**UNITED STATES PATENT AND TRADEMARK OFFICE**

**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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SAMSUNG ELECTRONICS CO., LTD.,
Petitioner

v.

ASUS TECHNOLOGY LICENSING INC.,
Patent Owner.

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Patent No. 10,986,585

IPR Case No.: IPR2024-01246

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**PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1–20 OF U.S. PATENT NO. 10,986,585 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §§ 42.100 ET SEQ.**

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# DECLARATION OF CRAIG BISHOP

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# I. INTRODUCTION

I, Craig Bishop, declare the following:

1. I have been retained as an independent expert witness on behalf of Samsung Electronics Co., Ltd. ("Petitioner") related to the *Inter Partes* Review ("IPR") of U.S. Patent No. 10,986,585 ("the '585 patent").

2. I am being compensated for my work in this matter at my normal consulting hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the results of my study, the substance of my opinions, or the outcome of this matter.

3. I have no financial interest in the '585 patent and have had no contact with the named inventors of said patent. Neither have I reviewed the '585 patent in detail, nor do I have any personal interest in the outcome of this IPR.

4. In forming the opinions expressed in this declaration, I have considered the reference materials cited herein and my own academic background and professional experiences as outlined below.

5. While I have attempted to organize the information presented in this declaration into helpful sections and/or divisions, my opinions are supported by the information in the declaration in its entirety.

## II. QUALIFICATIONS

6. My complete qualifications and professional experience are described in my *curriculum vitae*, a copy of which is attached as **Appendix 1.** The following is a summary of my relevant qualifications and professional experience.

7. I earned my Bachelor of Electronic Engineering degree with Honors from Polytechnic of Central London in 1989. In 2006, I earned my MSC in Computer Science with Distinction from the University of Kent.

8. After graduating with my first degree, I worked as an operations engineer at the British Broadcasting Corporation (BBC) for 4 years, then as a civil servant at the UK Radiocommunications Agency until 1996, during which time I became involved in telecommunications standardization in the European Telecommunication Standards Institute ("ETSI"), working in particular in Technical Committee Radio Equipment and Systems (TC RES2) concerned with the standardization of Private Mobile Radio (PMR). From 1994 through 1996, I acted as Rapporteur for voice and data related PMR standards ETS 300 113, ETS 300 219 and ETS 300 390. I participated as the only TC RES2 delegate on behalf of the UK Radiocommunications Agency, generating proposals in support of UK administration and business requirements, downloading and reviewing other meeting input documents, and proposing changes as necessary to ensure input documents and the resulting specifications were in line with said requirements.

9. In 1996, I joined Samsung Electronic Research Institute as a Senior Standards Engineer where I worked for 16 years, eventually becoming Director of Standards and Industry Affairs in 2011. My work at Samsung mainly focused on the standardization of Global System for Mobile Communications (GSM)/ General Packet Radio Service (GPRS), Universal Mobile Telecommunications System (UMTS), the IP Multimedia subsystem (IMS), and Long-Term Evolution (LTE)/ Evolved Packet System (EPS) systems. Initially, I participated in ETSI Special Mobile Group (SMG) committees SMG1, SMG2, SMG4, SMG5, and SMG9, and relevant UMTS related sub-committees working on the air interface radio access network protocols, service, and terminal aspects of UMTS and GSM/GPRS until 1999. In particular, I was a participant in the ETSI SMG2 meetings leading up to selection of Wideband Code Division Multiple Access (WCDMA) as the radio access technology for the Frequency Division Duplex (FDD) mode of UMTS.

10. Beginning in 1998, I worked as a Principal Standards Engineer on the 3rd Generation Partnership Project (3GPP) on UMTS. I attended the inaugural 3GPP Technical Specification Group (TSG) meetings held in December 1998, and I began attending Working Group (WG) meetings in 1999. Specifically, I was a regular participant in Radio Access Network (RAN) WG1, Services & System Aspects (SA) WG1, Terminals (T) WG2, but I also attended TSG RAN and T plenary meetings and sometimes other Working Groups and covering similar technical aspects as in

my previous work in ETSI. As an example, RAN WG2 was, and is, a Working Group responsible for the specification of layer 2 and layer 3 Radio Resource, protocols for the UE. As part of this work, I would prepare meeting contributions in support of Samsung's research and development activities. Also, by way of preparation for each meeting, I would download all contributions and review those of interest to Samsung, and where necessary, prepare additional input to the meeting based on said review.

11. Beginning in 2000, I acted as project manager and then as system engineering manager at Samsung, providing technical requirements for the team working on Samsung's UMTS modem development. This involved scrutiny of ongoing standardization work, particularly in RAN WG1, RAN WG2, and TSG Core Network (CN) WG1, from which I would download, and assess the impact of, contributions on Samsung's development projects, ensuring that Samsung's development team was kept informed about the latest developments as layers 2 and 3 of the UMTS standard were stabilized.

12. During this period, in addition to authoring and presenting technical contributions for the 3GPP standard, and producing technical requirements for the radio modem, I acted as Rapporteur for 3GPP Technical Reports covering User Equipment ("UE") capability requirements (3GPP TR 21.904) from 1999–2000, and the Evolution of the 3GPP System (3GPP TR 21.902) in 2003 (the first Study Item

to consider the 3GPP system beyond UMTS towards LTE/EPS).

13. In 2005, I became Head of Advanced Technologies, Standards, and Regulation (ATSR) at Samsung. In addition to my managerial duties which included responsibility for standards, research, and regulatory engineers—including three standards engineers who were regularly attending 3GPP RAN WG2 and Core Network and Terminals (CT) WG1 Working Groups—I personally continued to work on 3GPP standardization issues. From 2005 until 2008, I regularly attended and participated in SA WG2 meetings, mainly focusing on IP Multimedia Subsystem (IMS) including voice over IMS but also looking at wider Evolved Packet System (EPS) related issues. From 2008 until 2011, I regularly attended and participated in SA WG1 meetings. I also attended SA plenary meetings from 2008 until I left Samsung in 2013. As well as generating contributions in support of Samsung's research and development as preparation for each meeting, I would download and review documents from other 3GPP members, identifying those of interest to Samsung and, where necessary, preparing additional contributions on behalf of Samsung. The work required a sound working knowledge of the broader 3GPP system to ensure effective management of the ATSR team, effective participation in meeting discussions, expert assessment of third-party standards contributions, and provision of implementation guidance to Samsung developers.

14. From 2005 until I stopped attending SA WG1 meetings in 2011, I

authored and presented over 100 contributions to SA WG2 and SA WG1 meetings at 3GPP and appeared as an author/co-author on 18 patent applications related to User Equipment operation in the IMS and the 3GPP Core Network.

15. In 2011, I became Director of Standards and Industry Affairs at Samsung, and in November of that year I was elected to the Board of ETSI on which I served for a term of 3 years until November 2014. In this position I gained further perspective on the organisation, management, and activities of ETSI and its Technical Committees and Partnership Projects including 3GPP.

16. Since leaving Samsung in January 2013, I have formed my own consulting company which is a member of ETSI, and as part of various projects undertaken, I have continued to regularly access the ETSI and 3GPP document servers, and to keep abreast of ETSI and 3GPP document handling and publication practices.

17. Through my extensive work in ETSI and on 3GPP standardization issues over the years, I have become very familiar with ETSI and 3GPP practices for when and how the technical standards (including revisions thereto) and other standards-related contributions are made publicly available, including in the 1999–2012 timeframe when I was attending or monitoring various 3GPP Working Groups, including RAN WG1 and RAN WG2, and since 2013 in support of my work as an independent standardisation consultant.

18. For purposes of my analysis in this declaration, I have been informed that a person of ordinary skill in the art ("POSITA") in the field of the '585 patent at the time of the alleged invention of the '585 patent would have had the equivalent of an undergraduate degree in Electrical Engineering, Computer Science, or Computer Engineering, familiarity with the relevant 3GPP standards as of this time, and at least two years of experience in design, development, and/or testing of cellular networks. This definition is approximate, and more education may substitute for industry experience or vice versa.

## III. PUBLIC AVAILABILITY OF 3GPP STANDARDS PROPOSALS AND OTHER DOCUMENTS

19. Based on my years of experience working in various capacities in 3GPP and on 3GPP standards issues, I am familiar with the regular business practices of the 3rd Generation Partnership Project (3GPP) relating to technical documents including specifications, draft standards and proposals, and standards-related technical contributions, as well as the business practices through which 3GPP makes these documents public.

### A. Prominence and Purpose of 3GPP

20. 3GPP was inaugurated in December 1998 to produce Technical Specifications and Technical Reports for the Universal Mobile Telecommunications System (UMTS), a 3G Mobile System based on evolved GSM core networks and a

new radio access network known as UTRA (UMTS Terrestrial Radio Access). **Appendix 2** at 2, 3 ("[3GPP] Partnership Project Description"); **Appendix 3** at 1; **Appendix 4** at 5. At that time, various standards organisations agreed to cooperate to produce a "complete set of globally applicable Technical Specifications" that would then be transposed into standards by the relevant standardization bodies (also known as Organizational Partners). **Appendix 2** at 3, 5 ("[3GPP] Partnership Project Description"). 3GPP "attracted a very strong commitment from organisations and companies around the world, reflecting the truly global nature of the project." **Appendix 4** at 7.

21. 3GPP is a global initiative partnership made up of Organizational Partners, Market Representation Partners, and Individual Members. **Appendix 5** at 8, 9; **Appendix 2** at 10. Today, 3GPP unites seven telecommunications standard development organisations ("Organizational Partners") from around the world: the Association of Radio Industries and Businesses (ARIB) and the Telecommunication Technology Committee (TTC) from Japan, the China Communications Standards Association (CCSA) from China, the Telecommunications Standards Development Society, India (TSDSI) from India, the Telecommunications Technology Association (TTA) from Korea, the European Telecommunications Standards Institute (ETSI), and the Alliance for Telecommunications Industry Solutions (ATIS) from the United States. These Organizational Partners are regional standards

organisations that have the authority to define, publish, and set standards for their respective regions. **Appendix 2** at 12. 3GPP also includes "Market Representation Partners" that represent various industry perspectives and offer market advice. **Appendix 5** at 9 (3GPP Working Procedures, "Market Representation Partnership"); **Appendix 2** at 14; **Appendix 4** at 5. Additionally, 3GPP includes individual member companies ("Individual Members") that participate in 3GPP through their membership in a 3GPP Organizational Partner. **Appendix 5** at 9 (3GPP Working Procedures, "Individual Membership"); **Appendix 6** at 5 (textbook including a chart showing 3GPP structure at the time of publication); **Appendix 8** at 9, 10. As an example of how prominent 3GPP was (and remains) in the industry, there were 466 participating Individual Members in 2017. **Appendix 7** at 8 (3GPP Project Coordination Group document showing 3GPP membership numbers to 2017). There were 781 individual members as of February 2024. **Appendix 9**.

22. As noted in paragraph 20, a primary goal of 3GPP is to provide an environment to produce Technical Specifications and Technical Reports that define and standardize technologies covering cellular telecommunications networks, including User Equipment or Mobile Device (UE) technologies, Radio Access Network (RAN) technologies, Core Network (CN) technologies, and service and system capabilities such as work on codecs, security, and quality of service. The specifications also provide hooks for interworking with non-3GPP networks

including, but not limited to, Wi-Fi networks. **Appendix 2** at 32–40; **Appendix 3** at 2.

23. Given the prominence of 3GPP in the wireless communication industry, beginning in 1999 and continuing through today, interested POSITAs were tracking the developments of the latest 3GPP specifications and reports to ensure timely development of products and services by their companies that were consistent with the standards being developed. In other words, it is my opinion that a POSITA would have to be familiar with 3GPP and with the specification-related documents produced as part of the 3GPP process in order to properly perform his or her job. Without access to and knowledge of the 3GPP documentation, including, for example, the substantive contents of 3GPP technical specifications, an engineer could not develop products that were interoperable with the worldwide 3G, 4G, and 5G standards. Because 3GPP documents were an important aspect of a POSITA's professional experience, textbooks and articles about cellular communications commonly directed readers to the 3GPP website for information regarding standards development. **Appendix 4** at 9 (directing readers to the 3GPP website at the conclusion of the chapter on the success of 3GPP in the standards development process). As a POSITA myself, I would regularly visit the 3GPP website for the latest developments in mobile communications standards setting and refer colleagues involved in the development of such devices to the 3GPP website as a

valuable reference.

24. My personal experience at Samsung confirms 3GPP's prominence in the wireless industry. For example, engineers and managers at Samsung who were responsible for implementing 3GPP compliant modem software (and who were not attending 3GPP meetings or involved with development of the 3GPP standard in any direct way) would often enquire as to which version of a given 3GPP specification they should be developing. Further, between 2000 and 2004, part of my role at Samsung involved advising software engineers implementing the 3GPP standard on the correct interpretation of the specifications and ensuring that they were made aware of any changes and proposals made during the 3GPP standards development process that would impact their work. I also for a time maintained an internal company database that tracked 3GPP-approved changes to help the software engineers at Samsung implementing the 3GPP standard more readily stay informed as to changes that would impact their work. The database also included links to relevant 3GPP documents so that engineers could access the documents directly. In short, the technical output of 3GPP was, and continues to be, well known at 3GPP member companies, even for engineers who were not directly involved with designing the 3GPP system or contributing to the 3GPP standard process.

### B. 3GPP's Policy of Making Documents Public

25. 3GPP's policy was to make 3GPP documents available to the public,

including to interested POSITAs. The free availability of 3GPP documents to any interested member of the public was widely recognized in the industry. As an example of the prominence of 3GPP and its place in the wireless standards industry, I note that textbooks directed readers to the 3GPP website for information about relevant standards. For example, **Appendix 6** at 6, 9 ("The latest specifications can be obtained from 3GPP [9]", "[9] http//:www.3GPP.org"); **Appendix 8** at 10 ("3GPP TSs and TRs are publicly available at the 3GPP web site at either of the following URIs: http://www.3gpp.org/specs/specs.htm [or] http://www.3gpp.org/ftp/Specs/archive/"). Because the purpose of 3GPP is the worldwide adoption of a common standard, no restrictions on distribution or discussion have ever been placed on 3GPP documents. **Appendix 10** at 8 ("No password is needed to access any information on the 3GPP Web site, all information is openly published").

### C. 3GPP Structure and Standards Development Process

26. Within 3GPP, responsibility for producing specifications was delegated to the Technical Specification Groups (TSGs). **Appendix 5** at 10, 13 (3GPP Working Procedures, "TSG tasks"). At its inception, 3GPP was divided into four Technical Specification Groups (TSGs), each covering a particular category of technology. **Appendix 2** at 31 (3GPP Partnership Project Description); **Appendix 6** at 5, 6 (textbook listing four TSGs and noting the subsequent addition of a fifth

TSG); **Appendix 4** at 6, 11, 12. Each TSG is further divided into a number of Working Groups (WGs). **Appendix 8** at 8, 9; **Appendix 4** at 6; *see also* **Appendix 5** at 13 (3GPP Working Procedures). Two of the TSGs from 1999 are still in existence in 2024: TSG Radio Access Networks (RAN) and TSG Service & Systems Aspects (SA). The activities of two other TSGs, TSG Core Networks (CN) and TSG Terminals (T), were amalgamated under Core Network and Terminals (CT) following the closure of TSG T in 2005, with responsibility for terminal test specifications being moved to a RAN working group (RAN WG5). The fifth TSG, GSM EDGE Radio Access Networks (GERAN), was responsible for evolution of the GSM radio technology from 2000 until that TSG closed in 2016 and its work was transferred to a RAN working group (RAN WG6) which was itself closed in July 2020.

27. The TSGs held quarterly plenary meetings where members' contributions, draft specifications/reports, and other documents that had been agreed upon by the Working Groups were presented for discussion and approval. **Appendix 5** at 23 (3GPP Working Procedures, "Deliverable types," stating that Technical Specifications and Technical Reports are "drawn up by the TSGs" and are approved by TSGs); **Appendix 8** at 9 ("3GPP Deliverables"). Once a Technical Specification was, or Change Requests creating a new version of a Technical Specification were, formally approved by TSG plenary, the latest version of said Technical Specification

would be created by the Mobile Competence Centre (MCC) and uploaded to the file server. **Appendix 10** at 6, 7; **Appendix 11** at 1. In that way, the conclusion of 3GPP TSG plenary meetings serves as notice that new versions of specifications incorporating Change Requests approved by the TSG meeting will shortly be made available on the public 3GPP server.

28. As part of the standards development process, delegates could submit contributions on behalf of the Individual Members. Members had an incentive to stay updated on 3GPP developments because those members usually wanted to contribute to the standard and make suggestions as to what technology and/or features should (or should not) be included. Delegates also attended 3GPP meetings to keep their employers abreast of developments related to the standards that would ultimately apply to those members and the products those members (*e.g.*, companies) produced. 3GPP members around the world, and the interested POSITAs employed by them, would have been motivated to stay up to date regarding 3GPP technology evolution to ensure their research and development programmes remained relevant to the systems being specified and that their products were compliant with the published 3GPP specifications. In light of this need to follow the standards development process, delegates often distributed 3GPP-related documents far beyond the attendees at 3GPP meetings. This was certainly my experience at Samsung.

### D. 3GPP Documents

#### 1. Technical Specifications and Reports

29. The Technical Specifications and Reports developed by 3GPP were, and still are, driven by the technical contributions of 3GPP members. As part of that development process, various types of documents were produced. The 3GPP process involved the consideration of temporary documents ("TDocs," also referred to as "contributions"), many of which constituted technical proposals for how the system should be implemented and were adopted as the basis for parts of the Technical Specifications.

30. As I noted in paragraphs 20 and 22, a primary purpose of 3GPP is to prepare, approve, and maintain globally applicable Technical Specifications and Technical Reports. **Appendix 5** at 7 (3GPP Working Procedures, "Purpose"). A "Technical Specification" as defined by 3GPP is "[a] 3GPP output document containing normative provisions approved by a Technical Specification Group." **Appendix 5** at 28. 3GPP would (and still does) periodically freeze a complete set of standards (referred to as a "Release"), and each set would include many new specifications. **Appendix 10** at 6. 3GPP would also make publicly available draft specifications that would usually be included as part of the next Release once approved.

31. It was widely known that Technical Specifications (and Technical

Reports) were publicly available on 3GPP's website. It was also well known that the latest version of a given specification that was under change control would be made available following each TSG Plenary meeting responsible for that specification, and that TSG Plenary meetings usually occur four times per year. **Appendix 10** at 6, 7; **Appendix 11** at 1.

32. Latest and previous versions of Technical Specifications could be easily accessed from the 3GPP website. The specifications page provided direct links to the specifications area in the 3GPP website's file repository. **Appendix 11** at 1. In the 2017– 2018 timeframe, the specifications page listed the specifications by the date of the approval of the latest versions reflecting the TSG plenary meeting date. *E.g.*, **Appendix 11** at 1.

33. Additionally, the 3GPP specifications followed a clear numbering scheme to help the public, including interested POSITAs, identify the subject matter of each specification. **Appendix 12** at 1. As described on the 3GPP Numbering Scheme webpage, all 3G and GSM specifications had a specification number of 4 or 5 digits, where the first two digits defined the series. **Appendix 12** at 1. The Numbering Scheme webpage included a table showing the subject matter corresponding to each series. **Appendix 12** at 1. For example, the "38 series" focused on "Radio technology beyond LTE" aspects (*i.e.*, 5G NR). **Appendix 12** at 1. An interested POSITA could narrow down the relevant specifications based on

whether the specification applied to only 5G NR, evolved UTRA (*i.e.*, 4G or LTE), 3G, GSM, or to GSM, 3G and evolved UTRA (GSM-only specifications were transferred from ETSI to 3GPP in July 2000). **Appendix 12** at 1. For a specification in the 21–35 series, this could be determined based on the third digit of the specification number, where a "0" indicates that the specification applies to both systems. Specifications outside the 21–38 series in 2017–2018 applied only to GSM systems. **Appendix 12** at 1.

34. The specifications were stored on the 3GPP website's file repository as zipped files, where the filenames followed the structure: SM[-P[-Q]]-V.zip. This format corresponded to the numbering scheme discussed in paragraph 33. **Appendix 12** at 2. "S" represented the series number; "M" represented the mantissa (the part after the series number); "P" represented an optional part number; "Q" represented an optional sub-part number; and "V" represented the version number (without the separating dots). **Appendix 12** at 2.

