and reporting without the introduction of new RS(s)

Agreements:

- For UE-to-UE interference, support CLI measurement metrics which include at least one of
 - RSRP for the purpose of CLI
 - FFS the definition (e.g., based on SRS, DM-RS, etc.) and the corresponding reporting
 - RSSI for the purpose of CLI
 - FFS the definition (e.g., resources for the measurement) and the corresponding reporting
- For UE-to-UE interference, FFS additionally support CQI/CSI as the CLI measurement metrics and if so, its definition/reporting

R1-1711707	WF on inter-TRP signaling for UE-to-UE cross-link interference measurement	LGE
R1-1711700	WF on CLI measurement	MediaTek
R1-1711842	WF on UE-to-UE crosslink measurement	CMCC, Spreadtrum
R1-1711830	WF on UE-UE CLI measurement	Huawei, HiSilicon, ZTE, MediaTek, Intel, CMCC

[R1-1711851](#) **WF on inter-gNB signaling for cross-link interference management** LGE

Not treated.

[R1-1709981](#) TRP-to-TRP measurement for cross-link interference mitigation Huawei, HiSilicon
[R1-1710129](#) Channel sensing based schemes for cross-link interference mitigation in NR ZTE
[R1-1710351](#) Discussion on details of backhaul signaling for duplexing flexibility LG Electronics
[R1-1710582](#) On RS transmission location for cross-link interference measurement for NR duplex flexibility Intel Corporation
[R1-1710754](#) Cross-link Interference Management Based on UE Measurements Samsung
[R1-1710772](#) Discussions on intended DL/UL direction configuration via Xn signalling Panasonic
[R1-1710965](#) On cross-carrier scheduling and HARQ-ACK feedback for NR CA NEC
[R1-1711225](#) Dynamic TDD UE-to-UE measurement considerations Qualcomm Incorporated
[R1-1711226](#) Dynamic TDD Cross-link interference management consideration Qualcomm Incorporated
[R1-1711313](#) Cross-link interference management based on Xn support Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711561](#) On Hybrid TDD and Measurements for Cross-link Interference Mitigation Ericsson
[R1-1711695](#) WF on cross-link interference aware UPLC Huawei

5.1.6.2 Other

[R1-1709983](#) UL Power control for cross-link interference mitigation Huawei, HiSilicon
[R1-1710130](#) TRP-to-TRP measurement as an enabler for CLI mitigation schemes ZTE
[R1-1710756](#) Performance Evaluation of Cross-Link Interference Management Samsung
[R1-1710757](#) Timing Alignment on Cross-Link for Dynamic TDD Samsung
[R1-1710758](#) Cross-Link Interference Management based on Power Control Samsung
[R1-1710759](#) Discussion on CLI Mitigation with Network Coordination Samsung
[R1-1710760](#) Interference Measurement Table and Beam Coordination Samsung
[R1-1711130](#) Discussion on prioritized scenarios for duplexing flexibility NTT DOCOMO, INC.
[R1-1711315](#) LBT-based UL transmission for dynamic TDD Nokia, Alcatel-Lucent Shanghai Bell
[R1-1711563](#) On Dynamic TDD Scenarios Ericsson
[R1-1711564](#) On Duplexing in Paired Spectrum Ericsson

5.1.7 Wider bandwidth operations

Refer to [R1-1709841](#) for work plan. Note that this agenda will be closed after this meeting.

[R1-1711795](#) **On bandwidth parts and “RF” requirements** Ericsson

Possible observations (from Wednesday offline)

- Usage scenarios #1, and 2, and 3 are at least identified as usage scenarios for BW part
 - From UE perspective, usage scenarios #1 and 3 are the same
- Usage scenario #4 can be considered in the context of carrier aggregation

Observation:

- Usage scenarios #1, and 2, and 3 in [R1-1711795](#) are at least identified as usage scenarios for BW part
 - From UE perspective, at least for single active BW part scenario, usage scenarios #1 and 3 are the same

Agreements:

- Usage scenario #4 in [R1-1711795](#) is supported in the context of non-contiguous intra-band carrier aggregation
 - Carrier without SS block can be configured for some UEs
- Send LS to RAN2/4 to tell above agreement/observation in [R1-1711824](#)

[R1-1711824](#) **Draft LS on non-contiguous CA** AT&T

Decision: The document is noted and final LS is approved in [R1-1711825](#)

MCC: to attach [R1-1711795](#) to the LS

[R1-1711788](#) **Way forward on further details of bandwidth part operation** Intel, AT&T, Huawei, HiSilicon

Possible agreements (from Wednesday offline)

- For a single carrier WB UE, multiple active bandwidth parts with different numerologies are considered for a UE simultaneously
 - One TB is mapped per each active BWP.
 - FFS: The multiple active BWPs may overlap in frequency domain.
 - FFS: Cross-BWP scheduling is supported.
- Primary focus is to complete the single active bandwidth part case

Agreements:

- Primary focus is to complete the single active bandwidth part case
- If time is available later after completing the single active bandwidth part case, following cases should be considered for UE
 - For a single carrier WB UE, multiple active bandwidth parts with different numerologies are configured for a UE simultaneously
 - One TB is mapped per each active BWP.
 - FFS: The multiple active BWPs may overlap in frequency domain.
 - FFS: Cross-BWP scheduling is supported.

Possible agreement (from Wednesday offline)

- For intra-band scenario, capability(capabilities) of time required for bandwidth adaptation is reported by UE.
 - FFS: Detailed reporting contents
 - Minimum requirement for RF retuning time is to be determined by RAN 4

R1-1711802 Way Forward on Further Details for Bandwidth Part MediaTek, Huawei, HiSilicon

Agreements:

- For FDD, separate sets of bandwidth part (BWP) configurations for DL & UL per component carrier
 - The numerology of DL BWP configuration is applied to at least PDCCH, PDSCH & corresponding DMRS
 - The numerology of UL BWP configuration is applied to at least PUCCH, PUSCH & corresponding DMRS
- For TDD, separate sets of BWP configurations for DL & UL per component carrier
 - The numerology of DL BWP configuration is applied to at least PDCCH, PDSCH & corresponding DMRS
 - The numerology of UL BWP configuration is applied to at least PUCCH, PUSCH & corresponding DMRS
 - For UE, if different active DL and UL BWPs are configured, UE is not expected to retune the center frequency of channel BW between DL and UL

Agreements:

- At least one of configured DL BWPs includes one CORESET with common search space at least in primary component carrier
- Each configured DL BWP includes at least one CORESET with UE-specific search space for the case of single active BWP at a given time
 - In case of single active BWP at a given time, if active DL BWP does not include common search space, then UE is not required to monitor the common search space

Possible agreement:

- For the indication of active DL/UL bandwidth part(s), support both DCI and time pattern schemes
 - FFS UE-specific DCI or group common DCI
 - FFS details of time pattern schemes

Thursday

R1-1711812 WF on configuration of a BWP in wider bandwidth operation LG Electronics, MediaTek

Agreement:

- In configuration of a BWP,
 - A UE is configured with BWP in terms of PRBs.
 - The offset between BWP and a reference point is implicitly or explicitly indicated to UE.
 - FFS for reference point, e.g., center/boundary of NR carrier, channel number used for sync. and/or channel raster, or center/boundary of RMSI BW, center/boundary of SS block accessed during the initial access, etc.
- NR supports MU-MIMO between UEs in different (but overlapping) BWPs

[R1-1711855](#) Way forward on PRB indexing Intel, Sharp, Ericsson, MediaTek, NTT DOCOMO, Panasonic, Nokia, ASB, NEC, KT, ETRI

Agreements:

- Common PRB indexing is supported
 - o The indexing is common to all the UEs sharing a wideband CC from network perspective, regardless of whether they are NB, CA, or WB UEs.
 - o The indexing is with respect to the reference point
 - o The indexing is with respect to a given numerology
 - o Note: Example usage of common PRB indexing is for scheduling group common PDSCH, RS sequences, BWP configuration, etc.
- UE-specific PRB indexing is supported
 - o It is indexed per BWP with respect to the configured SCS for the BWP
 - o Note: Example usage of UE-specific indexing is for scheduling UE-specific PDSCH

[R1-1711853](#) Activation/deactivation of bandwidth part Ericsson

Agreements:

- Activation/deactivation of DL and UL bandwidth parts can be
 - o by means of dedicated RRC signaling
 - Possibility to activate in the bandwidth part configuration
 - o by means of DCI (explicitly and/or implicitly) or MAC CE [one to be selected]
 - by means of DCI could mean
 - Explicit: Indication in DCI (FFS: scheduling assignment/grant or a separate DCI) triggers activation/deactivation
 - o Separate DCI means DCI not carrying scheduling assignment/grant
 - Implicit: Presence of DCI (scheduling assignment/grant) in itself triggers activation/deactivation
 - This does not imply that all these alternatives are to be supported.
 - o FFS: by means of timer
 - o FFS: according to configured time pattern

Prepare draft LS to RAN2/4 until Friday – Pei-Kai (Mediatek), Intel

Friday

[R1-1711948](#) [Draft] LS on bandwidth part operation in NR MediaTek

Further revised in [R1-1711989](#) [Draft] LS on Bandwidth Part Operation in NR Mediatek

Decision: The document is noted and final LS is approved in [R1-1711998](#).

[R1-1711913](#) WF on introduction indication in SS block for cell update CMCC

[R1-1711873](#) WF on initial bandwidth part LG Electronics, Ericsson, MediaTek

Not treated.

[R1-1709972](#) Overview of wider bandwidth operations Huawei, HiSilicon
[R1-1710040](#) NR wider bandwidth operation CATT
[R1-1710126](#) Resource allocation for wideband operation ZTE
[R1-1710172](#) Discussion on UE specific RF bandwidth adaptation in NR Guangdong OPPO Mobile Telecom.
[R1-1710249](#) PRB and RBG indexing within wider channel BW for NR NEC
[R1-1710352](#) Remaining details on wider bandwidth operation LG Electronics
[R1-1710398](#) NR transmission on anchor bandwidth part vivo
[R1-1710416](#) Design considerations for NR operation with wide bandwidths AT&T
[R1-1710583](#) Open issues for wider bandwidth operations Intel Corporation
[R1-1710622](#) UE bandwidth configuration during initial access ETRI
[R1-1710761](#) Wider Bandwidth Operations Samsung
[R1-1710785](#) Discussion on the change of SS block frequency position CMCC

R1-1710796	Further Details on Wider Bandwidth Operations in NR	MediaTek Inc.
R1-1710878	Bandwidth Adaptation via BWP Selection in NR	InterDigital, Inc.
R1-1710883	On wider band aspects of NR	Nokia, Alcatel-Lucent Shanghai Bell
R1-1710943	Discussion on PRB grid and PRB indexing	Panasonic Corporation
R1-1711131	Remaing issues on wider bandwidth operations for NR	NTT DOCOMO, INC.
R1-1711227	UE Power Saving during Active State	Qualcomm Incorporated
R1-1711565	On bandwidth parties	Ericsson AB
R1-1711885	WF on change of SS block frequency position	CMCC

5.1.8 NR-LTE co-existence

Refer to [R1-1709844](#) for work plan.

[R1-1711919](#) Chairman's notes of AI 5.1.8 NR-LTE co-existence Ad-Hoc chair (Qualcomm)

The document was presented by RAN1 chair on behalf of Wanshi Chen (Vice Chair).

Decision: The document is endorsed. Content incorporated below.

R1-1709980	Subcarrier mapping for LTE-NR coexistence	Huawei, HiSilicon
R1-1710173	Discussion on the NR-LTE self-interference issue	Guangdong OPPO Mobile Telecom.
R1-1710250	Discussion on UL sharing of NR and LTE NEC	
R1-1710384	Interference analysis for LTE-NR co-existence	vivo
R1-1710417	Remaining details of NR-LTE coexistence in overlapping spectrum	AT&T

Proposals:

- Send an LS to RAN3 that specifications of Xn interface and enhanced X2 interface shall include messages to enable coordination between LTE MCG and NR SCG of:
 - SCell activation/deactivation/reconfiguration
 - MBSFN subframe configuration
 - Signaling needed for timing synchronization and SFN alignment between LTE and NR
 - TDD UL/DL configuration
 - Indication of semi-statically reserved resources reserved of LTE

Continue discussion offline – Ralf (AT&T)

Thursday

[R1-1711710](#) WF on NR-LTE coexistence AT&T, Nokia, Ericsson, Vodafone

Agreements:

- For LTE-NR coexistence in overlapping spectrum, support on the Xn interface and enhanced X2 interface messages
 - FFS details, e.g., SCell ON/OFF, LTE MBSFN subframe configuration, synchronization aspects between LTE and NR, indication of semi-statically reserved resources in frequency domain, Indication of semi-statically reserved resources in time domain, etc.
- For LTE-NR coexistence in adjacent spectrum, support on the Xn interface and enhanced X2 interface messages
 - FFS details, e.g., synchronization aspects between LTE and NR, TDD UL/DL configuration, etc.
 - FFS the case of multi-operator scenarios
- Aim to conclude the FFS parts for the above and send an LS to RAN3 in the next meeting

R1-1710584	Open issues for LTE-NR coexistence	Intel Corporation
R1-1710763	LTE-NR coexistence for UL	Samsung
R1-1710840	Discussion on Uplink TDM Operation for NR NSA	China Telecommunications
R1-1710880	On uplink half-tone shift	Ericsson AB
R1-1710904	Uplink transmission in NR NSA mode	Apple Inc.
R1-1711701	Considerations of NR-LTE coexistence in uplink	ZTE (Revision of R1-1710910)
R1-1711132	Views on single UL transmission and UL sharing	NTT DOCOMO, INC.
R1-1711229	NR-LTE Co-channel Coexistence Considerations	Qualcomm Incorporated
R1-1711337	On NR-LTE coexistence for NSA and SA	China Unicom

[R1-1711584](#) On UL coverage extension of TDD @3.5GHz ORANGE (Revision of [R1-1711365](#))
[R1-1711400](#) On 1Tx only UE in LTE-NR Dual Connectivity Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711709](#) WF on NR-LTE coexistence in overlapping spectrum AT&T, Deutsche Telekom, Vodafone, Intel, Ericsson, Samsung, Orange, China Unicom, Huawei, HiSilicon, China Telecom

Agreements:

- In NR, support configuration between the following for paired spectrum (support of scheme 2 below is conditioned on the assumption that 100kHz is adopted as a supported UL channel raster in NR to support LTE/NR co-existence with LTE FDD)
 - o Scheme 1: Do nothing to allow subcarrier alignment between NR UL (15 kHz) and LTE UL
 - o Scheme 2: Allow subcarrier alignment between NR UL (15 kHz) and LTE UL, where NR UL raster is with a 7.5 kHz shift to the LTE UL raster
- Send an LS to RAN4 - Ralf (AT&T)

Wednesday

[R1-1711779](#) [DRAFT] LS on subcarrier alignment and channel raster AT&T, Sprint, T-Mobile USA, Huawei, HiSilicon, Samsung, Deutsche Telekom, Ericsson, Intel, China Telecom

The document was presented by Ralf Bendlin from AT&T.

Discussion: Qualcomm: let's delete "to support configuration of subcarrier alignment between NR UL (15 kHz) and LTE UL in paired spectrum".

AT&T compromise: RAN1 kindly requests RAN4 to take the above RAN1 agreement into account ensuring scheme 1 and scheme 2 are possible

Qualcomm: Scheme 2 is conditioned to RAN4 decision

Decision: The document is noted and final LS is **approved in [R1-1711839](#)** with the following updates:

Action to RAN4 WG:

RAN1 kindly requests RAN4 to take the above RAN1 agreement ~~to support configuration of subcarrier alignment between NR UL (15 kHz) and LTE UL in paired spectrum~~ into account when discussing NR channel raster.

Dates of next TSG-RAN WG1 Meetings:

RAN1 #90	21st – 25th August 2017	Prague, Czech Republic
RAN1 NR Ad-Hoc#32	18th – 21th September 2017	Nagoya, Japan

Thursday

[R1-1711675](#) Way forward on UE self-interference Vivo, OPPO, Coolpad, China Telecom, Xiaomi, Huawei, HiSilicon, China Unicom

Agreements:

- RAN1 to continue study the solution(s) to mitigate UE self-interference due to the simultaneous transmission and reception at the same time
 - o Note: the issue is particular applicable for specific band combination(s) (e.g. harmonics related issues)
 - o Note: the issue can be addressed if UE is not mandated to transmit on one carrier (F1) and receive on another carrier (F2) at the same time
- Send an LS to RAN4 regarding the above agreements – Xueming (Vivo), which is **approved in [R1-1711872](#)**

[R1-1711705](#) Way forward on handling of single UL transmission NTT DoCoMo

[R1-1711848](#) Way forward on handling of single UL transmission NTT DoCoMo, Apple

Agreements:

- Support the following solution to single UL transmission where NW synchronization between eNodeB and gNodeB is assumed (where there is at least one LTE carrier and at least one NR carrier of a different carrier frequency)
 - o When UE is activated with multiple UL carriers on different frequencies, time-switching of LTE UL carrier and NR UL carrier is used
 - UL transmission timing pattern of LTE carrier and NR carrier is semi-statically shared between eNodeB and gNodeB
 - FFS: Signaling to UE of UL transmission timing pattern
 - o UE simultaneously receives signals/channels from both NR DL carrier and LTE DL carrier

- For scheduling/HARQ timing of LTE FDD carrier, the following timing can be considered, e.g., for LTE:
 - DL-reference UL/DL configuration for TDD
 - DL-reference UL/DL configuration defined for FDD-SCell in TDD-FDD CA with TDD-PCell
 - Up to NW implementation (i.e., no RAN1 spec. impact)
- For scheduling/HARQ timing of NR carrier, no special handling would be necessary
- o Other solutions are not precluded
- Send an LS to RAN2, RAN3, and RAN4 – Kazuaki (DCM), which is drafted and endorsed in [R1-1711877](#). Final LS approved in [R1-1711878](#).

[R1-1711817](#) **WF on LTE/NR DC deployment scenarios to extend NR UL coverage** Orange, Deutsche Telekom, Ericsson, China Unicom, OPPO, Huawei, China Telecom, Nokia, ZTE

Agreements:

- RAN1 should consider the following scenarios as listed in [R1-1711817](#) in the future work especially in terms of UL coverage
 - o Scenario 1
 - o Scenario 2 where UL sharing is from network perspective
 - FFS where UL sharing from UE perspective
 - Aim to conclude in the next meeting; if no consensus, consider sending an LS to RANP for clarification
 - o Scenario 3

Not treated.

R1-1709979	Overview of NR UL for LTE-NR coexistence	Huawei, HiSilicon
R1-1710041	Support of UL carrier sharing between NR-LTE	CATT
R1-1710353	Remaining details on DL sharing between LTE and NR	LG Electronics
R1-1710354	Remaining details on UL sharing between LTE and NR	LG Electronics
R1-1710385	Issues on UL transmission for LTE-NR co-existence vivo	
R1-1710762	LTE-NR coexistence for DL	Samsung
R1-1710909	Discussion of NR-LTE coexistence on DL	ZTE
R1-1710912	Reserved resources supporting NR co-existence with LTE and NB-IoT	Ericsson AB
R1-1711228	NR LTE Adjacent Channel Coexistence Consideration	Qualcomm Incorporated
R1-1711399	LTE and NR performance in NR-LTE UL sharing	Nokia, Alcatel-Lucent Shanghai Bell

5.1.9 UL power control

[R1-1711947](#) **Chairman's notes of AI 5.1.9 UL Power Control** Ad-Hoc chair (Qualcomm)

The document was presented by RAN1 chair on behalf of Wanshi Chen (Vice Chair).

Decision: The document is endorsed. Content incorporated below.

5.1.9.1 Power sharing mechanism

Including power sharing mechanism for LTE-NR dual connectivity, NR carrier aggregation and dual connectivity

R1-1709949	Power control for CA and DC	Huawei, HiSilicon
R1-1710042	Power Sharing Mechanism	CATT
R1-1710839	UL Power Sharing for LTE-NR Dual Connectivity	MediaTek Inc.
R1-1710879	Power Sharing Mechanisms with LTE-NR DC and NR DC	InterDigital, Inc.
R1-1711526	Power Sharing for LTE-NR Dual Connectivity	Ericsson

Agreements:

- Regarding power sharing for LTE-NR dual connectivity, support at least semi-static power sharing between LTE and NR
 - o FFS details
 - o Discuss further whether or not to support dynamic power sharing between LTE and NR
 - o Discuss further impacts due to other factors, e.g., different TTI lengths, channel/service types, synchronous vs. asynchronous, different processing latency for LTE vs. NR, assumption regarding communication between NR vs. LTE at UE, specification impact to LTE (if any) and/or NR, etc.

Send an LS to RAN4 to inform the above agreements – Ravi (Ericsson)

Friday

[R1-1711898](#) [DRAFT] LS on power sharing for LTE-NR Dual Connectivity Ericsson

Discussion: Nokia → should RAN2 be informed as well?

AT&T → WI code is incorrect

Decision: The document is noted and final LS is approved in [R1-1711999](#) by adding RAN2 in CC part and updating work item code to “NR_newRAT”.

[R1-1711862](#) WF on LTE-NR power sharing mechanism NTT DoCoMo, InterDigital

Not treated.

[R1-1710355](#) Discussion on power sharing for LTE-NR dual connectivity LG Electronics
[R1-1710585](#) Power sharing mechanism for NR dual connectivity Intel Corporation
[R1-1710764](#) On UL Power Sharing for Multi-Cell Transmissions Samsung
[R1-1710911](#) Power Control for CA and DC in NR ZTE
[R1-1711133](#) LTE-NR power sharing mechanism NTT DOCOMO, INC.
[R1-1711396](#) On power sharing between LTE and NR in DC Nokia, Alcatel-Lucent Shanghai Bell

5.1.9.2 NR power control framework

Including power control for PUSCH/PUCCH/SRS/DMRS, PHR calculation

[R1-1710174](#) Uplink power control for NR Guangdong OPPO Mobile Telecom.

[R1-1710356](#) Discussion on uplink power control for NR LG Electronics

[R1-1711818](#) WF on UL power control LGE, Ericsson, InterDigital

Agreements:

- In NR, PUSCH and at least some type(s) of SRS can share same closed loop power control command from gNB
 - FFS details, e.g., the type(s) of SRS, beam related aspects, etc.
- In NR, PUSCH and PUCCH rely on independent closed loop power control commands from gNB
- Study aspects related SRS carrier switching

[R1-1711134](#) Power control framework for PUSCH NTT DOCOMO, INC.

[R1-1711230](#) Power control and PHR for NR Qualcomm Incorporated

[R1-1711397](#) UL Power Control for MIMO Nokia, Alcatel-Lucent Shanghai Bell

[R1-1711724](#) Summary of power control ZTE

[R1-1711721](#) WF on UL power control ZTE, NTT DoCoMo

[R1-1711863](#) WF on NR power control framework NTT DOCOMO, Nokia, Intel, InterDigital

[R1-1711819](#) WF on PHR for different waveforms LG Electronics, NTT DOCOMO, InterDigital

Agreement: UE's power headroom report is based on the corresponding PUSCH transmission(s)

- FFS details

Not treated.

[R1-1709948](#) General considerations on UL power control design Huawei, HiSilicon
[R1-1710043](#) NR Power Control Framework CATT
[R1-1710209](#) On NR power control ZTE
[R1-1710210](#) On NR PHR calculation ZTE
[R1-1710219](#) UL transmission power control Mitsubishi Electric Co.
[R1-1710357](#) Discussion on uplink power headroom report for NR LG Electronics
[R1-1710404](#) UL multi-beam power control vivo
[R1-1710475](#) Discussion on PHR calculation Huawei, HiSilicon
[R1-1710586](#) PUSCH and PUCCH power control Intel Corporation
[R1-1710765](#) Power Control Framework Samsung

R1-1710766	On PHR Requirements and Calculation	Samsung
R1-1710786	Discussion on NR power control and sharing	CMCC
R1-1711602	Common and Beam Specific Power Control Parameters	InterDigital, Inc.
R1-1711054	On the NR UL power control framework	Ericsson
R1-1711335	UL power control in multi-beam based approaches	ASUSTEK COMPUTER (SHANGHAI)

5.1.10 Channel model

[R1-1711623](#) **Correction on the formula of AnnexA** ZTE, Ericsson (Revision of [R1-1711255](#))

Decision: Agreed in [R1-1711758](#) as 38.901CR0016 with latest version of cover sheet (v11.2).

[R1-1711624](#) **Correction on Procedure A of spatially-consistency UT mobility modeling** ZTE, Ericsson (Revision of [R1-1711256](#))

Decision: Agreed in [R1-1711760](#) as 38.901CR0017 with latest version of cover sheet (v11.2).

5.1.11 Other

R1-1709971	Remaining issues on ECP Huawei, HiSilicon	
R1-1710358	Multiplexing NCP and ECP	LG Electronics
R1-1710405	Feasibility study on subband constellation rotation for uplink PAPR reduction for CP-OFDM waveform	
	vivo	
R1-1710406	PAE consideration on supporting CP-OFDM and DFT-S-OFDM	vivo
R1-1710407	Forward compatibility consideration for ECP design and NR-MBMS	vivo
R1-1710767	ECP Aspects for 60kHz SCS	Samsung
R1-1710768	On PAPR of DMRS for p/2-BPSK DFT-s-OFDM with Spectrum Shaping	Samsung
R1-1710769	RACH Aspects for CA and DC	Samsung
R1-1710966	Flexible subcarrier spacing in the uplink for NR use cases including mMTC	ATR
R1-1711326	Comment on NR specification	Panasonic
R1-1711389	Further details on scrambling	Ericsson
R1-1711424	On bandwidth adaptation	Huawei, HiSilicon
R1-1711459	Modulation Scheme for URLLC with Preemption Multiplexing	Samsung
R1-1711460	On Transparency of Spectrum Shaping for p/2-BPSK DFT-s-OFDM	Samsung
R1-1711461	On Spectrum Shaping Methods for p/2-BPSK DFT-s-OFDM	Samsung
R1-1711462	On Modulation Schemes for High Spectral Efficiency	Samsung
R1-1711463	Transmission and Reception for High-Order Modulation with MIMO	Samsung
R1-1711528	Extended Range Considerations for mMTC	HUGHES Network Systems Ltd
R1-1711529	Channel Model for Non-Terrestrial Networks	HUGHES Network Systems Ltd
R1-1711574	Discussion on bandwidth part configuration	LG Electronics Inc.
R1-1711595	Impact of channel estimation error on the performance of high spectral efficiency MIMO schemes	
	Samsung	
R1-1711597	Remaining Issues on RB Grid	Samsung
R1-1711908	Reserved resource for forward compatibility	Ericsson

5.2 Other

R1-1711317	Discussion on NR Operating in Unlicensed Spectrum	ASUSTEK COMPUTER (SHANGHAI)
R1-1711464	High level consideration on NR unlicensed band operation	Huawei, HiSilicon
R1-1711465	NR Numerology on unlicensed bands	Huawei, HiSilicon
R1-1711466	NR Frame structure on unlicensed bands	Huawei, HiSilicon
R1-1711467	Coexistence and Channel access for NR unlicensed band operations	Huawei, HiSilicon
R1-1711469	NR standalone operation on unlicensed bands	Huawei, HiSilicon
R1-1711470	Discussion on NoMA study for Rel-15 SI	Huawei, HiSilicon
R1-1711520	Discussion of Multi-Antenna and Highly Directional Beam-Forming for Operation in Unlicensed Spectrum	
	Ericsson	
R1-1711521	On Autonomous UL Transmissions for NR in Unlicensed Spectrum	Ericsson
R1-1711522	On Channel Access Mechanisms for NR in Unlicensed Spectrum	Ericsson
R1-1711523	On NR Operation in the 60 GHz Unlicensed Band	Ericsson
R1-1711524	On Physical Layer Design Policies for Unlicensed Operation of NR	Ericsson

R1-1711525	Technology Components for Unlicensed Operation	Ericsson
R1-1711549	Considerations on Satellite channel model	THALES
R1-1711550	NTN Bentpipe payload architecture and characteristics	THALES
R1-1711568	Considerations on HAPS channel model	CNES, Thales
R1-1711614	Dynamic resource allocation for Integrated Access and Backhaul	Samsung
R1-1711615	Deployment scenarios for Integrated Access and Backhaul	Samsung
R1-1711616	Evaluation assumptions for Integrated Access and Backhaul	Samsung
R1-1711637	Discussion on NTN Deployment Scenarios	Samsung
R1-1711652	Summary of the 2nd NOMA Workshop	ZTE

6 Closing of the meeting

Mr Chair thanked all for the progress achieved during this second ad-hoc meeting on NR.

Special thanks to the Vice chairmen, especially at the start of the meeting and for chairing their respective sessions.

Mr Chair thanked the host ZTE for the organization and facilities. Although meeting's start was a bit challenging, with inadequate number of seats, no power to all seats... during the first 1,5 hours of day one, the number of meeting rooms (5 all together) were really appreciated.

Then Mr chair warned the delegates that organizing the RAN1 chair and vice chair election at the next meeting could also be a challenge (due to the number of voting companies – likely to be around 300 – and the potential number of round of voting. August will be last meeting chaired by Satoshi-san.

Meeting was closed at 20:15.

See you all in Prague.