35. The Working Groups would create incremental versions of the draft specifications (*e.g.*, V0.2.1, V1.0.0, V1.1.0, etc.). These versions were made available on the 3GPP website's file repository which is accessible from the 3GPP specifications page. The version numbering scheme for Technical Specifications and Technical Reports was standardized by 3GPP. The version number included three fields: the major version field, the technical version field, and the editorial version

field. **Appendix 13** at 3. The major version field reflects the stage of the specification, with "0" representing an immature draft and a value of "3" or greater representing a specification that has been approved by the relevant TSG and thus placed under change control. **Appendix 13** at 3. The technical version field begins at zero and is incremented every time a technical change is made to the specification (either as part of the drafting process or as part of an approved change request). **Appendix 13** at 3. The editorial version field begins at zero and is incremented each time a non-technical change is made to the specification (*e.g.*, to fix a typographical or formatting issue). **Appendix 13** at 3.

36. I understand that the alleged invention in the '585 patent relates to cellular telecommunications networks, and more particularly to triggering power headroom reports for multiple pathloss references in a wireless communications system. Any POSITA interested in power headroom reporting would have been monitoring 3GPP's activities in this area and would probably have been already participating as a full or associate member or observer in the standard development process, or would have at least known that information regarding the proposed revisions to the technical specifications under discussion were available through 3GPP.

### 2. 3GPP TDocs

37. As mentioned in paragraph 29, the technical specifications and reports

developed by 3GPP were and are driven by the technical contributions of 3GPP member companies. As part of that development process, various types of documents were produced and submitted. Relevant to this case, the 3GPP process involved the consideration of temporary documents or "TDocs," which are also referred to as proposals, contributions, or change requests. The agreement of proposals submitted as TDocs results in the production of technical specifications.

38. Prior to each Working Group meeting, members of the Working Group would prepare TDocs to identify, discuss, and/or propose a new feature or change(s) to an existing feature or to identify a technical issue for discussion. Interested POSITAs would have known that TDocs could be a helpful source of technical information regarding the 3GPP specifications.

39. Each TDoc was assigned a TDoc number, according to a standard format set by 3GPP.[1] As described in the 3GPP Working Procedures, the numbering system followed the format xminnzzzz. **Appendix 5** at 19. This general naming convention has been in use since at least 1999 with only minor variations. Within that format, "x" referred to the relevant TSG. **Appendix 5** at 20. For example, "R" was used for TSG RAN. **Appendix 5** at 20. Likewise, "m" referred to the relevant Working Group. **Appendix 5** at 20. A document for RAN WG2 would therefore

[1] Documents other than technical contributions (such as meeting reports) were also assigned TDoc numbers for ease of reference.



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begin with "R2." **Appendix 5** at 20. The two digits "nn" represented the year (*e.g.*, 17), and the digits "zzzz" represented the unique document number. **Appendix 5** at 20. This document number was used as the TDoc's filename. **Appendix 5** at 20.

40. Each TDoc would include in its header the meeting at which the contributor intended the TDoc to be discussed. Most TDocs were uploaded to the 3GPP website for public viewing prior to the relevant Working Group meeting listed on the TDoc, although some TDocs, including those created at meetings, were uploaded during or after the meeting. **Appendix 10** at 8. The documents were uploaded to the public file repository in an area allocated to the particular Working Group, *e.g.*, **Appendix 14** at 2 (RAN WG2 homepage with link to WG2's "Meeting documents"). Immediately upon upload, any member of the public could download and access the TDocs and other documents offered for discussion. This process has been in place since I began attending Working Group meetings in 1999.

### E. The 3GPP Website's Public File Repository

41. All TDocs, Technical Reports, and Technical Specifications were also freely available to interested members of the public through the public file repository accessible via the 3GPP website. Interested members of the public would have been well aware of 3GPP and of the 3GPP website. 3GPP documents were accessible to any member of the public through the 3GPP website without providing any login credentials or other exclusive access criteria. **Appendix 10** at 8.

42. It is my recollection that, during the 2017–2018 timeframe, any interested member of the public could locate relevant documents of interest on the 3GPP website using reasonable diligence based on the website's indexing scheme or the TDoc's naming convention. The documents on the 3GPP website were (and remain) organized according to the relevant Working Groups within 3GPP (each of which focused on particular subject matter) and then further organized based on the meetings of those groups. The Technical Specifications and Reports were (and remain) organized according to their subject matter as indicated by their series number and version. POSITAs would have known which Working Groups focused on particular subject matter.

43. An interested member of the public could locate documents of interest by first navigating a web browser to the 3GPP website (www.3gpp.org). In the 2017–2018 timeframe, to locate documents from the 3GPP home page, a user could have clicked "Specification Groups" **Appendix 15**. The corresponding webpages contained links to the 3GPP's public file repository (*e.g.*, through the "Meeting documents" link of a Working Group page). **Appendix 14**. To locate specifications, a user could have clicked "Specifications" and followed links as described in section III.D.1 above. Instead of accessing the 3GPP file repository from the 3GPP website home page, a user could have also accessed the file repository through the web address www.3gpp.org/ftp or directly using ftp client software connected to



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ftp.3gpp.org. A POSITA was also able to search for relevant documents using keywords on the search facility on the 3GPP website from at least 2000, and from at least 2015 using the 3GPP search portal (https://portal.3gpp.org/#/), where an interested person could search for documents by title and source, among other things.

44. The top two levels of indexing within the file repository were based wholly on subject matter, as reflected by the division of subject matter among the various TSGs and Working Groups, or into various Specifications. Specifically, an individual could select the relevant TSG (or specification series) covering the subject matter of interest. **Appendix 16**.

45. If the individual were interested in the radio access aspects of 3GPP, they would click "tsg_ran." From there, the individual would click on the particular RAN Working Group covering the subject matter of interest. **Appendix 17**.

46. For example, if the individual were interested in the Radio Interface Radio layer 2 and Radio layer 3 RRC, the individual would know to choose the folder for WG2. **Appendix 17**. Once a user is in the relevant Working Group folder (RAN WG2 in this example), an individual would see a list of all meetings held by RAN WG2. **Appendix 18**.

47. As shown in **Appendix 18**, a folder existed for each meeting. For example, "TSGR2_100" corresponded to TSG RAN WG2 Meeting #100, and the timestamp associated with the meeting #100 directory indicates that, as of April 14,

2017, the TSGR1_100 directory had most recently been updated on April 8, 2017. **Appendix 18** at 1.

48. A POSITA would know which meeting(s) would have covered particular subject matter based on the working groups area of responsibility (*e.g.*, for RAN WG2 - **Appendix 14)**, and from publicly available meeting agendas. *E.g.*, **Appendix 19** (see link to agenda for RAN WG2 Meeting #100). Many POSITAs received a link to the meeting agenda directly via the 3GPP Working Group email reflector lists. **Appendix 20**. Further, an individual could ascertain what subject matter was addressed at each meeting by reviewing the report issued after each meeting, stored in the Report directory and also linked in (or attached to) an email sent via the group's email reflector. **Appendix 19**; **Appendix 21**.

49. In my experience, whilst the servers used for 3GPP file repository and many of its directories have been updated since 1999, and directories may as a result have later dates associated with them (*e.g.*, reflecting the last time they were modified in some way or their contents were updated), the original upload date for files including specifications has always been preserved, providing a true and accurate indication of their earliest availability for download.

50. Once an individual navigated to the desired meeting folder, for example "TSGR2_100" the individual could then select the "Docs" folder to view the documents associated with that meeting. **Appendix 19.** The documents within this

folder were listed by TDoc number, and interested members of the public would have known to review the meeting report for each meeting to confirm which topics were discussed at that meeting. *E.g.*, **Appendix 22**.

51. Many TDocs were uploaded to the public file server for public viewing prior to the relevant meeting (although some TDocs, particularly those created during meetings, were submitted during or soon after the meetings). **Appendix 10** at 8. Throughout and since my participation in 3GPP, it has been recommended that delegates attending a meeting download the relevant set of documents from the 3GPP file repository onto their personal computers prior to each meeting. **Appendix 10** at 7. Given that any interested member of the public could and was likely to subscribe to the Working Group listserv, it would also have been simple to locate the location of relevant TDocs on the 3GPP server based on the information sent out over the listserv.

52. 3GPP's public file repository provides a reliable mechanism for identifying the date and time a document was uploaded to the website and then available to download for public viewing. When a document is uploaded, the file server automatically assigns the document a time stamp—*i.e.*, an accurate and automatically computer-generated electronic record of when the document was uploaded—as part of the regular business practices of 3GPP. **Appendix 10** at 8 (3GPP FAQs). This has been the practice regarding uploading documents to the



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3GPP file repository since 3GPP was inaugurated, and my personal experience confirms that the time stamps have always been a reliable way to determine when a file was uploaded to the 3GPP website and immediately available for public download.

53. Following each 3GPP meeting, the secretary would usually distribute the meeting minutes via the corresponding email list with a request for comments. *E.g.*, **Appendix 21**. Said email would effectively therefore inform subscribers that the meeting had taken place, would inform subscribers of the documents that had been treated (or not), and in the event that the meeting was a TSG plenary meeting, serve as notice that new versions of specifications incorporating Change Requests approved by the TSG meeting, would shortly be made available on the 3GPP public server. Further, an interested member of the public following a certain topic would have known to check said report for related contributions as the reports included a list of all TDocs submitted, indexed by contribution title, TDoc number, source, and agenda item (*e.g.*, Annex B of the report of RAN2 #100, **Appendix 22a**).

## IV. 3GPP EXHIBITS

### A. Ex-1007: 3GPP Tdoc R2-1713484: "Power Headroom Reporting in NR", 3GPP TSG-RAN WG2 #100, Nov. 27–Dec. 1, 2017 (Ericsson)

54. R2-17131484 is a technical contribution submitted to 3GPP TSG RAN WG2, meeting #100 which was held between November 27–December, 2017. It

follows the general naming format ("xminnzzzz") described in paragraph 39.[2] Accordingly, "R2" indicates that the contribution was submitted to RAN WG2, "17" indicates the year (2017) that this technical contribution was submitted, and "13484" is the unique number that was assigned to this contribution document. It is titled "Power Headroom Reporting in NR".

55. As I mention in paragraph 41 above, it has always been, and was in the 2017–2018 timeframe, standard practice to make 3GPP meeting documents publicly available on the 3GPP public file server from where an interested member of the public exercising reasonable diligence could freely access them. To confirm the availability of R2-1713484 on the 3GPP document server in the 2017 timeframe, I navigated to the 3GPP website at http://www.3gpp.org, selected "3GPP Groups" from the drop down menu, and then selected the "RAN2 – Radio Layer 2 and Layer 3 RRC" from the 3GPP Groups page, and the "Meeting documents" link to access the public file server where documents for the TSG-RAN Working Group 2 are stored, and from where I navigated to the documents for RAN WG2 #100. A true and correct copy of the relevant portion of the Documents directory listing produced by the file server website is provided below and in **Appendix 23** at 40.

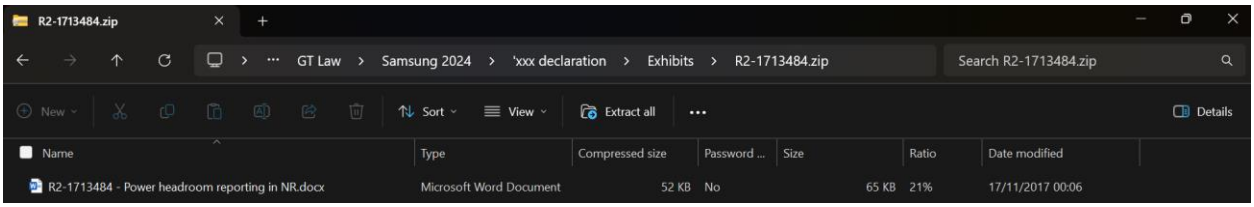
[2] Note that from 2017, RAN2 added another digit to the unique identifier "z" field to cater for the increasing number of Tdocs being submitted.



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| | | |
|---|---|---|
| R2-1713483.zip | 2017/11/17 0:47 | 51,9 KB |
| R2-1713484.zip | 2017/11/17 0:47 | 51,8 KB |
| R2-1713485.zip | 2017/11/17 0:47 | 39,7 KB |

56. The Docs directory index stated that R2-1713484 was uploaded on "2017/11/17". I selected the link for "R2-1713484.zip" and downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document, "R2-1713484 Power headroom reporting in NR.docx," with a date stamp of "17/11/2017" (European date format) the same day that the ZIP file was uploaded.




57. A true and correct copy of the document within the ZIP file (R2-1713484 Power headroom reporting in NR.docx) is provided as Ex-1007. Based on my experience, I understand that these date stamps mean that R2-1713484.zip was uploaded to 3GPP's publicly available website on November 17, 2017, prior to the RAN WG2 #100 meeting, and that any member of the public could have downloaded the ZIP file, extracted the Word document enclosed, and viewed the contents of said document without restriction on November 17, 2017 and thereafter. The draft report from RAN WG2 #100, made available on December 18, 2017 (**Appendix 21**), confirms the availability of R2-1713484 at the meeting (**Appendix 22** at 145). I have

no reason to believe that either the date stamp or the report from RAN WG2 #100 are inaccurate. I have therefore determined that R2-1713484 was publicly available on the file server no later than November 17, 2017.

58. Based on the information above, it is my opinion that R2-1713484, titled "Power Headroom Reporting in NR" and provided as Ex-1007, was publicly available to download from the 3GPP file server no later than November 17, 2017 and could have been distributed thereafter without restriction. Further, it was publicly available at the 3GPP TSG RAN WG2 #100 meeting held November 27–December 1, 2017.

### B. Ex-1008: 3GPP TS 38.213 V15.1.0 (2018-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15)

59. 3GPP TS 38.213 v15.1.0 is a Technical Specification titled "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15)." Ex-1008.

60. The date on the face of the specification ("2018-03") corresponds to the year (2018) and month (March) that this version of the specification was approved by 3GPP TSG RAN and subsequently made publicly available.

61. 3GPP TS 38.213 v15.1.0, being an approved version of the Release 15 specification on NR physical layer procedures for control, was created by TSG RAN #79 held March 19–22, 2018. An interested member of the public would know that

the latest version of an approved specification or report would be available following the plenary meeting responsible for that specification (in this case TSG RAN) in accordance with 3GPP standard practice as described in paragraphs 31 and 53. The approval of the TS 38.213 v15.1.0 is confirmed by the approval of the Change Requests to TS 38.213 v15.0.0 documented in the CR list as referenced in annex E of the meeting report from TSG RAN #79 (**Appendix 24** annex E, TDoc list at 1073). The 3GPP file server is and has always been open to all and free from restriction such as username or password. **Appendix 10** at 8. By way of example of how an interested member of the public could access the TS 38.213 v15.1.0 Technical Specification from the 3GPP website, I accessed the file server by going to the 3GPP website at http://www.3gpp.org/, selected "Specifications & Technologies" from the menu bar, and then selected "Specifications by series" from the dropdown menu. I then selected the "38 Series" link to access the public file server where the specifications are stored. I then searched for "38.213" in the specification number search bar, and for the TS 38.213 specification selected the eyeglasses icon that says "See details" when a cursor is placed on it. From there, I selected "Click to see all versions of this specification," which took me to the archive housing all versions of TS 38.213 found at the following URL: https://www.3gpp.org/ftp/Specs/archive/38_series/38.213. A true and correct copy of the relevant portion of the directory listing produced by the file server website is

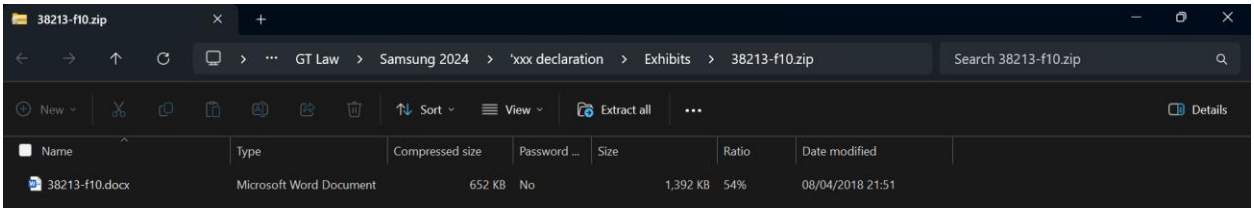


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provided below and in **Appendix 25** at 1.

| | | |
|---|---|---|
| 38213-f00.zip | 2018/01/03 17:30 | 480,9 KB |
| 38213-f10.zip | 2018/04/08 20:02 | 651,6 KB |
| 38213-f20.zip | 2018/06/29 11:50 | 811 KB |

62. The archive directory index stated that TS 38.213 v15.1.0 was uploaded on "2018/04/08." Selecting the link for "38213-f10.zip," I downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document "38213-f10.docx" and a date stamp of "08/04/2018" (European date format), the same day that the ZIP file was uploaded to the server. An excerpt of the ZIP file directory is provided below.




63. I have confirmed that the document in the ZIP file ("38213-f10.docx") is TS 38.213 v15.1.0. A true and correct copy of the Microsoft Word document "38213-f10" is TS 38.213 v15.1.0 that is provided in EX-1008.

64. Based on my experience, I understand these date stamps to mean that 38213-f10.zip was uploaded to 3GPP's publicly available website on April 8, 2018, and that an interested member of the public could have downloaded the ZIP file, extracted the Word document enclosed, viewed the contents of the Word document,

and further disseminated said document without restriction on April 8, 2018 and thereafter.

### C. Ex-1009: 3GPP TS 38.321 V15.1.0 (2018-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol specification (Release 15)

65. 3GPP TS 38.321 v15.1.0 is a Technical Specification titled "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol specification (Release 15)." Ex-1009.

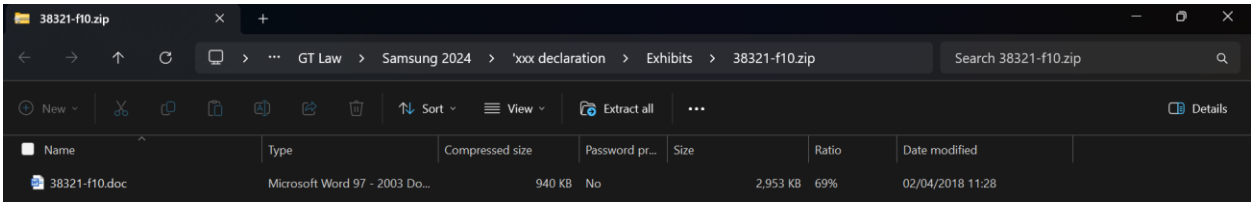
66. The date on the face of the specification ("2018-03") corresponds to the year (2018) and month (March) that this version of the specification was approved by 3GPP TSG RAN and subsequently made publicly available.

67. 3GPP TS 38.321 v15.1.0, being an approved version of the Release 15 specification on NR Medium Access Control (MAC) protocol, was created by TSG RAN #79 held March 19–22, 2018. An interested member of the public would know that the latest version of an approved specification or report would be available following the plenary meeting responsible for that specification (in this case TSG RAN) in accordance with 3GPP standard practice as described in paragraphs 31 and 53. The approval of the TS 38.321 v15.1.0 is confirmed by the approval of the Change Requests to TS 38.321 v15.0.0 documented in the CR list as referenced in

annex E of the meeting report from TSG RAN #79 (**Appendix 24** annex E, TDoc list at 1078). The 3GPP file server is, and has always been, open to all and free from restriction such as username or password. **Appendix 10** at 8. By way of example of how an interested member of the public could access the TS 38.321 v15.1.0 Technical Specification from the 3GPP website, I accessed the file server by going to the 3GPP website at http://www.3gpp.org/, selected "Specifications & Technologies" from the menu bar, and then selected "Specifications by series" from the dropdown menu. I then selected the "38 Series" link to access the public file server where the specifications are stored. I then searched for "38.321" in the specification number search bar, and for the TS 38.321 specification selected the eyeglasses icon that says "See details" when a cursor is placed on it. From there, I selected "Click to see all versions of this specification," which took me to the archive housing all versions of TS 38.321 found at the following URL: https://www.3gpp.org/ftp/Specs/archive/38_series/38.321. A true and correct copy of the relevant portion of the directory listing produced by the file server website is provided below and in **Appendix 26** at 1.

| | | |
|---|---|---|
| 38321-f00.zip | 2018/01/04 11:14 | 680,6 KB |
| 38321-f10.zip | 2018/04/02 12:18 | 939,9 KB |
| 38321-f20.zip | 2018/06/20 2:18 | 913,9 KB |

68. The archive directory index stated that TS 38.321 v15.1.0 was uploaded on "2018/04/02". Selecting the link for "38321-f10.zip", I downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document "38321-f10.docx" and a date stamp of "02/04/2018" (European date format), the day the ZIP file was uploaded to the server. An excerpt of the ZIP file directory is provided below.




69. I have confirmed that the document in the ZIP file ("38321-f10.doc") is TS 38.321 v15.1.0. A true and correct copy of the Microsoft Word document "38321-f10" is TS 38.321 v15.1.0 that is provided in Ex-1009.

70. Based on my experience, I understand these date stamps to mean that 38321-f10.zip was uploaded to 3GPP's publicly available website on April 2, 2018, and that an interested member of the public could have downloaded the ZIP file, extracted the Word document enclosed, viewed the contents of the Word document, and further disseminated said document without restriction on April 2, 2018 and thereafter.

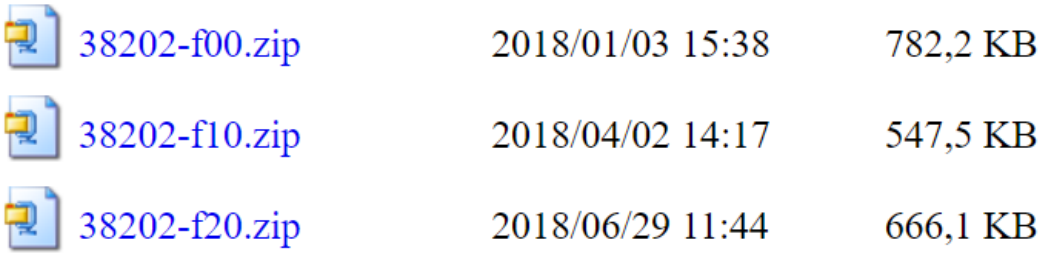
### D. Ex-1010: 3GPP TS 38.202 V15.1.0 (2018-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Services provided by the physical layer (Release 15)

71. 3GPP TS 38.202 v15.1.0 is a Technical Specification titled "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Services provided by the physical layer (Release 15)." Ex-1010.

72. The date on the face of the specification ("2018-03") corresponds to the year (2018) and month (March) that this version of the specification was approved by 3GPP TSG RAN and subsequently made publicly available.

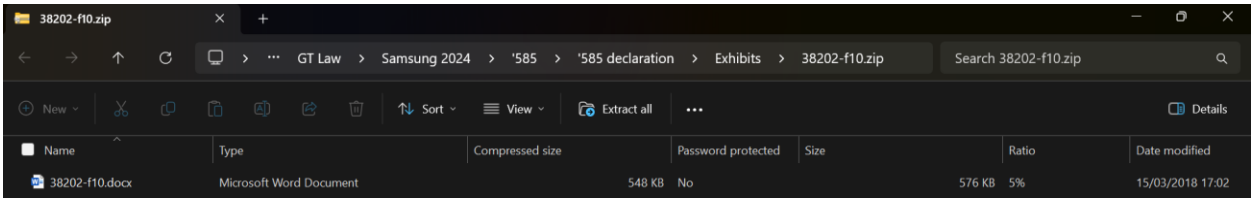
73. 3GPP TS 38.202 v15.1.0, being an approved version of the Release 15 specification on NR physical layer procedures for control, was approved by TSG RAN #79 held March 19–22, 2018. An interested member of the public would know that the latest version of an approved specification or report would be available following the plenary meeting responsible for that specification (in this case TSG RAN) in accordance with 3GPP standard practice as described in paragraphs 31 and 53. The approval of the TS 38.202 v15.1.0 is confirmed by the approval of the Change Requests to TS 38.202 v15.0.0 documented in the CR list as referenced in annex E of the meeting report from TSG RAN #79 (**Appendix 24** annex E, TDoc list at 1070). The 3GPP file server is and has always been open to all and free from restriction such as username or password. **Appendix 10** at 8. By way of example of how an interested member of the public could access the TS 38.202 v15.1.0

Technical Specification from the 3GPP website, I accessed the file server by going to the 3GPP website at http://www.3gpp.org/, selected "Specifications & Technologies" from the menu bar, and then selected "Specifications by series" from the dropdown menu. I then selected the "38 Series" link to access the public file server where the specifications are stored. I then searched for "38.202" in the specification number search bar, and for the TS 38.202 specification selected the eyeglasses icon that says "See details" when a cursor is placed on it. From there, I selected "Click to see all versions of this specification," which took me to the archive housing all versions of TS 38.202 found at the following URL: https://www.3gpp.org/ftp/Specs/archive/38_series/38.202. A true and correct copy of the relevant portion of the directory listing produced by the file server website is provided below and in **Appendix 27** at 1.




74. The archive directory index stated that TS 38.213 v15.1.0 was uploaded on "2018/04/02." Selecting the link for "38202-f10.zip," I downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document "38202-f10.docx" and a date stamp of "15/03/2018" (European date format), 18 days before

the ZIP file was uploaded to the server. An excerpt of the ZIP file directory is provided below.




75. I have confirmed that the document in the ZIP file ("38202-f10.docx") is TS 38.202 v15.1.0. A true and correct copy of the Microsoft Word document "38202-f10" is TS 38.202 v15.1.0 that is provided in EX-1010.

76. Based on my experience, I understand these date stamps to mean that 38202-f10.zip was uploaded to 3GPP's publicly available website on April 2, 2018, and that an interested member of the public could have downloaded the ZIP file, extracted the Word document enclosed, viewed the contents of the Word document, and further disseminated said document without restriction on April 2, 2018 and thereafter.

### E. Ex-1011: 3GPP TS 38.331 V15.1.0 (2018-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio Resource Control (RRC) protocol specification (Release 15)

77. 3GPP TS 38.331 v15.1.0 is a Technical Specification titled "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio Resource Control (RRC) protocol specification (Release 15)." Ex-1011.

78. The date on the face of the specification ("2018-03") corresponds to the year (2018) and month (March) that this version of the specification was approved by 3GPP TSG RAN and subsequently made publicly available.

79. 3GPP TS 38.331 v15.1.0, being an approved version of the Release 15 specification on NR Radio Resource Control (RRC) protocol, was created by TSG RAN #79 held March 19–22, 2018. An interested member of the public would know that the latest version of an approved specification or report would be available following the plenary meeting responsible for that specification (in this case TSG RAN) in accordance with 3GPP standard practice as described in paragraphs 31 and 53. The approval of the TS 38.331 v15.1.0 is confirmed by the approval of the Change Requests to TS 38.331 v15.0.0 documented in the CR list as referenced in annex E of the meeting report from TSG RAN #79 (**Appendix 24** annex E, TDoc list at 1082). The 3GPP file server is, and has always been, open to all and free from restriction such as username or password. By way of example of how an interested member of the public could access the TS 38.331 v15.1.0 Technical Specification from the 3GPP website, I accessed the file server by going to the 3GPP website at http://www.3gpp.org/, selected "Specifications & Technologies" from the menu bar, and then selected "Specifications by series" from the dropdown menu. I then selected the "38 Series" link to access the public file server where the specifications are stored. I then searched for "38.331" in the specification number search bar, and

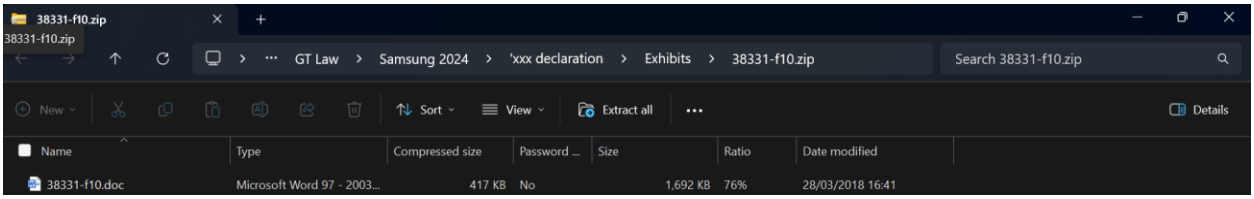


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for the TS 38.331 specification selected the eyeglasses icon that says "See details" when a cursor is placed on it. From there, I selected "Click to see all versions of this specification," which took me to the archive housing all versions of TS 38.331 found at the following URL: https://www.3gpp.org/ftp/Specs/archive/38_series/38.331. A true and correct copy of the relevant portion of the directory listing produced by the file server website is provided below and in **Appendix 28** at 1.

| | | |
|---|---|---|
| 38331-f00.zip | 2018/01/04 11:16 | 299,2 KB |
| 38331-f10.zip | 2018/04/02 0:08 | 416,5 KB |
| 38331-f20.zip | 2018/06/20 2:20 | 488,5 KB |

80. The archive directory index stated that TS 38.331 v15.1.0 was uploaded on "2018/04/02." Selecting the link for "38331-f10.zip," I downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document "38331-f10.doc" and a date stamp of "28/03/2018" (European date format), five days before the ZIP file was uploaded to the server. An excerpt of the ZIP file directory is provided below.




81. I have confirmed that the document in the zip file ("38331-f10.doc") is

TS 38.331 v15.1.0. A true and correct copy of the Microsoft Word document "38331-f10" is TS 38.331 v15.1.0 that is provided in Ex-1011.

82. Based on my experience, I understand these date stamps to mean that 38331-f10.zip was uploaded to 3GPP's publicly available website on April 2, 2018, and that an interested member of the public could have downloaded the ZIP file, extracted the Word document enclosed, viewed the contents of the Word document, and further disseminated said document without restriction on April 2, 2018 and thereafter.

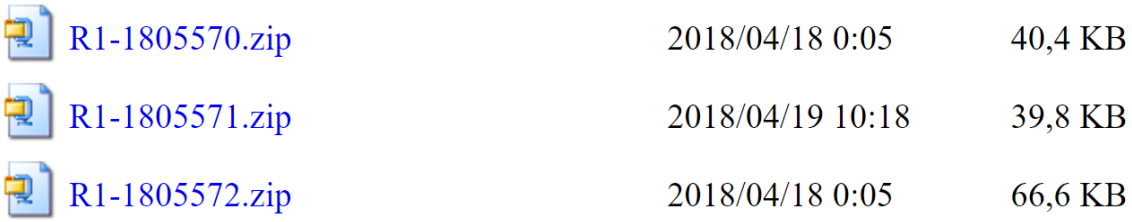
### F. Ex-1012: 3GPP Tdoc R1-1805571: "Summary of NR UL power control – CA aspects," 3GPP TSG RAN WG1 #92bis Apr. 16-20, 2018 (Samsung).

83. R1-1805571 is a technical contribution submitted to 3GPP TSG RAN WG1, meeting #92bis which was held between April 16–20, 2018. It follows the general naming format ("xminnzzzz") described in paragraph 39[3]. Accordingly, "R1" indicates that the contribution was submitted to RAN WG1, "18" indicates the year (2018) that this technical contribution was submitted, and "05571" is the unique number that was assigned to this contribution document. It is titled "Summary of NR UL power control – CA aspects".

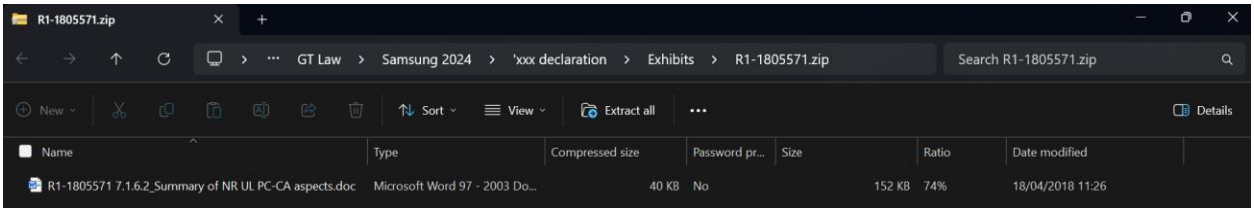
84. As I mention in paragraph 41 above, it has always been, and was in the

[3] Note that from August 2016, RAN1 added another digit to the unique identifier "z" field to cater for the increasing number of Tdocs being submitted.

2017–2018 timeframe, standard practice to make 3GPP meeting documents publicly available on the 3GPP public file server from where an interested member of the public exercising reasonable diligence could freely access them. To confirm the availability of R1-1805571 on the 3GPP document server in the 2018 timeframe, I navigated to the 3GPP website at http://www.3gpp.org, selected "3GPP Groups" from the drop down menu, and then selected the "RAN1 – Radio Layer 1 (Physical Layer)" from the 3GPP Groups page, and the "Documents area" link to access the public file server where documents for the TSG-RAN Working Group 1 are stored, and from where I navigated to the documents for RAN WG1 #92bis. A true and correct copy of the relevant portion of the Documents directory listing produced by the file server website is provided below and in **Appendix 29** at 57.




85. The Docs directory index stated that R1-1805571 was uploaded on "2018/04/19. I selected the link for "R1-1805571.zip" and downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document, "R1-1805571 Summary of NR UL PC-CA aspects.doc," with a date stamp of "18/04/2018" (European date format) the day before the date that the ZIP file was uploaded.




86. A true and correct copy of the document within the ZIP file (R1-1805571 Summary of NR UL PC-CA aspects.doc) is provided as Ex-1012. Based on my experience, I understand that these date stamps mean that R1-1805571.zip was uploaded to 3GPP's publicly available website on April 19, 2018, during the RAN WG1 #92bis meeting, and that any member of the public could have downloaded the ZIP file, extracted the Word document enclosed, and viewed the contents of said document without restriction on April 19, 2018 and thereafter. The draft report from RAN WG1 #92bis, made available on April 26, 2018 (**Appendix 30**), confirms the availability of R1-1805571 at the meeting (**Appendix 31** at 124). I have no reason to believe that either the date stamp or the report from RAN WG1 #92bis are inaccurate. I have therefore determined that R1-1805571 was publicly available on the file server no later than April 19, 2018.

87. Based on the information above, it is my opinion that R1-1805571, titled "Summary of NR UL power control – CA aspects" and provided as Ex-1012, was publicly available to download from the 3GPP file server no later than April 19, 2018 and could have been distributed thereafter without restriction. Further, it was publicly available at the 3GPP TSG RAN WG1 #92bis meeting held April 16–20,

2018.

### G. Ex-1018: 3GPP Tdoc R1-1710475: "Discussion on PHR calculation," 3GPP TSG RAN WG1 NR Ad Hoc Meeting, June 27-30, 2017 (Huawei-I).

88. R1-1710475 is a technical contribution submitted to the 3GPP TSG RAN WG1, NR AH 1706 meeting which was held between June 27–30, 2017. It follows the general naming format ("xminnzzzz") described in paragraph 39[4]. Accordingly, "R1" indicates that the contribution was submitted to RAN WG1, "17" indicates the year (2017) that this technical contribution was submitted, and "10475" is the unique number that was assigned to this contribution document. It is titled "Discussion on PHR calculation".

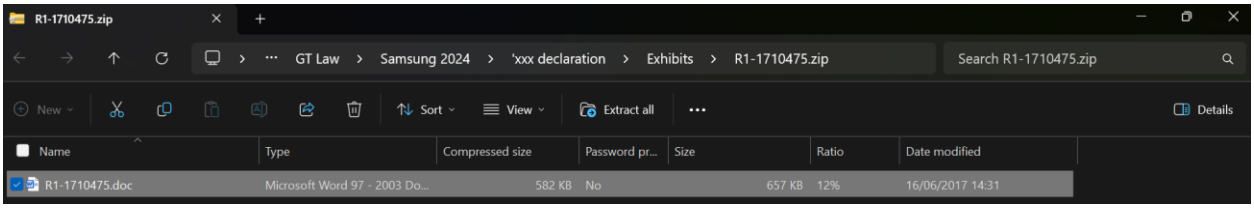
89. As I mention in paragraph 41 above, it has always been, and was in the 2017–2018 timeframe, standard practice to make 3GPP meeting documents publicly available on the 3GPP public file server from where an interested member of the public exercising reasonable diligence could freely access them. To confirm the availability of R1-1710475 on the 3GPP document server in the 2017 timeframe, I navigated to the 3GPP website at http://www.3gpp.org, selected "3GPP Groups" from the drop down menu, and then selected the "RAN1 – Radio Layer 1 (Physical Layer)" from the 3GPP Groups page, and the "Documents area" link to access the

[4] Note that from August 2016, RAN1 added another digit to the unique identifier "z" field to cater for the increasing number of Tdocs being submitted.

public file server where documents for the TSG-RAN Working Group 1 are stored, and from where I navigated to the documents for RAN WG1 NR AH 1706. A true and correct copy of the relevant portion of the Documents directory listing produced by the file server website is provided below and in **Appendix 32** at 18.

| | | |
|---|---|---|
| R1-1710474.zip | 2017/06/17 2:57 | 339,8 KB |
| R1-1710475.zip | 2017/06/17 2:56 | 581,1 KB |
| R1-1710476.zip | 2017/06/17 2:56 | 106,2 KB |

90. The Docs directory index stated that R1-1710475 was uploaded on "2017/06/17. I selected the link for "R1-1710475.zip" and downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document, "R1-1710475.doc," with a date stamp of "16/06/2017" (European date format) the day before the date that the ZIP file was uploaded.




91. A true and correct copy of the document within the ZIP file (R1-1710475.doc) is provided as Ex-1018. Based on my experience, I understand that these date stamps mean that R1-1710475.zip was uploaded to 3GPP's publicly available website on June 17, 2017, prior to the RAN WG1 NT AH 1706 meeting, and that any member of the public could have downloaded the ZIP file, extracted

the Word document enclosed, and viewed the contents of said document without restriction on June 17, 2017 and thereafter. The draft report from RAN WG1 NR AH 1706, made available on July 3, 2017 (**Appendix 32**), confirms the availability of R1-1710475 at the meeting (**Appendix 33** at 94). I have no reason to believe that either the date stamp or the report from RAN WG1 NR AH 1706 are inaccurate. I have therefore determined that R1-1710475 was publicly available on the file server no later than June 17, 2017.

92. Based on the information above, it is my opinion that R1-1710475, titled "Discussion on PHR calculation" and provided as Ex-1018, was publicly available to download from the 3GPP file server no later than June 17, 2017 and could have been distributed thereafter without restriction. Further, it was publicly available at the 3GPP TSG RAN WG1 NR AH 1706 meeting held June 27–30, 2017.

### H. Ex-1019: 3GPP TS 36.321 V11.6.0 (2015-03) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Envolved UMTS Terrestrial Radio Accesss (E-UTRA); Medium Access Control (MAC) protocol specification (Release 11)

93. 3GPP TS 36.321 v11.6.0 is a Technical Specification titled "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Envolved UMTS Terrestrial Radio Accesss (E-UTRA); Medium Access Control (MAC) protocol specification (Release 11)." Ex-1019.

94. The date on the face of the specification ("2015-03") corresponds to the

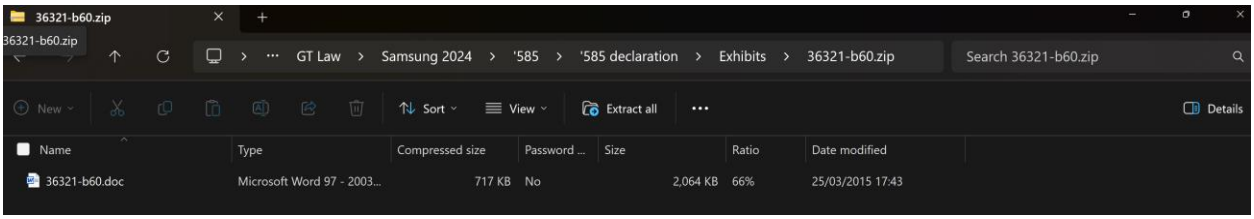
year (2015) and month (March) that this version of the specification was approved by 3GPP TSG RAN and subsequently made publicly available.