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Annex A: List of Tdocs at RAN1 #AH_NR2

Please see excel file attached to this report

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Annex B: List of CRs agreed at RAN1 #AH_NR2

TS/TR	CR	Rev	Rel	Title	Cat	Vsn	@ Mtg	TD#	Source to WG	Work Item
38.901	16	-	Rel-14	Correction on the fomula of Annex A	F	14.1.0	R1#AH_NR2	R1-1711758	ZTE, Ericsson	NR_newRAT-Core
38.901	17	-	Rel-14	Correction on Procedure A of spatially-consistency UT mobility modeling	F	14.1.0	R1#AH_NR2	R1-1711760	ZTE, Ericsson	NR_newRAT-Core

Annex C-1: List of Outgoing LSs from RAN1 #AH_NR2

TDoc #	Title	Source	Release	Related W/ls	Reply to	To	Cc	Original LS	Reply in
R1-1711686	LS on NR UL SPS / UL transmission without UL grant	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN2			
R1-1711825	LS on non-contiguous CA	RAN1, AT&T	Rel-15	NR_newRAT-Core		RAN2, RAN4			
R1-1711839	LS on subcarrier alignment and channel raster	RAN1, AT&T	Rel-15	NR_newRAT-Core		RAN4			
R1-1711872	LS on UE self-interference	RAN1, vivo	Rel-15	NR_newRAT-Core		RAN4			
R1-1711878	LS on single UL transmission	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN2, RAN3, RAN4			
R1-1711880	LS on Beam Aspects of NR RACH	RAN1, Huawei	Rel-15	NR_newRAT-Core		RAN2			
R1-1711966	Reply LS on reading time index indication for RRM measurements	RAN1, Intel	Rel-15	NR_newRAT-Core	R2- 1706160	RAN2			
R1-1711975	LS response on required parameters from RAN4 perspective	RAN1, Ericsson	Rel-15	NR_newRAT-Core	R4- 1704216	RAN4			
R1-1711987	Reply LS response on NR basic handover	RAN1, Samsung	Rel-15	NR_newRAT-Core	R2- 1707503	RAN2			
R1-1711997	Response LS on Support for fake gNB detection mechanisms	RAN1, Nokia	Rel-15	NR_newRAT-Core	S3-171568	SA3	RAN2, RAN4		
R1-1711998	LS on bandwidth part operation in NR	RAN1, MediaTek	Rel-15	NR_newRAT-Core		RAN2, RAN4			
R1-1711999	LS on power sharing for LTE-NR Dual Connectivity	RAN1, Ericsson	Rel-15	NR_newRAT-Core		RAN4	RAN2		
R1-1712000	LS on support of multi-TRP transmission in NR	RAN1, Intel	Rel-15	NR_newRAT-Core		RAN2	RAN3		
R1-1712001	LS on NR initial access and mobility	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN2			
R1-1712002	LS on NR initial access and mobility	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN4			
R1-1712005	Reply LS on PDCCH design	RAN1, Ericsson, CATT	Rel-15	NR_newRAT-Core		RAN2			
R1-1712007	LS on NR Beam Management	RAN1, Qualcomm	Rel-15	NR_newRAT-Core		RAN2			
R1-1712008	LS on HARQ operation	RAN1, Nokia	Rel-15	NR_newRAT-Core		RAN2			
R1-1712009	Reply LS on CSI-RS design for beam management	RAN1, NTT DOCOMO	Rel-15	NR_newRAT-Core	R4- 1704216	RAN4	RAN2		
R1-1712010	LS on a correction to the applicable UL modulation schemes	RAN1, Huawei	Rel-15	NR_newRAT-Core		RAN4			

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Annex C-2: List of Incoming LSs from RAN1 #AH_NR2

TDoc #	Title	Source	Release	Related WIs	Reply to	To	Cc	Original LS	Reply in
R1-1710211	LS on SR design principles in NR	RAN2, Samsung	Rel-15	NR_newRAT-Core		RAN1		R2-1705867	
R1-1710212	LS on UE measurement capabilities across LTE and NR	RAN2, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN4	RAN1	R2-1706140	
R1-1710213	LS on UE categories for NR and LTE-NR Dual Connectivity	RAN2, NTT DOCOMO	Rel-15	NR_newRAT-Core		RAN, RAN1	RAN4	R2-1706141	
R1-1710214	LS reply to SA2 on maximum data rate	RAN2, MediaTek	Rel-15	NR_newRAT-Core	S2-172398, R1-1706857	SA2, RAN1	RAN3, SA1, CT1, CT4	R2-1706155	
R1-1710215	Response LS on reading time index indication for RRM measurements	RAN2, Intel	Rel-15	NR_newRAT-Core	R1-1706707	RAN1		R2-1706160	
R1-1710216	LS on Emergency Support in NR	SA2, Nokia	Rel-15	NR_newRAT-Core		RAN	SA, RAN1, RAN2, RAN3	S2-173700	
R1-1710217	LS on Support for fake gNB detection mechanisms	SA3, Nokia	Rel-15	NR_newRAT-Core		RAN1, RAN2, RAN4		S3-171568	
R1-1710220	Reply LS on Emergency Support in NR	RAN, T-Mobile	Rel-15	NR_newRAT-Core	S2-173700	SA2	SA, RAN1, RAN2, RAN3	RP-171434	
R1-1710221	Reply LS on UE categories for NR and LTE-NR Dual Connectivity	RAN, NTT DOCOMO	Rel-15	NR_newRAT-Core	R2-1706141	RAN2, RAN1	RAN4	RP-171480	
R1-1711892	Reply LS on PBCH content	RAN2, Huawei	Rel-15	NR_newRAT-Core	R1-1709789	RAN1		R2-1707490	
R1-1711940	LS to RAN1 on NR basic handover	RAN2, Ericsson	Rel-15	NR_newRAT-Core		RAN1		R2-1707503	
R1-1711949	Reply LS to RAN1 on UL data transmission without UL grant for NR	RAN2, Huawei	Rel-15	NR_newRAT-Core	R1-1709805	RAN1		R2-1707499	
R1-1711950	LS to RAN1 on Random Access	RAN2, Samsung	Rel-15	NR_newRAT-Core		RAN1		R2-1707504	

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Annex D: List of Approved updated WIDs

None

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Annex E: List of draft TSs/TRs agreed at RAN1 #AH_NR2

Tdoc Number	Title	Source	Conclusion/Decision
R1-1712004	TS38.211 v0.1.0 NR; Physical channels and modulation	Ericsson LM	Endorsed

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Annex F: List of actions

- Outgoing LS

[NRAH2-01] Sundar (Qualcomm)

R1-1711683 [DRAFT] LS on NR Beam Management Qualcomm

Email approval until July 10th

Done: According to email posted on July 13th by Mr Chair, final LS is approved in R1-1712007.

[NRAH2-02] Karri (Nokia)

R1-1711685 [DRAFT] LS on HARQ operation Nokia

Email approval until July 6th

Done: According to email posted on July 10th by Mr Chair, final LS is approved in R1-1712008.

[NRAH2-06] Yuichi (NTT DOCOMO)

R1-1712003 [DRAFT] Reply LS on CSI-RS design for beam management NTT DOCOMO

Email approval until July 7th

Done: According to email posted on July 10th by Mr Chair, final LS is approved in R1-1712009.

[NRAH2-07] Lihui (NTT DOCOMO)

R1-1711686 LS on NR UL SPS / UL transmission without UL grant RAN1, NTT DOCOMO

Email approval until July 6th

Done: According to email posted on July 10th by Mr Chair, the LS is approved.

[NRAH2-13] Yi (Huawei)

LS on a correction to the applicable UL modulation schemes

The agreed LS (to RAN4) related to modulation in R1-1711975, incorrectly stated that pi/2 BPSK is supported for OFDM (without DFT precoding). Email approval until July 10th to clarify that pi/2 BPSK is only supported for DFT-S-OFDM.

Done: According to email posted on July 11th by Mr Chair, final LS is approved in R1-1712010.

- CR approval

None

- Text proposal for TS and TR

[NRAH2-03] Editors

Email discussion until August meeting about all specs

- 1st step: All spec editors will provide new draft specs (including all agreements and WA) until July 14th
- 2nd step: All spec editors will provide further updated specs (including all agreements and WA) until August 4th
- All companies are recommended checking these specs and comment via the reflector
- All spec editors will update specs via the reflector and submit them to the August meeting (RAN1#90)
- Objective is to get the updated specs endorsed on Monday on Monday (day 1 of RAN1#90)

Done: Step 1, namely draft versions to capture decisions up to and including RAN1 NR AdHoc #2 were provided as follows:

R1-1712011	TS38.211 v0.1.1 NR; Physical channels and modulation	Ericsson LM
R1-1712012	TS38.201 v0.0.1 NR; Physical layer; General description	NTT DOCOMO
R1-1712013	TS38.202 v0.0.1 NR; Physical layer services provided by the physical layer Qualcomm	
R1-1712014	TS38.212 v0.0.1 NR; Multiplexing and channel coding	Huawei
R1-1712015	TS38.213 v0.0.1 NR; Physical layer procedures for control	Samsung
R1-1712016	TS38.214 v0.0.1 NR; Physical layer procedures for data	Nokia
R1-1712017	TS38.215 v0.0.1 NR; Physical layer measurements	Intel

- Miscellaneous

[NRAH2-04] Daniel (Ericsson)

Email discussion until the August meeting w.r.t the RRC parameters list for NR

- Daniel (Ericsson) will provide an initial RRC parameters list until August 9th
- All companies are recommended checking it and comment via the reflector
- Daniel (Ericsson) will update it via the reflector and submit it to the August meeting (RAN1#90)
- Objective is to get the (updated) RRC parameters list agreed on Monday (day 1 of RAN1#90)

Done: Draft version of the xls-sheet summarizing RRC parameters was distributed. Status to be check in RAN1#90.

[NRAH2-05] Daewon (Intel)

DMRS sequence for NR PBCH

Companies are encouraged to provide the information on NR PBCH DMRS sequence until July 28th in order to finalize the design

Done: Summary to be provided in RAN1#90.

[NRAH2-08] Jeongho (Samsung)

Email approval until July 13th to down select CBG-based (re)transmission

Done: On July 14th, the following list of options is confirmed for down selection:

- For the indicated number of CBGs per TB where “indicated” is realized by RRC, MAC, L1 signalling, the following options are considered for down-selection in RAN1#90.
 - o Option 1. RRC signaling (for bit-field size)
 - o Option 2. L1 signaling (for indication the number of CBGs per TB) + RRC signaling (for bit-field size)
 - o Option 3. both Option 1 and Option 2
- To determine the number of CBG HARQ-ACK bits per TB, the following options are considered for down-selection in RAN1#90.
 - o Option 1. A UE transmits HARQ-ACK bits only for scheduled CBGs.
 - “scheduled CBGs” means the CBGs scheduled in a (re)transmission
 - o Option 2. A UE transmits HARQ-ACK bits for indicated CBGs.
 - FFS: “indicated” is realized by RRC, MAC, L1 signalling
 - o Option 3. both Option 1 and Option 2 by configuration
 - o Note: Option1 and Option2 are the basis for the scheme to determine the number of feedback bits. Overhead reduction schemes can be considered.
- The number of actually used feedback bits can be different from the number of scheduled CBGs (Option1) or indicated CBGs (Option2).
 - o The number of actually used feedback bits can be different from the number of scheduled CBGs (Option1) or indicated CBGs (Option2).
- For DL CBG-based (re)transmission, when information on which CBG(s) is/are (re)transmitted options are considered for down-selection in RAN#90.
 - o Option 1. TB-level NDI is jointly encoded with the information on which CBG(s) is/are (re)transmitted
 - o Option 2. There is separate 1-bit bit-field for TB-level NDI.
 - o Option 3. TB-level NDI can be differently interpreted according to whether all CBGs of a TB is transmitted.
- When CBG-based retransmission is configured, TB-level HARQ-A/N is supported and at least following options can be considered for down-selection in RAN1#90.
 - o Option 1. Add 1 bit upon CBG-level HARQ-ACK bits
 - o Option 2. Use all NACK of CBG-level HARQ-ACK bits
 - o Option 3. Use different PUCCH format or PUCCH resource
- For HARQ-ACK codebook for CBG-based retransmission, the following options are considered for down-selection in RAN1#90.
 - o Option 1. Dynamic codebook determination for multiple PDSCHs
 - o Option 2. Semi-static codebook determination for multiple PDSCHs
 - o Option 3. both Option 1 and Option 2 by configuration

Updated summary of CBG transmission shall be presented in RAN1#90.

[NRAH2-09] Joseph (Qualcomm)

Processing Time Requirements - Email discussion about the followings:

- Step 1: identify the candidate factors for processing time (until Aug.4th)
- Step 2: identify the table (until Aug.4th) 1 Based on the proponents' input for step 1 and step 2, following work will be done:

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- Step 3: fill-in the table
- Targeting finishing step 3 until September meeting.

² Note: companies are encouraged to bring up initial numbers for the table to the August meeting

- Note: fill-in the table does not necessarily results in defining some UE capabilities or exact values of K1 and K2 in the specification.

Done: Summary to be provided in RAN1#90.

[NRAH2-10] Zhenfei (Huawei)

Scheduling/HARQ aspects for CA for email approval until July 10th

Done: According to email posted on July 15th by Mr Chair, the following is agreed:

Agreements

- On the search space
 - A UE monitors PDCCH candidates in common search space(s) at least for RMSI and UE specific search space(s) on Primary Component Carrier (PCC)
 - A UE monitors PDCCH candidates at least on UE-specific search space(s) for an Secondary Component Carrier (SCC)
- Support cross carrier scheduling with CIF
 - NR at least support that a carrier is scheduled by one and only one carrier
 - FFS: the number of CIF bits
 - FFS: BWP aspects for cross carrier scheduling
- For cross-carrier scheduling, PDCCH and the scheduled PDSCH can have the same or different numerologies.
- For self-scheduling, PDCCH and the scheduled PDSCH have the same numerology
 - FFS whether for self-scheduling, PDCCH and the scheduled PDSCH can have different numerologies.
- For self and cross-carrier scheduling, PDCCH and the scheduled PUSCH can have the same or different numerologies.
- When numerology are different between PDCCH and the scheduled transmission, the time granularity indicated in the DCI for the timing relationship between the end of PDCCH and the corresponding scheduled transmission is based on the numerology of the scheduled transmission.
- For multiple timing advance groups
 - LTE timing difference requirement can be used as a starting point
 - FFS factors related to this requirement.
 - Support PRACH transmission for timing advance acquisition on SCC
- NR Supports 2 cell groups for PUCCH for NR DC
 - FFS: NR supports 2 cell groups for PUCCH for NR CA

Working assumptions

- HARQ-ACK transmission related to multiple DL component carriers is supported for DL component carriers operating with the same and different numerology
 - The time granularity of a HARQ-ACK transmission, indicated in the DCI scheduling the PDSCH, is based on the numerology of PUCCH transmission.

Further discussion for the next meeting

- NR supports at least the configuration of one carrier transmitting the PUCCH within the cell group
 - o FFS The carrier transmitting the PUCCH is always PCC and/or carrier(s) transmitting the PUCCH can be SCC in a cell group containing PCC
 - o FFS The possibility of the configuration of multiple carriers transmitting the PUCCH in a cell group
 - o This does not preclude on PUCCH fast carrier switching

[NRAH2-11] Zukang (Huawei)

Polar code sequence

- Polar code sequence candidates, including any merged solutions, should be provided by Wed 2nd Aug
- Identify candidates of polar code sequence according to the procedure below by Wed 9th Aug
- Rate matching proposals for any sequence that has been selected as a winner by at least one company to be provided by Wed 16th Aug.

Done: Summary to be provided in RAN1#90.

[NRAH2-12] Zukang (Huawei)

Polar code design on polynomial and interleaver for email discussion until August 7th

Main target is on gathering all proposals about detailed design on polynomial and interleaver.

Done: Summary to be provided in RAN1#90.

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Annex G: List of participants at RAN1 #AH_NR2

Please see excel file attached to this report

Appendix F

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Annex H: TSG RAN WG1 meetings in 2017 – 2018

TITLE	TYPE	DATES	LOCATION	CTRY
<u>3GPPRAN1#90</u>	WG	21 – 25 Aug 2017	Prague	Rep Czech
<u>3GPPRAN1-NR3</u>	AH	18 – 21 Sep 2017	Nagoya	Japan
<u>3GPPRAN1#90bis</u>	WG	09 – 13 Oct 2017	Prague	Rep Czech
<u>3GPPRAN1#91</u>	WG	27 Nov – 01 Dec 2017	Reno	US
<u>3GPPRAN1-AH-1801</u>	AH	22 – 26 Jan 2018	TBD	
<u>3GPPRAN1#92</u>	WG	26 Feb – 2 Mar 2018	Athens	Greece
<u>3GPPRAN1#92bis</u>	WG	16 – 20 Apr 2018	TBD	China
<u>3GPPRAN1#93</u>	WG	21 – 25 May 2018	TBD	Korea
<u>3GPPRAN1#94</u>	WG	20 – 24 Aug 2018	Gothenburg	Sweden
<u>3GPPRAN1#94bis</u>	WG	8 – 12 Oct 2018	TBD	China
<u>3GPPRAN1#95</u>	WG	12 – 16 Nov 2018	TBD	US

MEETING TYPES	
AH = Ad Hoc	RG = Rapporteurs Group
JM = Joint	SG = Steering Group
PM = Preparatory Meeting	TG = Task Group
RM = Resolution Meeting	XO = Extraordinary

End of document

TDoc	Title	Source	TDoc Status	Reservation date	Uploaded
R1-1709880	Draft Agenda of RAN1#AH_NR2 meeting	RAN1 Chair	revised	2017-06-08 07:56:05	2017-06-08 08:07:46
R1-1709881	Report of RAN1#89 meeting	ETSI	noted	2017-06-08 07:56:09	2017-06-22 14:16:07
R1-1709882	Enhancement of Early Termination of Polar Codes by placing UE-ID on Frozen Symbols	Tsotun Algorithm	available	2017-06-08 09:08:38	2017-06-19 17:58:35
R1-1709883	Study of Split-CRC Polar Code Construction for Early Termination	Tsotun Algorithm	revised	2017-06-08 09:13:04	2017-06-19 17:58:35
R1-1709884	NR-SS sequence design	ZTE	available	2017-06-08 11:12:14	2017-06-17 02:00:24
R1-1709885	The composition of SS burst sets	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709886	Timing indication based on SS blocks	ZTE	available	2017-06-08 11:12:16	2017-06-19 14:06:44
R1-1709887	Multiple SS blocks in wideband CC	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709888	NR-PBCH contents	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709889	NR-PBCH RE mapping and SS block composition	ZTE	available	2017-06-08 11:12:16	2017-06-19 14:06:44
R1-1709890	NR-PBCH DMRS design	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709891	RMSI delivery	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709892	Other SI delivery	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709893	Paging design in NR	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709894	NR-PRACH formats for long/short sequences	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709895	NR-PRACH formats: capacity enhancements and other use cases	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709896	Power control during random access procedure	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709897	4-step random access procedure	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709898	RRM measurements on IDLE mode RS	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709899	RRM measurements on CSI-RS for L3 mobility	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709900	Radio link monitoring in NR	ZTE	available	2017-06-08 11:12:16	2017-06-17 02:00:24
R1-1709901	Scrambling pattern for timing indication over PBCH	Sequans Communications	available	2017-06-08 12:35:54	2017-06-15 15:48:24
R1-1709902	Enhancements for Polar code construction	Sequans Communications	available	2017-06-08 12:37:26	2017-06-15 15:48:24
R1-1709903	Discussion of LTE-RM decoding ambiguity	Sequans Communications	available	2017-06-08 12:41:19	2017-06-15 19:15:08
R1-1709904	Discussion on Remaining Details of Codeword Mapping	Beijing Xinwei Telecom Techn.	available	2017-06-08 13:20:28	2017-06-16 09:52:57
R1-1709905	Further Discussion on DL PRB Bundling	Beijing Xinwei Telecom Techn.	noted	2017-06-08 13:20:33	2017-06-16 09:52:57
R1-1709906	Discussion on DL Beam Management	Beijing Xinwei Telecom Techn.	available	2017-06-08 13:20:33	2017-06-16 09:52:57
R1-1709907	Discussion on Beam Failure Recovery	Beijing Xinwei Telecom Techn.	available	2017-06-08 13:20:33	2017-06-16 09:52:56
R1-1709908	Discussion on CSI Framework and Semi-persistent CSI-RS Resources and Reports Activation	Beijing Xinwei Telecom Techn.	available	2017-06-08 13:20:33	2017-06-16 09:52:56

R1-1709909	Further Evaluation and Discussion on DMRS Design Details	Beijing Xinwei Telecom Techn.	noted	2017-06-08 13:20:33	2017-06-16 09:52:56
R1-1709910	NR MIMO System Level Phase 3 Calibration Results	Beijing Xinwei Telecom Techn.	available	2017-06-08 13:20:33	2017-06-16 09:52:56
R1-1709911	Finalization of the NR-SSS	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709912	SS Burst Set and Block Composition	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 03:15:49
R1-1709913	Time Index Indication	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709914	NR-PBCH contents and payload size	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709915	Discussion on NR RMSI delivery	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709916	Multi-beam Paging for NR	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709917	PRACH preamble sequences and formats for capacity enhancement and beam management	Huawei, HiSilicon	revised	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709918	Discussion on power ramping and power control during RA procedure	Huawei, HiSilicon	available	2017-06-08 13:23:32	2017-06-17 02:50:38
R1-1709919	SS Burst Periodicities and timing for UE RRM measurement	Huawei, HiSilicon	noted	2017-06-08 13:23:33	2017-06-17 02:50:38
R1-1709920	CSI-RS configuration parameters for L3 mobility	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:50:38
R1-1709921	Discussion on remaining issues of radio link monitoring	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:50:38
R1-1709922	On numerology determination during initial access	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:50:38
R1-1709923	Non-codebook based transmission for UL MIMO	Huawei, HiSilicon	noted	2017-06-08 13:23:33	2017-06-17 02:58:56
R1-1709924	Multiple NR-PDCCH for Multiple TRP transmission	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:58:56
R1-1709925	PRB bundling size for DL data precoding	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:58:56
R1-1709926	Discussion on transmission parameter sets	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:58:56
R1-1709927	Beam indication for DL control channel	Huawei, HiSilicon	available	2017-06-08 13:23:33	2017-06-17 02:58:56
R1-1709928	UL beam management	Huawei, HiSilicon	noted	2017-06-08 13:23:33	2017-06-17 02:58:56
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R1-1709932	Channel and interference measurement for CSI acquisition	Huawei, HiSilicon	revised	2017-06-08 13:23:33	2017-06-17 03:15:49
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R1-1709947	CSI-RS design for beam management	Huawei, HiSilicon	available	2017-06-08 13:23:34	2017-06-17 02:55:43

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R1-1710099	Discussion on number of HARQ processes and HARQ RTT	CATT	available	2017-06-09 04:09:17	2017-06-17 03:10:43
R1-1710100	Soft buffer management for NR	CATT	available	2017-06-09 04:09:17	2017-06-17 03:10:43
R1-1710101	Further design considerations for DL pre-emption indication	CATT	available	2017-06-09 04:09:17	2017-06-17 03:10:43
R1-1710102	Scheduling and HARQ support for NR CA	CATT	available	2017-06-09 04:09:17	2017-06-17 03:10:43
R1-1710103	Scheduling and HARQ support for NR DC	CATT	available	2017-06-09 04:09:17	2017-06-17 03:10:43
R1-1710104	CCE mapping with REG bundling	ZTE	available	2017-06-09 05:05:04	2017-06-17 02:00:24
R1-1710105	Issues regarding DMRS structure and mapping	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710106	NR-PDCCH CORESET configuration	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24

R1-1710107	Search space design for NR- PDCCH	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710108	Supporting Multi-beam in NR-PDCCH	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710109	Resource sharing between PDCCH and PDSCH	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710110	Group-common PDCCH design consideration	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710111	NR-PDCCH for supporting URLLC	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710112	On short PUCCH for up to 2 bits UCI	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710113	On short-PUCCH for more than 2 bits	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710114	On long-PUCCH for up to 2 bits	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710115	On long-PUCCH for more than 2 bits	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710116	Consideration on long-PUCCH over slots	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710117	NR PUCCH resource allocation	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710118	UCI multiplexing on PUSCH	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710119	Multiplexing of PUSCH and short PUCCH	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710120	Analysis of URLLC reliability for uplink control channel	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710121	Resource allocation in frequency domain	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710122	On scheduling request in NR	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710123	DL pre-emption indication	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710124	Uplink multiplexing for different transmission durations	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710125	Supporting Ultra reliability in scheduling	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710126	Resource allocation for wideband operation	ZTE	available	2017-06-09 05:05:08	2017-06-17 02:00:24
R1-1710127	Viewpoint on NR CLI Management for Duplexing Work Plan	ZTE	noted	2017-06-11 03:47:14	2017-06-16 19:17:01
R1-1710128	UE-to-UE measurement as an enabler for CLI mitigation schemes	ZTE	noted	2017-06-11 03:49:05	2017-06-16 19:17:01
R1-1710129	Channel sensing based schemes for cross-link interference mitigation in NR	ZTE	available	2017-06-11 03:50:57	2017-06-16 19:17:01
R1-1710130	TRP-to-TRP measurement as an enabler for CLI mitigation schemes	ZTE	available	2017-06-11 03:52:32	2017-06-16 19:17:01
R1-1710131	Discussion on design of SS block	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:15	2017-06-16 10:20:33
R1-1710132	Discussion on the timing indication of SS block	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710133	Remaining details on multiple SS block transmissions in wideband CC	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-17 07:24:57
R1-1710134	Discussion on the numerology of the RMSI	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710135	Discussion on the on-demand SI	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710136	On NR paging design and transmission	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710137	Discussion on Power ramping and power control during RA procedure	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710138	NR 4-Step Random Access Procedure	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33

R1-1710139	On RRM measurement based on SS block	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710140	On uplink codebook design	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710141	Considerations on the multi-TRP/Multi-panel design to support the reception of multiple PDCCH	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710142	Discussion on the DL Beam Management	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710143	Discussion on the UL Beam Management	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710144	On Beam Recovery Mechanism	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710145	Beam association relationship between data and control channels	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710146	Discussion on CSI-RS design for beam management	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710147	On SRS design for NR	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710148	NR-PDCCH CCE-to-REG mapping with REG bundling	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710149	On NR PDCCH RS design	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710150	PDCCH CORESET configuration and UE procedure on NR-PDCCH monitoring	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710151	NR PDCCH search space design with nested structure	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710152	Search space design consideration for NR PDCCH with BF	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710153	On resource sharing between PDCCH and PDSCH	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710154	Impact on common channel reception to PDCCH design	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710155	DL control channel design for URLLC	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710156	Discussion on short PUCCH for up to 2 UCI bits	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710157	Discussion on short PUCCH for more than 2 UCI bits	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710158	Discussion on long PUCCH for up to 2 UCI bits	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710159	Slot aggregation and configuration for NR long PUCCH	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710160	Design of NR PUCCH with long duration	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33

R1-1710161	Resource indication for UL control channel	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710162	On UCI and data multiplexing in PUSCH	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710163	Multiplexing of short PUCCH and long PUCCH	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710164	Bandwidth part configuration and frequency resource allocation	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710165	Time-domain resource allocation for NR	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710166	Discussion on the UL waveform indication	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710167	HARQ for uplink grant-free transmission	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710168	Discussion on CBG indication in DCI	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710169	Discussion on HARQ-ACK feedback for CBG-based transmission	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710170	Symbol-level resource allocation and pre-emption indication	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710171	Bandwidth part based resource scheduling for carrier aggregation	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710172	Discussion on UE specific RF bandwidth adaptation in NR	Guangdong OPPO Mobile Telecom.	available	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710173	Discussion on the NR-LTE self-interference issue	Guangdong OPPO Mobile Telecom.	noted	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710174	Uplink power control for NR	Guangdong OPPO Mobile Telecom.	noted	2017-06-11 13:52:20	2017-06-16 10:20:33
R1-1710175	Codeword mapping and interleaving	ZTE	revised	2017-06-12 04:53:25	2017-06-17 06:03:44
R1-1710176	Codebook based UL transmission	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:03:44
R1-1710177	Non-Codebook based and Hybrid based UL transmission	ZTE	noted	2017-06-12 04:53:26	2017-06-17 07:34:50
R1-1710178	Diversity based uplink transmission schemes	ZTE	noted	2017-06-12 04:53:26	2017-06-17 07:59:10
R1-1710179	On PRB Bundling	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:03:44
R1-1710180	Multi-TRP Transmission and interference coordination	ZTE	noted	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710181	Discussion on rate matching	ZTE	available	2017-06-12 04:53:26	2017-06-17 09:49:27
R1-1710182	On transmission setting	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710183	DL beam management for NR MIMO	ZTE	noted	2017-06-12 04:53:26	2017-06-17 08:38:22
R1-1710184	UL beam management for NR MIMO	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710185	Discussion on beam recovery mechanism	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710186	Beam grouping evaluation for beam management	ZTE	noted	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710187	On CSI framework details	ZTE	revised	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710188	Details of CSI acquisition	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:03:45
R1-1710189	On reciprocity based CSI acquisition	ZTE	revised	2017-06-12 04:53:26	2017-06-17 06:08:04
R1-1710190	CSI feedback mechanism on PUCCH	ZTE	noted	2017-06-12 04:53:26	2017-06-17 06:22:50