95. 3GPP TS 36.321 v11.6.0, being an approved version of the Release 11 specification on E-UTRA Medium Access Control (MAC) protocol, was created by TSG RAN #67 held March 9-12, 2015. An interested member of the public would know that the latest version of an approved specification or report would be available following the plenary meeting responsible for that specification (in this case TSG RAN) in accordance with 3GPP standard practice as described in paragraphs 31 and 53. The approval of the TS 36.321 v11.6.0 is confirmed by the approval of the Change Requests to TS 36.321 v11.5.0 documented in the CR list as referenced in annex E of the meeting report from TSG RAN #67 (**Appendix 35** annex E, at 117. The 3GPP file server is, and has always been, open to all and free from restriction such as username or password. **Appendix 10** at 8. By way of example of how an interested member of the public could access the TS 36.321 v11.6.0 Technical Specification from the 3GPP website, I accessed the file server by going to the 3GPP website at http://www.3gpp.org/, selected "Specifications & Technologies" from the menu bar, and then selected "Specifications by series" from the dropdown menu. I then selected the "36 Series" link to access the public file server where the specifications are stored. I then searched for "36.321" in the specification number search bar, and for the TS 36.321 specification selected the eyeglasses icon that says

"See details" when a cursor is placed on it. From there, I selected "Click to see all versions of this specification," which took me to the archive housing all versions of TS 36.321 found at the following URL: https://www.3gpp.org/ftp/Specs/archive/36_series/36.321. A true and correct copy of the relevant portion of the directory listing produced by the file server website is provided below and in **Appendix 36** at 2.

| | | |
|---|---|---|
| 36321-b50.zip | 2014/03/20 13:17 | 747,7 KB |
| 36321-b60.zip | 2015/03/26 10:19 | 716,7 KB |
| 36321-c00.zip | 2014/01/06 10:55 | 759,5 KB |

96. The archive directory index stated that TS 36.321 v11.6.0 was uploaded on "2015/03/26". Selecting the link for "36321-b60.zip", I downloaded a ZIP file of the same name. The ZIP file contained a Microsoft Word document "36321-b60.docx" and a date stamp of "25/03/2015" (European date format), the day before the ZIP file was uploaded to the server. An excerpt of the ZIP file directory is provided below.




97. I have confirmed that the document in the ZIP file ("36321-b60.doc")

is TS 36.321 v11.6.0. A true and correct copy of the Microsoft Word document "36321-b60" is TS 36.321 v11.6.0 that is provided in Ex-1019.

98. Based on my experience, I understand these date stamps to mean that 36321-f10.zip was uploaded to 3GPP's publicly available website on March 26, 2015, and that an interested member of the public could have downloaded the ZIP file, extracted the Word document enclosed, viewed the contents of the Word document, and further disseminated said document without restriction on March 26, 2015 and thereafter.

## V. CONCLUSION

99. Based on the information in section IV.A above, it is my opinion that Ex-1007 3GPP R2-1713484 titled: "Power Headroom Reporting in NR" was publicly available to download from the 3GPP server without restriction on November 17, 2017.

100. Based on the information in section IV.B above, it is my opinion that Ex-1008, 3GPP TS 38.213 v15.1.0 titled: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15), was publicly available to download from the 3GPP server without restriction on April 8, 2018.

101. Based on the information in section IV.C above, it is my opinion that Ex-1009, 3GPP TS 38.321 v15.1.0 titled: "3rd Generation Partnership Project;

Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol (Release 15), was publicly available to download from the 3GPP server without restriction on April 2, 2018.

102. Based on the information in section IV.D above, it is my opinion that Ex-1010, 3GPP TS 38.202 v15.1.0 titled: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Services provided by the physical layer (Release 15), was publicly available to download from the 3GPP server without restriction on April 2, 2018.

103. Based on the information in section IV.E above, it is my opinion that Ex-1011, 3GPP TS 38.331 v15.1.0 titled: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio Resource Control (RRC) protocol (Release 15), was publicly available to download from the 3GPP server without restriction on April 2, 2018.

104. Based on the information in section IV.F above, it is my opinion that R1-1805571, titled "Summary of NR UL power control – CA aspects", was publicly available to download from the 3GPP server without restriction on April 19, 2018.

105. Based on the information in section IV.G above, it is my opinion that R1-1710475, titled "Discussion on PHR calculation", was publicly available to download from the 3GPP server without restriction on June 17, 2017.

106. Based on the information in section IV.H above, it is my opinion that

Ex-1011, 3GPP TS 36.321 v11.6.0 titled: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved UMTS Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol (Release 11), was publicly available to download from the 3GPP server without restriction on March 26, 2015.

107. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. I hereby 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 wilful 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.

August 1, 2024



**Printed Name: Craig Bishop**

# APPENDIX 1

# Curriculum Vitae


**Name:** Craig Bishop

**Contact Tel No.:** +44 (0)7984 564949 (mobile)

**Email**: craig@bishopcom.co.uk

**Current job title:** Independent Consulting Engineer, CEO

**Address:** 43 Ospringe Street, Faversham, Kent, ME13 8TW


**Key Skills and Experience**

- 35 years Telecoms, Radio and Broadcast experience
- 27 years experience of 2G/3G/4G telecoms standardisation
- Extensive knowledge of 3GPP and ETSI specifications and procedures including document handling and publication practices
- Sound understanding of 3GPP systems, including Radio Access Interfaces and Networks, Access Stratum protocols, Core Networks, Non-Access Stratum protocols, and IMS
- Experience of ETSI role from regulatory perspective (harmonised standards, mandates, spectrum, etc)
- Depositions, reports, and declarations as expert witness in cases on 3GPP technologies and on 3GPP & ETSI practices and procedures.
- Intellectual property analysis including prior art search and evaluation of patent essentiality
- Application of data analytics and machine learning techniques to standards and IP data
- Programming in Java, Python, C, Octave (Matlab)

**Career History**

## Bishop Communications Ltd. 01/13 –

## Independent Telecommuncations Standards and Intellectual Property Consultant

Company is a full ETSI member

Activities have included:

- Provision of expert support for IPR litigation from standards landscape analysis / background technical reports to expert testimony reports / declarations and depositions on matters including the public availability of 3GPP and ETSI prior art.
- Intellectual property analysis assessing strengths and weaknesses of patents and patent portfolios, conducting searches for prior art, evaluating patent essentiality, and acquring relevant documentation.
- Provision of expertise for EC funded ETSI Specialist Task Force (STF489) to produce implementation guidelines for Total Conversation for emergency services. Project delivered on time / budget and well received. Ouput published March 2016 as ETSI TR 103 201.
- Provision of expertise for ETSI Specialist Task Force (STF555) assessing the impact on existing standards of communications involving IoT devices in all types of emergency situations. Project delivered on time / budget and well received. Ouput published July 2019 as ETSI TR 103 582.
- Provision of standards consultancy services for Samsung Electronics in ETSI including membership of the ETSI Board until November 2014

Technologies covered in patent related work include: 3GPP GSM, UMTS, LTE, 5G NR radio interface technologies (Phy, MAC, RLC, RRC), 3GPP access and core networks (GPRS/UMTS & EPC NAS), IMS. Organisations covered include 3GPP & ETSI.

Clients served / represented include: ADT, Apple, AT&T, Blackberry, Cradlepoint, DELL, Ericsson, Honeywell, HTC, Huawei, LG, Lenovo, Motorola, Nokia, Oneplus, Oppo, Samsung, Sierra Wireless, Thales, T-Mobile, Sprint, Verizon, Vodafone, Xiaomi, ZTE.

Working with: Addy Hart LLP, Alston & Bird LLP, Baker Botts LLP, Banner Witcoff LLP, DLA Piper LLP, European Telecommunications Standards Institute (ETSI), Fish & Richardson P.C., Gibson Dunn LLP, Haynes and Boone LLP, Hillebrand-CE GmbH, Kirkland & Ellis LLP, K&L Gates LLP, MckoolSmith LLP, PV Law LLP, Paul Hastings LLP, Perkins Coie LLP, Powell Gilbert LLP, Sidley Austin LLP, Samsung Electronics Research & Development Institute UK (SRUK), Taylor Wessing LLP, Williams & Connolly LLP, WilmerHale LLP.

Expert testimony through deposition:

- *Huawei Technologies Co. Ltd. vs. T-Mobile US, Inc., et al.*, Case Nos. 2:16-cv-0052-JRG-RSP, 2:16-cv-0055-JRG-RSP, 2:16-cv-0056-JRG-RSP, and 2:16-cv-0057-JRG-RSP (E.D. Tex.). On behalf of T-Mobile US Inc.
- *T-Mobile US, Inc., et al.* v. *Huawei Technologies Co. Ltd.*, Case Nos. IPR2017-00696 and IPR2017-00697 (PTAB). On behalf of T-Mobile US Inc.
- *LG Electronics, Inc., v. Koninklijke KPN N.V.*, Case No. IPR2018-00558 (PTAB). On behalf of LG Electronics, Inc.
- *Nokia of America Corp. and Ericsson Inc. v. IPCOM, GMBH & Co.,* Case No. IPR2021-00533 (PTAB). On behalf of Ericsson Inc.
- *IPCom, GmbH & Co., Plaintiff, v. AT&T Inc., et al, Defendant, Nokia of America Corp., Intervenor, Ericsson Inc., Intervenor.,* Civil Action No. 2:20-CV-322-JRG*, and IPCom, GmbH & Co., Plaintiff, v. Verizon Communications, et al., Defendant, Nokia of America Corp., Intervenor, Ericsson* nc*., Intervenor.,* Civil Action No. 2:20-CV-323-JRG. On behalf of Ericsson Inc.
- *Ericsson Inc. v. Koninklijke KPN N.V.,* Case No. IPR2022-00069 (PTAB). On behalf of Ericsson Inc.

Expert testimony in court:

- *Between IPCom GmbH and Vodafone, et al.,* Claim No. HP-2018-000030 Claim No. HP-2018-000031, High Court of Justice, Business & Property Courts of England and Wales, Intellectual Property List (ChD), Patents Court. Retained by Vodafone.
- *Between (1) Mitsubishi Electric Corporation (2) Sisvel International SA and Oneplus Mobiletech UK Limited, Oppo Mobile UK Ltd, Xiaomi Technology UK Limited, et al.,* Claim No. HP-2019-000014, High Court of Justice, Business & Property Courts of England and Wales, Intellectual Property List (ChD), Patents Court. Retained by Oneplus, Oppo, and Xiaomi (trial held remotely due to COVID-19 restrictions)

## Samsung Electronics Research Institute (SERI) 12/96 – 01/13

## Director Standards and Industry Affairs 03/11 – 01/13

Mission and Tasks as for previous role plus:

- Proactive member of ETSI Board following election as Board member in November 2011
- Worked with Samsung internal and external legal counsel in response to EC investigation into Samsung suspected abuse of Standards Essential Patents.
- Deposed by Apple as fact witness in ITC investigation 337-TA-794.

## Head of Advanced Technologies Standards & Regulation 09/05 - 03/11

Mission: To help position Samsung and SERI at the forefront of mobile telecommunication developments through participation in and leadership of mobile communications standards and European regulatory affairs

Key tasks:

- Developed standards and research strategy and coordinated activites with head office, acting as official Samsung contact for the European Telecommunications Standars Institute.
- Programme managed standardisation and regulation projects covering 3GPP (RAN2, CT1, SA2, SA1, SA, RAN, CT), OMA, and mobile Broadcast strategies and technologies (DVB Forum), European Framework projects (FP7), Spectrum Management (CEPT, ETSI EM, TFES, BRAN, …) and European Regulatory affairs (Digital Europe, relations with European Commission, …). - Grew department from 3 to 12 persons to cater for these activities.
- Participated and actively contributed to 3GPP SA1 (11/08 – 11/11), SA2 (10/05 – 08/11) , SA and ETSI TC SCP groups on issues including IMS / CS Interworking (VCC / SRVCC, VoLTE, T-ADS, ICS), Local IP Access & Selected IP Traffic Offload (LIPA-SIPTO), MOSAP, M2M/MTC, Embedded / 4FF UICC.
- Drafted and filed communication technology related patents related to 3GPP SA2 and CT1 technologies – 18 filed, mainly IMS and 3GPP NAS related
- Supported Samsung IP team with analysis of Samsung and 3rd party communication technology related patents and claim charts including GSM/GPRS, UTRAN, NAS, and IMS patents
- Chaired SERI Patent Committee from 2007-2009 - SERI achieved patent targets for first time in 2007 and did so in every year following

## Standards consultant – part time 09/04 – 09/05

(Whilst studying fulltime for MSC)

During this time, I conducted a review of the wireless communication technolgies and the associated standards space, with a particular emphasis on 802.16a, as well as 3G and 802.11 evolutions. I was also involved in analysis of 3rd party patents and claim charts on request from Samsung IP team.

## Technology Manager System Engineering group 06/03 – 09/04

Mission: To establish a System Engineering group within SERI to support development of SERI's dual mode GSM/UMTS radio modem platform.

Key Tasks:

- Defined and implemented System Engineering group strategy including recruitment and line management of the group which grew from 3 to 10 engineers during this period.
- Developed detailed system requirements for SERI's dual mode 2G/3G radio modem platform(s) including production of background documentation describing system wide behaviour
- Defined system test programme for platform, including example test cases using off the shelf test equipment. This project outsourced (under my supervision) to a third party company for completion.
- Provided continued support to development engineers in terms of understanding specification and system requirements, particularly with respect to Access Stratum and Non Access Stratum specifications and protocols.
- Instigated and managed studies investigating optimised system architecture for future Samsung mobile platforms.
- Analysed Samsung and 3rd party 3GPP technology related patents and claim charts on request by Samsung IP team and reported on their value and standards essentiality.

## Technology Manager Standards & System Group 04/02 – 06/03

Mission: To provide Standards support to SERI development teams and Samsung's global standardisation activities.

Key Tasks:

- Devised and implemented revised strategy to improve the focus of activities and provide improved support for software developers from a system perspective.

- Attended 3GPP TSG SA plenary and occasional SA WG1 meetings - acted as rapporteur for 3GPP Evolution technical report 3GPP TR 21.902.
- Analysed 3rd party GSM/GPRS technology related patents and claim charts on request by Samsung IP team and reported on their value and standards essentiality.
- Line managed 3 engineers, ensuring that the group provided expert support for SERI SW and HW developers in terms of standards interpretation and system requirements, particularly with respect to the Radio Access Network.

## Project Manager 04/00 – 04/02

Mission: To establish and manage development of a dual mode GSM/UMTS modem platform.

Key tasks:

- Defined and managed work relating to core technology development for Samsung's 3G handsets.
- Determined major technical architecture and parameters for the platform producing high level system requirements specification and project development plan.
- As a technical authority on UMTS, supported the project in terms of requirements specification and interpretation (L1, MAC/RLC, RRC, and NAS specifications), and contributed towards the training of UMTS project team members.
- Acting in a consultative capacity, interfaced with other departments in Samsung and with external customers/suppliers on issues relating to 2G and 3G technologies
- Responsible for the overall planning, work allocation and co-ordination of engineers for the project, as well as being involved in recruitment – during this period the number of engineers working on the project increased from 10 to over 40.
- Instigated, defined and managed a feasibility study involving HW and SW engineers, as essential preparation for the development of a dual mode GSM/UMTS radio modem platform.

## Senior/Principal Standards Engineer 12/96 – 04/00

Mission: To support Samsung standards and development activities in ETSI and 3GPP.

Key Tasks:

- Gathered and disseminated information throughout Samsung concerning latest specifications and trends in telecommunications, providing advice to Senior Management on future strategies for telecommunications development.
- Acted as sole Samsung representative in ETSI TC SMG2 from December 1996 and during the selection phase for the UMTS Radio Acces Technology providing training for Samsung engineers on elaborated technologies
- Participated in 3GPP TSG RAN WG1 (UTRA Physical Layer), and RAN WG2 (L2/3) contributing specifically in areas related to FEC, Common Packet Channel, and Transmit Diversity
- In 3GPP TSG T WG2 I initiated and acted as rapporteur for the UE capabilities work item. I also acted as liaison officer between TSG T WG2, TSG RAN WG1 and TSG SA WG1 (Service Aspects) on issues of common interest
- Acted as main spokesperson for and advisor on Samsung strategic activities in, 3GPP TSG RAN from 3GPP's creation until April 2000
- Acted in a consultative capacity advising the company on technical, commercial and regulatory issues relating to 3rd generation telecommunications development and implementation.
- Developed and promoted programme to co-ordinate standards activities throughout Samsung. – Samsung Global Standards Strategy Group established in September 1998.
- Attended ETSI TCs, SMG1, SMG4, SMG5, SMG7, SMG9 and SMG11 as required by Samsung to keep abreast of developments prior to establishment of 3GPP

## Radiocommunications Agency 06/93 -11/96

### HPTO Spectrum Engineer

- Responsible for the management of spectrum for use by PMR and Wireless LAN technologies.
- Defined and instigated development of an improved assignment methodology for Private Mobile Radio (PMR) channels, promoting increased quality and spectrum efficiency.
- Managed research projects involving the assessment and selection of bids from external companies, submitted under competitive tender.
- Represented the Agency in the National and International fora associated with the use of Land Mobile Radio, acting as rapporteur for PMR voice and data standards in ETSI Sub-Technical-Committee RES02, and as chairman of a sub-working group under ITU WP8A drafting the recommendation for use of the radio spectrum by Radio LANs.
- Involved in CEPT Spectrum Engineering Project Teams, dealing with spectrum for Narrow band PMR technology and co-ordination between that technology and T-DAB transmissions in Band III.
- Dispensed technical advice both within the Agency and to external customers, on national and international PMR standards, assessing requests for additional frequencies, and providing technical justification for assignments and wider spectrum policy

## BBC Radio 11/89 – 05/93

**Radio Operations Engineer**

- Worked on projects requiring the design, development, maintenance and testing of equipment for use within the broadcasting chain.
- Responsible for acceptance testing of new studios for Radio 5, and in particular redesign of outside source circuits for the main sports continuity studio.
- Involved in acceptance testing for NICAM transmission routers. Designed and implemented modifications to synchronise transmission feeds, resulting in seamless switching between routers.