R1-1710191	CSI feedback mechanism on PUSCH	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:27:05
R1-1710192	Overhead reduction for Type II CSI	ZTE	available	2017-06-12 04:53:26	2017-06-17 06:34:51
R1-1710193	Discussion on multiplexing of different RSs	ZTE	noted	2017-06-12 04:53:26	2017-06-17 06:37:44
R1-1710194	On CSI-RS for beam management	ZTE	available	2017-06-12 04:53:27	2017-06-17 09:31:38
R1-1710195	On CSI-RS for CSI acquisition	ZTE	available	2017-06-12 04:53:27	2017-06-17 06:42:11
R1-1710196	Discussion on downlink DMRS design	ZTE	noted	2017-06-12 04:53:27	2017-06-17 06:45:51
R1-1710197	Evaluation results on DL DMRS	ZTE	available	2017-06-12 04:53:27	2017-06-17 06:47:54
R1-1710198	Discussion on uplink DMRS design	ZTE	available	2017-06-12 04:53:27	2017-06-17 06:50:33
R1-1710199	Discussion on RS for phase tracking	ZTE	available	2017-06-12 04:53:27	2017-06-17 06:54:49
R1-1710200	Discussion on SRS design for NR	ZTE	available	2017-06-12 04:53:27	2017-06-17 06:56:23
R1-1710201	Discussion on fine time/frequency tracking of channel	ZTE	available	2017-06-12 04:53:27	2017-06-17 07:00:25
R1-1710202	QCL design for UL and DL MIMO	ZTE	noted	2017-06-12 04:53:27	2017-06-17 08:49:19
R1-1710203	Calibration results for Phase 1 NR MIMO link level calibration	ZTE	withdrawn	2017-06-12 04:53:27	
R1-1710204	Calibration results for Phase 1 NR MIMO system level calibration	ZTE	withdrawn	2017-06-12 04:53:27	
R1-1710205	Calibration results for Phase 2 NR MIMO link level calibration	ZTE	withdrawn	2017-06-12 04:53:27	
R1-1710206	Calibration results for Phase 2 NR MIMO system level calibration	ZTE	available	2017-06-12 04:53:27	2017-06-17 09:53:31
R1-1710207	Calibration results for Phase 3 NR MIMO calibration	ZTE	available	2017-06-12 04:53:27	2017-06-17 09:53:31
R1-1710208	Further clarification on Phase 3 NR MIMO calibration	ZTE	available	2017-06-12 04:53:27	2017-06-17 09:53:31
R1-1710209	On NR power control	ZTE	available	2017-06-12 04:53:27	2017-06-17 07:03:20
R1-1710210	On NR PHR calculation	ZTE	available	2017-06-12 05:00:17	2017-06-17 07:07:22
R1-1710211	LS on SR design principles in NR	RAN2, Samsung	treated	2017-06-12 06:44:17	2017-06-12 07:18:45
R1-1710212	LS on UE measurement capabilities across LTE and NR	RAN2, NTT DOCOMO	treated	2017-06-12 06:44:19	2017-06-12 07:18:45
R1-1710213	LS on UE categories for NR and LTE-NR Dual Connectivity	RAN2, NTT DOCOMO	treated	2017-06-12 06:44:19	2017-06-12 07:18:45
R1-1710214	LS reply to SA2 on maximum data rate	RAN2, MediaTek	treated	2017-06-12 06:44:19	2017-06-12 07:18:45
R1-1710215	Response LS on reading time index indication for RRM measurements	RAN2, Intel	treated	2017-06-12 06:44:19	2017-06-12 07:18:45
R1-1710216	LS on Emergency Support in NR	SA2, Nokia	treated	2017-06-12 06:44:19	2017-06-12 07:18:45
R1-1710217	LS on Support for fake gNB detection mechanisms	SA3, Nokia	treated	2017-06-12 06:44:19	2017-06-12 07:18:45
R1-1710218	RACH transmission count	Mitsubishi Electric Co.	available	2017-06-12 07:51:14	2017-06-16 00:23:55
R1-1710219	UL transmission power control	Mitsubishi Electric Co.	available	2017-06-12 07:52:49	2017-06-16 00:23:56
R1-1710220	Reply LS on Emergency Support in NR	RAN, T-Mobile	treated	2017-06-12 09:48:20	2017-06-12 09:57:25
R1-1710221	Reply LS on UE categories for NR and LTE-NR Dual Connectivity	RAN, NTT DOCOMO	treated	2017-06-12 09:48:20	2017-06-12 09:57:25
R1-1710222	Transmit diversity for DFTsOFDM-based PUCCH in long duration	Mitsubishi Electric RCE	available	2017-06-12 14:29:33	2017-06-16 14:58:34
R1-1710223	Discussion on timing indication based on SS block	Beijing Xinwei Telecom Techn.	available	2017-06-13 06:18:38	2017-06-16 09:52:57
R1-1710224	Discussion and evaluation on SS block composition	Beijing Xinwei Telecom Techn.	available	2017-06-13 06:18:39	2017-06-16 09:52:57

R1-1710225	Discussion and evaluation on DMRS design for NR-PBCH	Beijing Xinwei Telecom Techn.	available	2017-06-13 06:18:39	2017-06-16 09:52:57
R1-1710226	Discussion on 2-symbol Short PUCCH with More Than 2 Bits	Beijing Xinwei Telecom Techn.	available	2017-06-13 06:18:39	2017-06-16 09:52:57
R1-1710227	Further Discussion on PTRS Design Details	Beijing Xinwei Telecom Techn.	withdrawn	2017-06-13 06:18:39	
R1-1710228	Further discussion on channel reciprocity and beam correspondence	MTI	available	2017-06-13 10:38:10	2017-06-16 09:18:05
R1-1710229	[89-16] Email discussion on NR-PRACH preamble formats based on short sequence length	ZTE Corporation	revised	2017-06-13 11:51:50	2017-06-13 11:58:10
R1-1710230	UL PTRS for DFTsOFDM waveform	Mitsubishi Electric RCE	noted	2017-06-13 15:34:41	2017-06-16 14:58:34
R1-1710231	Consideration on timing indication based on SS block	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:53
R1-1710232	Discussion on DMRS for NR-PBCH	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:54
R1-1710233	Discussion on the CORESET for RMSI delivery	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:55
R1-1710234	Discussion on 4-step RA procedure	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:55
R1-1710235	Discussion on multiple NR-PDCCHs in NC-JT scheme	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:56
R1-1710236	Discussion on beam failure recovery procedure	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:57
R1-1710237	PUCCH resource allocation	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:40:58
R1-1710238	Discussion on time domain resource allocation	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:41:00
R1-1710239	Discussions on HARQ for grant-free transmission	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:41:02
R1-1710240	Discussion on DL control signaling related to CBG based (re)-transmission	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:41:02
R1-1710241	Discussion on CBG based HARQ-ACK Design	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:41:04
R1-1710242	Discussion on HARQ-ACK codebook	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:41:04
R1-1710243	On eMBB and URLLC multiplexing for Uplink	Fujitsu	available	2017-06-13 16:37:38	2017-06-16 16:41:04
R1-1710244	PRB indexing for RMSI in NR	NEC	available	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710245	Frequency-domain resource allocation schemes for NR	NEC	available	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710246	Time-domain resource allocation schemes for NR	NEC	available	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710247	Frequency hopping for NR UL PUSCH	NEC	available	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710248	UL data transmission without grant	NEC	available	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710249	PRB and RBG indexing within wider channel BW for NR	NEC	available	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710250	Discussion on UL sharing of NR and LTE	NEC	noted	2017-06-13 17:48:57	2017-06-17 05:46:17
R1-1710251	Discussion on beam failure recovery request	NEC Corporation	available	2017-06-14 03:06:13	2017-06-16 08:51:56
R1-1710252	Discussion on preamble transmitting power	NEC Corporation	withdrawn	2017-06-14 03:07:23	
R1-1710253	Discussion on extending of scheduling request	NEC Corporation	withdrawn	2017-06-14 03:08:16	
R1-1710254	Discussion on beam sweeping or beam changing of SR	NEC Corporation	withdrawn	2017-06-14 03:08:59	
R1-1710255	Remaining details on DMRS ports and number of layers indication	NEC Corporation	available	2017-06-14 03:09:46	2017-06-16 08:51:56
R1-1710256	CSI-RS design for beam management and interference measurement	NEC Corporation	available	2017-06-14 03:11:05	2017-06-16 08:51:56
R1-1710257	Considerations on the design of DMRS	NEC Corporation	available	2017-06-14 03:11:40	2017-06-16 08:51:56
R1-1710258	Remaining issue on SS Sequence Design	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710259	Discussion on SS burst set composition	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17

R1-1710260	Discussion on SS block time index indication	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710261	Remaining issues on Multiple SS block transmissions in wideband CC	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710262	Consideration on NR-PBCH contents and payload size	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710263	Discussion on NR-PBCH RE mapping and SS block composition	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710264	Discussion on DMRS design for NR-PBCH	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710265	Remaining minimum system information delivery	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710266	Other system information delivery	LG Electronics	withdrawn	2017-06-14 07:52:45	
R1-1710267	Paging design in NR	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710268	Discussion on PRACH preamble format details	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710269	Discussion on PRACH preamble for capacity enhancement	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710270	Discussion on Power Control issue for Message 1 and 3	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710271	RACH Procedure	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710272	SS block based RRM Measurement	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710273	CSI-RS based RRM Measurement for L3 Mobility	LG Electronics	noted	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710274	Discussion on Radio Link Monitoring in NR	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710275	Discussion on codeword mapping	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710276	Discussion on codebook based transmission for UL	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:30:17
R1-1710277	Discussion on non-codebook based transmission for UL	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710278	Discussion on diversity transmission for UL	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710279	Discussion on cooperative transmission	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710280	Discussion on rate matching	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710281	Discussion on DL beam management	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710282	Discussion on UL beam management	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710283	Discussion on beam failure recovery	LG Electronics	noted	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710284	Discussion on CSI framework	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710285	Discussion on interference measurement	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:05
R1-1710286	Discussion on CSI acquisition for reciprocity based operation	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710287	Discussion on overhead reduction for Type II codebook	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710288	Discussions on CSI reporting contents	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710289	CSI feedback for OL and semi-OL MIMO	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710290	UL channel utilization for CSI reporting	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710291	On collision avoidance for PTRS and other RSs	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710292	On CSI-RS design for beam management	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710293	On CSI-RS design for CSI acquisition	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710294	On DL DMRS design	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710295	On UL DMRS design	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710296	On DL PT-RS design	LG Electronics	noted	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710297	On UL PT-RS design	LG Electronics	revised	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710298	On SRS design and related operations	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710299	Discussion on fine time/frequency tracking of channel	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710300	Discussion on QCL for NR	LG Electronics	available	2017-06-14 07:52:45	2017-06-17 05:32:06
R1-1710301	Phase 3 SLS Calibration Results for NR MIMO	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41

R1-1710302	Phase 2 LLS Calibration Results for NR MIMO	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710303	Discussion on NR-PDCCH structure	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710304	Discussion on reference signal for NR-PDCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710305	Discussion on CORESET configuration	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710306	Discussion on hierarchical search space structure	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710307	Discussion on multi-beam operation for NR-PDCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710308	Discussion on multiplexing between control and data	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710309	Discussion on the structure of group common PDCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710310	Discussion on the contents of group common PDCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710311	Discussion on UE behavior for the group common PDCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710312	Discussion on DL control with ultra-reliability	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710313	Design of short NR-PUCCH for up to 2 UCI bits	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710314	Design of short NR-PUCCH for more than 2 UCI bits	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710315	Design of long NR-PUCCH for up to 2 UCI bits	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710316	Design of long NR-PUCCH for more than 2 UCI bits	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710317	Support of long NR-PUCCH over multiple slots	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710318	Consideration on transmit diversity for NR-PUCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710319	Consideration on resource allocation for NR-PUCCH	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710320	Support of UCI piggyback on PUSCH for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:33:41
R1-1710321	Support of uplink channel multiplexing for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710322	Discussion on UL control with ultra-reliability	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710323	Discussion on frequency-domain resource allocation	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710324	Discussion on time-domain resource allocation	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710325	Discussion on TB size determination for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710326	Discussion on scheduling request for UL transmission with grant	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710327	Discussion on UL transmission without grant	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710328	Summary of [89-22] Email discussion about UL data transmission without UL grant	LG Electronics	noted	2017-06-14 07:52:46	2017-06-27 15:27:51
R1-1710329	Consideration on CBG construction for NR HARQ	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710330	Consideration on DCI signaling for CBG based HARQ	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710331	Consideration on UCI signaling for CBG based HARQ	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710332	Consideration on HARQ-ACK feedback timing for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710333	Support of HARQ-ACK multiplexing/bundling for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710334	Discussion on HARQ process number for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710335	Discussion on soft buffer management for NR	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710336	Discussion on pre-emption indication for downlink	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710337	Discussion on eMBB and URLLC multiplexing for uplink	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710338	Discussion on scheduling and HARQ procedure for URLLC	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710339	Support of cross-CC DCI/UCI transmission for NR CA	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710340	Discussion on dual connectivity with single active UL at a given time	LG Electronics	available	2017-06-14 07:52:46	2017-06-17 05:45:28
R1-1710341	Discussion on CRC reduction and attachment for eMBB data	LG Electronics	available	2017-06-14 07:52:46	2017-06-20 05:34:16
R1-1710342	Code block segmentation for eMBB	LG Electronics	noted	2017-06-14 07:52:46	2017-06-20 05:34:16

R1-1710343	On rate matching with LDPC code for eMBB	LG Electronics	available	2017-06-14 07:52:46	2017-06-20 05:34:16
R1-1710344	Discussion on bit level interleaver	LG Electronics	noted	2017-06-14 07:52:47	2017-06-20 05:34:16
R1-1710345	Circulant permutation matrix design for LDPC codes	LG Electronics	revised	2017-06-14 07:52:47	2017-06-27 15:17:52
R1-1710346	Early termination effect of polar codes	LG Electronics	available	2017-06-14 07:52:47	2017-06-20 05:34:16
R1-1710347	Repetition scheme of polar codes	LG Electronics	revised	2017-06-14 07:52:47	2017-06-20 05:34:16
R1-1710348	Design of polar codes with high order modulations	LG Electronics	available	2017-06-14 07:52:47	2017-06-20 05:34:16
R1-1710349	Details on PBCH coding	LG Electronics	available	2017-06-14 07:52:47	2017-06-20 05:34:16
R1-1710350	Discussion on CLI measurement for Duplexing Flexibility	LG Electronics	noted	2017-06-14 07:52:47	2017-06-17 05:45:28
R1-1710351	Discussion on details of backhaul signaling for duplexing flexibility	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710352	Remaining details on wider bandwidth operation	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710353	Remaining details on DL sharing between LTE and NR	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710354	Remaining details on UL sharing between LTE and NR	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710355	Discussion on power sharing for LTE-NR dual connectivity	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710356	Discussion on uplink power control for NR	LG Electronics	noted	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710357	Discussion on uplink power headroom report for NR	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710358	Multiplexing NCP and ECP	LG Electronics	available	2017-06-14 07:52:47	2017-06-17 05:46:07
R1-1710359	PT-RS design	Panasonic Corporation	available	2017-06-14 08:59:05	2017-06-16 08:17:09
R1-1710360	Discussion on PRB bundling size for NR DL	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710361	Differential RSRP report for beam management	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710362	DMRS configurations for CP-OFDM.	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710363	Considerations on PT-RS for CP-OFDM	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710364	Discussion on beam failure recovery	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710365	Discussion on CSI-RS design for CSI acquisition	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710366	Discussion on NR-REG to NR-CCE time-frequency mapping	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710367	Discussion on 1-symbol PUCCH design	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710368	The relation among UE-specific DCI, GC-PDCCH, and semi-static signaling	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710369	NR-PBCH RE mapping and SS block composition	Spreadtrum Communications	noted	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710370	Discussion on time index indication	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-19 14:13:21
R1-1710371	Remaining issues on the subcarrier spacing of SS block	Spreadtrum Communications	available	2017-06-14 09:08:41	2017-06-16 10:31:12
R1-1710372	Remaining issues on SS block and SS burst set composition	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710373	Discussion on SS block time index indication	vivo	available	2017-06-14 12:28:06	2017-06-20 05:37:40

R1-1710374	SS block transmissions and RRM measurement in wideband CC	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710375	Views on NR-PBCH contents and payload size	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710376	NR-PBCH RE mapping and evaluation	vivo	noted	2017-06-14 12:28:06	2017-06-20 05:37:40
R1-1710377	SS block time index for idle/inactive measurement	vivo	withdrawn	2017-06-14 12:28:06	
R1-1710378	CSI-RS configuration for L3 mobility	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710379	Identification NSA mode during initial access	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710380	Discussion on UL grant-free transmission	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710381	Scheduling and HARQ aspects for URLLC reliability	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710382	Discussion on pre-emption indication for downlink	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710383	Discussion on UL multiplexing data with different transmission durations	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710384	Interference analysis for LTE-NR co-existence	vivo	noted	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710385	Issues on UL transmission for LTE-NR co-existence	vivo	available	2017-06-14 12:28:06	2017-06-17 06:44:33
R1-1710386	Discussion on short-PUCCH up to 2-bit	vivo	withdrawn	2017-06-14 12:28:07	2017-06-17 06:56:31
R1-1710387	Discussion on short-PUCCH more than 2-bit	vivo	revised	2017-06-14 12:28:07	2017-06-17 06:56:31
R1-1710388	Discussion of PUCCH resource indication	vivo	withdrawn	2017-06-14 12:28:07	
R1-1710389	DMRS design for NR-PDCCH	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710390	Discussion on REG bundling size/structure	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710391	Discussion on group common PDCCH and BD	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710392	Discussion on downlink RA	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710393	Discussion on search space design supporting dynamic DCI size	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710394	Discussion on NR UE supporting self-contained operation	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710395	DCI content size and compression	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710396	Discussion on CB grouping	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710397	Discussion on flexible length scheduling	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710398	NR transmission on anchor bandwidth part	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710399	Beam management and beam reporting	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710400	Beam failure recovery procedure	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710401	On CSI-RS design for beam management	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710402	On DL DMRS design	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710403	On PT-RS design for CP-OFDM	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710404	UL multi-beam power control	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710405	Feasibility study on subband constellation rotation for uplink PAPR reduction for CP-OFDM waveform	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710406	PAE consideration on supporting CP-OFDM and DFT-S-OFDM	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710407	Forward compatibility consideration for ECP design and NR-MBMS	vivo	available	2017-06-14 12:28:07	2017-06-17 06:44:33
R1-1710408	On pre-DFT RS/UCI multiplexing for PUCCH in short duration	Mitsubishi Electric RCE	available	2017-06-14 13:38:38	2017-06-16 14:58:34
R1-1710409	Views on SRS designs	Mitsubishi Electric Co.	revised	2017-06-14 15:38:40	2017-06-16 09:53:04
R1-1710410	Evaluation of DL DMRS designs	Mitsubishi Electric Co.	available	2017-06-14 15:43:21	2017-06-16 09:53:04

R1-1710411	Views on DL DMRS designs	Mitsubishi Electric Co.	available	2017-06-14 15:46:25	2017-06-16 09:53:04
R1-1710412	NR SS block and burst set composition	AT&T	noted	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710413	Further details on forward compatible resources in NR	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710414	Transmission duration indication for symbol-level/slot-level/multi-slot-level scheduling	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710415	Remaining details on the number of HARQ processes in NR	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710416	Design considerations for NR operation with wide bandwidths	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710417	Remaining details of NR-LTE coexistence in overlapping spectrum	AT&T	noted	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710418	HARQ-ACK feedback timing for FDD, semi-static TDD and mini-slot based transmissions	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710419	SS block time index indication	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710420	SS block transmissions in a wideband CC	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710421	Details of NR-PBCH contents	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710422	DL Tx beam reporting in msg. 3	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710423	Measurement based on SS block	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710424	Measurement based on CSI-RS for L3 mobility	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710425	Radio link monitoring	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710426	Remaining details of codeword mapping for NR MIMO	AT&T	noted	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710427	UL diversity transmission for NR	AT&T	noted	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710428	On the details of multi-TRP and multi-panel transmission	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710429	On the need of per RE level PDSCH rate-matching and RE mapping signalling	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710430	DL beam management details	AT&T	available	2017-06-14 18:39:05	2017-06-17 03:18:23
R1-1710431	Considerations on beam failure recovery mechanism	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710432	Discussion on the channels to carry CSI report	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710433	On the details of CSI acquisition	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710434	CSI feedback for closed loop and semi open loop transmission schemes	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710435	Multiplexing of CSI-RS with PDSCH in mixed numerology scenarios	AT&T	noted	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710436	Remaining details of CSI-RS	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710437	Control channel configuration for multi-TRP and multi-panel transmission	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710438	Group common PDCCH Structure for NR	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710439	On the contents of group common PDCCH	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710440	UE behaviour for group common PDCCH	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710441	Transmit diversity for PUCCH	AT&T	withdrawn	2017-06-14 18:45:46	
R1-1710442	On CBG construction for NR PDSCH and PUSCH	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710443	DCI design for CBG based retransmission	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710444	Uplink control channel design for CBG based retransmission	AT&T	available	2017-06-14 18:45:46	2017-06-17 03:18:23
R1-1710445	Minimum UE bandwidth in NR	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:52:07
R1-1710446	Codeword to layer mapping in NR	Huawei, HiSilicon	noted	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710447	Codebook based transmission for UL MIMO	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56

R1-1710448	Diversity-based transmission for UL	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710449	General views on DL beam management	Huawei, HiSilicon	revised	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710450	Multi-beam transmission for DL control channel	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710451	CSI acquisition details for NCJT	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710452	CSI acquisition details for hybrid CSI	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710453	The remaining issues for Type I codebook	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710454	The remaining issues for Type II codebook	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710455	Signaling of DMRS ports for SUMU-MIMO	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710456	DMRS design for URLLC	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710457	Considerations on UE-specific RS Sequence Design	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710458	Discussion on UL DMRS power boosting	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710459	Discussion on UL SRS transmission power	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710460	Resource sharing between NR-PDCCH and data	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710461	PUCCH resource allocation for HARQ-ACK and SR	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710462	On HARQ-ACK multiplexing and/or bundling	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710463	Transmit diversity for PUCCH	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710464	Multiplexing of PUCCH and PUSCH	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:56:42
R1-1710465	On uplink data scheduling	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:52:07
R1-1710466	Consideration on subsequent transmission after pre-emption	Huawei, HiSilicon	available	2017-06-14 21:19:49	2017-06-17 02:58:56
R1-1710467	DCI design for URLLC	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:58:56
R1-1710468	Discussion on Multi-TRP cooperation for URLLC	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:58:56
R1-1710469	Support of URLLC for TDD	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:58:56
R1-1710470	Necessity of multiple sequence for Polar code	Huawei, HiSilicon	noted	2017-06-14 21:19:50	2017-06-20 05:17:55
R1-1710471	CRC polynomial for L1 control information and MIB	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-20 05:17:55
R1-1710472	Benefits of implicit soft combining for PBCH by Polar code construction	Huawei, HiSilicon	revised	2017-06-14 21:19:50	2017-06-20 05:17:55
R1-1710473	Network-based mechanism for millimeter-wave link recovery	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:58:56
R1-1710474	Further consideration on pi/2 BPSK with FDSS	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:58:56
R1-1710475	Discussion on PHR calculation	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:56:42
R1-1710476	UE behavior related to group-common PDCCH	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:56:42
R1-1710477	Discussion on other system information delivery	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:52:07
R1-1710478	RACH procedures and resource configuration	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-17 02:52:07
R1-1710479	Evaluation of PM based early termination for Polar code	Huawei, HiSilicon	available	2017-06-14 21:19:50	2017-06-20 05:17:55
R1-1710480	CRC Attachment for Code Block Group	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710481	Study of Number of CRC Bits for Code Blocks	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710482	Study of Number of CRC Bits for Small Transport Blocks	Ericsson	noted	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710483	LDPC Code Performance at High Code Rate	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710484	Bit Ordering for Circular Buffer of LDPC Codes	Ericsson	noted	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710485	Rate Matching for NR LDPC codes	Ericsson	noted	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710486	Throughput Requirements of LDPC Decoder	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710487	LDPC Code Design for Base Graph #1	Ericsson	available	2017-06-14 22:27:05	2017-06-27 15:17:52
R1-1710488	LDPC Code Design for Base Graph #2	Ericsson	available	2017-06-14 22:27:05	2017-06-27 15:17:52
R1-1710489	Application of Two Base Graphs for NR Data Channels	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710490	CRC-based Polar Code Construction	Ericsson	noted	2017-06-14 22:27:05	2017-06-20 07:06:34

R1-1710491	Study of Early Termination for DCI	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710492	Information Sequence Design for Polar Codes	Ericsson	withdrawn	2017-06-14 22:27:05	
R1-1710493	On Bit Mapping Design for Polar Codes	Ericsson	revised	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710494	Impact of Puncturing on Bit-channel Capacities	Ericsson	revised	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710495	Polar Code Performance in Fading Channel	Ericsson	revised	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710496	Thresholds for Mother Code Size Determination	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:35
R1-1710497	Study of Number of CRC Bits for PBCH	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:35
R1-1710498	Polar Code Design for NR-PBCH	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:35
R1-1710499	LDPC Code Performance for High Reliability Use Cases	Ericsson	available	2017-06-14 22:27:05	2017-06-20 07:06:34
R1-1710500	Draft Reply LS on reading time index indication for RRM measurements	Intel Corporation	noted	2017-06-15 00:22:53	2017-06-17 06:19:32
R1-1710501	NR PSS and SSS design	Intel Corporation	noted	2017-06-15 00:22:53	2017-06-17 06:19:32
R1-1710502	SS Burst Set Composition	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:32
R1-1710503	Time Index Signaling for SS Blocks	Intel Corporation	revised	2017-06-15 00:22:54	2017-06-20 04:44:09
R1-1710504	SS Block(s) in Wideband Operation	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 10:18:33
R1-1710505	NR PBCH Design	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710506	SS Block Composition	Intel Corporation	revised	2017-06-15 00:22:54	2017-06-20 04:44:09
R1-1710507	DMRS Sequence for NR PBCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 08:09:28
R1-1710508	RMSI Delivery Mechanisms	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710509	NR Paging Design	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710510	NR PRACH Preamble design	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710511	Discussions on PRACH Capacity	Intel Corporation	available	2017-06-15 00:22:54	2017-06-27 15:17:52
R1-1710512	PRACH Power ramping procedure	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710513	4-step PRACH Procedures	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710514	SS Block based RRM Measurements	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 07:10:49
R1-1710515	CSI-RS based RRM Measurements	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 07:10:49
R1-1710516	NR Radio Link Monitoring	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710517	Remaining details on CW to MIMO layer mapping	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710518	On codebook based UL transmission	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710519	On non-codebook based UL transmission	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710520	On diversity based UL transmission	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710521	On PRB bundling for DL	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710522	Discussion on uplink multi-panel and multi-TRP operation	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710523	Support of downlink NC-JT in NR	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710524	Rate matching for NR	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710525	Details for UL Beam Management	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710526	Details for DL Beam Management	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710527	Discussion for Mechanism to Recover from Beam Failure	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710528	On Timing Advance for multi-beam operation	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710529	On NR CSI framework	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710530	On Details of CSI acquisition	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710531	On multiplexing of different RS types	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710532	On CSI-RS for beam management	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710533	On CSI-RS for CSI acquisition	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31

R1-1710534	On the remaining details of DM-RS design	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710535	On PT-RS for CP-OFDM	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710536	On PT-RS for DFT-s-OFDM	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710537	Discussion on SRS for NR	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710538	Discussion on TRS	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710539	On QCL for different BW parts and other QCL details	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710540	Calibration results for Phase 2 NR MIMO system level calibration	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710541	NR PDCCH physical structure	Intel Corporation	noted	2017-06-15 00:22:54	2017-06-17 08:50:57
R1-1710542	On DM-RS design for NR PDCCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710543	CORESETs for NR PDCCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710544	NR PDCCH: Search spaces and monitoring behavior	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710545	Multi-beam operation for NR PDCCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710546	Dynamic resource sharing between control and data	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710547	Group-common PDCCH: Physical structure	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:24:59
R1-1710548	Group-common PDCCH: Contents	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:24:59
R1-1710549	Group-common PDCCH: UE behavior	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:24:59
R1-1710550	Satisfying ultra-reliability targets for NR PDCCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710551	Performance of short PUCCH format for 1~2 bits HARQ-ACK	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710552	2-symbol NR PUCCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710553	Structure of 1~2 bits HARQ-ACK long PUCCH with TDM DMRS	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710554	Long PUCCH for moderate and large payload	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710555	Long PUCCH over multiple slots	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 09:31:05
R1-1710556	Transmit diversity for PUCCH	Intel Corporation	available	2017-06-15 00:22:54	2017-06-17 06:19:31
R1-1710557	Resource allocation for PUCCH during initial access	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710558	UCI multiplexing onto PUSCH	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710559	PUCCH-PUSCH multiplexing	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710560	On UL control channel design aspects for URLLC	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710561	Configurations of various long PUCCH lengths	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710562	Short PUCCH formats for 1~2 bits UCI	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710563	Cyclic shift assignment and CM for FDM DMRS and UCI	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710564	Short UL control channel early in a slot	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710565	DL/UL data frequency-domain resource allocation	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 09:35:22
R1-1710566	Time-domain resource allocation for DL and UL data	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:24:59
R1-1710567	SR configuration and UL data scheduling	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710568	UL grant-free transmissions: Resource configuration	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710569	On CBG construction	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:24:59
R1-1710570	DCI design and scheduling of CBG-based (re)transmissions	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710571	HARQ-ACK feedback for CBG-based (re)transmissions	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710572	HARQ-ACK multiplexing and bundling	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710573	On HARQ processes and HARQ RTT	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710574	Soft-buffer requirements in NR	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710575	Remaining details of DL pre-emption indication	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32

R1-1710576	Multiplexing of UL transmissions with different data durations and latency requirements	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710577	On link adaptation enhancements to support URLLC	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710578	Scheduling and UCI feedback for carrier aggregation	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:24:59
R1-1710579	On SRS fast switching	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 07:00:10
R1-1710580	On Dual Connectivity for NR	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:24:59
R1-1710581	Details on cross-link interference measurement	Intel Corporation	noted	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710582	On RS transmission location for cross-link interference measurement for NR duplex flexibility	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710583	Open issues for wider bandwidth operations	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710584	Open issues for LTE-NR coexistence	Intel Corporation	noted	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710585	Power sharing mechanism for NR dual connectivity	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:24:59
R1-1710586	PUSCH and PUCCH power control	Intel Corporation	available	2017-06-15 00:22:55	2017-06-17 06:19:32
R1-1710587	Polar code construction for NR control channel	NEC Corporation	available	2017-06-15 00:57:03	2017-06-20 03:41:45
R1-1710588	Results for short PUCCH for UCI of up to 2 bits	IITH	available	2017-06-15 01:02:02	2017-06-16 22:04:30
R1-1710589	Further discussion on pre-DFT multiplexing for short PUCCH	IITH	available	2017-06-15 01:04:00	2017-06-16 22:22:45
R1-1710590	Views on long-duration PUCCH	IITH	available	2017-06-15 01:06:19	2017-06-16 22:36:26
R1-1710591	Sequence design evaluation for rate-matched polar codes	NEC Corporation	available	2017-06-15 01:07:14	2017-06-20 03:42:25
R1-1710592	Next steps for pi/2 BPSK with spectrum shaping	IITH	available	2017-06-15 01:10:10	2017-06-16 21:25:44
R1-1710593	Discussion on CBG grouping	Guangdong OPPO Mobile Telecom.	available	2017-06-15 01:13:24	2017-06-16 10:20:33
R1-1710594	On codeword to RE mapping scheme	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710595	Discussion of RS for DL beam management	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710596	Discussion of beam recovery procedure	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710597	Enhanced SR carried in UL control channel	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710598	Long PUCCH design for UCI of up to 2 bits	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710599	Long PUCCH design for UCI of more than 2 bits	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710600	Long PUCCH over multiple slots	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710601	UL grant-free transmission for URLLC	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710602	CBG construction for CBG-based retransmission	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710603	DL control signalling for CBG-based retransmission	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710604	UL HARQ-ACK feedback for CBG-based retransmission	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37

R1-1710605	HARQ-ACK codebook design for CBG-based transmission	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710606	On eMBB/URLLC multiplexing for uplink transmission	Lenovo, Motorola Mobility	available	2017-06-15 02:53:58	2017-06-16 18:49:37
R1-1710607	On DM-RS for NR	Intel Corporation	available	2017-06-15 03:58:48	2017-06-17 06:19:32
R1-1710608	Delivery of remaining minimum system information	ETRI	available	2017-06-15 04:47:45	2017-06-17 02:52:24
R1-1710609	Delivery of other system information	ETRI	available	2017-06-15 04:47:45	2017-06-17 02:52:24
R1-1710610	NR-PRACH for various use cases	ETRI	available	2017-06-15 04:47:45	2017-06-17 02:52:24
R1-1710611	Discussion on codeword mapping	ETRI	available	2017-06-15 04:47:45	2017-06-17 02:52:24
R1-1710612	Discussion on downlink DMRS design	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710613	Discussion on uplink DMRS design	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710614	NR-PDCCH mapping structure and REG bundle size	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710615	DMRS design for NR-PDCCH	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710616	NR-PDCCH for broadcast information delivery	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710617	Discussion on dynamic indication of PDSCH start symbol	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710618	Short-PUCCH for UCI of up to 2 bits	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710619	Short-PUCCH for UCI of more than 2 bits	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710620	Long-PUCCH over multiple slots	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710621	Resource allocation and transmission scheme for URLLC grant-free transmission	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710622	UE bandwidth configuration during initial access	ETRI	available	2017-06-15 04:47:46	2017-06-17 02:52:24
R1-1710623	Remaining details on SS sequence design	Samsung	available	2017-06-15 08:06:47	2017-06-16 20:00:34
R1-1710624	SS burst set composition	Samsung	revised	2017-06-15 08:06:47	2017-06-17 01:00:30
R1-1710625	Timing indication based on SS block	Samsung	revised	2017-06-15 08:06:47	2017-06-20 04:47:54
R1-1710626	Remaining details on multiple SS block transmissions in wideband CC	Samsung	available	2017-06-15 08:06:47	2017-06-16 16:24:13
R1-1710627	NR-PBCH contents and payload size	Samsung	available	2017-06-15 08:06:47	2017-06-16 21:03:18
R1-1710628	NR-PBCH RE mapping and SS block composition	Samsung	noted	2017-06-15 08:06:47	2017-06-20 04:50:07
R1-1710629	Sequence design of DMRS for NR-PBCH	Samsung	available	2017-06-15 08:06:47	2017-06-16 20:00:34
R1-1710630	Remaining minimum system information delivery	Samsung	available	2017-06-15 08:06:47	2017-06-16 12:30:24
R1-1710631	Other system information delivery	Samsung	available	2017-06-15 08:06:47	2017-06-16 12:30:24
R1-1710632	Paging design	Samsung	available	2017-06-15 08:06:47	2017-06-17 00:42:26
R1-1710633	PRACH preamble format details for long/short sequence length	Samsung	available	2017-06-15 08:06:47	2017-06-16 07:58:22
R1-1710634	PRACH preamble format details for capacity enhancement and beam management	Samsung	available	2017-06-15 08:06:47	2017-06-16 10:51:50
R1-1710635	Power ramping and power control during RA procedure	Samsung	available	2017-06-15 08:06:47	2017-06-16 10:51:50
R1-1710636	4-step RACH procedure	Samsung	available	2017-06-15 08:06:47	2017-06-16 10:51:50
R1-1710637	Measurement based on SS block	Samsung	noted	2017-06-15 08:06:47	2017-06-16 19:59:42
R1-1710638	Measurement based on CSI-RS for L3 mobility	Samsung	revised	2017-06-15 08:06:47	2017-06-16 19:59:42
R1-1710639	Radio link monitoring	Samsung	available	2017-06-15 08:06:47	2017-06-16 19:59:42
R1-1710640	Discussion on SS periodicity and PBCH TTI	Samsung	available	2017-06-15 08:06:47	2017-06-17 01:50:11
R1-1710641	Considerations on PRACH design in high-mobility scenario	Samsung	available	2017-06-15 08:06:47	2017-06-16 10:51:50
R1-1710642	Finalizing Layer Mapping	Samsung	noted	2017-06-15 08:06:47	2017-06-16 21:23:17

R1-1710643	Codebook-Based UL Transmission	Samsung	noted	2017-06-15 08:06:47	2017-06-16 20:15:10
R1-1710644	Discussion on Non-Codebook-Based UL Transmission	Samsung	noted	2017-06-15 08:06:47	2017-06-16 21:23:17
R1-1710645	Diversity transmission for UL	Samsung	available	2017-06-15 08:06:47	2017-06-16 06:58:08
R1-1710646	PRB bundling for NR DMRS	Samsung	available	2017-06-15 08:06:47	2017-06-16 06:58:08
R1-1710647	Discussions on NR DL network coordination	Samsung	available	2017-06-15 08:06:47	2017-06-16 07:44:43
R1-1710648	Discussions on NR UL multi-panel/multi-TRP	Samsung	noted	2017-06-15 08:06:47	2017-06-16 07:44:43
R1-1710649	On PDSCH rate matching for NR	Samsung	noted	2017-06-15 08:06:48	2017-06-16 19:59:42
R1-1710650	Discussion on transmission parameter sets	Samsung	available	2017-06-15 08:06:48	2017-06-16 06:58:08
R1-1710651	Discussion of number of PDSCHs in NR-CoMP	Samsung	available	2017-06-15 08:06:48	2017-06-16 19:15:24
R1-1710652	Multi-TA procedures for Multi-TRP	Samsung	available	2017-06-15 08:06:48	2017-06-16 23:45:41
R1-1710653	UL beam management	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:31:21
R1-1710654	DL beam management for NR	Samsung	noted	2017-06-15 08:06:48	2017-06-16 22:14:27
R1-1710655	Beam failure recovery	Samsung	available	2017-06-15 08:06:48	2017-06-17 01:50:11
R1-1710656	Measurement and reporting for beam management	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:31:21
R1-1710657	Discussion on Group based reporting	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:31:21
R1-1710658	Discussion on Tx beam grouping configuration	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:31:22
R1-1710659	Discussion on beam indication for PDSCH	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:31:22
R1-1710660	L1 RSRP reporting for beam management	Samsung	available	2017-06-15 08:06:48	2017-06-16 06:58:08
R1-1710661	L1-RSRP measurement duration	Samsung	available	2017-06-15 08:06:48	2017-06-16 22:14:27
R1-1710662	On SS-block based beam management	Samsung	noted	2017-06-15 08:06:48	2017-06-16 22:14:27
R1-1710663	DL beam management configuration	Samsung	available	2017-06-15 08:06:48	2017-06-16 22:14:27
R1-1710664	QCL associations for beam management RS	Samsung	available	2017-06-15 08:06:48	2017-06-16 22:14:27
R1-1710665	Aperiodic BSI reporting	Samsung	available	2017-06-15 08:06:48	2017-06-16 23:45:41
R1-1710666	Beam management for PDCCCH	Samsung	revised	2017-06-15 08:06:48	2017-06-16 00:17:37
R1-1710667	CSI Acquisition and Beam Management Framework	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:23:17
R1-1710668	Discussions on CSI measurements and reporting for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 06:58:08
R1-1710669	CSI Reporting for Reciprocity Operation	Samsung	noted	2017-06-15 08:06:48	2017-06-16 21:23:17
R1-1710670	Remaining details of Type I and Type II CSI codebooks	Samsung	available	2017-06-15 08:06:48	2017-06-16 20:15:10
R1-1710671	CSI support for transparent precoder cycling	Samsung	available	2017-06-15 08:06:48	2017-06-16 06:58:08
R1-1710672	CSI parameters and multiplexing	Samsung	noted	2017-06-15 08:06:48	2017-06-16 21:23:17
R1-1710673	Differential reporting of Type II CSI	Samsung	available	2017-06-15 08:06:48	2017-06-16 20:15:10
R1-1710674	On higher rank (3 and 4) Type II CSI	Samsung	available	2017-06-15 08:06:48	2017-06-16 20:15:10
R1-1710675	Discussion on CSI-RS Resource Activation	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:23:17
R1-1710676	Discussions on channel and interference measurements for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 06:58:08
R1-1710677	Discussions on CSI Feedback Signalling Overhead Reduction	Samsung	available	2017-06-15 08:06:48	2017-06-16 18:47:31
R1-1710678	Discussions on multiplexing of different types of RSs for DL	Samsung	noted	2017-06-15 08:06:48	2017-06-16 07:44:43
R1-1710679	Discussions on multiplexing of different types of RSs for UL	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:44:43
R1-1710680	Discussions on CSI-RS design for NR MIMO	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:44:43
R1-1710681	CSI-RS for beam management	Samsung	available	2017-06-15 08:06:48	2017-06-16 10:13:46
R1-1710682	Discussion on DL DMRS design for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:25:09
R1-1710683	Evaluation results on DL DMRS for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:46:21
R1-1710684	Discussion on UL DMRS design for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:46:21
R1-1710685	Evaluation results on UL DMRS for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:46:21

R1-1710686	On DL PTRS design	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:58:22
R1-1710687	On UL PTRS for DFT-s-OFDM	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:58:22
R1-1710688	SRS design for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 21:31:22
R1-1710689	Discussions on fine time/frequency tracking for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 07:44:43
R1-1710690	On QCL for NR	Samsung	available	2017-06-15 08:06:48	2017-06-16 19:59:42
R1-1710691	Resource Mapping for PDCCH	Samsung	available	2017-06-15 08:06:48	2017-06-16 12:30:24
R1-1710692	DMRS Structure for PDCCH	Samsung	revised	2017-06-15 08:06:49	2017-06-16 12:30:24
R1-1710693	CORESET Configurations	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710694	Search Space Design	Samsung	available	2017-06-15 08:06:49	2017-06-16 12:30:24
R1-1710695	Multibeam Transmission for PDCCH	Samsung	available	2017-06-15 08:06:49	2017-06-16 12:30:24
R1-1710696	Multiplexing NR-PDCCH and PDSCH	Samsung	available	2017-06-15 08:06:49	2017-06-16 12:30:24
R1-1710697	UE-Group Common PDCCH Structure	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710698	Functionalities of UE-Common PDCCH	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710699	UE Behavior for UE-Group Common PDCCH Detection	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710700	PDCCH Design for URLLC	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:17:15
R1-1710701	Transmit Diversity for PDCCH	Samsung	available	2017-06-15 08:06:49	2017-06-17 00:42:26
R1-1710702	Bandwidth Part Hopping for CORESETS	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710703	Short PUCCH for UCI of 1 or 2 Bits	Samsung	available	2017-06-15 08:06:49	2017-06-17 02:43:12
R1-1710704	Short PUCCH for UCI of more than 2 Bits	Samsung	available	2017-06-15 08:06:49	2017-06-17 02:43:12
R1-1710705	Long PUCCH for UCI of 1 or 2 Bits	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710706	Long PUCCH for UCI of more than 2 Bits	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710707	Multi-Slot Long PUCCH Transmission	Samsung	available	2017-06-15 08:06:49	2017-06-16 12:30:24
R1-1710708	Transmit Diversity for PUCCH	Samsung	available	2017-06-15 08:06:49	2017-06-17 02:43:12
R1-1710709	Resource Allocation for PUCCH with HARQ-ACK	Samsung	available	2017-06-15 08:06:49	2017-06-16 10:51:50
R1-1710710	On UCI Multiplexing in PUSCH	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710711	On Simultaneous PUSCH and PUCCH Transmissions	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710712	PUCCH Design for URLLC	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:17:15
R1-1710713	Performance Results for Long PUCCH	Samsung	available	2017-06-15 08:06:49	2017-06-17 02:43:12
R1-1710714	Performance Results for UCI and Data Multiplexing	Samsung	available	2017-06-15 08:06:49	2017-06-17 02:43:12
R1-1710715	UE-Group CSI Reporting	Samsung	withdrawn	2017-06-15 08:06:49	
R1-1710716	Multiplexing PUSCH with Short PUCCH or SRS	Samsung	available	2017-06-15 08:06:49	2017-06-17 01:26:31
R1-1710717	BSI/CSI Transmission on PUCCH	Samsung	available	2017-06-15 08:06:49	2017-06-16 23:45:41
R1-1710718	DL/UL Frequency Resource Allocation	Samsung	available	2017-06-15 08:06:49	2017-06-17 00:42:26
R1-1710719	DL/UL Time Resource Allocation	Samsung	available	2017-06-15 08:06:49	2017-06-16 10:51:50
R1-1710720	Transport Block Size Determination	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:36:57
R1-1710721	SR Transmission for Multiple Configurations	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:39:43
R1-1710722	Procedures for Grant-Based UL Transmissions	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:39:43
R1-1710723	Procedures for Grant-Free UL Transmissions	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:39:43
R1-1710724	Grant-Free and Grant-Based UL Transmissions	Samsung	available	2017-06-15 08:06:49	2017-06-16 10:51:50
R1-1710725	CBG Construction	Samsung	available	2017-06-15 08:06:49	2017-06-16 07:36:57
R1-1710726	Scheduling for CBG Retransmissions	Samsung	available	2017-06-15 08:06:49	2017-06-16 10:51:50
R1-1710727	HARQ-ACK Feedback for CBG-Based Retransmissions	Samsung	available	2017-06-15 08:06:49	2017-06-16 10:51:50
R1-1710728	HARQ-ACK Feedback Timing	Samsung	available	2017-06-15 08:06:49	2017-06-16 10:51:50
R1-1710729	HARQ-ACK Codeword Determination	Samsung	available	2017-06-15 08:06:50	2017-06-16 10:51:50

R1-1710730	On Number of HARQ Processes and HARQ RTT	Samsung	available	2017-06-15 08:06:50	2017-06-16 07:36:57
R1-1710731	Soft Buffer Partitioning	Samsung	available	2017-06-15 08:06:50	2017-06-17 01:26:31
R1-1710732	Indication of Preempted Resources in DL	Samsung	available	2017-06-15 08:06:50	2017-06-16 07:17:15
R1-1710733	On Indication of Preempted Resources in UL	Samsung	available	2017-06-15 08:06:50	2017-06-16 12:30:24
R1-1710734	Scheduling/HARQ Procedures for URLLC	Samsung	available	2017-06-15 08:06:50	2017-06-16 07:17:16
R1-1710735	Remaining Aspects for Short Scheduling Durations	Samsung	available	2017-06-15 08:06:50	2017-06-16 07:39:43
R1-1710736	Triggered UCI Transmissions	Samsung	available	2017-06-15 08:06:50	2017-06-17 01:26:31
R1-1710737	DL Resource Allocation for Multiplexing Data with Different Transmissions Durations	Samsung	available	2017-06-15 08:06:50	2017-06-16 06:52:04
R1-1710738	Average User Plane Latency for Preemption based Multiplexing	Samsung	available	2017-06-15 08:06:50	2017-06-16 06:52:04
R1-1710739	Cross-Carrier Scheduling and HARQ-ACK Feedback	Samsung	available	2017-06-15 08:06:50	2017-06-17 01:26:31
R1-1710740	Fast Carrier Switching for SRS Transmissions	Samsung	available	2017-06-15 08:06:50	2017-06-17 01:26:31
R1-1710741	DC for UE with Single UL Carrier Capability	Samsung	available	2017-06-15 08:06:50	2017-06-17 01:26:31
R1-1710742	CB segmentation on data channel	Samsung	noted	2017-06-15 08:06:50	2017-06-19 10:55:02
R1-1710743	UE operation for two different base graphs	Samsung	available	2017-06-15 08:06:50	2017-06-19 10:55:02
R1-1710744	LDPC Code for BG#1	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710745	LDPC Code for BG#2	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710746	Modulo Lifting for Length-Flexible QC LDPC Codes	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710747	Polar code construction	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710748	Scrambling for polar codes	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710749	Design of combined-and-Nested polar code sequences	Samsung	revised	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710750	Design of unified rate-matching for polar codes	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710751	Circular buffer management for polar code rate-matching	Samsung	noted	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710752	Design of channel interleaver for polar codes	Samsung	available	2017-06-15 08:06:50	2017-06-20 06:37:16
R1-1710753	Modulation Schemes for NR	Samsung	available	2017-06-15 08:06:50	2017-06-17 02:01:01
R1-1710754	Cross-link Interference Management Based on UE Measurements	Samsung	available	2017-06-15 08:06:50	2017-06-16 22:14:27
R1-1710755	Cross-link Interference Management based on Coordinated Beamforming	Samsung	noted	2017-06-15 08:06:50	2017-06-16 07:54:11
R1-1710756	Performance Evaluation of Cross-Link Interference Management	Samsung	available	2017-06-15 08:06:50	2017-06-16 22:14:27
R1-1710757	Timing Alignment on Cross-Link for Dynamic TDD	Samsung	available	2017-06-15 08:06:50	2017-06-16 07:54:11
R1-1710758	Cross-Link Interference Management based on Power Control	Samsung	available	2017-06-15 08:06:50	2017-06-16 07:54:11
R1-1710759	Discussion on CLI Mitigation with Network Coordination	Samsung	available	2017-06-15 08:06:50	2017-06-16 19:15:24
R1-1710760	Interference Measurement Table and Beam Coordination	Samsung	available	2017-06-15 08:06:51	2017-06-16 08:10:01
R1-1710761	Wider Bandwidth Operations	Samsung	available	2017-06-15 08:06:51	2017-06-16 12:30:24
R1-1710762	LTE-NR coexistence for DL	Samsung	available	2017-06-15 08:06:51	2017-06-16 12:30:24
R1-1710763	LTE-NR coexistence for UL	Samsung	noted	2017-06-15 08:06:51	2017-06-16 09:36:38
R1-1710764	On UL Power Sharing for Multi-Cell Transmissions	Samsung	available	2017-06-15 08:06:51	2017-06-22 03:09:57
R1-1710765	Power Control Framework	Samsung	available	2017-06-15 08:06:51	2017-06-17 02:43:12
R1-1710766	On PHR Requirements and Calculation	Samsung	available	2017-06-15 08:06:51	2017-06-16 10:51:50
R1-1710767	ECP Aspects for 60kHz SCS	Samsung	available	2017-06-15 08:06:51	2017-06-17 02:43:12

R1-1710768	On PAPR of DMRS for p2-BPSK DFT-s-OFDM with Spectrum Shaping	Samsung	available	2017-06-15 08:06:51	2017-06-17 02:01:01
R1-1710769	RACH Aspects for CA and DC	Samsung	available	2017-06-15 08:06:51	2017-06-16 13:47:05
R1-1710770	Discussion on Polar code construction	Spreadtrum Communications	available	2017-06-15 08:42:47	2017-06-19 14:13:21
R1-1710771	Discussions on UE-to-UE interference measurement and report	Panasonic	noted	2017-06-15 09:25:24	2017-06-16 09:22:06
R1-1710772	Discussions on intended DL/UL direction configuration via Xn signalling	Panasonic	available	2017-06-15 09:25:24	2017-06-16 09:22:06
R1-1710773	CORESET configuration for RMSI scheduling	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710774	Discussion on RACH configuration	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710775	Discussion on RRM measurement on SS blocks	CMCC	withdrawn	2017-06-15 09:46:37	
R1-1710776	Comparisons on Beam Reporting in NR	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710777	Discussion on PT-RS design	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710778	On DMRS Design for NR-PDCCH	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710779	Discussion on CORESET duration	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710780	Discussion on NR-PDCCH search space design	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710781	UE behaviour related to dynamic and semi-static configured resources	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710782	Discussion on subband-based PUCCH resource allocation and indication	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710783	Discussion on timing design for semi-static DL/UL assignment	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710784	Discussion on UE-to-UE cross-link interference management	CMCC	noted	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710785	Discussion on the change of SS block frequency position	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710786	Discussion on NR power control and sharing	CMCC	available	2017-06-15 09:46:37	2017-06-17 02:39:22
R1-1710787	On default bandwidth part	PANASONIC	available	2017-06-15 09:50:28	2017-06-15 09:57:44
R1-1710788	Discussions on NR-PDCCH Structure	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710789	RS structures for NR-PDCCH	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710790	Discussions on CORESET configurations	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710791	Resource sharing between PDCCH and PDSCH	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710792	Structure of group-common PDCCH	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710793	Contents of group-common PDCCH	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710794	UE behaviour for group-common PDCCH	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710795	Timing of HARQ-ACK for PDSCH	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710796	Further Details on Wider Bandwidth Operations in NR	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710797	Discussion on PBCH Contents	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-17 05:19:18
R1-1710798	Discussion on SS burst set composition	MediaTek Inc.	available	2017-06-15 10:24:15	2017-06-20 06:02:12
R1-1710799	Further discussion on SS block index indication	MediaTek Inc.	available	2017-06-15 10:24:16	2017-06-17 05:19:18
R1-1710800	Performance evaluation for RE mapping and SS block composition	MediaTek Inc.	noted	2017-06-15 10:24:16	2017-06-20 06:02:12
R1-1710801	Further discussion on Remaining minimum system information delivery	MediaTek Inc.	available	2017-06-15 10:24:16	2017-06-17 05:47:09
R1-1710802	Further discussion on OSI delivery	MediaTek Inc.	available	2017-06-15 10:24:16	2017-06-17 05:19:18
R1-1710803	Further discussion on paging design	MediaTek Inc.	available	2017-06-15 10:24:16	2017-06-20 06:02:12

<u>R1-1710804</u>	Discussion on measurement based on SS block	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710805</u>	Discussion on CSI-RS for L3 mobility	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710806</u>	Discussion on Radio Link Monitoring	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710807</u>	On the Robustness of NR SSS in Frequency Offset	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710808</u>	Discussions on NR DL beam management	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710809</u>	Efficient UL beam management with imperfect beam correspondence	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710810</u>	Mechanism for flexible beam failure recovery	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710811</u>	IFDMA Based Beam Management CSI-RS for Flexible TX/RX Beam Sweeping	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710812</u>	CSI acquisition for reciprocity based operation	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710813</u>	Remaining issues in NR CSI feedback	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710814</u>	Multi-TRP and panel transmission	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-23 20:31:49
<u>R1-1710815</u>	codeword mapping in NR	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710816</u>	Codebook based transmission in UL	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710817</u>	SRS design in NR	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-23 20:31:49
<u>R1-1710818</u>	CLI measurements in NR	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710819</u>	Performance evaluation on channel structure of short PUCCH for 1 or 2 bits UCI	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710820</u>	Discussion on UCI on PUSCH	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710821</u>	Discussion on PUCCH and PUSCH multiplexing	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710822</u>	On PRACH design to support uplink requests	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710823</u>	PRACH Msg1 retransmission	MediaTek Inc.	<u>revised</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710824</u>	On 4-step RACH procedure	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710825</u>	Optimization and comparison of Polar code rate-matching design	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-20 06:02:12
<u>R1-1710826</u>	Polar coding design for NR-PBCH combining	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-20 06:02:12
<u>R1-1710827</u>	On CRC attachment for TB and CB	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-20 06:02:12
<u>R1-1710828</u>	On interleaver for NR LDPC code	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-20 06:02:12
<u>R1-1710829</u>	On NR LDPC design and performance	MediaTek Inc.	<u>revised</u>	2017-06-15 10:24:16	2017-06-20 06:02:12
<u>R1-1710830</u>	Discussion on CBG construction for CBG-based (re)transmission	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710831</u>	On downlink DMRS design	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:18
<u>R1-1710832</u>	On TRS design requirement	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710833</u>	On CSI-RS configuration for fine time and frequency tracking support	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710834</u>	On support of Grant-free and Grant-based transmission for UL URLLC	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710835</u>	Grant-free Scheduling and retransmission schemes for UL URLLC	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710836</u>	On use of scrambling for UL Grant-free URLLC transmission	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710837</u>	HARQ procedure for DL URLLC	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710838</u>	Cross-slot scheduling for UE power saving	MediaTek Inc.	<u>available</u>	2017-06-15 10:24:16	2017-06-17 05:19:19
<u>R1-1710839</u>	UL Power Sharing for LTE-NR Dual Connectivity	MediaTek Inc.	<u>noted</u>	2017-06-15 10:24:16	2017-06-17 05:19:19

R1-1710840	Discussion on Uplink TDM Operation for NR NSA	China Telecommunications	noted	2017-06-15 10:49:27	2017-06-16 12:39:08
R1-1710841	Discussion on remaining system information delivery	Beijing Xinwei Telecom Techn.	available	2017-06-15 11:12:24	2017-06-16 09:52:57
R1-1710842	A flexible, low-latency, hardware-efficient SCL polar decoder	AccelerComm Ltd	available	2017-06-15 11:29:56	2017-06-16 21:38:19
R1-1710843	On the storage of polar code sequences	AccelerComm Ltd	noted	2017-06-15 11:31:22	2017-06-16 21:38:19
R1-1710844	Consideration on coding chain for eMBB data channel	ZTE	available	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710845	Shift coefficients design for base graph 1	ZTE	revised	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710846	Shift coefficients design for base graph 2	ZTE	revised	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710847	Performance evaluations on Polar codes	ZTE	available	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710848	Rate matching scheme of Polar codes	ZTE	available	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710849	Segmentation of Polar codes	ZTE	revised	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710850	Considerations on Channel Coding for NR-PBCH	ZTE	available	2017-06-15 12:32:22	2017-06-20 06:38:44
R1-1710851	Considerations on DL beam management	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710852	Considerations on UL beam management	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710853	Considerations on fine time/frequency tracking	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710854	Considerations on interference measurement	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710855	Considerations on SRS design	Sony	noted	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710856	On contents of group-common PDCCH	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710857	On structure of group-common PDCCH	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710858	Discussion on SS block time index indication	Sony	revised	2017-06-15 13:05:36	2017-06-19 20:01:27
R1-1710859	Considerations on SS block compositions	Sony	revised	2017-06-15 13:05:36	2017-06-19 20:01:27
R1-1710860	Considerations on 4-step RA procedure	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710861	Pre-emption in UL grant free resource	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710862	Reliable PDCCH operation for URLLC	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710863	Discussion on the retransmission of UL transmission without grant	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710864	Discussion on the CBG index indication by DCI	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710865	Remaining issues on using pre-emption indicator for DL URLLC/eMBB multiplexing	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710866	Feedback for improving URLLC reliability	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710867	Multiplexing data with different transmission durations for Uplink	Sony	available	2017-06-15 13:05:36	2017-06-16 16:58:19
R1-1710868	Blind Detection with Polar Codes	McGill University	withdrawn	2017-06-15 13:49:00	
R1-1710869	Partitioned List Decoding of Polar Codes	McGill University	withdrawn	2017-06-15 13:52:26	
R1-1710870	Power ramping for Msg1 preamble re-transmission	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710871	Multiple Msg1 transmissions for one monitored RAR window	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710872	CORESET Monitoring Under Dynamic Change of BWP	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710873	PDSCH starting position in NR	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710874	Considerations for ultra-reliable DCI transmission	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710875	Considerations for ultra-reliable UCI transmission	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710876	CBG based HARQ for NR	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710877	DL HARQ Feedback suppression	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710878	Bandwidth Adaptation via BWP Selection in NR	InterDigital, Inc.	available	2017-06-15 14:07:00	2017-06-16 20:55:03

R1-1710879	Power Sharing Mechanisms with LTE-NR DC and NR DC	InterDigital, Inc.	noted	2017-06-15 14:07:00	2017-06-16 20:55:03
R1-1710880	On uplink half-tone shift	Ericsson AB	noted	2017-06-15 14:31:31	2017-06-16 21:30:26
R1-1710881	On pi/2-BPSK DFTS-OFDM with spectrum shaping	Ericsson AB	available	2017-06-15 14:33:11	2017-06-16 21:30:26
R1-1710882	Multiple SS Blocks in wideband carrier	Ericsson AB	available	2017-06-15 14:38:27	2017-06-16 21:30:26
R1-1710883	On wider band aspects of NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 14:43:35	2017-06-16 16:34:45
R1-1710884	On NR CADC configuration	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 14:43:35	2017-06-16 16:34:45
R1-1710885	On cross-carrier scheduling and joint UCI design	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 14:43:35	2017-06-16 16:34:45
R1-1710886	UL diversity transmission for DFTsOFDM	Mitsubishi Electric RCE	available	2017-06-15 16:01:47	2017-06-16 14:58:34
R1-1710887	UL grant-free transmissions: Physical layer procedures	Intel Corporation	available	2017-06-15 16:40:08	2017-06-17 06:19:32
R1-1710888	HARQ-ACK feedback: Timing considerations	Intel Corporation	withdrawn	2017-06-15 16:41:03	
R1-1710889	NR Physical Random Access Channel	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:23:41	2017-06-16 21:12:36
R1-1710890	NR Physical Random Access Channel Capacity	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-15 17:23:41	2017-06-16 21:12:36
R1-1710891	Preamble Power Ramping and RACH Message 3 Power Control	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:23:41	2017-06-16 21:12:36
R1-1710892	NR 4-step RACH procedure	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:23:41	2017-06-16 21:12:36
R1-1710893	On the short PUCCH design for small UCI payloads	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710894	Short PUCCH design for UCI of more than 2 bits	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710895	On long PUCCH design for small payloads	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710896	Long PUCCH design for UCI more than 2 bits	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710897	Transmit Diversity for PUCCH	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710898	On the resource allocation for PUCCH	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710899	UCI multiplexing on PUSCH	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710900	On the multiplexing between PUCCHs and PUSCH	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710901	On URLLC UCI transmission	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710902	CP-OFDM waveform for NR long PUCCH	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-15 17:24:28	2017-06-16 21:23:22
R1-1710903	PDCCH structure for NR	NEC	available	2017-06-15 17:34:00	2017-06-17 05:46:17
R1-1710904	Uplink transmission in NR NSA mode	Apple Inc.	noted	2017-06-15 18:48:58	2017-06-17 04:14:25