## Education

1. MSC in Computer Science from the University of Kent

   Awarded (with distinction): 07/2006

   Dissertation title: Roles Variables and Program Analysis – Received prize for outstanding achievement

2. B.Eng. (Hons) in Electronic Engineering from the Polytechnic of Central London

   Awarded: 07/1989

3. In house and external technical and management training including: Learning Tree courses on System Analysis and Design, User Requirements, UML, and Project Management.
4. On-line courses from: Cousera, Udemy, and Zenva courses covering Machine Learning, Python, Data Science, and Natural Language Processing

# APPENDIX 2

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# *THIRD GENERATION PARTNERSHIP PROJECT (3GPP)*

## *PARTNERSHIP PROJECT DESCRIPTION*

**During the meeting held in Copenhagen, 2 - 4 December 1998 ARIB, ETSI, T1, TTA and TTC agreed this Partnership Project Description.**

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# *Preamble*

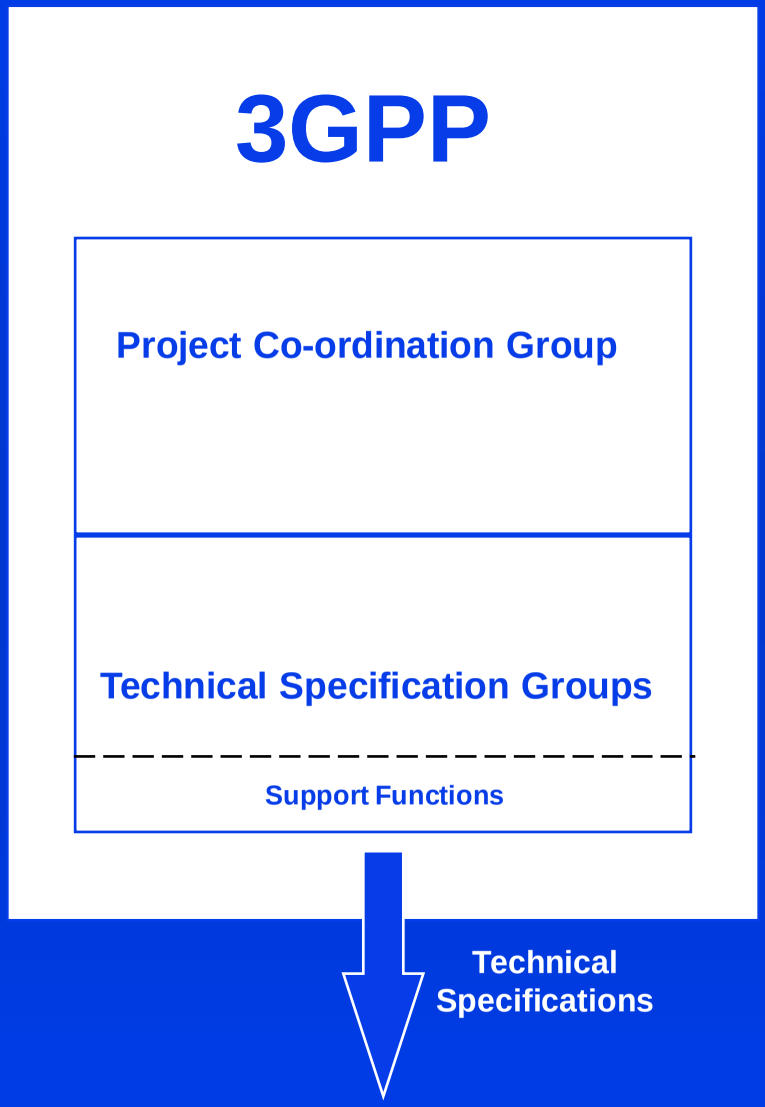
**Standards organizations and other related bodies have agreed to co-operate for the production of a complete set of globally applicable Technical Specifications for a 3rd Generation Mobile System based on the evolved GSM core networks and the radio access technologies supported by 3GPP partners (i.e., UTRA both FDD and TDD modes).**

**The Project is entitled the "Third Generation Partnership Project" and may be known by the acronym "3GPP".**

**3GPP has been established for the preparation and maintenance of the above mentioned Technical Specifications, and is not a legal entity.**

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# *3GPP Overview*




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# *Definition of the Third Generation Partnership Project*

**3GPP will provide globally applicable Technical Specifications for a 3rd Generation Mobile System based on the evolved GSM core network, and the Universal Terrestrial Radio Access (UTRA), to be transposed by relevant standardization bodies (Organizational Partners) into appropriate deliverables (e.g., standards).**

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# *Scope and objectives (1)*

**The Technical Specifications will be developed in view of global roaming and circulation of terminals.**

**The 3rd Generation Mobile System and its capabilities will be developed in a phased approach. Initially, 3GPP will elaborate, approve and maintain the necessary set of Technical Specifications for the first phase of a 3rd Generation Mobile System including:**

- **UTRAN (including UTRA; W-CDMA in Frequency Division Duplex (FDD) mode and TD-CDMA in Time Division Duplex (TDD) mode)**
- **3GPP Core Network (Third Generation networking capabilities evolved from GSM . These capabilities include mobility management and global roaming.)**
- **Terminals for access to the above (including specifications for a UIM)**
- **System and service aspects**

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# *Scope and objectives (2)*

**The set of global specifications for the first phase of the 3GPP core network and the specifications for the GSM core network should be common to the largest extent possible and should not be needlessly different.**

**The results of the 3GPP work will form the basis of member contributions to the ITU in accordance with existing procedures.**

**3GPP will take account of emerging ITU recommendations on interworking between IMT-2000 family members.**

**In the framework of agreed relationships, 3GPP will elaborate Technical Specifications that will form the basis of standards, or parts of standards, of the Organizational Partners.**

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# *Characteristics of 3GPP (1)*

**3GPP is characterized by the following attributes:**

- **Minimum production time for Technical Specifications from conception to approval**
- **Fast, electronic based approval process**
- **Maximum use of modern (electronic) working methods**
- **Minimum number of hierarchical levels with decision making taking place at the lowest appropriate levels**

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# *Characteristics of 3GPP (2)*

- **A Project Co-ordination function and a Technical Specification function**
- **Task oriented, ensuring that on completion of the tasks the future of the project is re-evaluated**
- **Cost effective use of financial/human resources provided by Partner Organizations (if required)**

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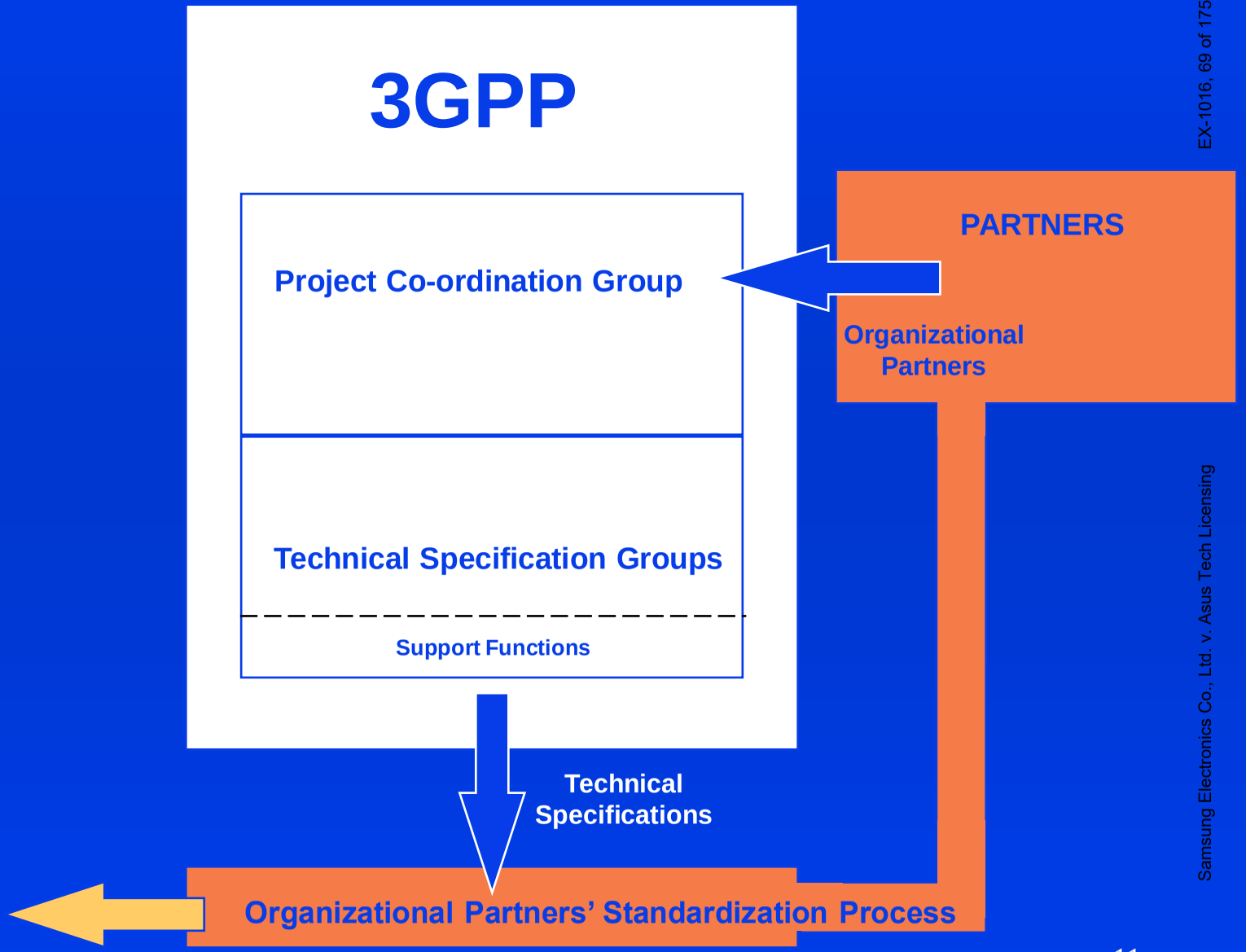
# *Partnership and Membership*

**3GPP comprises of:**

- **Partners:**
  - **Organizational Partners**
    - **3GPP is open to all standards organizations irrespective of the geographical location.**
  - **Market Representation Partners**
- **Individual Members**

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# Organizational Partners (1)




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# *Organizational Partners (2)*

**An Organizational Partner is:**

**An open standards organization with a national, regional or other officially recognized status (in their country or region)**

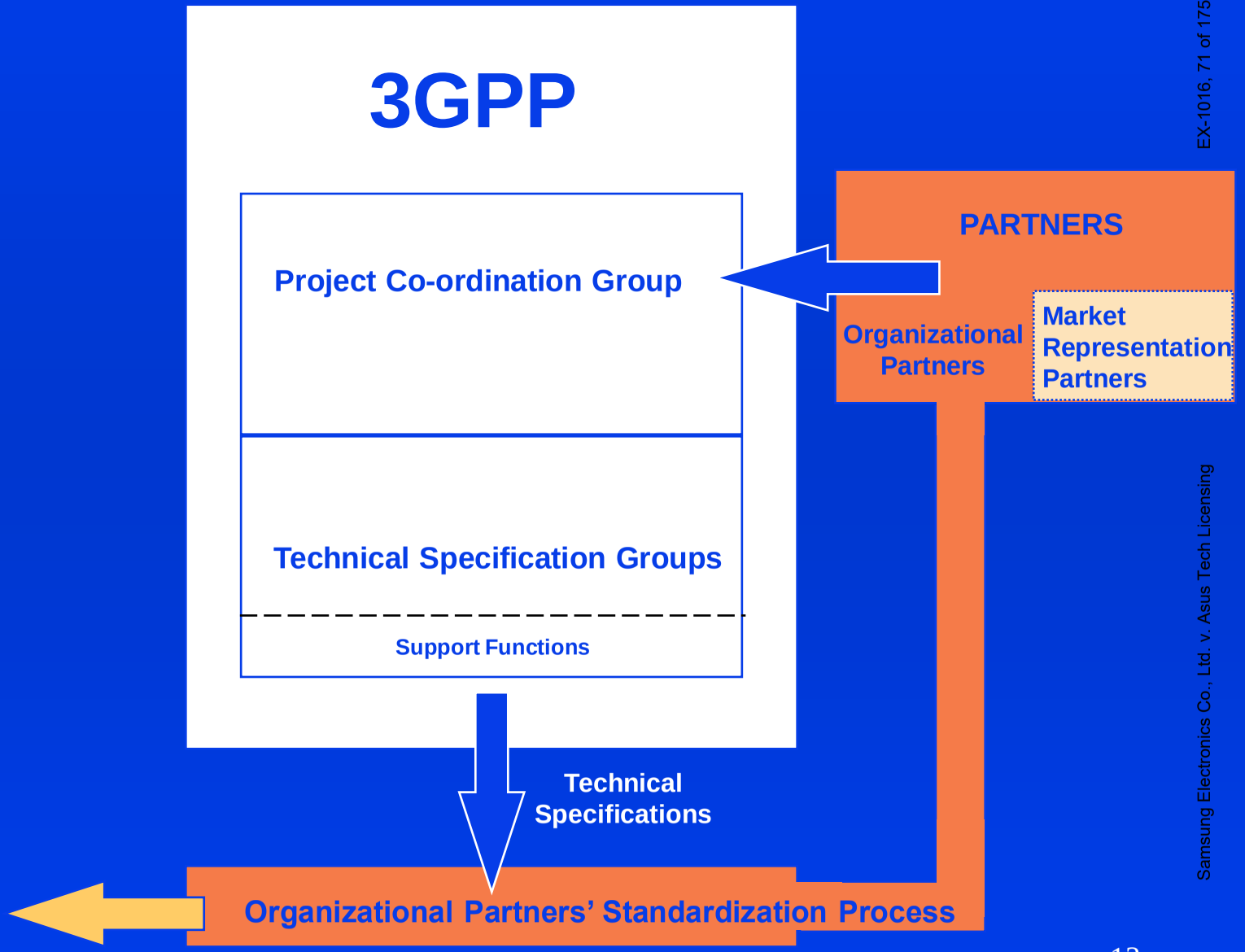
**that:**

- **has the capability and authority to define, publish and set standards nationally or regionally and**
- **has signed (or whose sponsor has signed) the Partnership Project Agreement**

**Organizational Partners will meet as approriate and make decisions by consensus.**

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# *Market Representation Partners (1)*




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# *Market Representation Partners (2)*

**Standardization should meet market needs.**

**In order to identify market requirements, the high competence of Market Representation Partners should be used.**

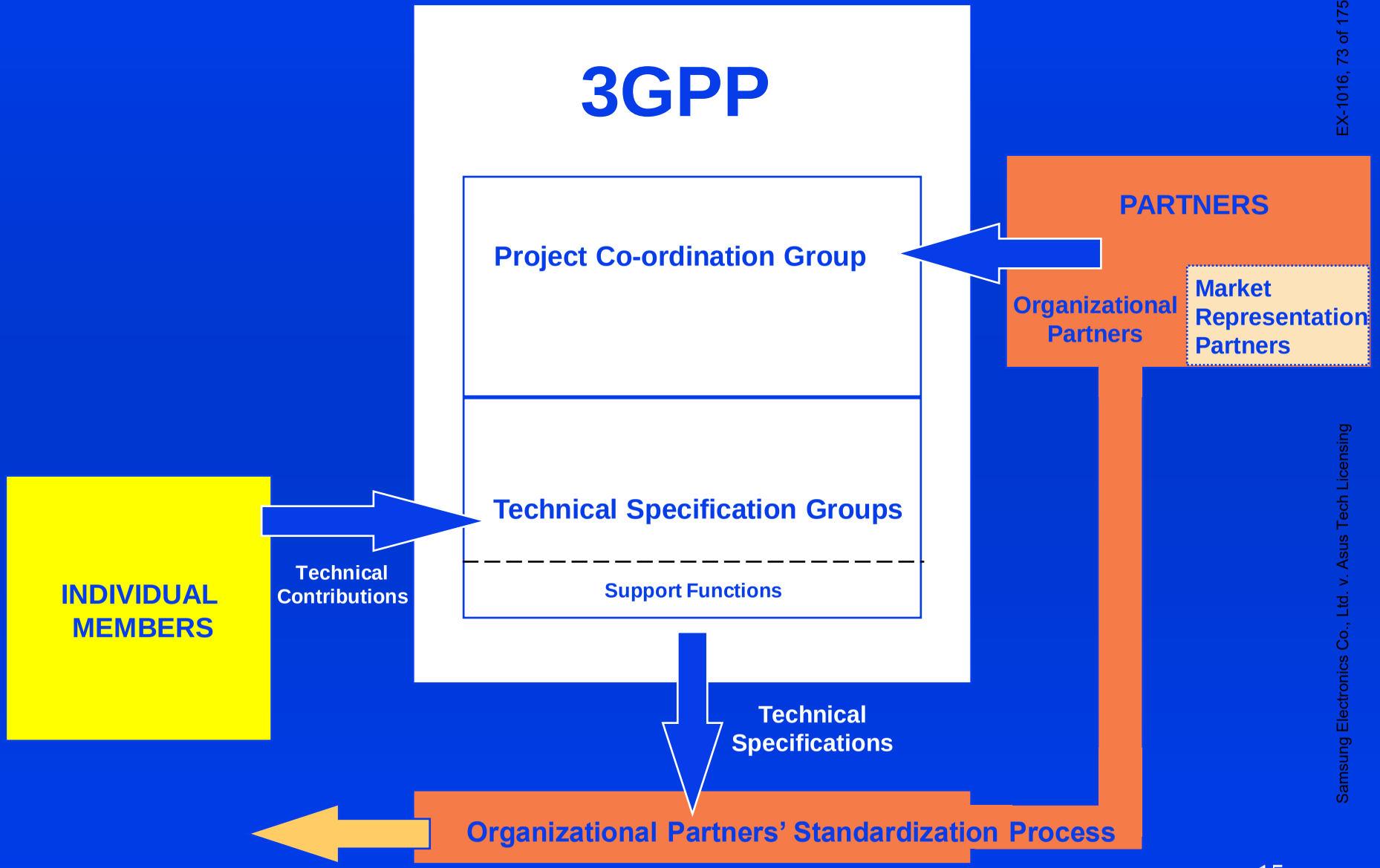
**A Market Representation Partner is an organization invited to participate by the Organizational Partners to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g. services, features and functionality) falling within the 3GPP scope.**

**A Market Representation Partner:**

- **does not have the capability and authority to define, publish and set standards nationally or regionally**
- **has signed (or whose sponsor has signed) the Partnership Project Agreement**
- **has committed itself to the 3GPP scope**

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# Individual Members (1)




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# *Individual Members (2)*

**Membership in an Organizational Partner is a pre-requisite for Individual Membership in 3GPP.**

**Individual Membership is open to legal entities committed to support 3GPP and to:**

- **contribute technically or otherwise to one or more of the Technical Specification Groups within the 3GPP scope**
- **use the 3GPP results to the extent feasible**

**Individual Membership in 3GPP will be terminated by dissolution, abolition, resignation or expulsion from the related Organizational Partner.**

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# *Individual Members (3)*

**All entities registered as members of an Organizational Partner and eligible for participation in the technical work of that Partner, can become Individual Members of 3GPP. Individual members shall apply to their Organizational Partner to participate in 3GPP.**

**Individual Members act in the 3GPP in their own right; they carry the full responsibility for their contributions.**

**Individual Membership applicants residing in a country/area without an Organizational Partner can apply for membership in an Organizational Partner according to the rules of each Partner. (e.g. ETSI Associate Membership is available)**

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# *Observership*

**In order to ensure globally applicable Technical Specifications, the status of "Observer" may be granted by the Organizational Partners to an entity which has the qualifications to become a future Organizational Partner. The status of "Observer" includes obligations to:**

- **identify as early as possible any regulatory requirements that may lead to options within Technical Specifications**
- **make their IPR policy available for consideration**
- **contribute to the common objective of the 3GPP and avoid duplication of work related to the 3GPP**

**The participation rights of an Observer will be decided on a case by case basis.**

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**The following 3 documents describe 3GPP:**

- **The Partnership Project Agreement**
- **The Partnership Project Description (this present document)**
- **The Partnership Project Working Procedures**

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# *The Partnership Project Agreement (1)*

**The Partnership Project Agreement is a concise legal document signed by participating Partners (or their sponsor).**

**It contains the minimum legal text necessary for 3GPP to function correctly.**

**The Partnership Project Agreement refers to the Partnership Project Description and the Partnership Project Working Procedures.**

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## *The Partnership Project Agreement (2)*

**The Partnership Project Agreement includes obligations on Organizational Partners to commit themselves to the 3GPP scope:**

- **to encourage their members to contribute to the common set of Technical Specifications and to avoid duplication of work**
- **to convert / transpose / adopt all relevant Technical Specifications resulting from 3GPP into their own relevant deliverables through their normal processes**
- **to identify as early as possible, any national / regional regulatory requirements that may lead to options within the Technical Specifications**
- **to make their IPR Policy available for consideration**

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## *The Partnership Project Agreement (3)*

**The Partnership Project Agreement includes obligations on Market Representation Partners to identify market and service requirement of 3GPP and to contribute to:**

- **the promotion of 3GPP**
- **the definition of 3GPP System and Service scenarios**

**The Market Representation Partners should also encourage their members to contribute to the common objectives of 3GPP and to avoid duplication of work.**