R1-1710905	Signaling of SS block index	Apple Inc.	noted	2017-06-15 18:48:59	2017-06-17 04:14:25
R1-1710906	UE behavior on UL/DL transmission direction determination in NR TDD	Apple Inc.	available	2017-06-15 18:48:59	2017-06-17 04:14:25
R1-1710907	Control indicator in group-common PDCCH for UE power saving	Apple Inc.	available	2017-06-15 18:48:59	2017-06-17 04:14:25
R1-1710908	DL control signal for CBG-based transmission	Apple Inc.	available	2017-06-15 18:48:59	2017-06-17 04:14:25
R1-1710909	Discussion of NR-LTE coexistence on DL	ZTE	available	2017-06-15 19:16:36	2017-06-17 02:58:30
R1-1710910	Considerations of NR-LTE coexistence in uplink	ZTE	revised	2017-06-15 19:20:04	2017-06-17 02:58:30
R1-1710911	Power Control for CA and DC in NR	ZTE	available	2017-06-15 19:22:45	2017-06-17 02:58:30
R1-1710912	Reserved resources supporting NR co-existence with LTE and NB-IoT	Ericsson AB	available	2017-06-15 20:57:12	2017-06-16 21:30:26
R1-1710913	On Design of Synchronization Signal Sequences in NR	InterDigital, Inc.	available	2017-06-16 00:11:27	2017-06-17 02:41:30
R1-1710914	On SS Burst Set Composition and Multiplexing	InterDigital, Inc.	available	2017-06-16 00:13:07	2017-06-17 02:41:30
R1-1710915	On SS Block Based Timing Indication in NR	InterDigital, Inc.	available	2017-06-16 00:15:16	2017-06-20 04:20:51
R1-1710916	On Physical Broadcast Channel in NR	InterDigital, Inc.	available	2017-06-16 00:17:06	2017-06-17 02:41:30
R1-1710917	On NR-PBCH RE Mapping and SS Block Composition	InterDigital, Inc.	noted	2017-06-16 00:18:23	2017-06-20 04:20:51
R1-1710918	On DMRS Designs for NR-PBCH	InterDigital, Inc.	available	2017-06-16 00:19:14	2017-06-17 02:41:30
R1-1710919	On Minimum System Information Delivery	InterDigital, Inc.	available	2017-06-16 00:20:20	2017-06-17 02:41:30
R1-1710920	TPMI Indication for Frequency Selective UL Precoding	InterDigital, Inc.	available	2017-06-16 00:21:43	2017-06-16 23:50:38
R1-1710921	STBC-based Transmission for Uplink Transmit Diversity	InterDigital, Inc.	available	2017-06-16 00:22:23	2017-06-16 23:50:38
R1-1710922	PRG Size Indication in NR	InterDigital, Inc.	available	2017-06-16 00:23:13	2017-06-16 23:50:38
R1-1710923	DCI Design for Multi-TRP/Panel Transmission for DL	InterDigital, Inc.	available	2017-06-16 00:23:55	2017-06-16 23:50:38
R1-1710924	On Beam Management for DL Control and Data Channels	InterDigital, Inc.	available	2017-06-16 00:24:51	2017-06-16 23:50:38
R1-1710925	On Efficient UL Beam Management	InterDigital, Inc.	available	2017-06-16 00:25:56	2017-06-16 23:51:11
R1-1710926	On Remaining Details of Beam Failure Recovery	InterDigital, Inc.	available	2017-06-16 00:26:36	2017-06-16 23:51:11
R1-1710927	On CSI framework for NR	InterDigital, Inc.	available	2017-06-16 00:27:17	2017-06-16 23:51:11
R1-1710928	On CSI acquisition for NR	InterDigital, Inc.	available	2017-06-16 00:27:59	2017-06-16 23:51:11
R1-1710929	Discussion on SRS sequence generation for NR	Panasonic Corporation	available	2017-06-16 00:28:02	2017-06-16 10:02:07
R1-1710930	Discussion on 1-symbol NR-PUCCH for UCI of up to 2 bits	Panasonic Corporation	revised	2017-06-16 00:28:38	2017-06-16 10:02:07
R1-1710931	CSI-RS Design for Beam Management	InterDigital, Inc.	noted	2017-06-16 00:28:44	2017-06-16 23:51:11
R1-1710932	Discussion on channel structure of long-duration NR-PUCCH for UCI of up to 2 bits	Panasonic Corporation	available	2017-06-16 00:29:05	2017-06-16 10:02:07
R1-1710933	On DM-RS design for NR	InterDigital, Inc.	available	2017-06-16 00:29:16	2017-06-16 23:51:34
R1-1710934	Discussion on channel design of long-duration NR-PUCCH for UCI of more than 2 bits	Panasonic Corporation	available	2017-06-16 00:29:27	2017-06-16 10:02:07
R1-1710935	Discussion on support of long-duration NR-PUCCH over multiple slots	Panasonic Corporation	available	2017-06-16 00:29:48	2017-06-16 10:02:07
R1-1710936	Remaining issues on PTRS for NR	InterDigital, Inc.	noted	2017-06-16 00:29:52	2017-06-16 23:51:34
R1-1710937	Discussion on resource allocation for uplink control channel	Panasonic Corporation	available	2017-06-16 00:30:13	2017-06-16 10:02:07
R1-1710938	On SRS for NR	InterDigital, Inc.	available	2017-06-16 00:30:27	2017-06-16 23:51:34
R1-1710939	Discussion on UCI on PUSCH	Panasonic Corporation	available	2017-06-16 00:30:35	2017-06-16 10:02:07
R1-1710940	Discussion on UCI and data multiplexing	Panasonic Corporation	available	2017-06-16 00:30:53	2017-06-16 10:02:07
R1-1710941	On OCL for NR	InterDigital, Inc.	available	2017-06-16 00:31:02	2017-06-16 23:51:34

R1-1710942	Discussion on SR for URLLC and multiplexing with HARQ-ACK	Panasonic Corporation	available	2017-06-16 00:31:10	2017-06-16 10:02:07
R1-1710943	Discussion on PRB grid and PRB indexing	Panasonic Corporation	available	2017-06-16 00:31:33	2017-06-16 10:02:07
R1-1710944	On the impact of multi-beam operation on PDCCH structure	InterDigital, Inc.	available	2017-06-16 00:31:54	2017-06-16 23:51:34
R1-1710945	On REG bundling and associated DMRS	InterDigital, Inc.	available	2017-06-16 00:32:29	2017-06-16 23:51:58
R1-1710946	Search space design for eMBB-URLLC Multiplexing	InterDigital, Inc.	available	2017-06-16 00:33:05	2017-06-16 23:51:58
R1-1710947	Group-common PDCCH design considerations	InterDigital, Inc.	available	2017-06-16 00:33:54	2017-06-16 23:51:58
R1-1710948	UE behaviour related to CORESET(s) configured by PBCH	InterDigital, Inc.	available	2017-06-16 00:34:31	2017-06-16 23:51:58
R1-1710949	On Ultra-reliable and low-latency PDCCH	InterDigital, Inc.	available	2017-06-16 00:35:27	2017-06-16 23:51:58
R1-1710950	Evaluations of 1-symbol short PUCCH with 1 or 2 bit(s)	InterDigital, Inc.	available	2017-06-16 00:36:11	2017-06-17 05:36:32
R1-1710951	On transmit diversity for Long PUCCH	InterDigital, Inc.	available	2017-06-16 00:36:52	2017-06-16 23:52:20
R1-1710952	Considerations on UCI transmission on PUSCH	InterDigital, Inc.	available	2017-06-16 00:37:46	2017-06-16 23:52:20
R1-1710953	On frequency-domain resource allocation for NR	InterDigital, Inc.	available	2017-06-16 00:38:23	2017-06-16 23:52:20
R1-1710954	HARQ feedback design considerations for CBG based transmission	InterDigital, Inc.	available	2017-06-16 00:39:02	2017-06-16 23:52:20
R1-1710955	Signalling design considerations for DL pre-emption indication	InterDigital, Inc.	available	2017-06-16 00:39:39	2017-06-16 23:52:20
R1-1710956	Multiplexing of low-latency traffic and non-latency sensitive traffic in UL	InterDigital, Inc.	available	2017-06-16 00:40:25	2017-06-16 23:52:42
R1-1710957	Data channel processing and CRC attachment	InterDigital, Inc.	noted	2017-06-16 00:41:15	2017-06-16 23:52:42
R1-1710958	Code block segmentation for eMBB data channel	InterDigital, Inc.	available	2017-06-16 00:43:49	2017-06-16 23:52:42
R1-1710959	Parameter selection for polar codes puncturing and shortening	InterDigital, Inc.	available	2017-06-16 00:44:32	2017-06-16 23:52:42
R1-1710960	Parameter selection for polar codes repetition	InterDigital, Inc.	available	2017-06-16 00:45:06	2017-06-16 23:52:42
R1-1710961	Interleaver design for polar codes with high order modulation	InterDigital, Inc.	available	2017-06-16 00:45:37	2017-06-16 23:52:55
R1-1710962	Common and Beam Specific Power Control Parameters	InterDigital, Inc.	withdrawn	2017-06-16 00:46:20	2017-06-16 23:52:55
R1-1710963	On network resources and UE transmission configurations for grant-free access	NEC	available	2017-06-16 01:48:34	2017-06-16 06:28:42
R1-1710964	On UE-to-UE measurement for CLI management	NEC	available	2017-06-16 01:48:34	2017-06-16 06:28:42
R1-1710965	On cross-carrier scheduling and HARQ-ACK feedback for NR CA	NEC	available	2017-06-16 01:48:34	2017-06-16 06:28:42
R1-1710966	Flexible subcarrier spacing in the uplink for NR use cases including mMTC	ATR	available	2017-06-16 01:49:13	2017-06-16 02:14:35
R1-1710967	Number of HARQ processes for co-existence with TD-LTE	NEC Corporation	available	2017-06-16 02:03:08	2017-06-16 09:27:36
R1-1710968	Summary of [89-20] email discussion on Group-common PDCCH for NR	CATT	noted	2017-06-16 02:20:28	2017-06-28 13:47:51
R1-1710969	NR-PDCCH for multi-TRP transmission	China Telecommunications	available	2017-06-16 02:21:34	2017-06-16 08:11:55
R1-1710970	On front-load DMRS design	China Telecommunications	available	2017-06-16 02:23:10	2017-06-16 08:11:55
R1-1710971	UL grant-free transmission for URLLC	China Telecommunications	available	2017-06-16 02:27:44	2017-06-16 08:11:55
R1-1710972	Control signalling for CBG-based (re)transmission	China Telecommunications	available	2017-06-16 02:29:56	2017-06-16 08:11:55
R1-1710973	Discussion on REG bundle size	ITRI	available	2017-06-16 02:36:07	2017-06-16 08:54:11

R1-1710974	Discussion on using sub-time unit for CSI-RS of beam management	ITRI	available	2017-06-16 02:36:07	2017-06-16 08:54:11
R1-1710975	Considerations and Evaluation on SS Sequence Design for New Radio	ITRI	available	2017-06-16 02:36:07	2017-06-16 08:54:11
R1-1710976	NR Long PUCCH Requirements	CMCC	available	2017-06-16 02:43:39	2017-06-17 02:39:22
R1-1710977	Discussion on RRM measurement on SS blocks	CMCC	noted	2017-06-16 02:50:19	2017-06-17 02:39:22
R1-1710978	On the PDCCH construction for NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710979	On the remaining details of PDCCH reference signal structure	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710980	On the PDCCH control resource set and its connection to the search space for NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710981	On the search space design and UE blind detection	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710982	PDCCH support for multi-beam system	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710983	Resource sharing between PDCCH and PDSCH in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710984	On the structure of group common PDCCH in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710985	On the contents of group common PDCCH in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710986	On the UE behaviour related to group common PDCCH in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710987	On the URLLC specific aspects for DL control channel	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:52	2017-06-17 03:29:17
R1-1710988	On the usage of PDCCH DMRS as a complementary synchronization signal in DL	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
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R1-1710992	Discussion on multiple SR configuration	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
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R1-1710994	UE identification and HARQ for URLLC UL grant-free	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-1710995	Mapping code blocks to code block groups	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-1710996	DL control signalling for CBG-based transmissions	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17

R1-17110997	HARQ-ACK feedback for CBG-based (re-)transmission in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
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R1-17111000	On the number of HARQ processes	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-17111001	On the HARQ soft buffer handling	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-17111002	On pre-emption indication	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-17111003	Pause-Resume Scheduling for Low Latency Uplink Transmissions	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-17111004	Discussion on scheduling based URLLC transmission	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 03:29:17
R1-17111005	CSI measuring and reporting procedure for URLLC	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 02:57:53	2017-06-17 04:36:40
R1-17111006	Issues and Control Design for UL Grant-free URLLC	Ill	available	2017-06-16 03:22:13	2017-06-16 20:22:34
R1-17111007	Codeword to layer mapping for DL and UL	Ericsson	noted	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-17111008	UL MIMO for codebook based transmission	Ericsson	revised	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-17111009	UL MIMO for non-codebook based transmission	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-17111010	Robust Transmission Scheme for PUSCH	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
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R1-17111012	UL multi-panel transmission	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
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R1-17111016	UL beam management details	Ericsson	noted	2017-06-16 03:22:19	2017-06-17 05:29:06
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R1-17111023	Analysis of beam indication signalling options	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-17111024	Further details of CSI framework	Ericsson	noted	2017-06-16 03:22:19	2017-06-17 05:29:06
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R1-17111026	Further discussion on CSI acquisition for reciprocity-based operation	Ericsson	revised	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-17111027	CSI feedback and Transparent PDSCH Tx	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
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R1-17111029	Type I & II CSI reporting	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
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R1-1711044	On DL DMRS evaluations	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-1711045	On UL DMRS design	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-1711046	On UL DMRS evaluations	Ericsson	available	2017-06-16 03:22:19	2017-06-17 05:29:06
R1-1711047	On PTRS DL design	Ericsson	available	2017-06-16 03:22:20	2017-06-17 05:29:06
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R1-1711057	Discussion on SS burst set composition for NR	NTT DOCOMO, INC.	available	2017-06-16 03:35:04	2017-06-17 03:27:56
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R1-1711059	Discussion on remaining details on multiple SS block transmissions in wideband CC for NR	NTT DOCOMO, INC.	available	2017-06-16 03:35:04	2017-06-17 03:27:56
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R1-1711070	Discussion on NR RRM measurement based on CSI-RS for L3 mobility	NTT DOCOMO, INC.	available	2017-06-16 03:35:04	2017-06-17 03:27:56
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R1-1711099	FDM-based PUCCH for UCI of more than 2 bits	NTT DOCOMO, INC.	available	2017-06-16 03:35:05	2017-06-17 04:15:18
R1-1711100	Long-PUCCH for UCI of up to 2 bits	NTT DOCOMO, INC.	available	2017-06-16 03:35:05	2017-06-17 04:15:18
R1-1711101	Long-PUCCH for UCI of more than 2 bits	NTT DOCOMO, INC.	available	2017-06-16 03:35:05	2017-06-17 04:15:18
R1-1711102	Long-PUCCH for more than one slot	NTT DOCOMO, INC.	available	2017-06-16 03:35:05	2017-06-17 04:15:19
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R1-1711117	Processing time and HARQ process number for NR	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711118	Soft-buffer size and management	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711119	Pre-emption indication for downlink	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711120	Multiplexing of different data durations for uplink	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711121	Scheduling and HARQ procedures for URLLC	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711122	NR carrier aggregation	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711123	LTE-NR Dual connectivity	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711124	Distributed simple parity check Polar codes	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-20 03:01:06
R1-1711125	Performance evaluation of DPC-Polar codes	NTT DOCOMO, INC.	noted	2017-06-16 03:35:06	2017-06-20 03:01:06
R1-1711126	Sequence design of Polar codes	NTT DOCOMO, INC.	noted	2017-06-16 03:35:06	2017-06-20 03:01:06
R1-1711127	Rate matching of Polar codes	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-20 03:01:06
R1-1711128	Interleaving design of Polar codes	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-20 03:01:06
R1-1711129	Discussion on cross-link interference mitigation for duplexing flexibility	NTT DOCOMO, INC.	noted	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711130	Discussion on prioritized scenarios for duplexing flexibility	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 04:15:18
R1-1711131	Remaining issues on wider bandwidth operations for NR	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-16 16:33:53
R1-1711132	Views on single UL transmission and UL sharing	NTT DOCOMO, INC.	noted	2017-06-16 03:35:06	2017-06-16 10:05:35
R1-1711133	LTE-NR power sharing mechanism	NTT DOCOMO, INC.	available	2017-06-16 03:35:06	2017-06-17 03:27:57
R1-1711134	Power control framework for PUSCH	NTT DOCOMO, INC.	noted	2017-06-16 03:35:06	2017-06-17 03:27:57
R1-1711135	Synchronization signal sequence design	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:10
R1-1711136	SS burst set composition consideration	Qualcomm Incorporated	revised	2017-06-16 03:51:27	2017-06-17 06:59:10
R1-1711137	Timing indication based on SS block consideration	Qualcomm Incorporated	revised	2017-06-16 03:51:27	2017-06-20 04:56:36
R1-1711138	Multiple SS block transmissions design in wideband CC	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:10
R1-1711139	PBCH contents and payload size consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:10
R1-1711140	SS block composition and PBCH RE mapping design	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-20 04:56:36
R1-1711141	DMRS design for NR-PBCH	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711142	Remaining system information delivery consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11

R1-1711143	Other system information delivery consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711144	Paging design consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711145	PRACH preamble format design for long/short sequence length	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711146	PRACH preamble design for capacity enhancement	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711147	Power ramping and power control for RA procedure	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711148	4-step RACH procedure consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:11
R1-1711149	Measurement based on SS block consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:10
R1-1711150	Measurement based on CSI-RS for L3 mobility consideration	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:59:10
R1-1711151	Radio link monitoring consideration	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 07:04:57
R1-1711152	CW to layer mapping and frequency domain interleaving	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711153	Codebook based UL transmission	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:58:12
R1-1711154	Non-codebook based UL transmission	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 05:59:34
R1-1711155	On UL diversity transmission scheme	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:33:03
R1-1711156	Discussion on PRB bundling for DL	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711157	On multi-TRP and multi-panel transmission	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711158	On PDSCH and PUSCH RE mapping	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:01:02
R1-1711159	Transmission scheme for broadcast PDSCH	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 06:02:25
R1-1711160	Beam management for NR	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711161	Beam recovery procedures	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711162	Details of CSI framework	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:05:57
R1-1711163	Details of CSI acquisition	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 06:05:57
R1-1711164	CSI acquisition for reciprocity based operation	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:50:14

R1-1711165	On Type I and Type II CSI feedback using PUCCH	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:51:33
R1-1711166	On CSI feedback for open- or semi-open-loop transmission	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:52:48
R1-1711167	On multiplexing of different types of RSs	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711168	Discussion on CSI-RS design	Qualcomm Incorporated	revised	2017-06-16 03:51:27	2017-06-17 05:54:22
R1-1711169	Discussion on UL DMRS design	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:33:03
R1-1711170	Discussion on DL DMRS design	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711171	Evaluation of UL DMRS design	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:31
R1-1711172	Evaluation of DL DMRS design	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:32
R1-1711173	Phase and frequency tracking reference signal considerations	Qualcomm Incorporated	available	2017-06-16 03:51:27	2017-06-17 05:16:32
R1-1711174	Discussion on SRS design	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 05:17:10
R1-1711175	Further analysis on fine time/frequency tracking RS design	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 06:09:16
R1-1711176	Discussion on QCL	Qualcomm Incorporated	noted	2017-06-16 03:51:27	2017-06-17 06:09:16
R1-1711177	PDCCCH structure	Qualcomm Incorporated	revised	2017-06-16 03:51:27	2017-06-17 06:48:43
R1-1711178	RS for DL control channel	Qualcomm Incorporated	revised	2017-06-16 03:51:27	2017-06-17 06:48:43
R1-1711179	Control resource set and search space	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:48:43
R1-1711180	Nested search space design	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:48:43
R1-1711181	Multi-beam control operation	Qualcomm Incorporated	withdrawn	2017-06-16 03:51:28	
R1-1711182	Resource reuse for data in DL control region	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:48:43
R1-1711183	Structure of group common PDCCCH	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:48:43
R1-1711184	Contents of group common PDCCCH	Qualcomm Incorporated	revised	2017-06-16 03:51:28	2017-06-17 06:48:43
R1-1711185	UE behaviour related to group common PDCCCH	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:48:43
R1-1711186	Common control resource set signaling in MIB	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:40:09

R1-1711187	Advanced Grant Indication for UE Power Saving	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:40:09
R1-1711188	Channelization of 1-symbol short PUCCH with 1 or 2 bits payload	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711189	Channelization of 1-symbol short PUCCH with more than 2 bits payload	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:33:03
R1-1711190	Long PUCCH design with 1 or 2 bits UCI payload	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711191	Long PUCCH design with more than 2 bits UCI payload	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:37:55
R1-1711192	Long PUCCH over multiple slots	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711193	Transmit diversity for PUCCH	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:35:03
R1-1711194	Resource allocation for PUCCH	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711195	UCI piggyback on PUSCH	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711196	Multiplexing of PUCCH and PUSCH	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:38:14
R1-1711197	MPR issue with distributed RB allocation in UL	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711198	Short PUSCH transmission in UL short duration	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711199	Discussion TB size determination	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711200	Simultaneous UL SR channel	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711201	Uplink Resource for SR	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:10
R1-1711202	CBG Construction Principles for CBG-based Transmission with Multi-Bit HARQ feedback	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-18 23:50:05
R1-1711203	DCI considerations for CBG-based (re)- Transmissions	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-18 23:50:05
R1-1711204	UCI considerations for CBG-based (re)- Transmissions	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-18 23:50:05
R1-1711205	Low latency impact analysis on user plane and control plane	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:42
R1-1711206	UE processing time	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-18 23:50:05
R1-1711207	Considerations for soft buffer management	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 06:12:46
R1-1711208	Timing advance for different numerology	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-17 05:17:42

R1-1711209	CA with mixed numerology	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-23 20:31:49
R1-1711210	CRC attachment	Qualcomm Incorporated	noted	2017-06-16 03:51:28	2017-06-20 05:20:08
R1-1711211	LDPC segmentation	Qualcomm Incorporated	noted	2017-06-16 03:51:28	2017-06-20 05:20:08
R1-1711212	LDPC rate matching	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-20 05:20:08
R1-1711213	LDPC rate compatible design	Qualcomm Incorporated	revised	2017-06-16 03:51:28	2017-06-20 05:20:08
R1-1711214	Early termination scheme for Polar codes	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-20 06:50:31
R1-1711215	Evaluation of early termination for Polar codes	Qualcomm Incorporated	noted	2017-06-16 03:51:28	2017-06-20 06:50:31
R1-1711216	Decoding and encoding latency for polar codes with PC frozen bits or distributed CRC bits	Qualcomm Incorporated	noted	2017-06-16 03:51:28	2017-06-20 06:50:31
R1-1711217	Performance comparison between CA-polar and PC-polar	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-20 06:26:53
R1-1711218	Sequence construction of Polar codes for control channel	Qualcomm Incorporated	revised	2017-06-16 03:51:28	2017-06-20 06:50:31
R1-1711219	Determination of the values for the parameters in rate-matching for control channel	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-20 06:26:53
R1-1711220	Rate-matching scheme for control channel	Qualcomm Incorporated	available	2017-06-16 03:51:28	2017-06-20 06:26:53
R1-1711221	Design of Polar code for large UCI with segmentation	Qualcomm Incorporated	available	2017-06-16 03:51:29	2017-06-20 06:26:53
R1-1711222	Design and evaluation of Interleaver for Polar codes	Qualcomm Incorporated	available	2017-06-16 03:51:29	2017-06-20 06:26:53
R1-1711223	PBCH channel coding	Qualcomm Incorporated	revised	2017-06-16 03:51:29	2017-06-20 05:25:02
R1-1711224	Consideration for MCS table	Qualcomm Incorporated	noted	2017-06-16 03:51:29	2017-06-18 23:50:05
R1-1711225	Dynamic TDD UE-to-UE measurement considerations	Qualcomm Incorporated	available	2017-06-16 03:51:29	2017-06-17 06:20:57
R1-1711226	Dynamic TDD Cross-link interference management consideration	Qualcomm Incorporated	available	2017-06-16 03:51:29	2017-06-17 06:20:57
R1-1711227	UE Power Saving during Active State	Qualcomm Incorporated	available	2017-06-16 03:51:29	2017-06-17 06:20:57
R1-1711228	NR LTE Adjacent Channel Coexistence Consideration	Qualcomm Incorporated	available	2017-06-16 03:51:29	2017-06-17 06:20:57
R1-1711229	NR-LTE Co-channel Coexistence Considerations	Qualcomm Incorporated	noted	2017-06-16 03:51:29	2017-06-17 06:20:57
R1-1711230	Power control and PHR for NR	Qualcomm Incorporated	noted	2017-06-16 03:51:29	2017-06-17 05:17:42

R1-1711231	TDD-SUL CA scenario	Qualcomm Incorporated	withdrawn	2017-06-16 03:51:29	
R1-1711232	Indication of actually transmitted SS blocks	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711233	Remaining issues on power ramping in NR	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711234	Discussion on mechanisms for beam failure recovery	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711235	REG bundling for NR PDCCH	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711236	Indication of PDSCH starting position for NR	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711237	Group common PDCCH structure for NR	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711238	Group common PDCCH contents for NR	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711239	Group common PDCCH monitoring for NR	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711240	Slot structure of NR long PUCCH for more than 2 bits	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711241	Structure of NR long PUCCH over multiple slots	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711242	Short PUCCH structure for UCI of up to 2 bits	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711243	Short PUCCH structure for UCI of more than 2 bits	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711244	PUCCH and PUSCH multiplexing methods	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711245	Pardon the Interruption: Downlink Control Signaling to Enable Preemption and CBG-based (Re) Transmission	Sharp	available	2017-06-16 03:52:45	2017-06-17 01:27:00
R1-1711246	Discussion on Bursty Interference Measurement Resources	Qualcomm Incorporated	available	2017-06-16 04:20:24	2017-06-17 05:17:42
R1-1711247	Contents of group common PDCCH	Qualcomm Incorporated	available	2017-06-16 04:20:24	2017-06-23 20:31:49
R1-1711248	NR-LTE Co-channel Coexistence Considerations	Qualcomm Incorporated	withdrawn	2017-06-16 04:20:24	
R1-1711249	Power control and PHR for NR	Qualcomm Incorporated	withdrawn	2017-06-16 04:20:24	
R1-1711250	TDD-SUL CA scenario	Qualcomm Incorporated	withdrawn	2017-06-16 04:20:24	
R1-1711251	Design of Long-PUCCH for UCI of more than 2 bits	Cohere Technologies	available	2017-06-16 04:37:23	2017-06-17 05:25:01
R1-1711252	Support of long-PUCCH over multiple slots	Cohere Technologies	available	2017-06-16 04:41:50	2017-06-17 05:25:14
R1-1711253	Resource configuration for UL transmission without grant	NICT	available	2017-06-16 04:45:59	2017-06-16 11:03:26
R1-1711254	Discussion on Paging Design	III	available	2017-06-16 05:41:13	2017-06-16 12:14:15
R1-1711255	Correction on the formula of AnnexA	ZTE	revised	2017-06-16 05:46:26	2017-06-17 03:37:13
R1-1711256	Correction on Procedure A of spatially-consistency UT mobility modeling	ZTE	revised	2017-06-16 05:46:26	2017-06-17 03:37:13
R1-1711257	Discussion on DL control signalling for CBG-based retransmission	HTC Corporation	available	2017-06-16 05:57:05	2017-06-17 01:28:34
R1-1711258	Discussion on UL control signalling for CBG-based retransmission	HTC Corporation	available	2017-06-16 05:58:13	2017-06-17 01:28:34
R1-1711259	Discussion on CBG-based HARQ feedback multiplexing	HTC Corporation	available	2017-06-16 05:59:28	2017-06-17 01:28:34
R1-1711260	Remaining open issues on NR Synchronisation signal design	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711261	On SS Burst Set Composition	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14

R1-1711262	SS block time index indication	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711263	SS-block transmission in multi CC deployments	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711264	NR-PBCH content	Nokia, Alcatel-Lucent Shanghai Bell	revised	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711265	SS block composition	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711266	NR-PBCH DMRS design	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711267	On Remaining System Information Delivery	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711268	SS block measurements and procedures	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711269	NR Radio link monitoring	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:06:34	2017-06-16 18:13:14
R1-1711270	[89-16] Email discussion on NR-PRACH preamble formats based on short sequence length	ZTE Corporation	available	2017-06-16 06:08:11	2017-06-16 21:19:03
R1-1711271	Paging in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 06:14:48	2017-06-16 18:13:14
R1-1711272	Configuration for control resource sets and search spaces	HTC Corporation	available	2017-06-16 06:18:37	2017-06-16 10:59:06
R1-1711273	Design of resource mapping and NR-PDCCH	HTC Corporation	available	2017-06-16 06:25:14	2017-06-16 10:59:29
R1-1711274	Discussion on location and timing indication of SS block	Xiaomi Technology	available	2017-06-16 06:39:00	2017-06-18 03:18:55
R1-1711275	Discussion on NR-SSS working assumption	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-17 06:13:40
R1-1711276	Indication of SS block timing information	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-20 06:28:55
R1-1711277	Discussion on NR-PBCH contents	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-19 03:13:16
R1-1711278	NR-PBCH RE mapping	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-20 06:28:55
R1-1711279	RACH configuration and procedure	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-17 05:59:36
R1-1711280	On CCE and PDCCH mapping	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-19 06:26:29
R1-1711281	NR Group-common PDCCH contents and structure	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-19 03:13:16
R1-1711282	Short PUCCH for up to 2 bit UCI	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-26 09:06:31
R1-1711283	PUCCH resource allocation for HARQ-ACK feedback to Msg4	Motorola Mobility, Lenovo	available	2017-06-16 07:11:37	2017-06-19 03:13:16
R1-1711284	Codebook Based Transmission and Codebook Design for UL MIMO	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:08

R1-1711285	Non-codebook based UL-MIMO transmission	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711286	UL-MIMO diversity-based transmission	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711287	On details of PRB Bundling	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711288	On the maximum number of PDSCH/PDSCCHs to be supported for multi-TRP transmission	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711289	On the utilization of SS block for beam management	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711290	SRS transmission for beam management	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711291	Beam Recovery in NR	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711292	BPL definition and Spatial QCL time indication	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:15:08
R1-1711293	On beam grouping and reporting	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-17 05:31:19
R1-1711294	On Multi-beam Downlink Control Channel Operation	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:13:19
R1-1711295	Multi-beam Uplink Control Channel Operation	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:47
R1-1711296	On the CRI definition and usability in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:47
R1-1711297	Remaining aspects on interference estimation options and configuration	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:15:48
R1-1711298	On the channel reciprocity support for CSI acquisition	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:15:48
R1-1711299	Feedback transmission of type II codebook	Nokia, Alcatel-Lucent Shanghai Bell	revised	2017-06-16 07:40:21	2017-06-16 21:15:48
R1-1711300	CSI feedback in support of semi-open loop transmission	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:15:48
R1-1711301	On the CSI timing relationships	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:48
R1-1711302	On multiplexing of different RS types	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-17 05:31:19
R1-1711303	On the CSI-RS configurations for NR CSI acquisition	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:15:48
R1-1711304	On CSI-RS Design for DL Beam Management	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711305	On design of DL DM-RS for NR physical data channels	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711306	DL DM-RS patterns link performance evaluation	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33

R1-1711307	On design of UL DM-RS for NR physical data channels	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711308	Discussion on PT-RS design for CP-OFDM	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711309	On Details of the PT-RS Design for DFT-s-OFDM	Nokia, Alcatel-Lucent Shanghai Bell	revised	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711310	UL SRS design considerations in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711311	Views on the TFFT-RS in NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711312	On QCL Framework and Configurations in NR	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 07:40:21	2017-06-16 21:16:33
R1-1711313	Cross-link interference management based on Xn support	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 08:09:04	2017-06-16 18:18:46
R1-1711314	On NR Cross-Link Symbol Alignment Scheme	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 08:09:04	2017-06-16 18:18:46
R1-1711315	LBT-based UL transmission for dynamic TDD	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 08:09:04	2017-06-16 18:18:46
R1-1711316	DL control signaling for CBG-based (re)transmission	Shenzhen Coolpad Technologies	available	2017-06-16 08:41:31	2017-06-16 09:58:22
R1-1711317	Discussion on NR Operating in Unlicensed Spectrum	ASUSTEK COMPUTER (SHANGHAI)	available	2017-06-16 08:45:52	2017-06-16 12:44:50
R1-1711318	Discussion on the options in NR design	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:33:21
R1-1711319	Relation among NR-PBCH, SIBs and subcells	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:33:21
R1-1711320	Resource sharing between PDCCH and PDSCH	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:54:48
R1-1711321	PDCCH BD reduction	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:33:21
R1-1711322	Frequency/time resource assignment of the operation modes	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:37:48
R1-1711323	UL data transmission without grant	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:37:48
R1-1711324	DL control signalling for CBG-based (re)transmission	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:49:07
R1-1711325	UE category modelling and soft buffer	Panasonic	available	2017-06-16 08:50:17	2017-06-16 11:49:07
R1-1711326	Comment on NR specification	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:37:48
R1-1711327	The relation among REG, CCE, and CORESET	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:49:07
R1-1711328	RS mapping of NR-PDCCH	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:52:25
R1-1711329	Configuration of CORESET	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:52:25
R1-1711330	Search space design	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:41:35
R1-1711331	Discussion on structure of group common PDCCH	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:41:35
R1-1711332	Discussion on contents of group common PDCCH	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:41:35
R1-1711333	Discussion on DL/UL transmission direction	Panasonic	available	2017-06-16 08:50:18	2017-06-16 11:52:25
R1-1711334	Considerations on UE Beamforming Management	ASUSTEK COMPUTER (SHANGHAI)	available	2017-06-16 08:51:31	2017-06-16 17:56:36

R1-1711335	UL power control in multi-beam based approaches	ASUSTEK COMPUTER (SHANGHAI)	available	2017-06-16 08:53:02	2017-06-16 17:56:36
R1-1711336	Discussion on group based beam reporting	China Unicom	available	2017-06-16 08:59:23	2017-06-17 05:46:05
R1-1711337	On NR-LTE coexistence for NSA and SA	China Unicom	noted	2017-06-16 09:01:40	2017-06-17 05:46:05
R1-1711338	Consideration on physical downlink control channel for URLLC	CATR	available	2017-06-16 09:06:00	2017-06-16 09:11:15
R1-1711339	Consideration on the CSI-RS design for NR	CATR	available	2017-06-16 09:06:00	2017-06-16 09:11:15
R1-1711340	Consideration on the font loaded DM RS design for NR	CATR	available	2017-06-16 09:06:00	2017-06-16 09:11:15
R1-1711341	Discussions on the indication for CBG	CATR	available	2017-06-16 09:06:00	2017-06-16 09:11:15
R1-1711342	Discussion on the granularity of preemption indication	CATR	available	2017-06-16 09:06:00	2017-06-16 09:11:15
R1-1711343	Discussion on URLLC transmitted in same or different numerology resources	ASUSTEK COMPUTER (SHANGHAI)	available	2017-06-16 09:06:17	2017-06-16 10:34:01
R1-1711344	LDPC Coding chain	Intel Corporation	available	2017-06-16 09:17:09	2017-06-20 05:18:59
R1-1711345	Base Graph 1 lifting and evaluations	Intel Corporation	revised	2017-06-16 09:17:09	2017-06-20 05:20:10
R1-1711346	Base Graph 2 lifting and evaluations	Intel Corporation	revised	2017-06-16 09:17:09	2017-06-20 05:20:10
R1-1711347	Simple distributed CRC design for Polar codes	Intel Corporation	noted	2017-06-16 09:17:09	2017-06-20 06:23:28
R1-1711348	Evaluations of Polar code designs	Intel Corporation	available	2017-06-16 09:17:09	2017-06-20 06:23:28
R1-1711349	Discussion on Polar code rate-matching	Intel Corporation	available	2017-06-16 09:17:09	2017-06-20 05:20:10
R1-1711350	DMRS pattern configuration for NR	ITL	available	2017-06-16 09:23:22	2017-06-17 10:46:11
R1-1711351	On timing indication for NR	ITL	available	2017-06-16 09:24:51	2017-06-19 06:27:36
R1-1711352	Multiple SS block indication in wideband CC	ITL	available	2017-06-16 09:26:34	2017-06-17 10:46:11
R1-1711353	DMRS sequence design for NR-PBCH	ITL	available	2017-06-16 09:27:42	2017-06-17 10:46:11
R1-1711354	PDSCH starting position indication for NR	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711355	Discussion on structure for group-common PDCCH for NR	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711356	Discussion on contents for group-common PDCCH for NR	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711357	Discussion on UE behavior for group-common PDCCH for NR	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711358	Short PUCCH structure for UCI of up to 2 bits	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711359	Discussion on UCI piggyback on PUSCH	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711360	Simultaneous transmission for long-PUCCH and PUSCH	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711361	Discussion on UL HARQ-ACK feedback for CBG-based retransmission	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711362	Discussion on UE behavior by pre-emption indication	WILUS Inc.	available	2017-06-16 09:49:13	2017-06-17 08:04:26
R1-1711363	Two-step resource allocation for data channel in NR	ASUSTEK COMPUTER (SHANGHAI)	available	2017-06-16 09:50:00	2017-06-17 02:48:57
R1-1711364	Multiple SS block transmissions in a wideband CC	ASUSTEK COMPUTER (SHANGHAI)	available	2017-06-16 09:52:21	2017-06-17 02:49:16
R1-1711365	On UL coverage extension of TDD @3.5GHz	ORANGE	revised	2017-06-16 09:53:43	2017-06-16 15:23:03
R1-1711366	TS38.211 v0.0.1 NR; Physical channels and modulation	Ericsson LM	revised	2017-06-16 10:27:10	2017-06-19 07:47:13
R1-1711367	On UE processing time	Ericsson LM	available	2017-06-16 10:29:05	2017-06-16 15:16:59
R1-1711368	Discussion on the search space design	Xiaomi technology	available	2017-06-16 10:42:13	2017-06-16 11:53:51

R1-1711369	Discussion on the content of group common PDCCH	Xiaomi technology	available	2017-06-16 10:43:15	2017-06-16 11:53:51
R1-1711370	Discussion on the search space design	Xiaomi Technology	withdrawn	2017-06-16 10:44:13	
R1-1711371	Remaining details on NR-SS sequence design	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711372	SS burst set composition	Ericsson	noted	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711373	Timing indication based on SS block	Ericsson	noted	2017-06-16 10:46:48	2017-06-19 21:15:41
R1-1711374	NR-PBCH Content and payload size	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711375	NR-PBCH RE mapping and SS block composition	Ericsson	available	2017-06-16 10:46:48	2017-06-19 21:15:41
R1-1711376	NR-PBCH DMRS design	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711377	NR delivery of remaining minimum system information	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711378	NR delivery of other system information	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711379	On NR paging design	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711380	NR-RACH preamble format details	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711381	NR-RACH preamble format details for capacity enhancement and beam management	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711382	Power ramping and power control during RA procedure	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711383	4-step random access procedure	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711384	Mobility measurements based on SS block	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711385	Measurements based on CSI-RS for L3 mobility	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711386	Radio link monitoring	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711387	Consideration of PRACH Configuration in NR	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711388	Additional synchronization provision	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711389	Further details on scrambling	Ericsson	available	2017-06-16 10:46:48	2017-06-17 05:48:06
R1-1711390	Discussion on the structure of group common PDCCH	Xiaomi Technology	available	2017-06-16 10:49:26	2017-06-16 11:53:51
R1-1711391	On Other System Information Delivery	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 11:03:00	2017-06-19 11:19:16
R1-1711392	CSI-RS configuration for L3 mobility purposes	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 11:03:00	2017-06-16 18:13:14
R1-1711393	Calibration results for Phase 1 NR MIMO system level calibration	MOTOROLA MOBILITY LLC	available	2017-06-16 11:14:26	2017-06-17 04:32:27
R1-1711394	Discussion on SS Burst Set Design	Conviva Wireless LLC	available	2017-06-16 11:39:23	2017-06-17 03:55:55
R1-1711395	Discussion on Multi-beam Operation for PDCCH	Conviva Wireless LLC	available	2017-06-16 11:42:33	2017-06-17 03:56:38
R1-1711396	On power sharing between LTE and NR in DC	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 11:47:55	2017-06-16 16:22:19
R1-1711397	UL Power Control for MIMO	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 11:47:55	2017-06-16 16:22:19
R1-1711398	On spectrum shaping for uplink P1/2 BPSK with DFT-S-OFDM	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 12:28:57	2017-06-16 18:22:15
R1-1711399	LTE and NR performance in NR-LTE UL sharing	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 12:28:57	2017-06-16 18:44:34
R1-1711400	On 1Tx only UE in LTE-NR Dual Connectivity	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 12:28:57	2017-06-16 18:44:34
R1-1711401	Measurement RS for beam management	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711402	Relationship between beam failure recovery and RLF	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711403	Robust transmission for UL control channel	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49

R1-1711404	Discussion on reciprocity based CSI acquisition mechanism	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 04:46:39
R1-1711405	CSI acquisition for DL robust transmission	Huawei, HiSilicon	noted	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711406	Other remaining issues for CSI framework	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711407	Multiple-panel codebook	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 05:30:51
R1-1711408	Category 2 codebook design for type II codebook	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711409	Codebook design for beamformed CSI-RS	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711410	Cross-carrier beam management	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711411	Evaluation on REG bundle sizes for 1-symbol CORESET duration	Huawei, HiSilicon	noted	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711412	Evaluation on REG bundle sizes for more than 1 symbol CORESET duration	Huawei, HiSilicon	noted	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711413	CCE-to-REG mapping	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711414	PDCCCH-to-CCE mapping	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711415	NR DL control capacity and blocking probability	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711416	Performance evaluations on 1-symbol PUCCH for up to 2 UCI bits	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711417	Long PUCCH structure for large payload with no multiplexing capacity	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711418	On CSI feedback in NR	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711419	Transmit diversity for short duration PUCCH	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711420	Multiplexing between PUCCHs	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711421	Multiplexing of UL control channel and SRS in NR	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711422	Resource allocation for data channels	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711423	PDCCCH monitoring for slot-aggregation and cross-slot scheduling	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711424	On bandwidth adaptation	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:52:07
R1-1711425	Summary of LTE CA/DC and remaining issues for NR	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:56:42
R1-1711426	CBG-based transmission/retransmission for DL multiplexing of eMBB and URLLC	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711427	Discussion on group common pre-emption indication	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711428	Superposed transmission of pre-emption indication with eMBB data	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711429	Consideration on ACK/NACK error in CBG-based retransmission	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711430	Discussion on UL multiplexing of grant-based eMBB and URLLC	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711431	HARQ feedback indication design for UL grant-free transmission	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711432	Discussion on over-the-air time synchronization for URLLC	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 02:58:56
R1-1711433	Discussion on remaining frequency resources on symbol carrying CORESET	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711434	Discussion on TB size determination	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711435	Unified design for slot and mini-slot	Huawei, HiSilicon	available	2017-06-16 12:36:39	2017-06-17 03:15:49
R1-1711436	LDPC design for base graph 1	Huawei, HiSilicon	revised	2017-06-16 12:36:40	2017-06-27 15:17:52

R1-1711437	LDPC design for base graph 2	Huawei, HiSilicon	available	2017-06-16 12:36:40	2017-06-27 15:17:52
R1-1711438	Rate matching for LDPC codes	Huawei, HiSilicon	noted	2017-06-16 12:36:40	2017-06-20 05:18:35
R1-1711439	Segmentation for eMBB data	Huawei, HiSilicon	noted	2017-06-16 12:36:40	2017-06-20 05:18:35
R1-1711440	On LDPC codes for eMBB data	Huawei, HiSilicon	withdrawn	2017-06-16 12:36:40	
R1-1711441	On the feedback overhead reduction for multi-subband UL MIMO	Huawei, HiSilicon	available	2017-06-16 12:36:40	2017-06-18 14:26:23
R1-1711442	Summary of [89-27] Polar code proposal for NR	Huawei	noted	2017-06-16 12:36:40	2017-06-20 05:17:55
R1-1711443	Summary of [89-26] Polar code for NR -- alignment of latency/complexity calculation for early termination	Huawei	noted	2017-06-16 12:36:40	2017-06-20 05:17:55
R1-1711444	Continuous precoding for NR DMRS in time domain	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711445	System level evaluation results for beam management	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711446	Link level evaluation results for beam management	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711447	Link level simulation assumptions for beam management	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711448	System level simulation assumptions for beam management	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711449	Discussions on service specific CSI for NR	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711450	MIMO Phase-2 SLS calibration results on 30GHz frequency band	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711451	MIMO Phase-2 LLS calibration results on 30GHz frequency band	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711452	Evaluation results for dense urban on 30GHz frequency band	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711453	DL and UL Assignment for NR TDD	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711454	Slot Reconfiguration for Low Latency in TDD	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711455	Indication of Reserved Resources	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711456	HARQ Process Management in NR	Samsung	available	2017-06-16 12:56:25	2017-06-16 19:59:42
R1-1711457	Indication of Preempted Resources Prior to HARQ-ACK Feedback	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711458	Considerations on Signaling for Indicating Preempted Resources	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711459	Modulation Scheme for URLLC with Preemption Multiplexing	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711460	On Transparency of Spectrum Shaping for p2-BPSK DFT-s-OFDM	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711461	On Spectrum Shaping Methods for p2-BPSK DFT-s-OFDM	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711462	On Modulation Schemes for High Spectral Efficiency	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711463	Transmission and Reception for High-Order Modulation with MIMO	Samsung	available	2017-06-16 12:56:25	2017-06-17 02:01:01
R1-1711464	High level consideration on NR unlicensed band operation	Huawei, HiSilicon	available	2017-06-16 12:57:57	2017-06-17 02:52:07
R1-1711465	NR Numerology on unlicensed bands	Huawei, HiSilicon	available	2017-06-16 12:59:14	2017-06-17 02:52:07
R1-1711466	NR Frame structure on unlicensed bands	Huawei, HiSilicon	available	2017-06-16 13:00:09	2017-06-17 02:52:07
R1-1711467	Coexistence and Channel access for NR unlicensed band operations	Huawei, HiSilicon	available	2017-06-16 13:01:00	2017-06-17 02:52:07
R1-1711468	On CSI-RS design for DL beam management	KT Corp.	available	2017-06-16 13:01:55	2017-06-16 13:21:51
R1-1711469	NR standalone operation on unlicensed bands	Huawei, HiSilicon	available	2017-06-16 13:01:55	2017-06-17 02:52:07
R1-1711470	Discussion on NoMA study for Rel-15 SI	Huawei, HiSilicon	available	2017-06-16 13:02:52	2017-06-17 02:52:07
R1-1711471	Discussions on Transmission Duration	KT Corp.	available	2017-06-16 13:04:51	2017-06-16 13:21:51

R1-1711472	Considerations on TB-CRC Failure	KT Corp.	available	2017-06-16 13:07:24	2017-06-16 13:21:51
R1-1711473	View on Multi-Beam Management	KT Corp.	available	2017-06-16 13:09:28	2017-06-16 13:21:52
R1-1711474	Views on preemption indication for DL	KT Corp.	available	2017-06-16 13:11:45	2017-06-16 13:21:52
R1-1711475	Views on CCE-to-REG mapping	KT Corp.	available	2017-06-16 13:12:59	2017-06-16 13:21:52
R1-1711476	On UE Categories/Capabilities	Ericsson	noted	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711477	On NR-PDCCH Structure	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711478	On DM-RS for NR-PDCCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711479	On Configuration of Control Resource Sets	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711480	On Search Space and Blind Decoding Design	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711481	On Multi-beam and Multi-TRP Operation for PDCCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711482	On Data Transmission in Control Resource Sets	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711483	On Group-Common PDCCH Structure and Configuration	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:05:49
R1-1711484	On the Content of Group-Common PDCCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:05:49
R1-1711485	On UE Procedures Related to Group-Common PDCCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:05:49
R1-1711486	On PDCCH for Ultra-Reliable Transmission	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711487	On the Performance Evaluation of PDCCH for Ultra-Reliable Transmission	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711488	On the Design of Short PUCCH for 1-2 UCI bits	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711489	On the Design of Short PUCCH for more than 2 UCI bits	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711490	On the Design of Long PUCCH for 1-2 UCI bits	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711491	On the Design of Long PUCCH for more than 2 UCI bits	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711492	On support of Long PUCCH over multiple slots	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711493	On Transmit Diversity Schemes for PUCCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711494	On Resource Allocation for PUCCH and Multiplexing PUCCH Formats	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711495	On UCI on PUSCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711496	On Simultaneous Transmission of PUSCH and PUCCH	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:02
R1-1711497	On PUCCH for Ultra-Reliable Transmission	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711498	On the Performance Evaluation of PUCCH for Ultra-Reliable Transmission	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711499	On Resource Allocation in the Frequency Domain	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711500	On Resource Allocation in the Time Domain	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711501	On MCS/transport Block Size Determination	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711502	On UL Data Scheduling Grant in NR	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711503	On Scheduling Request Enhancements	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711504	On SPS/Grant-Free Transmission	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711505	On HARQ Retransmission for SPS/Grant-free	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711506	On Code Block Group Formation and CRC Attachment	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711507	On Retransmission Decoder Throughput Issues and CBG-based Retransmission Control	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711508	On Design of CBG HARQ-ACK Feedback Schemes	Ericsson	available	2017-06-16 13:23:46	2017-06-17 06:02:03
R1-1711509	On HARQ Feedback Timing	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:03
R1-1711510	On HARQ Codebook	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02

R1-1711511	On Minimum Processing Time and Number of HARQ Processes in NR	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711512	On HARQ and Soft Buffer Handling	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711513	On Pre-emption Indication for Downlink	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711514	On Pre-emption Indication for Uplink	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711515	On Supporting High Reliability for Data Transmissions	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711516	On Mixed Numerology	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711517	On Scheduling and UCI Handling in Carrier Aggregation	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711518	On SRS Fast Switching in NR	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711519	On Dual Connectivity for NR	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711520	Discussion of Multi-Antenna and Highly Directional Beam-Forming for Operation in Unlicensed Spectrum	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711521	On Autonomous UL Transmissions for NR in Unlicensed Spectrum	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711522	On Channel Access Mechanisms for NR in Unlicensed Spectrum	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711523	On NR Operation in the 60 GHz Unlicensed Band	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711524	On Physical Layer Design Policies for Unlicensed Operation of NR	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711525	Technology Components for Unlicensed Operation	Ericsson	available	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711526	Power Sharing for LTE-NR Dual Connectivity	Ericsson	noted	2017-06-16 13:23:47	2017-06-17 06:02:02
R1-1711527	PRACH Preamble Format Design	Cohere Technologies	available	2017-06-16 13:28:26	2017-06-17 03:53:10
R1-1711528	Extended Range Considerations for mMTC	HUGHES Network Systems Ltd	available	2017-06-16 13:29:00	2017-06-16 18:49:43
R1-1711529	Channel Model for Non-Terrestrial Networks	HUGHES Network Systems Ltd	available	2017-06-16 13:30:50	2017-06-16 18:50:04
R1-1711530	CBG based HARQ-Ack/Nack	Sequans Communications	available	2017-06-16 13:31:43	2017-06-16 13:40:06
R1-1711531	CBG based retransmission	Sequans Communications	available	2017-06-16 13:32:49	2017-06-16 13:40:06
R1-1711532	CRC attachment for CBG	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:15
R1-1711533	CRC attachment for Smaller TBs	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 13:33:18	2017-06-19 20:31:15
R1-1711534	Code block segmentation of eMBB	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 13:33:18	2017-06-19 20:31:15
R1-1711535	Padding for LDPC	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 13:33:18	2017-06-19 20:31:15
R1-1711536	Rate matching for LDPC	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:15
R1-1711537	LDPC designs for base graph 1 and base graph 2	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-27 15:17:52
R1-1711538	Interleaving for LDPC	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-16 13:33:18	2017-06-19 20:31:16

R1-1711539	Distributed CRC Polar code construction	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711540	Early termination benefits of CRC distribution	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711541	Performance evaluation of polar code constructions	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-25 11:52:50
R1-1711542	Sequence design for Polar codes	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711543	Rate matching for Polar codes	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711544	Implicit timing indication for PBCH	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711545	Summary of [89-24] Email discussion LDPC code base graph #1 for NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711546	Summary of [89-25] Email discussion on LDPC code base graph #2 for NR	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-16 13:33:18	2017-06-19 20:31:16
R1-1711547	Discussion on PRACH designs for short sequence	Sequans Communications	available	2017-06-16 13:34:47	2017-06-16 13:40:06
R1-1711548	Resource allocation for PUCCH to support URLLC	Sequans Communications	available	2017-06-16 13:36:26	2017-06-16 13:40:06
R1-1711549	Considerations on Satellite channel model	THALES	available	2017-06-16 13:46:12	2017-06-16 16:38:55
R1-1711550	NTN Bentpipe payload architecture and characteristics	THALES	available	2017-06-16 13:48:59	2017-06-16 17:39:55
R1-1711551	Considerations on multiplexing with different transmission durations	KDDI Corporation	available	2017-06-16 14:03:54	2017-06-16 14:06:30
R1-1711552	Management of URLLC DL control channel efficiency and reliability	Qualcomm Incorporated	available	2017-06-16 14:05:10	2017-06-17 05:17:42
R1-1711553	The necessity of reliable SR design for GF/GB UL URLLC transmission	Qualcomm Incorporated	available	2017-06-16 14:05:10	2017-06-17 05:17:42
R1-1711554	URLLC DL pre-emption and UL suspension indication channel design	Qualcomm Incorporated	available	2017-06-16 14:05:10	2017-06-17 05:17:42
R1-1711555	UL URLLC Capacity Based on URLLC and eMBB dynamic multiplexing	Qualcomm Incorporated	available	2017-06-16 14:05:10	2017-06-17 05:17:42
R1-1711556	Ultra reliable HARQ design with async CSI feedback	Qualcomm Incorporated	available	2017-06-16 14:05:10	2017-06-17 05:17:42
R1-1711557	Performance of polar code for very small block length	Qualcomm Incorporated	available	2017-06-16 14:05:10	2017-06-20 06:26:53
R1-1711558	Multiplexing of different types of RS for uplink	Ericsson	available	2017-06-16 14:11:16	2017-06-17 05:29:07
R1-1711559	Uplink operation for LTE+NR Dual Connectivity	VODAFONE Group Plc	available withdrawn	2017-06-16 14:15:40	
R1-1711560	Discussion on wireless time synchronization for URLLC	SIA	available	2017-06-16 14:18:16	2017-06-16 15:23:03
R1-1711561	On Hybrid TDD and Measurements for Cross-link Interference Mitigation	Ericsson	available	2017-06-16 14:51:20	2017-06-17 04:32:04
R1-1711562	On Hybrid TDD and Signaling for Cross-link Interference Mitigation	Ericsson	revised	2017-06-16 14:51:20	2017-06-17 04:32:04

R1-1711563	On Dynamic TDD Scenarios	Ericsson	available	2017-06-16 14:51:20	2017-06-17 04:32:04
R1-1711564	On Duplexing in Paired Spectrum	Ericsson	available	2017-06-16 14:51:20	2017-06-17 04:32:04
R1-1711565	On bandwidth parties	Ericsson AB	available	2017-06-16 14:56:26	2017-06-16 21:30:26
R1-1711566	On semi-persistent CSI reporting on PUSCH	Ericsson	available	2017-06-16 14:58:03	2017-06-16 21:13:44
R1-1711567	Summary of e-mail discussion on DCI content	Ericsson LM	available	2017-06-16 15:03:03	2017-06-27 15:17:52
R1-1711568	Considerations on HAPS channel model	CNES, Thales	available	2017-06-16 16:18:46	2017-06-16 16:39:44
R1-1711569	PRACH Design	TCL Communication Ltd.	available	2017-06-16 21:26:15	2017-06-16 21:32:24
R1-1711570	UE_ID Insertion for Early Block Discrimination on DCI Blind Detection	Coherent Logix	available	2017-06-16 21:34:19	2017-06-20 02:58:41
R1-1711571	Scrambling Sequence Design for Early Block Discrimination on DCI Blind Detection	Coherent Logix	available	2017-06-16 21:34:19	2017-06-20 02:58:41
R1-1711572	Scrambling Sequence Design for Multi-Mode Block Discrimination on DCI Blind Detection	Coherent Logix	withdrawn	2017-06-16 21:34:19	
R1-1711573	Early Block Discrimination on DCI Blind Detection	Coherent Logix	available	2017-06-16 21:34:19	2017-06-28 13:47:52
R1-1711574	Discussion on bandwidth part configuration	LG Electronics Inc.	available	2017-06-17 07:03:22	2017-06-17 10:09:23
R1-1711575	Discussion on Polar codes for PBCH	CATT	available	2017-06-19 07:50:21	2017-06-19 08:58:20
R1-1711576	L3 Mobility based on CSI-RS based measurements	CATT	available	2017-06-19 07:51:33	2017-06-20 07:43:52
R1-1711577	On UL coverage extension of TDD @3.5GHz	ORANGE	revised	2017-06-19 20:43:18	2017-06-20 07:43:52
R1-1711578	Circulant permutation matrix design for LDPC codes base graph #2	LG Electronics	revised	2017-06-20 09:15:57	2017-06-27 15:17:52
R1-1711579	Calibration results for Phase 1 and Phase 2 NR MIMO system level calibration	vivo	available	2017-06-20 09:21:11	2017-06-21 16:29:24
R1-1711580	SS burst set composition	Samsung	noted	2017-06-20 09:25:07	2017-06-27 15:17:52
R1-1711581	Measurement based on CSI-RS for L3 mobility	Samsung	available	2017-06-20 09:25:41	2017-06-28 13:47:52
R1-1711582	Analysis of the benefits of PC bits for Polar code	Huawei, HiSilicon	available	2017-06-20 16:24:50	2017-06-21 16:29:24
R1-1711583	DMRS Structure for PDCCCH	Samsung	available	2017-06-21 12:15:49	2017-06-23 20:31:49
R1-1711584	On UL coverage extension of TDD @3.5GHz	ORANGE	noted	2017-06-21 12:18:11	2017-06-23 20:31:49
R1-1711585	Partial pre-emption based multiplexing data with different transmission durations in DL	Samsung	available	2017-06-21 12:21:03	2017-06-23 20:31:49
R1-1711586	Selected highlights from RAN#76 of relevance to RAN1	RAN1 Chair	noted	2017-06-21 12:26:05	2017-06-21 16:29:24
R1-1711587	Shift coefficients design for base graph 1	ZTE	revised	2017-06-21 16:44:44	2017-06-27 15:17:52
R1-1711588	Shift coefficients design for base graph 2	ZTE	revised	2017-06-21 16:45:08	2017-06-27 15:17:52
R1-1711589	Timing indication based on SS block	Samsung	noted	2017-06-22 07:58:35	2017-06-23 20:31:49
R1-1711590	Feedback transmission of type II codebook	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-22 08:34:10	2017-06-22 08:57:13
R1-1711591	Link level performance evaluation for mobility scenario	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711592	Composite beam transmission for SS blocks	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711593	System level evaluation on effect of penetration loss in sub-6GHz and above-6GHz frequency bands	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711594	Analysis on random cluster effect in map-based hybrid channel model	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711595	Impact of channel estimation error on the performance of high spectral efficiency MIMO schemes	Samsung	available	2017-06-22 08:41:54	2017-06-27 15:17:52