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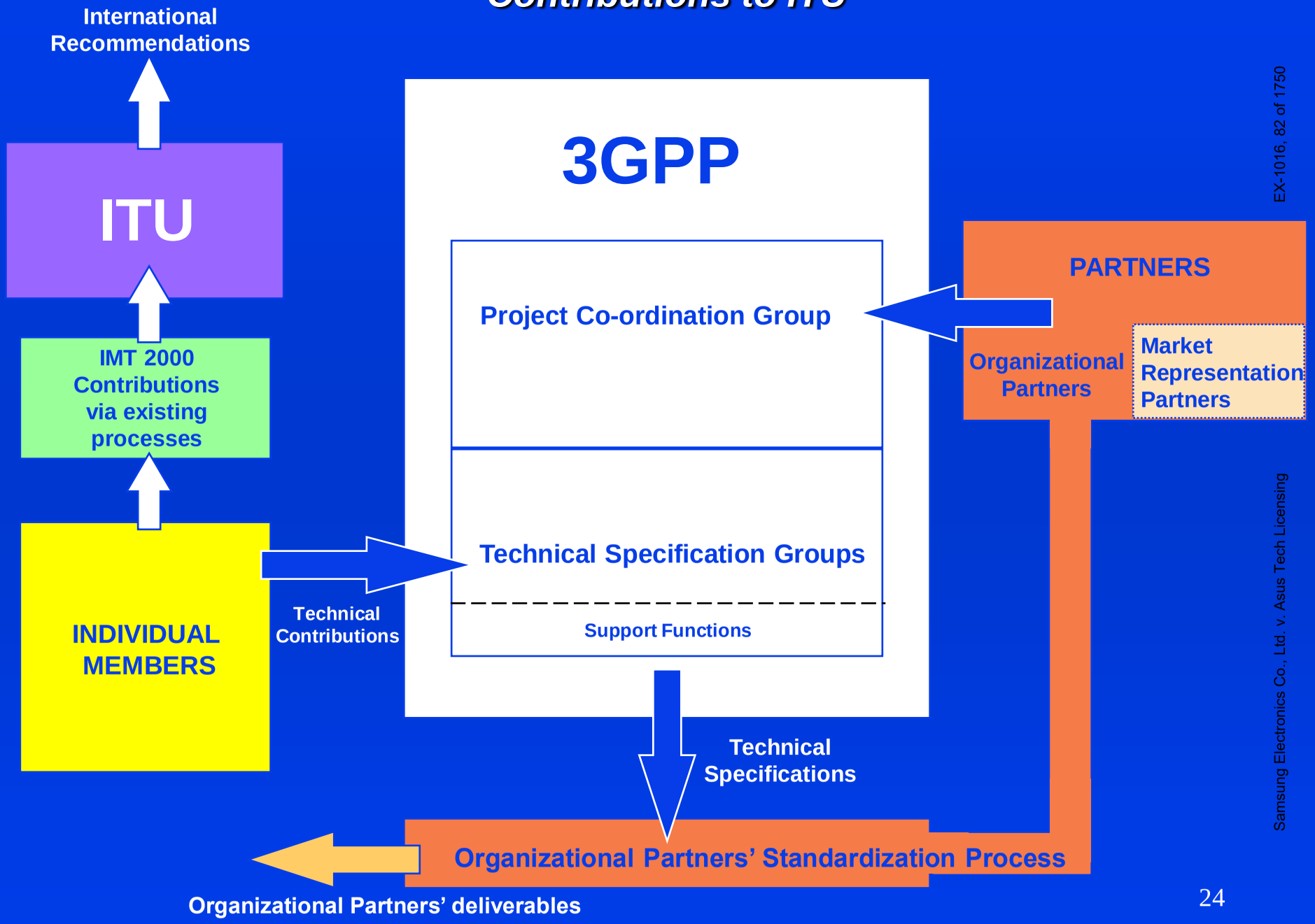
## *Ownership of the Partnership Project results*

**The Organizational Partners of 3GPP will have joint ownership (including copyright) of the Technical Specifications.**

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# Contributions to ITU




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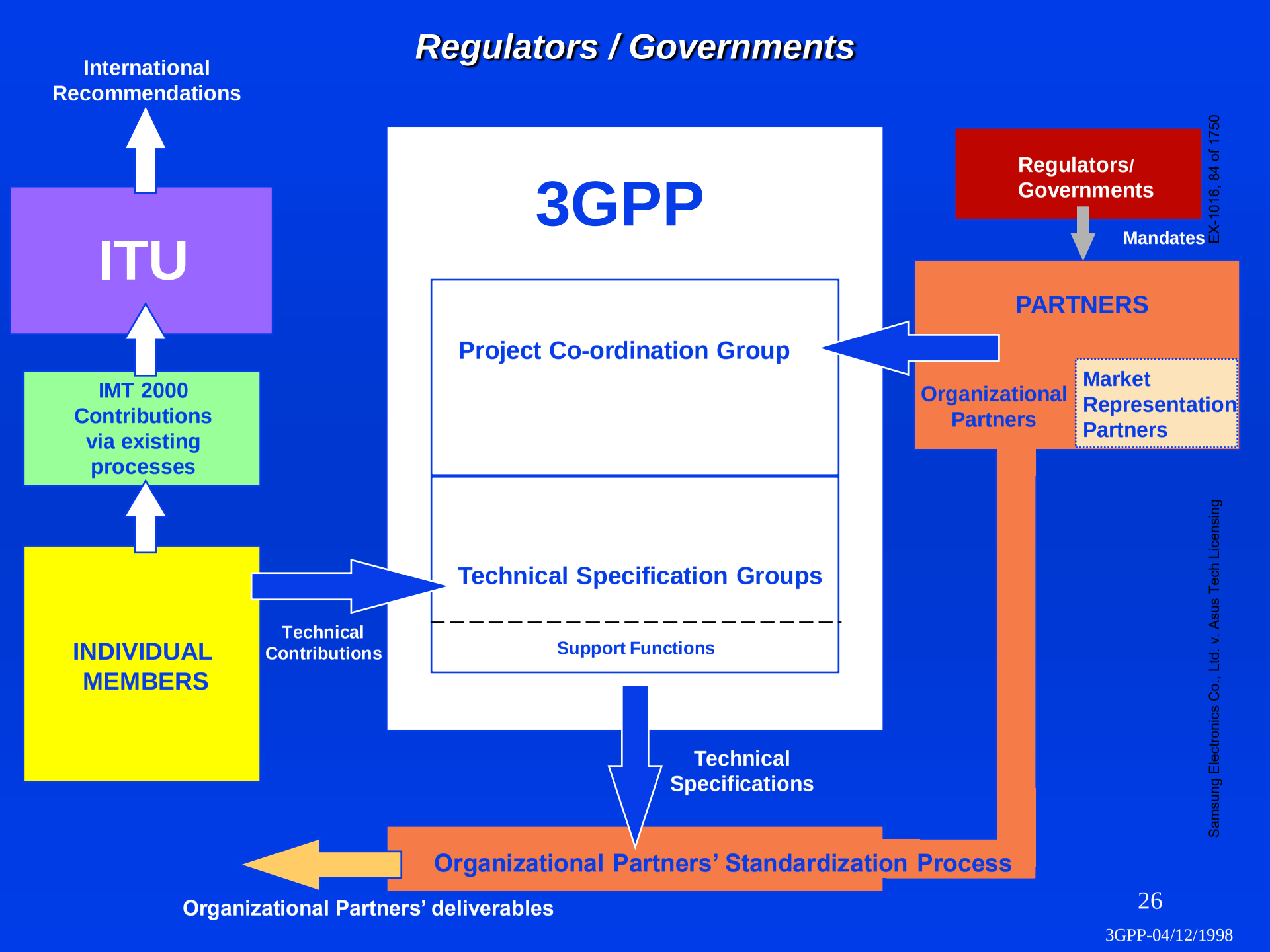
## *Submission of 3GPP results to ITU*

**3GPP will not contribute directly to the ITU.**

**Formal contributions to ITU Study Groups are made by ITU members following existing national/regional processes.**

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Regulators / Governments
International Recommendations
ITU
IMT 2000 Contributions via existing processes
INDIVIDUAL MEMBERS
Technical Contributions
3GPP
Project Co-ordination Group
Technical Specification Groups
Support Functions
Technical Specifications
Organizational Partners' Standardization Process
Organizational Partners' deliverables
Regulators/ Governments
Mandates
PARTNERS
Organizational Partners
Market Representation Partners
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## *National / regional regulatory requirements*

**Variations imposed by national / regional regulatory requirements will be included in the Technical Specifications as defined by the Technical Specification Groups.**

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## *Resource requirements for establishing 3GPP*

**ETSI will absorb the initial cost of establishing the 3GPP, if required.**

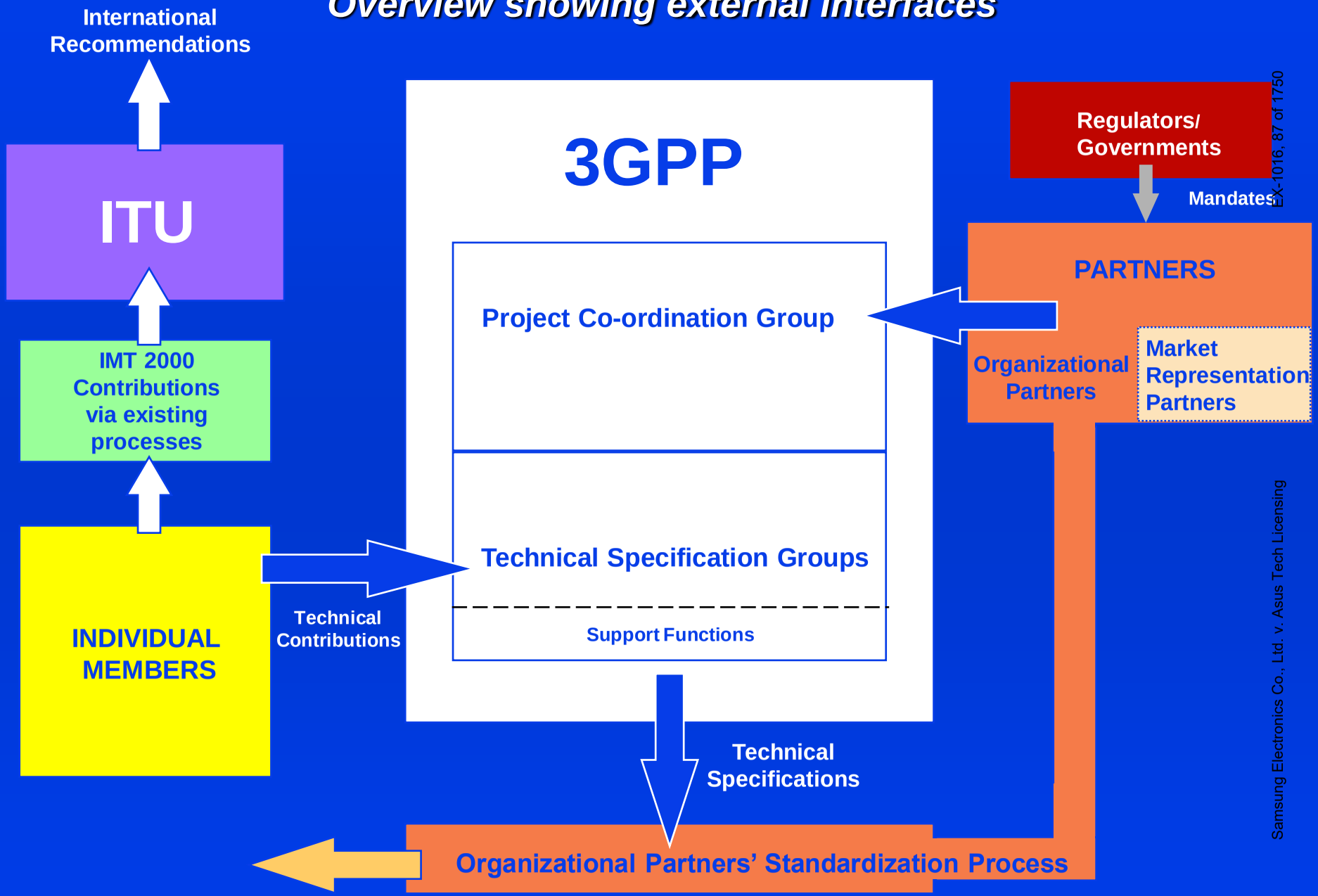
**Thereafter, the costs will be shared by the Organizational Partners. There will be no direct 3GPP membership fee for Individual Members.**

**Partners and Individual Members may provide support functions to the extent that they are able (eg hosting of meetings and provision of Secretariat support).**

**The longer term financial requirements are for further study.**

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# Overview showing external interfaces




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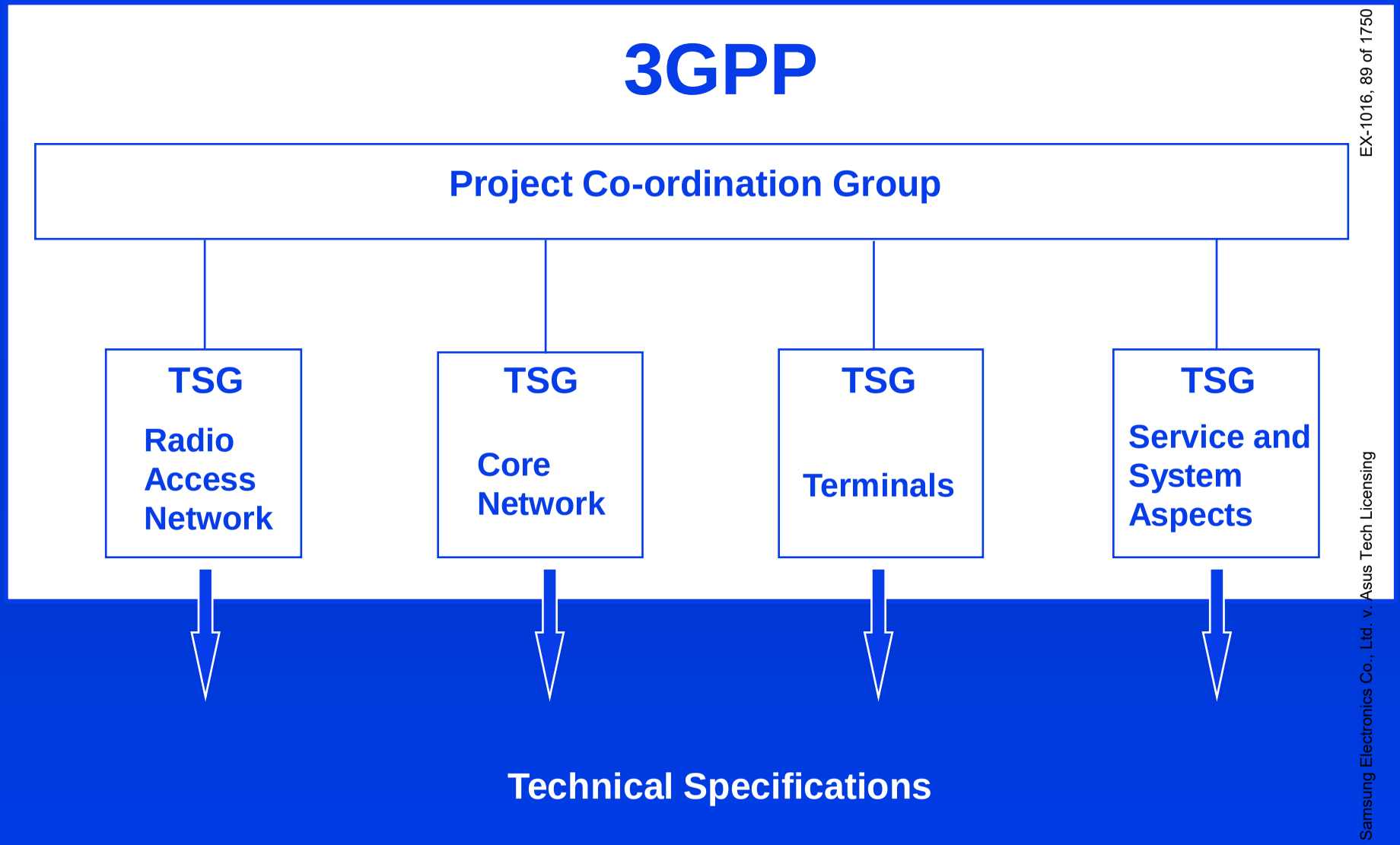
# *Internal structure of 3GPP (1)*

**3GPP consists of a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs).**

**To assist in the co-ordination of the technical activities, the TSGs are encouraged to meet at the same time and place, as and when appropriate (e.g. twice per year).**

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# *Internal structure of 3GPP (2)*




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## *Work areas to be covered by the Radio Access Network TSG*

- **Radio Layer 1 specification**
- **Radio Layer 2 specification**
- **Radio Layer 3 RR specification**
- **Iub specification**
- **Iur Interface**
- **Iu Interface**
- **UTRAN O&M requirements**
- **Base station radio performance specification**
- **Conformance test specification for testing of radio aspects of base stations**
- **Specifications for radio performance aspects from the system point of view**

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## *Work areas to be covered by the Core Network TSG*

- **Mobility management, call connection control signalling between the user equipment and the core network**
- **Core network signalling between the core network nodes. the signalling supports functionality such as user location information, subscription information and control of network services**
- **Definition of interworking functions between the core network and external networks**
- **Packet related questions such as mapping of QoS ( e.g. transparency for IP domain applications, general for bearer types, special for optimized applications such as Voice over IP)**
- **Core network aspects of the Iu interface**
- **Core network O&M requiremnents**

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## *Work areas to be covered by the Terminal TSG*

- **Service capability protocols**
- **Messaging**
- **Services end-to-end interworking**
- **USIM to Mobile Terminal interface**
- **Model/framework for terminal interfaces and services (application) execution**
- **Conformance test specifications of terminals, including radio aspects**

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# *Work areas to be covered by the Service and System Aspects TSG*

- **Service capabilities**
  - **Definition of services and feature requirements**
  - **Development of service capabilities and a service architecture for cellular, fixed (and cordless) applications**

- **Stage one and two descriptions for:**
  - **Charging and accounting**
  - **Network Management**
  - **Security Aspects**

- **Architecture**
  - **Definition, evolution, and maintenance of overall architecture, including assignment of functions to particular sub-systems and identification of key information flows**
  - **In co-operation with other TSGs, define required services, service capabilities and bearer capabilities offered by the different sub-systems**

- **Codec aspects**
  - **Principles for definition of end-to-end transmission**
  - **Definition, evolution and maintenance of relevant specifications**

- **Project co-ordination**
  - **High level co-ordination of the work performed in other TSGs and monitoring of progress**

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# *Primary responsibilities of PCG and TSGs (1)*

**The primary responsibilities of PCG, TSGs and Organizational Partners are given in the following tables:**

| | Function | Org Partners collectively | PCG | TSGs |
|---|---|---|---|---|
| 1 | Approval of new Partners for 3GPP | X | | |
| 2 | Approval of Organizational Partner funding requirements and contributions | X | | |
| 3 | Allocation of human and financial resources provided by Partners to PCG | X | | |
| 4 | Allocation of resources to TSGs | | X | |
| 5 | Allocation of resources within TSGs | | | X |

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# *Primary responsibilities of PCG and TSGs (2)*

| | Function | Org Partners collectively | PCG | TSGs |
|---|---|---|---|---|
| 6 | Allocation of voluntary human and financial resources by Market Representation Partners and Individual Members | | X | X |
| 7 | Handling of appeals from Individual Members on procedural matters | 2nd step | 1st step | |
| 8 | Handling of appeals from Individual Members on technical matters | | 2nd step | 1st step |
| 9 | Determine overall time frame and manage overall work progress | | X | |

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# *Primary responsibilities of PCG and TSGs (3)*

| | Function | Org Partner collectively | PCG | TSGs |
|---|---|---|---|---|
| 10 | Detailed time frame and manage detailed work progress | | | X |
| 11 | Approval of Technical Specifications | | | X |
| 12 | Proposal and approval of work items within the agreed scope and terms of reference | | | X |
| 13 | Final adoption of work items within the agreed scope and terms of reference | | X | |
| 14 | Management of work items | | | X |

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# *Primary responsibilities of PCG and TSGs (4)*

| | Function | Org Partners collectively | PCG | TSGs |
|---|---|---|---|---|
| 15 | Technical Co-ordination (System Aspects TSG will play a role here) | | | X |
| 16 | Appointment of Org Partners meeting Chairman (provided by host on a rotational basis) | X | | |
| 17 | Appointment of PCG Chairman (for one year term) | | X | |
| 18 | Election of TSG Chairman and Vice Chairmen | | | X |
| 19 | Creation of TSGs and approval of their terms of reference | X | | |

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# Primary responsibilities of PCG and TSGs (5)

| | Function | Org Partners collectively | PCG | TSGs |
|---|---|---|---|---|
| 20 | Creation of TSG working groups and approval of their terms of reference | | | X |
| 21 | Election of TSG Working Group Chairmen and Vice Chairmen | | | X |
| 22 | Confirmation of individual member participation rights | X | | |
| 23 | Approval of 3GPP scope and terms of reference | X | | |
| 24 | Maintain Partnership Project Agreement, Project Description and Working Procedures (consensus agreement by all Partners) | X | | |

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# *Participation rights in PCG and TSGs*

**The following have a right to participate in the PCG:**

- **Representatives of participating Organizational Partners**
- **Representatives of participating Market Representation Partners**
- **Chairman and Vice Chairmen of the TSGs, as ex-officio members**

**The following have a right to participate in the TSGs :**

- **Representatives of members of participating Organizational Partners (i.e. Individual Members)**
- **Representatives of participating Organizational and Market Representation Partners**

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# *Principles for decision making within 3GPP*

**Decision making within PCGs**

- **By consensus amongst the Organizational Partners**
- **By vote amongst the Organizational Partners in unavoidable cases**

**Decision making within TSGs**

- **By consensus amongst the Individual Members**
- **By vote amongst the Individual Members in unavoidable cases**

**The Organizational Partners will conduct a fairness review of the decision making process six months after 3GPP start-up, taking into account all concerns raised**

**(Note: voting will not be permitted on National/Regional regulatory requirements)**

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# *Principles for voting within TSGs*

**The following principles will be applied for voting within the TSGs**

- **One "Individual company Member", one vote**
- **Organizational Partners to interpret " Individual company Member" according to its own rules of membership**
- **The PCG will maintain a register of eligible voters for the TSGs**
- **Each Individual Member may carry the proxy for up to five other Individual Members**

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# *Working language for 3GPP*

**The working language for 3GPP shall be English**

- **Meetings of the PCG and TSGs shall be conducted in English**
- **3GPP Technical Specifications shall be prepared in English**

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## *Relationship with other groups*

**3GPP will establish and maintain good relationships with groups working on standards for other IMT-2000 family members.**

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## *Intellectual Property Rights (IPR) Principles (1)*

**The Individual Members of 3GPP are bound by the IPR Policies of their respective Organizational Partner.**

**Individual Members are encouraged to declare at the earliest opportunity, any IPRs which they may have and believe to be essential, or potentially essential, to any work ongoing within 3GPP.**

**After comparing their respective IPR policies, ARIB, ETSI, T1, TTA and TTC have agreed that their IPR policies share common principles are quite similar and have agreed on the following additional principles to maximize the success of 3GPP.**

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## *Intellectual Property Rights (IPR) Principles (2)*

(i) **To encourage their respective members' declaration of willingness to grant licences on fair, reasonable terms and conditions on a non-discriminatory basis, and consistent with the respective Organizational Partners' IPR policies.**

(ii) **To encourage their respective members who may have IPR which they believe to be essential, or potentially essential, and are unwilling to license such IPR, that early indication of such unwillingness be provided to their respective Organizational Partners.**

(iii) **To understand that essential IPRs mean essential IPRs relative to any or all parts of the content of the 3GPP technical specifications.**

(iv) **A mechanism for exchanging information associated with the patent statement among the Organizational Partners will be introduced so that such information may be used when adopting relevant standards in each Partner Organization.**

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# APPENDIX 3

About / Introducing 3GPP

# Introducing 3GPP



The 3rd Generation Partnership Project (3GPP) unites seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as “Organizational Partners” providing their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies.