R1-1711596	Indication of Preempted Resources for TB-based re-transmission	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711597	Remaining Issues on RB Grid	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711598	On numerology for NR RACH	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711599	Remaining issues on PT-RS density in CP-OFDM	Samsung	available	2017-06-22 08:41:54	2017-06-23 20:31:49
R1-1711600	PRACH preamble sequences and formats for capacity enhancement and beam management	Huawei, HiSilicon	noted	2017-06-22 09:02:24	2017-06-22 14:56:47
R1-1711601	Draft Agenda of RAN1#AH_NIR2 meeting	RAN1 Chair	approved	2017-06-22 13:29:38	2017-06-22 14:16:07
R1-1711602	Common and Beam Specific Power Control Parameters	InterDigital, Inc.	available	2017-06-22 13:33:16	2017-06-22 14:56:47
R1-1711603	Short PUCCH for small UCI payloads	CATT	available	2017-06-22 20:16:34	2017-06-23 20:31:49
R1-1711604	Beam management for PDCCH	Samsung	available	2017-06-22 20:19:15	2017-06-23 20:31:49
R1-1711605	PBCH channel coding	Qualcomm Incorporated	available	2017-06-22 20:20:43	2017-06-27 15:17:52
R1-1711606	Codeword mapping and interleaving	ZTE	available	2017-06-22 20:25:16	2017-06-25 11:52:50
R1-1711607	On CSI framework details	ZTE	available	2017-06-22 20:25:55	2017-06-25 11:52:50
R1-1711608	On reciprocity based CSI acquisition	ZTE	available	2017-06-22 20:26:20	2017-06-25 11:52:50
R1-1711609	Further discussion on CSI acquisition for reciprocity-based operation	Ericsson	available	2017-06-22 20:28:49	2017-06-26 03:03:20
R1-1711610	UL MIMO for codebook based transmission	Ericsson	noted	2017-06-22 20:29:25	2017-06-26 09:06:31
R1-1711611	Time Index Signaling for SS Blocks	Intel Corporation	revised	2017-06-22 20:30:39	2017-06-25 02:49:29
R1-1711612	SS Block Composition	Intel Corporation	revised	2017-06-22 20:31:07	2017-06-25 02:49:29
R1-1711613	On time and frequency tracking of the channel	Ericsson	available	2017-06-23 16:05:08	2017-06-26 01:09:57
R1-1711614	Dynamic resource allocation for Integrated Access and Backhaul	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711615	Deployment scenarios for Integrated Access and Backhaul	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711616	Evaluation assumptions for Integrated Access and Backhaul	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711617	RACH power control and power ramping procedure	CATT	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711618	NR RACH Preamble Format for capacity enhancement	CATT	available	2017-06-23 20:38:37	2017-06-26 01:09:57
R1-1711619	Discussion on msg.3 tx timing determination	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711620	Discussion on RACH design	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711621	Assisted information for Msg.3 tx beam determination	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711622	Discussion on NR-PBCH design and SS block composition	NTT DOCOMO, INC.	available	2017-06-23 20:38:37	2017-06-27 15:17:52
R1-1711623	Correction on the formula of AnnexA	ZTE, Ericsson	revised	2017-06-23 20:38:37	2017-06-28 13:47:52
R1-1711624	Correction on Procedure A of spatially-consistency UT mobility modeling	ZTE, Ericsson	revised	2017-06-23 20:38:37	2017-06-28 13:47:52
R1-1711625	PRACH Msg1 retransmission	MediaTek Inc.	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711626	RRM for wider bandwidth operations	Samsung	available	2017-06-23 20:38:37	2017-06-24 06:59:12
R1-1711627	LDPC shift coefficients design for BG1	Samsung	available	2017-06-23 20:38:37	2017-06-27 15:17:52
R1-1711628	LDPC shift coefficients design for BG2	Samsung	available	2017-06-23 20:38:37	2017-06-27 15:17:52
R1-1711629	Performance evaluation of LDPC shift coefficients design for BG1	Samsung	available	2017-06-23 20:38:37	2017-06-27 15:17:52
R1-1711630	Performance evaluation of LDPC shift coefficients design for BG2	Samsung	available	2017-06-23 20:38:37	2017-06-27 15:17:52

R1-1711631	On Details of the PT-RS Design for DFT-s-OFDM	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-23 20:38:37	2017-06-24 14:35:52
R1-1711632	Channel and interference measurement for CSI acquisition	Huawei, HiSilicon	available	2017-06-23 20:38:37	2017-06-25 11:52:50
R1-1711633	PDCCH structure	Qualcomm Incorporated	available	2017-06-23 20:49:38	2017-06-25 02:49:29
R1-1711634	RS for DL control channel	Qualcomm Incorporated	available	2017-06-23 20:50:11	2017-06-25 02:49:29
R1-1711635	Summary of Open Issues on Layer Mapping	Samsung	revised	2017-06-23 20:53:10	
R1-1711636	General views on DL beam management	Huawei, HiSilicon	available	2017-06-24 06:57:47	2017-06-25 11:52:50
R1-1711637	Discussion on NTN Deployment Scenarios	Samsung	available	2017-06-24 14:39:04	2017-06-25 11:52:50
R1-1711638	Discussion on transition between NR network coordination schemes	Samsung	available	2017-06-24 14:41:03	2017-06-25 11:52:50
R1-1711639	Performance comparison of interleaver designs	Qualcomm	available	2017-06-25 03:02:41	2017-06-27 15:17:52
R1-1711640	Interleaver design for Polar codes	Qualcomm Incorporated	withdrawn	2017-06-25 03:04:55	
R1-1711641	Repetition scheme of polar codes	LG Electronics	available	2017-06-26 01:56:09	2017-06-27 15:17:52
R1-1711642	NR topics requiring coordination between RAN1 and RAN2	RAN2 Chair	noted	2017-06-26 08:43:03	2017-06-26 09:06:31
R1-1711643	Views on SRS designs	Mitsubishi Electric	available	2017-06-26 08:43:54	2017-06-27 15:17:52
R1-1711644	Study of Split-CRC Polar Code Construction for Early Termination	Tsotun Algorithm	noted	2017-06-26 09:18:42	2017-06-27 15:17:52
R1-1711645	SS burst set composition consideration	Qualcomm Incorporated	noted	2017-06-26 09:20:30	2017-06-27 15:17:52
R1-1711646	Timing indication based on SS block consideration	Qualcomm Incorporated	noted	2017-06-26 09:21:26	2017-06-27 15:17:52
R1-1711647	Time Index Signaling for SS Blocks	Intel Corporation	available	2017-06-26 14:32:45	2017-06-27 15:17:52
R1-1711648	SS Block Composition	Intel Corporation	available	2017-06-26 14:33:33	2017-06-27 15:17:52
R1-1711649	Discussion on 1-symbol NR-PUCCH for UCI of up to 2 bits	Panasonic Corporation	available	2017-06-27 15:10:16	2017-06-27 15:17:52
R1-1711650	NR-PBCH content	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-06-27 15:10:17	2017-06-27 15:17:52
R1-1711651	Discussion on CSI-RS design	Qualcomm Incorporated	withdrawn	2017-06-27 15:10:18	
R1-1711652	Summary of the 2nd NOMA Workshop	ZTE	available	2017-06-27 15:10:19	2017-06-27 15:17:52
R1-1711653	Considerations of NR-LTE coexistence in uplink	ZTE	revised	2017-06-27 15:10:19	2017-06-27 15:17:52
R1-1711654	WF on NR-SS sequence design	NTT DOCOMO, ZTE, InterDigital	noted	2017-06-27 15:10:20	2017-06-27 15:17:52
R1-1711655	Discussion on short-PUCCH more than 2-bit	vivo	available	2017-06-27 15:10:20	2017-06-27 15:17:52
R1-1711656	WF on PRACH formats for long sequence length (L = 839)	ZTE	withdrawn	2017-06-27 15:10:20	
R1-1711657	[DRAFT] Response LS on Support for fake gNB detection mechanisms	Nokia	revised	2017-06-27 15:10:20	2017-07-01 00:57:51
R1-1711658	Considerations on SS block compositions	Sony	available	2017-06-27 15:10:21	2017-06-27 15:17:52
R1-1711659	Discussion on SS block time index indication	Sony	available	2017-06-27 15:10:21	2017-06-27 15:17:52
R1-1711660	WF on CSI-RS	Samsung, Ericsson, NTT DOCOMO, CATT	available	2017-06-27 15:10:21	2017-06-28 13:47:52

R1-1711661	Summary of views on NR CSI-RS	Huawei, HiSilicon	available	2017-06-27 15:10:21	2017-06-27 15:17:52
R1-1711662	WF on CW to layer mapping	Huawei, HiSilicon, ZTE, Xinwei, China Unicom, ETRI, Softbank, DOCOMO, LGE, Deutsche Telekom, CATR	available	2017-06-27 15:10:21	2017-06-28 13:47:52
R1-1711663	On UL PT-RS design	LG Electronics	withdrawn	2017-06-27 15:10:21	
R1-1711664	WF on number of MCS and CQI configuration	Intel, Samsung	available	2017-06-27 15:10:22	2017-07-01 00:57:51
R1-1711665	WF on MIMO layer to CW correspondence	Intel, AT&T	available	2017-06-27 15:10:22	2017-07-01 00:57:51
R1-1711666	WF on SS block and DM-RS collision handling	Intel	noted	2017-06-27 15:10:22	2017-06-29 12:37:51
R1-1711667	WF on multiple PDSCH approach of supporting NC-JT	Intel	noted	2017-06-27 15:10:22	2017-06-28 13:47:52
R1-1711668	WF on SRS sequence for NR	Intel, Samsung, Qualcomm	noted	2017-06-27 15:10:22	2017-06-29 12:37:51
R1-1711669	LDPC design for eMBB data	CATT	revised	2017-06-27 15:10:22	2017-06-27 15:17:52
R1-1711670	Summary of remaining items on beam management	Qualcomm	withdrawn	2017-06-27 15:10:23	
R1-1711671	Performance impact of inactive antenna ports	Ericsson	available	2017-06-27 15:10:23	2017-06-27 15:17:52
R1-1711672	Summary of QCL	Nokia, Alcatel-Lucent	available	2017-06-27 15:10:23	2017-06-27 15:17:52
R1-1711673	WF on QCL	Shanghai Bell	withdrawn	2017-06-27 15:10:23	
R1-1711674	Summary of issues and WFs on Codebook based transmission for UL	Nokia, Alcatel-Lucent	revised	2017-06-27 15:10:23	2017-06-28 13:47:52
R1-1711675	WF on UE self-interference	Intel	noted	2017-06-27 15:10:23	2017-06-27 15:17:52
R1-1711676	WF on Transmission Scheme of Broadcast PDSCH	Vivo, OPPO, Coolpad, China Telecom, Xiaomi, Huawei, HiSilicon, China Unicom	noted	2017-06-27 15:10:23	
R1-1711677	Summary of the E-mail Discussion [89-21]: On Long PUCCH for NR	Qualcomm	withdrawn	2017-06-27 15:10:23	2017-06-28 13:47:52
R1-1711678	Way forward on the mapping of SS blocks	Ericsson	noted	2017-06-27 15:10:23	2017-06-29 12:37:51
R1-1711679	Impact of Puncturing on Bit-channel Capacities	Nokia	revised	2017-06-27 15:10:23	2017-06-28 13:47:52
R1-1711680	WF on LTE-NR Coexistence with UL sharing	Ericsson	available	2017-06-27 15:10:23	
R1-1711681	WF on the structure of a data channel including DMRS	Huawei, HiSilicon	withdrawn	2017-06-27 15:10:24	2017-06-27 15:17:52
R1-1711682	WF on UE to UE measurement as an enabler for CLI mitigation schemes	Panasonic, OPPO, NTT DOCOMO	available	2017-06-27 15:10:24	
R1-1711683	[DRAFT LS] on NR Beam Management	ZTE	noted	2017-06-27 15:10:24	2017-06-27 15:17:52
R1-1711684	[DRAFT] LS on Beam Aspects of NR RACH	Qualcomm	revised	2017-06-27 15:10:24	2017-07-01 00:57:51
R1-1711685	[DRAFT] LS on HARQ operation	Huawei	revised	2017-06-27 15:10:24	2017-06-29 12:37:51
R1-1711686	LS on NR UL SPS / UL transmission without UL grant	Nokia	revised	2017-06-27 15:10:24	2017-07-01 00:57:51
R1-1711687	[DRAFT LS] to RAN2 on PDCCH monitoring and DRX	RAN1, NTT DOCOMO	approved	2017-06-27 15:10:24	2017-08-12 09:40:07
		CATT	withdrawn	2017-06-27 15:10:24	

R1-1711688	Way Forward on PTRS	Intel		revised	2017-06-27 15:10:24	2017-06-29 12:37:51
R1-1711689	Outputs of offline discussion on RBG size/number determination	OPPO		revised	2017-06-27 15:10:24	2017-07-03 14:07:51
R1-1711690	WF on the number of CBGs	OPPO		available	2017-06-27 15:10:24	2017-06-28 13:47:52
R1-1711691	Analysis of SSS Proposals	Intel Corporation		revised	2017-06-27 15:10:24	2017-06-28 13:47:52
R1-1711692	WF on final PCM selection	Nokia, Alcatel-Lucent Shanghai Bell		noted	2017-06-27 15:10:24	2017-06-27 15:17:52
R1-1711693	Base Graph 1 lifting and evaluations	Intel Corporation		available	2017-06-27 15:10:24	2017-06-27 15:17:52
R1-1711694	Base Graph 2 lifting and evaluations	Intel Corporation		available	2017-06-27 15:10:25	2017-06-27 15:17:52
R1-1711695	WF on cross-link interference aware UPLC	Huawei		available	2017-06-27 15:10:25	2017-06-27 15:17:52
R1-1711696	On NR LDPC design and performance	MediaTek Inc.		revised	2017-06-27 15:10:25	2017-06-27 15:17:52
R1-1711697	WF on rate-matching for Polar codes	Qualcomm		noted	2017-06-27 15:10:25	2017-06-29 12:37:51
R1-1711698	WF on interleaver design	Qualcomm		available	2017-06-27 15:10:25	2017-06-29 12:37:51
R1-1711699	WF on SRS design in NR	LG Electronics		revised	2017-06-27 15:10:25	2017-06-29 12:37:51
R1-1711700	WF on CLI measurement	MediaTek Inc.		noted	2017-06-27 15:10:25	2017-06-27 15:17:52
R1-1711701	Considerations of NR-LTE coexistence in uplink	ZTE		noted	2017-06-27 15:10:25	2017-06-27 15:17:52
R1-1711702	Rate matching for Polar code	Huawei, HiSilicon		available	2017-06-27 15:10:25	2017-06-28 13:47:52
R1-1711703	Support of implicit soft combining for PBCH by Polar code construction	Huawei, HiSilicon		withdrawn	2017-06-27 15:10:26	
R1-1711704	Benefits of implicit soft combining for PBCH by Polar code construction	Huawei, HiSilicon		withdrawn	2017-06-27 15:10:26	
R1-1711705	WF on handling of single UL transmission	NTT DOCOMO		revised	2017-06-27 15:10:26	2017-06-27 15:17:52
R1-1711706	On Hybrid TDD and Signaling for Cross-link Interference Mitigation	Ericsson		withdrawn	2017-06-27 15:10:26	
R1-1711707	WF on inter-TRP signaling for UE-to-UE cross-link interference measurement	LG Electronics		noted	2017-06-27 15:10:27	2017-06-27 15:17:52
R1-1711708	WF on REG bundle size in a CORESET with interleaving	LG Electronics, ETRI, NTT DOCOMO, Ericsson, InterDigital		noted	2017-06-27 15:10:27	2017-06-27 15:17:52
R1-1711709	WF on NR-LTE coexistence in overlapping spectrum	AT&T, Deutsche Telekom, Vodafone, Intel, Ericsson, Samsung, Orange, China Unicom, Huawei, HiSilicon, China Telecom		noted	2017-06-27 15:10:27	
R1-1711710	WF on NR-LTE coexistence	AT&T, Nokia, Ericsson, Vodafone		noted	2017-06-27 15:10:27	2017-06-29 12:37:51
R1-1711711	LDPC design for eMBB data	CATT		available	2017-06-27 15:10:27	2017-06-27 15:17:52
R1-1711712	WF on group-based beam reporting	ZTE, ASTRI, Nokia, ASB, NTT DOCOMO, Intel, Qualcomm, Samsung, AT&T		available	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711713	WF on beam indication	ZTE		withdrawn	2017-06-27 15:10:27	

R1-1711714	WF on DMRS multiplexing in time domain	ZTE, Xinwei, ASTRI, Spreadtrum	noted	2017-06-27 15:10:27	2017-06-28 13:47:52
R1-1711715	WF on channel reciprocity based CSI	ZTE, Nokia, ASB, LG Electronics, ASTRI, Ericsson, NTT DCOMO	available	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711716	WF on partial channel reciprocity based CSI	ZTE, CMCC, China Telecom, China Unicom, ASTRI	available	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711717	WF on using SS block for beam recovery	ZTE, Ericsson, NTT DCOMO, MediaTek, Spreadtrum, vivo, OPPO, Qualcomm, Xinwei, LG Electronics, AT&T, Lenovo, CMCC, China Unicom, China Telecom, ASTRI, Samsung, Nokia, ASB, Illi, MTI, Sharp, National Instruments	noted	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711718	WF on DL beam indication with beam correspondence	ZTE	withdrawn	2017-06-27 15:10:27	
R1-1711719	WF on CSI in PUCCH	ZTE, NTT DCOMO	available	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711720	WF on Type II CSI	ZTE, MediaTek	available	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711721	WF on power control	ZTE, NTT DCOMO	noted	2017-06-27 15:10:27	2017-06-29 12:37:51
R1-1711722	WF on DMRS multiplexing with data	ZTE, Qualcomm, KT Corp., NTT DCOMO	noted	2017-06-27 15:10:27	2017-06-29 12:37:51
R1-1711723	WF on CSI-RS CDM pattern	ZTE	available	2017-06-27 15:10:27	2017-06-28 13:47:52
R1-1711724	Summary of power control	ZTE	noted	2017-06-27 15:10:27	2017-06-29 12:37:51
R1-1711725	Summary of channel reciprocity based CSI	ZTE	noted	2017-06-27 15:10:27	2017-07-01 00:57:51
R1-1711726	WF on DMRS port multiplexing in frequency domain	MediaTek Inc.	withdrawn	2017-06-27 15:10:28	
R1-1711727	LDPC design for base graph 1	Huawei, HiSilicon	available	2017-06-27 15:10:28	2017-06-27 15:17:52
R1-1711728	WF on CRC Attachment for CBGs	Ericsson	available	2017-06-27 15:10:28	2017-06-28 13:47:52
R1-1711729	WF on Circular buffer of Polar Code	Ericsson, Qualcomm, MediaTek, LGE	noted	2017-06-27 15:10:28	2017-07-01 00:57:52
R1-1711730	WF on the Number of Assistant Bits for Polar Construction	Ericsson, NTT DCOMO, Qualcomm, Intel, Tsinghua, Samsung, LG, Fujitsu	noted	2017-06-27 15:10:28	2017-06-28 13:47:52
R1-1711731	WF on LDPC Code Usage Scenarios	MediaTek, Qualcomm, InterDigital, ZTE	noted	2017-06-27 15:10:28	2017-07-01 00:57:52
R1-1711732	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711733	void	ETSI	withdrawn	2017-06-27 15:10:28	

R1-1711734	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711735	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711736	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711737	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711738	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711739	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711740	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711741	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711742	void	ETSI	withdrawn	2017-06-27 15:10:28	
R1-1711743	void	ETSI	withdrawn	2017-06-27 15:10:29	
R1-1711744	void	ETSI	withdrawn	2017-06-27 15:10:29	
R1-1711745	void	ETSI	withdrawn	2017-06-27 15:10:29	
R1-1711746	WF on time resource indication	OPPO	withdrawn	2017-06-27 15:10:29	
<u>R1-1711747</u>	Shift coefficients design for base graph 1	ZTE	available	2017-06-28 13:41:41	2017-07-01 00:57:52
<u>R1-1711748</u>	Shift coefficients design for base graph 2	ZTE	available	2017-06-28 13:41:42	2017-07-01 00:57:52
<u>R1-1711749</u>	Segmentation of Polar codes	ZTE	available	2017-06-28 13:41:42	2017-07-01 00:57:52
<u>R1-1711750</u>	WF on UL non-codebook based transmission	Huawei, HiSilicon, DOCOMO, Sharp, LGE, Ericsson, China Telecom, Deutsche Telekom, Xinwei, Vodafone, CeWIT, China Unicom, Tejas Networks, CATR, IITH, IITM, Panasonic, ZTE, InterDigital, AT&T, SoftBank, KDDI	noted	2017-06-28 13:41:42	2017-07-01 00:57:52
<u>R1-1711751</u>	On Bit Mapping Design for Polar Codes	Ericsson	available	2017-06-28 13:41:43	2017-06-28 13:47:52
<u>R1-1711752</u>	Polar Code Performance in Fading Channel	Ericsson	available	2017-06-28 13:41:43	2017-06-28 13:47:52
<u>R1-1711753</u>	WF on UL resource allocation for PUSCH with DT-s-OFDM waveform in NR	NEC, NTT DOCOMO, Panasonic, OPPO, Ericsson, Nokia, ASB	noted	2017-06-28 13:41:43	2017-06-29 12:37:52
<u>R1-1711754</u>	WF on NR PDCCH blind decodes	vivo, Samsung	noted	2017-06-28 13:41:43	2017-06-28 13:47:52
<u>R1-1711755</u>	Open issues on SRS design	Sony	revised	2017-06-28 13:41:43	2017-06-28 13:47:52
R1-1711756	WF on Polar rate-matching selection	MediaTek Inc.	withdrawn	2017-06-28 13:41:43	
<u>R1-1711757</u>	Optimization and comparison of Polar code rate-matching design	MediaTek Inc.	available	2017-06-28 13:41:43	2017-06-28 13:47:52
<u>R1-1711758</u>	Correction on the formula of AnnexA	ZTE, Ericsson	agreed	2017-06-28 13:41:43	2017-07-01 00:57:52
<u>R1-1711759</u>	Summary of offline discussion on CSI-RS	Samsung	noted	2017-06-28 13:41:45	2017-06-28 13:47:52
<u>R1-1711760</u>	Correction on Procedure A of spatially-consistency UT modeling	ZTE, Ericsson	agreed	2017-06-28 13:41:45	2017-07-01 00:57:52
<u>R1-1711761</u>	WF on measurement based on SS block	NTT DOCOMO, Ericsson, Huawei, HiSilicon, AT&T	noted	2017-06-28 13:41:46	2017-06-28 13:47:52

R1-1711762	WF on measurement based on CSI-RS	NTT DOCOMO, Ericsson, AT&T	noted	2017-06-28 13:41:46	2017-06-28 13:47:52
R1-1711763	WF on radio link monitoring	NTT DOCOMO, Ericsson, AT&T	noted	2017-06-28 13:41:46	2017-06-28 13:47:52
R1-1711764	WF on Polar codes construction	NTT DOCOMO, Ericsson, Qualcomm, Intel, Tsofun Algorithm, CATT, AT&T	noted	2017-06-28 13:41:46	2017-06-28 13:47:52
R1-1711765	Summary of views on TRS	MediaTek Inc.	noted	2017-06-28 13:41:46	2017-06-29 12:37:52
R1-1711766	WF on TRS	MediaTek, Huawei, HiSilicon, Ericsson, Qualcomm	noted	2017-06-28 13:41:46	2017-07-01 00:57:52
R1-1711767	WF on SRS sequence generation for partial overlapping	LG Electronics, Intel Corporation, ZTE	noted	2017-06-28 13:41:46	2017-06-29 12:37:52
R1-1711768	On bandwidth parts and 'RF' requirements	Ericsson	revised	2017-06-28 13:41:46	2017-06-28 13:47:52
R1-1711769	WF on CSI feedback for NCJT	LG Electronics, Ericsson, Intel	available	2017-06-28 13:41:46	2017-07-01 00:57:52
R1-1711770	WF on DL DMRS for broadcast/multicast PDSCH	LG Electronics, Qualcomm	noted	2017-06-28 13:41:46	2017-06-28 13:47:52
R1-1711771	WF on signaling DMRS configuration	LG Electronics, ZTE	noted	2017-06-28 13:41:46	2017-06-28 13:47:52
R1-1711772	WF on processing time requirements	Qualcomm	revised	2017-06-28 13:41:46	2017-06-29 12:37:52
R1-1711773	WF on PT-RS collision avoidance	LG Electronics, Huawei, CATT, ZTE	noted	2017-06-28 13:41:47	2017-06-29 12:37:52
R1-1711774	Circulant permutation matrix design for LDPC codes	LG Electronics	revised	2017-06-28 13:41:47	2017-06-28 13:47:52
R1-1711775	Circulant permutation matrix design for LDPC codes base graph #2	LG Electronics	revised	2017-06-28 13:41:47	2017-06-28 13:47:52
R1-1711776	WF on PUCCH resource allocation	LG Electronics	available	2017-06-28 13:41:47	2017-07-01 00:57:52
R1-1711777	WF on CW to layer mapping scheme for data channels	Qualcomm, ATT, Ericsson, Samsung, Nokia, ASB, CATT, Interdigital, Intel, Sharp, Verizon, BT, CHITL, Panasonic, NEC, KDDI	available	2017-06-28 13:41:47	2017-07-01 00:57:52
R1-1711778	Remaining issues on NR DM-RS	Qualcomm	noted	2017-06-28 13:41:47	2017-06-29 12:37:52
R1-1711779	[DRAFT] LS on subcarrier alignment and channel raster	AT&T, Sprint, T-Mobile USA, Huawei, HiSilicon, Samsung, Deutsche Telekom, Ericsson, Intel, China Telecom	revised	2017-06-28 13:41:47	2017-06-28 13:47:52
R1-1711780	Summary on DL PRB bundling	Xinwei	revised	2017-06-28 13:41:47	2017-06-28 13:47:52
R1-1711781	WF on performance comparison of sequences for Polar code	Huawei, HiSilicon	noted	2017-06-28 13:41:47	2017-06-29 12:37:52
R1-1711782	WF on UL transmission without grant	NEC	available	2017-06-28 13:41:47	2017-06-28 13:47:52

R1-1711783	WF on UL DMRS pattern for DFT-S-OFDM	LG Electronics, ZTE, Ericsson, NEC, NTT DCOMO	noted	2017-06-28 13:41:47	2017-06-28 13:47:52
R1-1711784	WF on DMRS design	MediaTek, Huawei, HiSilicon, China Telecom, ZTE, ASUSTek, CeWIT, Spreadtrum, Tejas Networks, CATR, Deutsche Telekom, IITH, Xinwei, MTI, CHTTL, China Unicom, IITM, ITRI	noted	2017-06-28 13:41:47	2017-06-29 12:37:52
R1-1711785	WF on periodic CSI reporting on short PUCCH	Ericsson, Samsung, Huawei, HiSilicon, CATT	available	2017-06-28 13:41:47	2017-07-01 00:57:52
R1-1711786	WF on unifying wideband and partial band definitions	Ericsson, LG, Samsung	available	2017-06-28 13:41:47	2017-07-01 00:57:52
R1-1711787	WF on CSI-RS	Samsung, Ericsson, NTT DCOMO, CATT, LG	noted	2017-06-28 13:41:47	2017-06-29 12:37:52
R1-1711788	Way forward on further details of bandwidth part operation	Intel, AT&T, Huawei, HiSilicon	noted	2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711789	Way forward on PRB indexing	Intel, Sharp, ETRI	revised	2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711790	On NR LDPC design and performance	MediaTek Inc.	available	2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711791	WF on Antenna Switching for SRS Transmission	Huawei, HiSilicon, Softbank, CMCC, Deutsche Telekom, CATR, Tejas Networks, OPPO, Qualcomm, CeWIT, Sony, ZTE, Xinwei, IITM, China Unicom, IITH, Ericsson, InterDigital, China Telecom, MediaTek	noted	2017-06-28 13:41:48	2017-06-29 12:37:52
R1-1711792	WF on codebook based UL transmission	MediaTek, Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-28 13:41:48	2017-07-01 00:57:52
R1-1711793	WF on codeword mapping	MediaTek Inc.	available	2017-06-28 13:41:48	2017-07-01 00:57:52
R1-1711794	WF on polar code sequence	Samsung	noted	2017-06-28 13:41:48	2017-06-29 12:37:52
R1-1711795	On bandwidth parts and 'RF' requirements	Ericsson	noted	2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711796	1-symbol short PUCCH with 1 or 2 bits UCI	Qualcomm	available	2017-06-28 13:41:48	2017-06-28 13:47:52