3GPP specifications cover cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications. The 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with non-3GPP networks

## The Project’s Scope

The original scope of 3GPP (1998) was to produce Technical Specifications and Technical Reports for a 3G Mobile System based on evolved GSM core networks and the radio access technologies that they support (i.e., Universal Terrestrial Radio Access (UTRA) both Frequency Division Duplex (FDD) and Time Division Duplex (TDD) modes).

The scope was subsequently amended to include the maintenance and development of the Technical Specifications and Technical Reports for evolved 3GPP technologies, beyond 3G.

- The latest 3rd Generation Partnership Project Agreement (Annex 42).
- The discussions that led to the signing of the 3GPP Project Agreement were recorded in a series of slides called the “Partnership Project Description” that describes the basic principles and ideas on which the project is based. The document has not been maintained since its first creation, but the principles within do still remain valid.

## Organizing the work

The 3GPP Working Procedures are the rule book of 3GPP, with sections covering:

- Description, Purpose, Scope and objectives
- Participation
- Structure
- Partners' collective responsibilities
- Project Coordination Group (PCG)
- Technical Specification Groups (Incl. Elections)
- Work Programme & technical co-ordination
- Deliverables (Technical Specifications and Technical Reports)
- Reporting

The 3GPP production of specifications and studies (TRs) are contribution-driven, by member companies, in Working Groups and at the Technical Specification Group (TSG) level. The Technical Specification Groups in 3GPP are:

- Radio Access Networks (RAN)
- Services & Systems Aspects (SA)
- Core Network & Terminals (CT)

The Working Groups, within the TSGs, meet regularly and come together for their quarterly TSG Plenary meeting, where their work is presented for information, discussion and approval. The last meeting of the week of TSG Plenary meetings is TSG SA, which also has responsibility for the overall coordination of the technical work and for the monitoring of its progress.

## Generational Approach

The 3GPP technologies from these groups are constantly evolving through Generations of commercial cellular / mobile systems (see table below). With LTE and 5G work, 3GPP has become the focal point for the vast majority of mobile systems beyond 3G.

Although these Generations have become an adequate descriptor for the type of network under discussion, real progress on 3GPP standards is measured by the milestones achieved in particular Releases. New features

are 'functionality frozen' and are ready for implementation when a Release is completed. 3GPP works on a number of Releases in parallel, starting future work well in advance of the completion of the current Release. Although this adds some complexity to the work of the groups, such a way of working ensures that progress is continuous & stable.

## Backward Compatibility

The major focus for all 3GPP Releases is to make the system backwards and forwards compatible where possible, to ensure that the operation of user equipment is uninterrupted.

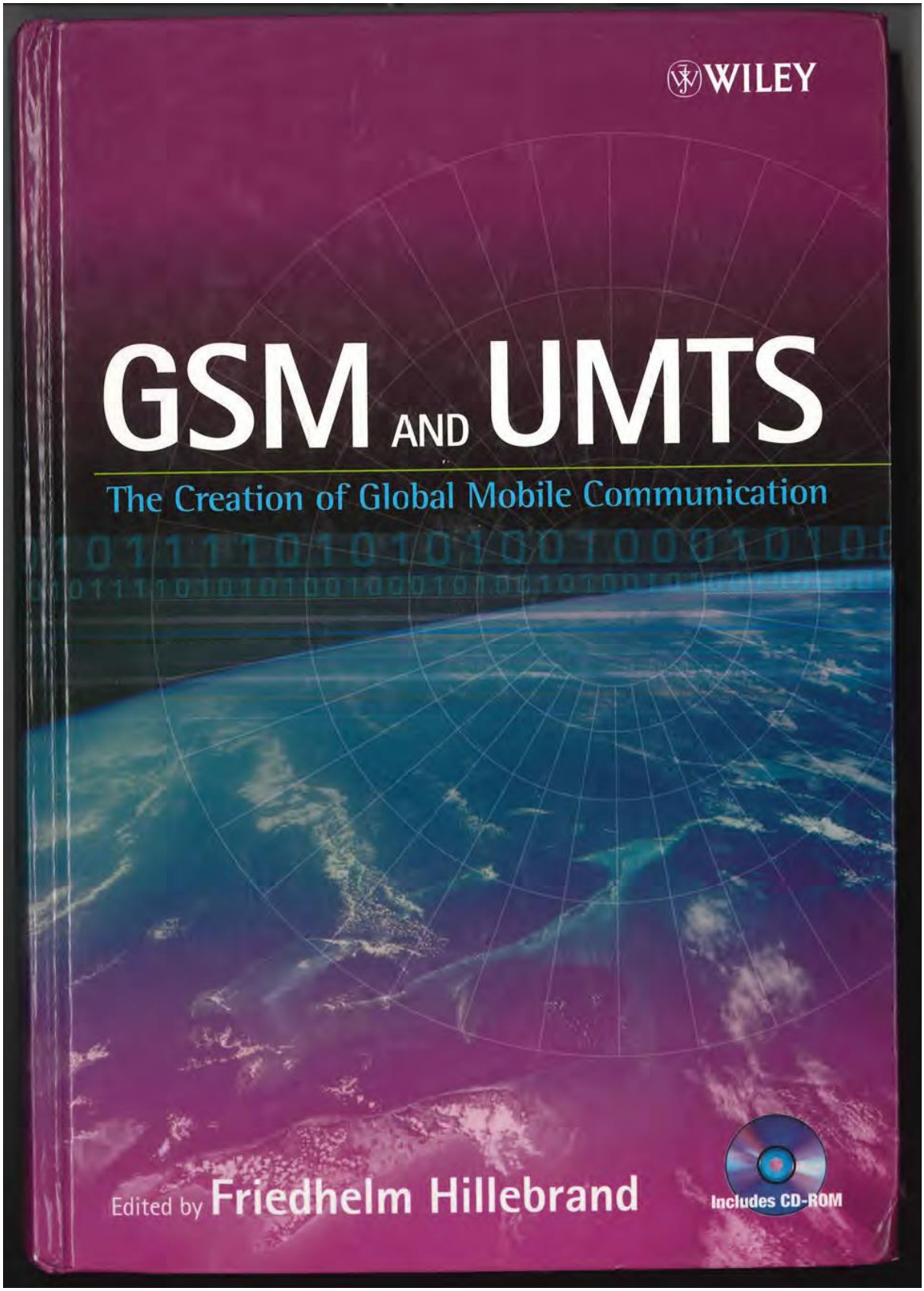
For 5G, many operators are starting with dual connectivity between LTE and 5G NR equipment – using the 'Non-Standalone' work completed early in Release 15. In the process of completing the early drop of 5G NR care has been taken to build 'forward compatibility' into Non-Standalone NR equipment, to ensure that it will be fit for use on Standalone 5G NR systems.

For details of the contents of each Release, see the appropriate 'Release Description' document or go to our dedicated Release page.

Details of all 3GPP Work Items are in the 3GPP Work Plan, which provides details of the cooperation between all of the 3GPP groups on "Features", defined as 'new or substantially enhanced functionality which represents added value to the existing 3GPP system'.

Previous Next

# APPENDIX 4






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# GSM and UMTS

## The Creation of Global Mobile Communication

Edited by

**Friedhelm Hillebrand**
*Consulting Engineer, Germany*

With contributions from 37 key players involved in the work for GSM and UMTS



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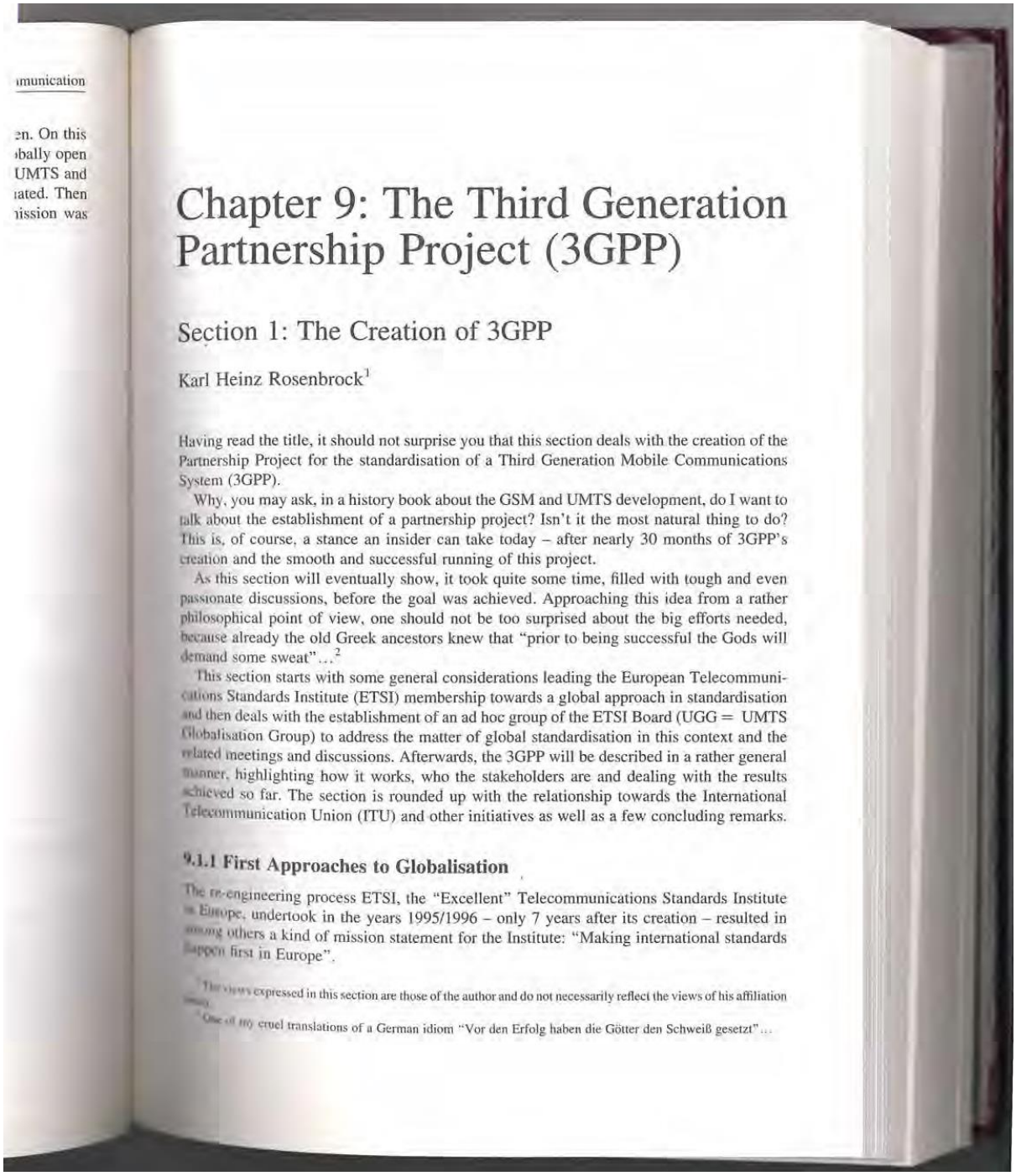
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# Chapter 9: The Third Generation Partnership Project (3GPP)

## Section 1: The Creation of 3GPP

Karl Heinz Rosenbrock[1]

Having read the title, it should not surprise you that this section deals with the creation of the Partnership Project for the standardisation of a Third Generation Mobile Communications System (3GPP).

Why, you may ask, in a history book about the GSM and UMTS development, do I want to talk about the establishment of a partnership project? Isn't it the most natural thing to do? This is, of course, a stance an insider can take today – after nearly 30 months of 3GPP's creation and the smooth and successful running of this project.

As this section will eventually show, it took quite some time, filled with tough and even passionate discussions, before the goal was achieved. Approaching this idea from a rather philosophical point of view, one should not be too surprised about the big efforts needed, because already the old Greek ancestors knew that "prior to being successful the Gods will demand some sweat"...[2]

This section starts with some general considerations leading the European Telecommunications Standards Institute (ETSI) membership towards a global approach in standardisation and then deals with the establishment of an ad hoc group of the ETSI Board (UGG = UMTS Globalisation Group) to address the matter of global standardisation in this context and the related meetings and discussions. Afterwards, the 3GPP will be described in a rather general manner, highlighting how it works, who the stakeholders are and dealing with the results achieved so far. The section is rounded up with the relationship towards the International Telecommunication Union (ITU) and other initiatives as well as a few concluding remarks.

### 9.1.1 First Approaches to Globalisation

The re-engineering process ETSI, the "Excellent" Telecommunications Standards Institute in Europe, undertook in the years 1995/1996 – only 7 years after its creation – resulted in among others a kind of mission statement for the Institute: "Making international standards happen first in Europe".

[1] The views expressed in this section are those of the author and do not necessarily reflect the views of his affiliation [illegible].

[2] One of my cruel translations of a German idiom "Vor den Erfolg haben die Götter den Schweiß gesetzt"...



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- unanimously requested the ETSI Board (through its UMTS Globalisation Group) to complete the negotiations with potential partners and to oversee the creation of the Partnership Project;
- unanimously requested the ETSI Board to agree and maintain on behalf of ETSI the final versions of the Partnership Project Description, the Partnership Project Working Procedures, and the Partnership Project Agreement;
- unanimously authorised the director-general to sign the Partnership Project Agreement.

#### 9.1.2.4.14 Happy End in Copenhagen

It was in Copenhagen where the last 3GPP preparatory meeting with all six OPs took place on 2–4 December 1998.

Here, the final fine-tuning of the 3GPP documentation was achieved. In addition, the 3GPP agreement[8] was signed (in a nice framework provided by the host, TeleDenmark) by the following OPs: ARIB, ETSI, T1, TTA, and TTC.

Unfortunately, the partners from CWTS (China) were not authorised to sign the 3GPP agreement yet. Furthermore, owing to the fact that the UMTS Forum was unable to participate in Copenhagen, they were prevented from co-signing the 3GPP agreement as a first Market Representative Partner (MRP).

During that Copenhagen meeting, another discussion ensued about the role the MRPs should play. Finally, it was concluded that the high competence of MRPs should be used in order to identify market requirements, thus enabling 3GPP standardisation to meet the needs of the market. An MRP is an organisation invited by the OPs to participate in 3GPP with the objective of offering market advice to 3GPP and to bring into 3GPP a consensus view of market requirements.

### 9.1.3 What is 3GPP?

The 3GPP is a global standardisation initiative created in December 1998. Its task was to develop a complete set of globally applicable Technical Specifications for a third generation (3G) mobile telecommunications system based on the evolved GSM core network and an innovative radio interface known as UTRA. The Project is based on a concept devised by ETSI aimed at facilitating better co-operation between regional standards organisations, fora and other industry groupings. 3GPP is a collaborative activity between officially recognised SDOs, with the participation of other industry groups and individual members.

Partnership in 3GPP is open to all national, regional or other SDOs, irrespective of their geographical location – within the project the participating SDOs are referred to as OPs. The OPs may invite MRPs to participate: these may be any organisation from anywhere in the world that can offer market advice to 3GPP and bring a consensus view of market requirements that fall within the project's scope. Individual membership is open to companies and organisations within the communications industry that are active members of one of the OPs. The truly global nature and the breadth of the market interest in the task of specifying this 3G system is evident from the identity of the 3GPP partners (see further in sub-paragraph 9.13.2) and all agree that 3GPP is proving a highly successful initiative.

[8] The 3GPP Agreement and the 3GPP Project Description can be found on the attached CD-ROM in



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The 3GPP has no legal status. Ownership (including copyright) of the specifications and reports it produces is shared between the partners. The 3GPP process includes a conversion (transposition) of the project's output into official standards and reports by one or more of the OPs.

The specifications being prepared by 3GPP are evolved in part from the enormously successful GSM standard, which is currently (February 2001) serving over 400 million subscribers in more than 140 countries. Building on this massive installed base, the system being specified by 3GPP will be an attractive upgrade path for existing operators and users. It also has an assured compatibility with GSM – good news for both operators and users who are unable, or unwilling, to upgrade to 3G.

Paramount among the 3GPP specifications is the definition of UTRA, the innovative radio access technology that is the key to the new system's high data rates and dramatically improved performance. UTRA is spectrum-efficient and supports FDD and TDD modes. This interface has been accepted by ITU as a member of the IMT-2000 family – or more correctly, as *two* family members: IMT-DS, the FDD mode; and IMT-TC, the TDD mode. IMT-2000 family membership requires the ability for users to roam globally and seamlessly, which implies interoperability with other family members: 3GPP thus co-operates closely with the 3GPP2 project which is specifying another family member, a 3G CDMA system based on an evolution of the ANSI-41 architecture.

### *9.1.3.1 How Does 3GPP Work?*

3GPP has been designed to minimise delays and inefficiencies. As a result, it has a "flat" organisational structure and a large degree of distributed autonomy. Overall project planning and co-ordination is the responsibility of the PCG, with input primarily from the OPs, guided by the MRPs. It is mainly at this level that regulatory requirements, provided by the telecommunications administrations and governments around the world, are taken into account.

The development of the specifications is performed by TSGs and their subordinate working groups. Here, the main participation is by technical experts from the individual members of the OPs. Individual members in their capacity as ITU members are also responsible for carrying the results of the 3GPP work to the ITU.

At the time of the creation, 3GPP had structured around four principal aspects of the 3G system being defined as TSGs:

- TSG CN: core network
- TSG RAN: radio access network
- TSG SA: services and systems aspects
- TSG T: terminals

Each TSG is authorised to develop and approve specifications and reports within its scope, and TSG SA also has a role of co-ordinating the work of the TSGs at a more detailed level than the PCG. The result is a process that is able to rapidly produce and approve specifications and reports in response to the needs of the market, although it is important to note that the deliverables do not have a formal status until they have been transposed by one or more of the OPs.

The formal status is necessary for regulatory and other purposes in the various regions, and all the OPs have committed themselves to complete this process rapidly. Each OP will apply



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its own procedures, appropriate to their respective regions. As the official European SDO within 3GPP, ETSI recognises the 3GPP output as ETSI Technical Specifications and ETSI Technical Reports without a need for any further endorsement within the Institute. This means that the 3GPP documents are published – within a matter of a few weeks – as identical text directly as ETSI deliverables. In addition, ETSI is transposing, i.e. adapting, a few of the initial 3GPP specifications into ENs for specific European regulatory requirements. This is happening in parallel with the publication of the initial Technical Specifications and will not impede the implementation of 3G in Europe.