R1-1711797	WF on DMRS sequence	Samsung, Ericsson, Qualcomm Incorporated, CATT, Nokia, Alcatel-Lucent Shanghai Bell, Intel, AT&T, NTT DOCOMO, INC., LG Electronics, KT Corp., MediaTek Inc., Mitsubishi Electric Co., Spreadtrum, Fujitsu, Xinwei, KDDI, Panasonic, IITL	noted		2017-06-28 13:41:48	2017-06-29 12:37:52
R1-1711798	Summary of CSI Acquisition Details	NTT DOCOMO	revised		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711799	WF on random access association configuration	ZTE	revised		2017-06-28 13:41:48	2017-06-29 12:37:52
R1-1711800	WF on SS block repetition	ZTE, Sierra Wireless	available		2017-06-28 13:41:48	2017-06-29 12:37:52
R1-1711801	WF on power offset of NR-PBCH DMRS and NR-SSS	MediaTek, Huawei, HiSilicon, NTT DOCOMO	noted		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711802	WF on further details for bandwidth part	MediaTek, Huawei, HiSilicon	noted		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711803	WF on configuration of CSI-RS for CSI acquisition	LG Electronics, Samsung	noted		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711804	WF on CDM-8 in CSI-RS for CSI acquisition	LG Electronics, Samsung, CATT, NTT DOCOMO	noted		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711805	WF on Single DCI based NC-JT	LG Electronics, Intel Corporation, ZTE	available		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711806	WF on radio link monitoring in NR	Huawei, HiSilicon, Qualcomm, ATT	noted		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711807	Summary of views on multi-TRP & multi-panel transmission	CATT	revised		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711808	WF on PDSCH rate matching	LG Electronics, Panasonic, NTT DOCOMO, InterDigital, Intel	available		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711809	WF on slot format indication with group common PDCCH	LG Electronics, InterDigital, ...	available		2017-06-28 13:41:48	2017-07-01 00:57:52
R1-1711810	Analysis of SSS Proposals	Intel Corporation	noted		2017-06-28 13:41:48	2017-06-28 13:47:52
R1-1711811	WF on CSI measurement details	NTT DOCOMO, ZTE, Nokia, ASB, NEC	available		2017-06-28 13:41:49	2017-07-01 00:57:52
R1-1711812	WF on configuration of a bandwidth part in wideband bandwidth operation	LG Electronics, MediaTek	noted		2017-06-28 13:41:49	2017-06-29 12:37:52

R1-1711813	WF on DM-RS	NTT DOCOMO, Ericsson, Nokia, ASB, ZTE, KT Corp, Sharp, Qualcomm	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711814	WF on PT-RS for DFT-S-OFDM	NTT DOCOMO, Ericsson, Nokia, ASB, Panasonic, Spreadtrum, ZTE	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711815	WF on PT-RS for CP-OFDM	NTT DOCOMO, Mitsubishi Electric, Huawei, HiSilicon, Nokia, ASB	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711816	WF on front-loaded DMRS design for slot aggregation	vivo, Huawei, HiSilicon	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711817	WF on LTE-NR DC deployment scenarios to extend NR UL coverage	Orange, Deutsche Telekom, Ericsson, China Unicom, OPPO, Huawei, China Telecom, Nokia, ZTE	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711818	WF on UL power control	LG Electronics, Ericsson, InterDigital	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711819	WF on PHR for different waveforms	LG Electronics, NTT DOCOMO, InterDigital	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711820	[DRAFT] LS on support of multi-TRP transmission in NR	Intel	revised	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711821	WF on Configuration of UL Transmission without Grant	Ericsson	withdrawn	2017-06-28 13:41:49	
R1-1711822	Design of combined-and-Nested polar code sequences	Samsung	noted	2017-06-28 13:41:49	2017-06-29 12:37:52
R1-1711823	WF on pre-emption indication	Huawei, HiSilicon, MediaTek, Sequans, NTT DOCOMO, Sony, vivo, ZTE, InterDigital, III	revised	2017-06-28 13:41:49	2017-07-03 14:07:52
R1-1711824	[DRAFT] LS on non-contiguous CA	AT&T	revised	2017-06-28 13:41:49	2017-06-28 13:47:52
R1-1711825	LS on non-contiguous CA	RAN1, AT&T	approved	2017-06-28 13:41:49	2017-06-28 13:47:52
R1-1711826	WF on interleaver design on NR polar codes	LG Electronics	withdrawn	2017-06-28 13:41:50	
R1-1711827	WF on Capacity Enhancement for option 1 of PRACH preamble	LG Electronics, ITL	noted	2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711828	WF on RACH power control	LG Electronics, ETRI	available	2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711829	Offline discussions on UL data transmission without grant	NTT DOCOMO	noted	2017-06-28 13:41:50	2017-06-28 13:47:52
R1-1711830	WF on UE-UE CLI measurement	Huawei, HiSilicon, ZTE, MediaTek, Intel, CMCC	noted	2017-06-28 13:41:50	2017-06-29 12:37:52

R1-1711831	WF on pi/2 BPSK with spectrum shaping	IITH, ATT, Qualcomm, Deutsche Telekom, IITM, Reliance Jio, Samsung, Thales, INL, CEWIT, Tejas Networks, DISH, Sony	noted	2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711832	WF on Pre-DFT Multiplexing of RS and UCI in short duration PUCCH	IITH	available	2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711833	WF on waveform for long duration PUCCH	IITH, ATT, Deutsche Telekom, IITM, Reliance Jio, DISH, Thales, CEWIT, Tejas Networks, Sony, INL	available	2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711834	WF on Long PUCCH Format with 1-2 UCI bits	Ericsson, Huawei, HiSilicon, LG, ZTE, MediaTek, Panasonic, WILUS Inc., Intel, Vivo, Cohere Technologies, ETRI, Motorola mobility, Lenovo, CATT	revised	2017-06-28 13:41:50	2017-06-28 13:47:52
R1-1711835	WF on Frequency Hopping for Long PUCCH	Ericsson, MediaTek, Qualcomm, Panasonic, Intel, LG, NTT DCOMO, Cohere Technologies, WILUS Inc., Huawei, HiSilicon, Samsung	noted	2017-06-28 13:41:50	2017-06-28 13:47:52
R1-1711836	WF on scheduling request for NR	Idaho National Laboratory, KDDI, Lenovo, Motorola Mobility, IITH, CEWIT, IITM, Tejas Networks, Qualcomm	available	2017-06-28 13:41:50	2017-07-01 00:57:52
R1-1711837	Open issues on SRS design	Sony	revised	2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711838	WF on Beam Reporting	Intel, Huawei, HiSilicon, InterDigital, CATT	available	2017-06-28 13:41:50	2017-07-01 00:57:52
R1-1711839	LS on subcarrier alignment and channel raster	RAN1, AT&T	approved	2017-06-28 13:41:50	2017-06-28 13:47:52
R1-1711840	WF on Frequency Hopping for Multi-slot Long PUCCH	LG Electronics	available	2017-06-28 13:41:50	2017-07-01 00:57:52
R1-1711841	Summary of views on resource for PDSCH and PUSCH rate matching	LG Electronics	noted	2017-06-28 13:41:50	2017-07-01 00:57:52
R1-1711842	WF on UE-to-UE crosslink measurement	CMCC, Spreadtrum	noted	2017-06-28 13:41:50	2017-06-29 12:37:52

R1-1711843	Outputs of offline discussion on RBG size/number determination	OPPO, Nokia, LGE, Samsung, vivo, ZTE, CATR	noted		2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711844	WF on the number of CBGs	OPPO	available		2017-06-28 13:41:50	2017-06-29 12:37:52
R1-1711845	Summary of AI 5.1.2.1/4 Diversity transmission for UL	Mitsubishi Electric	noted		2017-06-29 12:30:08	2017-07-01 00:57:52
R1-1711846	WF on NR CA	Huawei, HiSilicon, KT, CATR, MediaTek, Nokia, ASB, Ericsson, Intel	noted		2017-06-29 12:30:09	2017-07-01 00:57:52
R1-1711847	WF on SRS switching	Huawei, HiSilicon	available		2017-06-29 12:30:09	2017-07-01 00:57:52
R1-1711848	WF on handling of single UL transmission	NTT DOCOMO, Apple	noted		2017-06-29 12:30:09	2017-06-29 12:37:52
R1-1711849	WF on Preamble sequence for capacity enhancement	Huawei, HiSilicon	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711850	WF for NR RLM	CATT	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711851	WF on inter-gNB signaling for cross-link interference management	LG Electronics	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711852	WF on SRS sequence design	Ericsson, Huawei, HiSilicon, Nokia, ASB, Panasonic, NTT DOCOMO	noted		2017-06-29 12:30:10	2017-07-01 00:57:52
R1-1711853	Activation/deactivation of bandwidth parts	Ericsson	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711854	WF on SS Burst set Composition	LG Electronics	revised		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711855	Way forward on PRB indexing	Intel, Sharp, Ericsson, MediaTek, NTT DOCOMO, Panasonic, Nokia, ASB, NEC, KT, ETRI	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711856	WF on processing time requirements	Qualcomm, ZTE, Deutsche Telekom, Vodafone, Panasonic, Ericsson	revised		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711857	Summary of views on multi-TRP & multi-panel transmission	CATT	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711858	WF on beam failure recovery request	LG Electronics, Intel, Huawei, HiSilicon, vivo	available		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711859	WF on SRS beam sweeping behavior	LG Electronics, Huawei, HiSilicon, Samsung, Ericsson	available		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711860	Evaluation of NR-SS	Huawei, HiSilicon	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711861	WF on RACH power control mechanism Msg.1 transmission	LG Electronics, NTT DOCOMO	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711862	WF on power sharing mechanism	NTT DOCOMO, InterDigital	noted		2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711863	WF on NR power control framework	NTT DOCOMO INC., Nokia, Intel, InterDigital	noted		2017-06-29 12:30:10	2017-06-29 12:37:52

R1-1711864	Measurement window periodicity, duration and offset of CSI-RS for L3 mobility	Qualcomm	noted	2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711865	Multiple/repeated PRACH preamble transmission with OCC across preambles	Qualcomm, Interdigital, Samsung, AT&T, Verizon	noted	2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711866	WF on RACH configuration in RMSI	Huawei, HiSilicon	noted	2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711867	Observations on PBCH Signaling	Qualcomm	withdrawn	2017-06-29 12:30:10	
R1-1711868	WF on DMRS indication	Samsung	revised	2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711869	WF on collision avoidance between short PUCCH and SRS	Mitsubishi Electric, AT&T, Panasonic, Samsung, Huawei, HiSilicon, ZTE	noted	2017-06-29 12:30:10	2017-07-01 00:57:52
R1-1711870	NR PRACH capacity enhancement	CATT, Huawei, TCL	noted	2017-06-29 12:30:10	2017-07-01 00:57:52
R1-1711871	WF on radio link monitoring in NR	Huawei, HiSilicon, Qualcomm, ATT, NTT DOCOMO, Intel	revised	2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711872	LS on UE self-interference	RAN1, vivo	approved	2017-06-29 12:30:10	2017-06-29 12:37:52
R1-1711873	WF on initial bandwidth part	LG Electronics, Ericsson, MediaTek	noted	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711874	NR UL MIMO Signaling Mechanism	Ericsson, Nokia, Alcatel-Lucent Shanghai Bell, Qualcomm, CATT, ZTE	noted	2017-06-29 12:30:11	2017-07-01 00:57:52
R1-1711875	WF on PRACH Preamble Format for Short sequence with Option 1	LG Electronics, NTT DOCOMO	noted	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711876	WF on multiple Msg1 transmission for contention free case	Samsung, Huawei, Hisilicon, MediaTek, ZTE	noted	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711877	[DRAFT] LS on single UL transmission	NTT DOCOMO	revised	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711878	LS on single UL transmission	RAN1, NTT DOCOMO	approved	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711879	[DRAFT] LS on Beam Aspects of NR RACH	Huawei	revised	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711880	LS on Beam Aspects of NR RACH	RAN1, Huawei	approved	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711881	Summary of Issues and WFs on Codebook based transmission for UL	Intel	noted	2017-06-29 12:30:11	2017-07-01 00:57:52
R1-1711882	WF on use of SS blocks in beam management	Qualcomm	withdrawn	2017-06-29 12:30:11	
R1-1711883	WF on CBG retransmission	Samsung	revised	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711884	Summary of issues on UL non-codebook based transmission	Nokia, Alcatel-Lucent Shanghai Bell	noted	2017-06-29 12:30:11	2017-07-01 00:57:52
R1-1711885	WF on change of SS block frequency position	CMCC	available	2017-06-29 12:30:11	2017-06-29 12:37:52
R1-1711886	TS38.211 v0.0.2 NR; Physical channels and modulation	Ericsson LM	revised	2017-06-29 12:30:11	2017-07-01 00:57:52
R1-1711887	WF on 2-symbol NR-PUCCH	LG Electronics	available	2017-06-29 12:30:13	2017-07-01 00:57:52

R1-1711888	WF on m0 and m1 for NR-SSS	NTT DOCOMO, ITL, Intel, Samsung, InterDigital, Motorola Mobility, Lenovo	agreed	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711889	WF on radio link monitoring in NR	Huawei, HiSilicon, Qualcomm, ATT, NTT DCOMO, Intel, Vivo, LG	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711890	WF on UL frequency selective precoding in UL non-codebook based transmission	Huawei, HiSilicon, LG Electronics	available	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711891	WF on PT-RS for DFT-S-OFDM	Samsung, Intel, CATT	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711892	Reply LS on PBCH content	RAN2, Huawei	treated	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711893	Offline discussions summary on CSI framework	AT&T	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711894	WF on remaining issues on PTRS for CP-OFDM - Part 1	Huawei, HiSilicon, InterDigital, Xinwei, NI, Panasonic	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711895	WF on remaining issues on PTRS for CP-OFDM - Part 2	Huawei, HiSilicon, InterDigital, Xinwei, Intel, NI, Panasonic, Spreadtrum	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711896	WF on UE assistance information for UL beam management	MediaTek, Samsung, Intel	available	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711897	Offline discussion summary on beam recovery	MediaTek	noted	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711898	[DRAFT] LS on power sharing for LTE-NR Dual Connectivity	Ericsson	revised	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711899	Way forward on the mapping of SS blocks	Nokia	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711900	WF on remaining issues on CSI-RS for mobility with RAN4 impact	Ericsson	available	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711901	WF on remaining RLM issues with RAN4 impact	Ericsson	available	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711902	WF on CSI-RS resources for L3 mobility	Ericsson	available	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711903	WF on SRS for UL beam management	OPPO, Intel, Samsung, Xinwei	available	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711904	Summary of views on CSI feedback for Type I and Type II	Ericsson	noted	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711905	Summary of CSI Feedback for Open-loop/Semi-open-loop	Ericsson	noted	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711906	WF on SS Burst set Composition	LG Electronics, Nokia, InterDigital, British Telecom	noted	2017-06-29 12:30:13	2017-06-29 12:37:52
R1-1711907	Draft Reply LS on reading time index indication for RRM measurements	Intel Corporation	revised	2017-06-29 12:30:13	2017-07-01 00:57:52
R1-1711908	Reserved resource for forward compatibility	Ericsson	available	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711909	[DRAFT] LS response on required parameters from RAN4 perspective	Ericsson	revised	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711910	[DRAFT] Reply LS on PDCCH design	Ericsson, CATT	revised	2017-06-29 12:30:14	2017-06-29 12:37:52

R1-1711911	WF on pre-emption indication	Huawei, HiSilicon, MediaTek, Sequans, NTT DOCOMO, Sony, vivo, ZTE, InterDigital, Ill, Intel, LG, Samsung	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711912	WF on Long PUCCH Format with 1-2 UCI bits	Ericsson, Huawei, HiSilicon, LG, ZTE, MediaTek, Panasonic, WILUS Inc., Intel, Vivo, Cohere Technologies, ETRI, Motorola mobility, Lenovo, CATT, Qualcomm	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711913	WF on introduction indication in SS block for cell update	CMCC	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711914	Overview of WFs on PTRS	Ericsson	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711915	WF on PTRS multiplexing with other RSs for CP-OFDM	ZTE	revised	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711916	Chairman's notes of AI 5.1.2 MIMO	Ad-Hoc chair (Qualcomm)	endorsed	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711917	Chairman's notes of AI 5.1.4 Channel coding	Ad-Hoc chair (Nokia)	endorsed	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711918	Chairman's notes of AI 5.1.6 Duplexing	Ad-Hoc chair (Qualcomm)	endorsed	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711919	Chairman's notes of AI 5.1.8 NR-LTE co-existence	Ad-Hoc chair (Qualcomm)	endorsed	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711920	WF on SRS design in NR	LG Electronics, CATT, Intel Corp., KT Corp., Qualcomm	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711921	WF on PDCCH and PDSCH resource sharing	ZTE, Nokia, Ericsson, LG, Panasonic, Qualcomm, Sharp	noted	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711922	WF on CSI-RS for BM	Intel, Ericsson, CATT, Samsung, MediaTek, AT&T, NTT Docomo, KT	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711923	WF on CSI-RS for BM	Samsung, Intel, AT&T, NTT DOCOMO, ZTE	noted	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711924	Summary of CSI Acquisition Details	NTT DOCOMO	noted	2017-06-29 12:30:14	2017-07-01 00:57:52
R1-1711925	Remaining part of email summary for UL transmission without UL grant	LG Electronics	withdrawn	2017-06-29 12:30:14	
R1-1711926	WF on PT-RS pattern in the frequency domain	LG Electronics	revised	2017-06-29 12:30:14	2017-06-29 12:37:52
R1-1711927	WF on gNB response for beam failure request	Huawei, HiSilicon, LG Electronics, Intel	available	2017-06-29 12:30:14	2017-07-01 00:57:52

R1-1711928	WF on PRACH for beam failure recovery request transmission	Huawei, HiSilicon, LG Electronics, Ericsson, CATT, NTT DOCOMO	available	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711929	WF on Beam Reporting	Huawei, HiSilicon, Samsung, Intel, Nokia, Oppo, National Instruments	available	2017-06-29 12:30:15	2017-07-03 14:07:52
R1-1711930	WF on SRS Configuration	Huawei, HiSilicon, OPPO	noted	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711931	[Draft] Reply LS on PDCCH design	Ericsson, CATT	revised	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711932	WF on PT-RS pattern in the frequency domain	LG Electronics	noted	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711933	WF on HARQ-ACK multiplexing for NR	LG Electronics	available	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711934	WF on HARQ-ACK bundling for NR	LG Electronics	available	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711935	Summary of Open Issues on Layer Mapping	Samsung	noted	2017-06-29 12:30:15	2017-07-01 00:57:52
R1-1711936	WF on CSI-RS based RACH configuration	Samsung, Ericsson, ZTE, Mediatek	noted	2017-06-29 12:30:15	2017-06-29 12:37:52
R1-1711937	Circulant permutation matrix design for LDPC codes	Mitsubishi, MTI			
R1-1711938	Circulant permutation matrix design for LDPC codes base graph #2	LG Electronics	withdrawn	2017-07-01 00:51:26	
R1-1711939	WF on the mapping of SS blocks with 30kHz SCS	LG Electronics	withdrawn	2017-07-01 00:51:28	
R1-1711940	LS to RAN1 on NR basic handover	Huawei, HiSilicon, CATT, CATR, OPPO, MediaTek, Vivo	noted	2017-07-01 00:51:28	2017-07-01 00:57:52
R1-1711941	Way Forward on PTRS	RAN2, Ericsson	treated	2017-06-29 00:00:00	2017-06-29 00:00:00
		Intel, Huawei, HiSilicon, National Instruments, MediaTek	noted	2017-07-01 00:51:33	2017-07-01 00:57:52
R1-1711942	WF on periodic CSI reporting on short PUCCH	Ericsson, Samsung, Huawei, HiSilicon, CATT	available	2017-07-01 00:51:33	2017-07-01 00:57:52
R1-1711943	Discussion on DMRS sequence for NR PBCH	Intel	noted	2017-07-01 00:51:33	2017-07-01 00:57:52
R1-1711944	Observations on LDPC Shift Coefficients	Qualcomm	noted	2017-07-01 00:51:33	2017-07-01 00:57:52
R1-1711945	WF on random access association configuration	ZTE	noted	2017-07-01 00:51:33	2017-07-01 00:57:52
R1-1711946	WF on DMRS indication	Samsung	noted	2017-07-01 00:51:34	2017-07-01 00:57:52
R1-1711947	Chairman's notes of AI 5.1.9 UL Power Control	Ad-Hoc chair (Qualcomm)	endorsed	2017-07-01 00:51:34	2017-07-01 00:57:52
R1-1711948	[Draft] LS on bandwidth part operation in NR	MediaTek	revised	2017-07-01 00:51:34	2017-07-01 00:57:52
R1-1711949	Reply LS to RAN1 on UL data transmission without UL grant for NR	RAN2, Huawei	postponed	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711950	LS to RAN1 on Random Access	RAN2, Samsung	treated	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711951	Open issues on SRS design	Sony	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711952	Performance evaluation of interference randomization	Qualcomm Inc.	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711953	Evaluation of proposed PCMs for BG#1	Huawei, HiSilicon	withdrawn	2017-07-01 00:51:35	

R1-1711954	Evaluation of proposed PCMs for BG#2	Huawei, HiSilicon	withdrawn	2017-07-01 00:51:35	
R1-1711955	Ranking of proposed PCMs for BG#1 and BG#2 based on evaluation results	Huawei, HiSilicon	withdrawn	2017-07-01 00:51:35	
R1-1711956	On Pi/2-BPSK with spectrum shaping	Ericsson	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711957	WF on processing time requirements	Qualcomm	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711958	WF on CBG retransmission	Samsung, ZTE	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711959	WF on DL PRB bundling	Xinwei	revised	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711960	Summary on DL PRB bundling	Xinwei	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711961	WF on the false alarm rate target of eMBB DCI	Panasonic, Qualcomm, Intel, NTT DOCOMO	withdrawn	2017-07-01 00:51:35	
R1-1711962	Way Forward on network-based beam failure recovery	Huawei, HiSilicon	available	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711963	Crosscheck Results for PCM of BG1	Samsung	available	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711964	Crosscheck Results for PCM of BG2	Samsung	available	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711965	Beam management offline summary	Qualcomm	noted	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711966	Reply LS on reading time index indication for RRM measurements	RAN1, Intel	approved	2017-07-01 00:51:35	2017-07-01 00:57:52
R1-1711967	Timing information indicated by DMRS	ZTE	noted	2017-07-01 00:51:36	2017-07-01 00:57:52
R1-1711968	[DRAFT] Reply LS response on NR basic handover	Samsung	revised	2017-07-01 00:51:36	2017-07-01 00:57:52
R1-1711969	Offline discussions on UL data transmission without grant	NTT DOCOMO	noted	2017-07-01 00:51:36	2017-07-01 00:57:52
R1-1711970	WF on RACH preamble format for short sequence with 1 and 2 OFDM symbols	Nokia, Alcatel-Lucent Shanghai Bell	available	2017-07-01 00:51:36	2017-07-01 00:57:52
R1-1711971	WF on QCL assumption in NR	ZTE, ASTRI, Nokia, ASB	available	2017-07-01 00:51:37	2017-07-01 00:57:52
R1-1711972	[DRAFT] Reply LS on PDCCH design	Ericsson, CATT	revised	2017-07-01 00:51:37	2017-07-01 00:57:52
R1-1711973	WF on CSI-RS for BM	Intel, Ericsson, Spreadtrum, MediaTek, Samsung, Verizon	available	2017-07-01 00:51:37	2017-07-01 00:57:52
R1-1711974	Summary of views on multiplexing of different types of RS	Huawei, HiSilicon	noted	2017-07-01 00:51:37	2017-07-01 00:57:52
R1-1711975	LS response on required parameters from RAN4 perspective	RAN1, Ericsson	approved	2017-07-01 00:51:37	2017-07-01 00:57:52
R1-1711976	WF on CSI-RS for beam management	NTT DOCOMO, Ericsson, Samsung	noted	2017-07-01 00:51:37	2017-07-01 00:57:52
R1-1711977	Sequence construction of Polar codes for control channel	Qualcomm Incorporated	withdrawn	2017-07-01 00:51:37	
R1-1711978	LDPC rate compatible design	Qualcomm Incorporated	available	2017-07-01 00:51:38	2017-07-01 00:57:52
R1-1711979	Performance cross-check for PCMs of NR LDPC BG1 and BG2	MediaTek	withdrawn	2017-07-01 00:51:38	
R1-1711980	Performance with L1 CRC polynomial	Qualcomm Incorporated	noted	2017-07-01 00:51:38	2017-07-01 00:57:52
R1-1711981	WF on group common pre-emption indication	Huawei, HiSilicon, Sharp, ZTE, LGE, Sony, Panasonic, MediaTek, InterDigital	noted	2017-07-01 00:51:38	2017-07-01 00:57:52

R1-1711982	WF on LDPC parity check matrices	Nokia	noted	2017-07-01 00:51:38	2017-07-01 00:57:52
R1-1711983	WF on Polar Code Construction With PC bits	Huawei, HiSilicon, CATT, MTK, ZTE, DCM, Accelercomm, Coherentlogix, LG, Spreadtrum, Interdigital, Nokia	noted	2017-07-01 00:51:38	2017-07-01 00:57:52
R1-1711984	[DRAFT] LS on NR initial access and mobility	NTT DOCOMO	revised	2017-07-01 00:51:38	2017-07-01 00:57:52
R1-1711985	[DRAFT] LS on NR initial access and mobility	NTT DOCOMO	revised	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711986	WF on PTRS multiplexing with other RSs for CP-OFDM	ZTE	available	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711987	Reply LS response on NR basic handover	RAN1, Samsung	approved	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711988	WF on beam indication for PDCCH	Samsung	available	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711989	[Draft] LS on bandwidth part operation in NR	MediaTek	revised	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711990	WF on DL PRB bundling	Xinwei	noted	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711991	WF on contents of the group-common PDCCH	CATT, NEC	noted	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711992	[DRAFT] Reply LS on PDCCH design	Ericsson, CATT	revised	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711993	WF on UE behavior for reserved resource	Samsung	revised	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711994	WF on UE power saving with PDCCH monitoring in CDRX	Qualcomm	available	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711995	WF on the content of the long PUCCH resource configuration	Ericsson	available	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711996	WF on long PUCCH Format for more than 2 UCI bits with multi-user multiplexing	Ericsson	available	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711997	Response LS on Support for fake gNB detection mechanisms	RAN1, Nokia	approved	2017-07-01 00:51:39	2017-07-01 00:57:52
R1-1711998	LS on bandwidth part operation in NR	RAN1, MediaTek	approved	2017-07-01 00:51:40	2017-08-12 09:38:54
R1-1711999	LS on power sharing for LTE-NR Dual Connectivity	RAN1, Ericsson	approved	2017-07-01 00:51:40	2017-07-01 00:57:52
R1-1712000	LS on support of multi-TRP transmission in NR	RAN1, Intel	approved	2017-07-01 00:51:40	2017-07-01 00:57:52
R1-1712001	LS on NR initial access and mobility	RAN1, NTT DOCOMO	approved	2017-07-01 00:51:40	2017-07-01 00:57:52
R1-1712002	LS on NR initial access and mobility	RAN1, NTT DOCOMO	approved	2017-07-01 00:51:40	2017-07-01 00:57:52
R1-1712003	[DRAFT] Reply LS on CSI-RS design for beam management	NTT DOCOMO	revised	2017-07-01 00:51:41	2017-07-01 00:57:52
R1-1712004	TS38.211 v0.1.0 NR; Physical channels and modulation	Ericsson LM	endorsed	2017-07-01 00:51:41	2017-07-01 17:35:54
R1-1712005	Reply LS on PDCCH design	RAN1, Ericsson, CATT	approved	2017-07-01 00:51:45	2017-07-01 00:57:52
R1-1712006	WF on UE behavior for reserved resource	Samsung	noted	2017-07-01 00:51:45	2017-07-01 00:57:52
R1-1712007	LS on NR Beam Management	RAN1, Qualcomm	approved	2017-07-01 17:34:26	2017-08-12 09:30:36
R1-1712008	LS on HARQ operation	RAN1, Nokia	approved	2017-08-12 09:33:29	2017-08-12 09:34:07
R1-1712009	Reply LS on CSI-RS design for beam management	RAN1, NTT DOCOMO	approved	2017-08-12 09:33:30	2017-08-12 09:34:07
R1-1712010	LS on a correction to the applicable UL modulation schemes	RAN1, Huawei	approved	2017-08-12 09:33:30	2017-08-12 09:34:07
R1-1712011	TS38.211 v0.1.1 NR; Physical channels and modulation	Ericsson LM	available	2017-07-17 00:00:00	2017-07-17 00:00:00
R1-1712012	TS38.201 v0.0.1 NR; Physical layer; General description	NTT DOCOMO	available	2017-07-17 00:00:00	2017-07-17 00:00:00
R1-1712013	TS38.202 v0.0.1 NR; Physical layer services provided by the physical layer	Qualcomm	available	2017-07-17 00:00:00	2017-07-17 00:00:00
R1-1712014	TS38.212 v0.0.1 NR; Multiplexing and channel coding	Huawei	available	2017-07-17 00:00:00	2017-07-17 00:00:00

R1-1712015	TS38.213 v0.0.1 NR; Physical layer procedures for control	Samsung	available	2017-07-17 00:00:00	2017-07-17 00:00:00
R1-1712016	TS38.214 v0.0.1 NR; Physical layer procedures for data	Nokia	available	2017-07-17 00:00:00	2017-07-17 00:00:00
R1-1712017	TS38.215 v0.0.1 NR; Physical layer measurements	Intel	available	2017-07-17 00:00:00	2017-07-17 00:00:00

Appendix G

Declaration of Friedhelm Rodermund

Appendix	Description
A	Curriculum Vitae of Friedhelm Rodermund
B	Email sent via the 3GPP_TSG_RAN_WG2 email exploder on June 24, 2017, announcing TS 36.321 v14.3.0
C	Email sent via the 3GPP_TSG_RAN_WG4 email exploder on July 2, 2017, announcing TS 36.133 v14.4.0
D	Email sent via the 3GPP_TSG_RAN_WG2 email exploder on July 13, 2017, announcing TS 36.331 v14.3.0
E	Meeting report 3GPP RAN WG1 NR (New Radio) Ad-Hoc #2 held on June 27-30, 2017, Qingdao, China
F	Document list of 3GPP RAN WG1 NR (New Radio) Ad-Hoc #2
G	List of Appendices