#### 9.1.3.1.1 Electronic Working

3GPP has taken a leading role in changing the traditional ways of standards making. A very heavy dependence is now placed on electronic working, both outside and within meetings, advancing a trend that started in ETSI a year or two ago. This means that paper copies of draft documents have been almost entirely eliminated, saving time and expense, and making a significant contribution to the environment.

Given that 3GPP has participants from all over the world, the use of the Internet, e-mail exploders and other such facilities have proved invaluable for distributing and sharing information, working drafts and so on. Delegates to meetings had already become used to downloading working documents from the Internet and having updates to the documents distributed in meetings on CD-ROM. But in recent months, in meetings around the world participants have experienced the benefits of a local area network (LAN) solution as the latest step in improving working methods. ETSI's headquarters premises already have LANs in all its meeting rooms, but most other venues currently rely on temporary LANs (wired or radio), using equipment and support kindly donated by individual members.

Such facilities permit delegates to access all the meeting documents electronically from their laptop computers. As a result, the huge burden of producing paper copies (as many as 10 000 pages per delegate for some meetings) can be eliminated. Delegates can access new documents as soon as they are available, rather than having to wait for paper copies to be made or for the documents to be distributed by other means, such as diskette or CD-ROM.

#### 9.1.3.1.2 Project Support

For administrative and support purposes the 3GPP Partners have established a Mobile Competence Centre (MCC) which is hosted by ETSI at its premises in Sophia Antipolis, Southern France. The MCC was created in March 1999 to provide support not only to the 3GPP but also to ETSI's own studies in mobile technologies. A full description of MCC including the financing is given in Chapter 15, Section 3.

### *9.1.3.2 Who are the Stakeholders in 3GPP?*

3GPP has attracted a very strong commitment from organisations and companies around the world, reflecting the truly global nature of the project. There are currently six OPs (in alphabetical order):

- The Association of Radio Industries and Businesses (ARIB), Japan



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being TD-SCDMA, proposed by CWTS. A similar group, 3GPP2, is preparing the cdma2000 specifications, UWC-136 TDMA specifications are being developed principally by UWCC, and DECT specifications are defined by a set of ETSI standards (Figure 9.1.1).

Since the UWCC and ETSI are both partners in 3GPP (as an MRP and OP respectively), there is direct liaison between the Project and these two sources of specifications for other IMT-2000 family members.

When 3GPP and 3GPP2 were created it was felt that the interests of each group were sufficiently different to require them to remain separate but here again many of the OPs and MRPs are common to both groups, so there are natural channels for information exchange. Particular instances of formal co-operation between the groups were the two joint 3GPP-3GPP2 workshops held in 1999 to address the "Hooks and Extensions" issue aimed at ensuring interworking between the respective technologies.

In addition to all this, the 3GPP TSGs and their working groups are encouraged to liase directly with relevant technical bodies within the Project as well as among the Partners.

### 9.1.6 Conclusions

The attentive reader, and let's assume that you are one, may still be astonished to learn what big efforts have been necessary in order to establish 3GPP.

In the meantime, i.e. in the course of year 2000 nearly the whole work of the former ETSI TC SMG has been incorporated into 3GPP, to a large extent within the new TSG GERAN.

Well, our Japanese friends were not happy about this shift because they feared that it could result in delays in the 3G introduction in their country. They accepted this because a separate TSG for the GSM work was created.

Trying to recall the heated discussions within ETSI about the scope of 3GPP from 1998, one has to admit that such a move would have been violently rejected by a lot of ETSI members, maybe even by the majority. Using a philosophic approach, one can, of course, state that time helps healing (even wounds).

Today, i.e. February 2001, we can conclude from ETSI's point of view that all standardisation work related to further evolution of the second generation mobile system, i.e. GSM, and to UMTS is being done well within 3GPP. Thus, the objective to avoid parallel work within ETSI TBs and 3GPP has been fully achieved.

The ability of organisations and individuals around the world to co-operate and make available a full set of stable, agreed 3GPP specifications in 1 year is a remarkable achievement, one that is unprecedented in the world of standardisation. 3GPP meetings have taken place in many parts of the world, emphasising the strong commitment of the SDOs from China, Europe, Japan, Korea and the US. The MRPs have also lent very strong support to the work. Thanks to this widespread and determined commitment it has been possible to meet the very aggressive targets for 3G.

But Release 99 was only the first step – the workload has continued to intensify this year, as the initial specifications are refined and many new ones added, opening the path to full, seamless, global 3G services, changing forever the way that people communicate.

In the meantime, 3GPP has changed the designation of the releases and dropped to mention the year in order to avoid irritations and wrong expectations. Release 99 was first established in December 1999 and got its maturity in the course of year 2000. In 2000, more than 5700 change requests were implemented. The next big event will be Release #4 as a result of the



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series of TSG meetings scheduled for March 2001 in Palm Springs, US. This will obviously result in a further stabilisation and extension of the UMTS specifications.

3GPP is running very well. The individual members from the six OPs seem to be very satisfied with this arrangement – and the production line is in full swing.

Without exaggeration, one can give 3GPP the attribute of a success story. One may quote again here Mr Ed Roney who even addressed the 3GPP concept – prior to its realisation – as a "paradigm shift".

As the results of the GSM and UMTS related standardisation work represent a great part of ETSI's deliverables, it might be justified to note here that during the year 2000, ETSI published more than seven new deliverables each working day (Monday through Friday), i.e. one deliverable per hour!

Further information may be found on the 3GPP website at http://www.3gpp.org.



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# Chapter 9: The Third Generation Partnership Project (3GPP)

## Section 2: UMTS in 3GPP (December 1998–May 2001)

Niels Peter Skov Andersen[1]

### 9.2.1 A Change of Environment

In the period 1982 until end of 1998 the work on the GSM standard, and in the later part of the period on UMTS, had been performed in the same environment, starting under CEPT and later transferred into ETSI. The Technical Committee GSM, during this period renamed to SMG, and its working groups (Sub Technical Committees) had continuously existed and evolved. The same was the case for the working methods and procedures used within the work. Over time with the success of the GSM system more and more interested parties became involved in the work including parties from outside the original CEPT area. However, this was all a relatively slow evolution and no major revolutions in the organisation or the working methods occurred in this period.

After all these years of continuity in the work the discussions around the creation of 3GPP and the decision to establish 3GPP for the initial phase of UMTS[2] naturally created some uncertainty amongst the members of SMG. Especially the resulting split of the GSM standardisation, with the responsibility for the GSM core network transferred to 3GPP, but the responsibility for the GSM radio access Network maintenance remained in ETSI in SMG. This caused some concern amongst many delegates. Also the internal structure for the technical work within 3GPP was different from the well-known structure in SMG. SMG was based on a technical plenary with a number of working groups (SMG1, SMG2, ..., SMG12) performing the detailed technical work. The SMG plenary was the approving authority for the results of the work performed by the working groups. Also the plenary was the group responsible for approval of all new work items and the content of the releases. The structure for the work in 3GPP, as agreed by the partners, was quite different. The project

[1] The views expressed in this section are those of the author and do not necessarily reflect the views of his affiliation [illegible].

[2] The term UMTS is throughout this section used to keep consistency of terminology with the other chapters and sections. The term UMTS do not appear in the in 3GPP agreement, which defines the system as a third generation mobile system based on an evolved GSM core network and UTRAN (including UTRAN (FDD and TDD modes)).



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was organised with four equal Technical Specification Groups (TSGs), who had complete autonomy for their area of responsibility, i.e. they were responsible for approval of new work items and final approval of deliverables. The four technical groups originally defined were:

| | |
|---|---|
| TSG CN | Responsible for the core network development |
| TSG-RAN | Responsible for the radio access network based on UTRAN (FDD and TDD modes) |
| TSG-SA | Responsible for services and system aspects |
| TST-T | Responsible for Terminal and UIM |

In addition to the technical groups the 3GPP organisation has a Project Coordination Group (PCG). However, the role of this PCG cannot be compared to the role the SMG plenary played. The SMG plenary was an open technical group with the approving authority in all technical questions including approval of new work items. The 3GPP PCG is a closed group with a defined membership consisting of a limited number representative of each of the partners (SDOs, MRPs) and the leadership (chairman and two vice-chairmen) of each TSG. Thus as a closed group the role of the PCG becomes more like a board overlooking the overall well being of the project.

This structure made many long-term SMG delegates concerned about how the overall coordination of the project could be ensured. This new structure was not introduced to overcome known deficits of the SMG organisation, but in my opinion, by political considerations to ensure than no single individual, individual member, organisational partner could obtain a controlling position in the project.

### 9.2.2 The First Two TSG Meetings

The inauguration meeting of the 3GPP TSGs was held in December 1998 in Sophia Antipolis, France. In the process of creation of 3GPP this was the first time that the 3GPPs real work force – the technical experts – met. The main objectives for this first meeting was to get the work started. One of the elements of the meeting was a presentation from the different partners on the status of their work on the third generation mobile system, the work, which they now were in the process of handing over to 3GPP.

Listening to the presentations and the discussions during the breaks it was very obvious that the background for standardization amongst the delegates was quite different. As an example, I remember that during the coffee break just after I, as chairman of ETSI SMG2, had presented the status of the UMTS radio work in ETSI, and had ended my presentation by stating that the UMTS radio work would only be on the agenda of one more meeting of ETSI SMG2. This was in order to complete the documentation to be handed over to 3GPP and then the work on UMTS radio in ETSI would cease, a small group of non-ETSI delegates came to me and asked "if all work on UMTS radio in ETSI ceases, how do the Europeans then co-ordinate their views on 3GPP?" Coming from the ETSI SMG background this was a completely unexpected question, as the working procedures for 3GPP were very similar to those of ETSI, it was clear to me that the contributions to 3GPP in general should come from the individual members – the companies, regulators etc. – in their own name and not as regional contributions. I explained this, but I also understood that for delegates with a background in international standardization from, e.g. ITU this was the normal way of thinking. During the



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# Annex 2: Organisation Evolution of the Technical Groups

## Section 3: 3GPP

Adrian Scrase[1]

### A2.3.1 December 1998 to Mid-1999

During the preparatory talks that led to the creation of 3GPP, many discussions took place to find the optimum organizational structure. The ETSI TC SMG model had worked well for many years and it was very tempting to adopt a similar structure and just widen the sphere of participation. However, some voices called for a more radical approach in order to streamline the structure and to reduce the time taken for specifications production. As a result of these discussions, the following key principles were established on which 3GPP was structured:

- Minimum number of hierarchical levels;
- Large degree of distributed autonomy;
- Clear separation of technical activities from political and administrative activities.

When 3GPP was created, four Technical Specification Groups (TSGs) were formed to undertake the preparation of technical specifications. The four TSGs were as follows:

- TSG CN – core network
- TSG RAN – radio access network
- TSG SA – services and system aspects
- TSG T – terminals

Each of the TSGs was authorized to develop and approve specifications and reports within its terms of reference. This represented a departure from the more traditional approach where a single entity (i.e. a plenary) within a project has the authority to approve a project's output. It was believed that by distributing the approval authority, the time taken to produce specifications would be reduced since this effectively removes one level of hierarchy from the approval procedure. However, it was apparent from the outset that distributing the approval of specifications would lead to a greater requirement for technical co-ordination and thus TSG SA was tasked to perform a co-ordination role across all TSGs. This co-ordination role

[1] The views expressed in this section are those of the author and do not necessarily reflect the views of his affiliation entity.



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# APPENDIX 5



# Third Generation Partnership Project

# 3GPP

## Working Procedures

20 October 2016

# Foreword

These Working Procedures of the Third Generation Partnership Project (3GPP) are effective from 31 December 2014.

An electronic version of these Partnership Project Working Procedures is available from the following address:

http://www.3gpp.org

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# SECTION A: GENERAL

## Article 1: Description

The Partnership Project is not a legal entity but is a collaborative activity between the following recognized Standards Development Organizations:

ARIB (Japan)

CCSA (China)

ETSI (Europe)

ATIS (US)

TTA (Korea)

TTC (Japan)

TSDSI (India)

The Partnership Project is entitled the "THIRD GENERATION PARTNERSHIP PROJECT" and may be known by the acronym "3GPP".

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## Article 2: Purpose

The purpose of 3GPP is to prepare, approve and maintain globally applicable Technical Specifications and Technical Reports for

- a 3rd Generation Mobile System based on the evolved GSM core network, and the Universal Terrestrial Radio Access (UTRA),
- further development of radio technologies such as LTE, coupled with evolution of core network elements such as the Evolved Packet Core (EPC),
- continuing evolution of the 2nd generation GSM/EDGE Radio Access Network (GERAN),

to be transposed by the Organizational Partners into appropriate deliverables (e.g., standards).

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## Article 3: Scope and objectives

The 3rd Generation Mobile System and its capabilities shall be developed in a phased approach. Initially, 3GPP shall prepare, approve and maintain the necessary set of Technical Specifications and Technical Reports for a 3rd Generation Mobile System including:

- UTRAN (including UTRA; in Frequency Division Duplex (FDD) and Time Division Duplex (TDD) modes);
- 3GPP Core Network (Third Generation networking capabilities evolved from GSM. These capabilities include mobility management, global roaming, and utilisation of relevant Internet Protocols);
- Terminals for access to the above (including specifications for a UIM); and
- System and service aspects.

3GPP shall prepare, approve and maintain the necessary set of Technical Specifications and Technical Reports for:

- the Global System for Mobile communication (GSM) including GSM evolved radio access technologies (e.g., General Packet Radio Service (GPRS) and Enhanced Data rates for GSM Evolution (EDGE)).

3GPP shall consider the long term evolution.

The Technical Specifications and Technical Reports shall be developed in view of global roaming and circulation of terminals.

The set of 3GPP Technical Specifications and Technical Reports for the 3GPP core network and the specifications for the GSM core network should be common to the greatest extent possible and should not be unnecessarily different.

Options in the form of a regulatory requirement particular to one or more regions / nations shall be included in 3GPP specifications. TSGs should not debate the inclusion or rejection of such options.

The results of the 3GPP work shall form the basis of member contributions to the ITU in accordance with existing procedures.

3GPP shall take account of emerging ITU recommendations on interworking between IMT-2000 family members.

In the framework of agreed relationships, the 3GPP Technical Specifications and Technical Reports will form the basis of standards, or parts of standards, of the Organizational Partners.

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# SECTION B: PARTICIPATION

## Article 4: Categories

Participation in 3GPP shall be classified into one of the following categories:

- Partners;
- Individual Members;
- ITU Representatives;
- Observers;
- Guests.

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## Article 5: Partnership

Partners in 3GPP shall be classified into one of the following two categories:

- Organizational Partners;
- Market Representation Partners.

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## Article 6: Organizational Partnership

Organizational Partnership is open to any Standards Organization, irrespective of its geographical location, which has:

- a national, regional or other officially recognized status and the capability and authority to define, publish and set standards within the 3GPP scope, in that nation or region;
- an Intellectual Property Rights (IPR) Policy which is compatible with those of the Organizational Partners;
- committed itself to all or part of the 3GPP scope;
- signed the Partnership Project Agreement.

Standards Organizations may apply to become an Organizational Partner by writing to any of the existing Organizational Partners.

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# Article 7: Market Representation Partnership

The Organizational Partners may invite Market Representation Partners to take part in 3GPP.

An invitation for Market Representation Partnership is open to any organization, irrespective of its geographical location, which:

- has the ability to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g., services, features and functionality) falling within the 3GPP scope;
- does not have the capability and authority to define, publish and set standards within the 3GPP scope, nationally or regionally;
- has committed itself to all or part of the 3GPP scope;
- has signed the Partnership Project Agreement.

Organizations may apply to become Market Representation Partners by writing to any of the existing Partners. Further guidance for MRP applicants can be found in annex E.

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# Article 8: Individual Membership

Membership in an Organizational Partner is a pre-requisite for Individual Membership of 3GPP. All entities registered as members of an Organizational Partner and eligible for participation in the technical work of that Organizational Partner, can become Individual Members of 3GPP if they are committed to support 3GPP and:

- to contribute technically or otherwise to one or more of the Technical Specification Groups within the 3GPP scope;
- to use the 3GPP results to the extent feasible.

An Individual Member has the right to participate in the work of 3GPP by attending meetings of the Technical Specification Groups and subtending groups.

Applications for Individual Membership of a Technical Specification Group shall be made in writing to the relevant Organizational Partner using the form given at annex C. Applications may also be made on-line using the template available at http://www.3gpp.org.

Individual Members act in 3GPP in their own right and carry the full responsibility for their contributions.

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# Article 9: Termination of Individual Membership

Individual Membership of 3GPP may be terminated by dissolution, abolition, resignation or expulsion from the related Organizational Partner.

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# Article 10: Observers and Guests

The status of Observer may be granted by the Organizational Partners to an entity which has the qualifications to become a future Partner.

An Observer may send a single representative to an Organizational Partners or PCG meeting. An Observer may also have representatives at TSG meetings. Representatives of Observers may receive documents and contribute documents for information, but shall not submit documents that propose changes to the specifications, reports, work item descriptions, work plan, or any other document under the control of the TSG. Observers shall not take part in decision making or hold any leadership positions.

Additional participation rights of an Observer shall be decided by the Organizational Partners on a case-by-case basis.

The status of Guest may be granted for a limited period, by the Organizational Partners to an entity which has the qualifications to become a future Individual Member. The limited period shall be decided by the Organizational Partners on a case-by-case basis.

A Guest may have representatives at TSG and subtending group meetings. Representatives may receive documents but shall not take part in decision making, participate in discussions, contribute documents, or hold any leadership positions.

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# SECTION C: STRUCTURE

# Article 11: Structure of 3GPP

3GPP shall consist of a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs). The Technical Specification Groups may establish Working Groups if required.

The Organizational Partners may decide to call a meeting of the full 3GPP membership if required.

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# SECTION D: PARTNERS' COLLECTIVE RESPONSIBILITIES

# Article 12: Organizational Partners' Collective Responsibilities

The Organizational Partners shall determine the general policy and strategy of 3GPP.

In addition the Organizational Partners shall perform the following tasks:

- approval and maintenance of the 3GPP scope;

- maintenance the Partnership Project Description;
- taking decisions on the creation or cessation of Technical Specification Groups, and approving their scope and terms of reference;
- approval of Organizational Partner funding requirements;
- allocation of human and financial resources provided by the Organizational Partners to the Project Co-ordination Group;
- acting as a body of appeal on procedural matters referred to them;
- conduct compliance training at least annually for elected leadership, relevant Support Team personnel and interested parties on best practices to follow to
  - avoid issues with respect to antitrust/competition laws and regulations;
  - fulfil his or her leadership or support role with impartiality and in the interests of 3GPP.

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## Article 13: Collective responsibilities of all Partners

Organizational Partners and Market Representation Partners shall perform the following tasks:

- maintenance of the Partnership Project Agreement;
- approval of applications for 3GPP partnership;
- taking decisions relating to the dissolution of 3GPP.

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# SECTION E: PROJECT CO-ORDINATION GROUP (PCG)

## Article 14: PCG tasks

The PCG shall perform the following tasks:

- appointment of PCG Chairman and Vice Chairmen;
- allocation of human and financial resources provided by Organizational Partners to TSGs;
- allocation of voluntary human and financial resources provided by Market Representation Partners and Individual Members;
- management of the 3GPP Support Team;
- handling of appeals from Individual Members on procedural matters referred to them;
- propose and approve modifications to the Partnership Project Working Procedures;
- handling of appeals from Individual Members on technical matters referred to them;
- determination of the overall time frame and manage overall work progress;
- final adoption of new and stopped work items proposed by the TSGs within the agreed 3GPP scope and objectives;

- when a work item is outside the scope of the 3GPP, and where a common global solution is desired, recommend how to achieve a global solution;
- appointment or dismissal of TSG Chairmen and Vice Chairmen, as proposed by TSGs based on election results. (The proposed candidate shall be appointed unless there are extraordinary reasons that prevent such an appointment, e.g., severe company or geographical imbalance within 3GPP. In such cases the TSG shall be requested to elect an alternative candidate. The decision not to appoint a candidate shall be made by consensus.);
- authorizing requests from the TSGs for approval to liaise with external organizations, and maintain a list of approved requests;
- maintenance of the register of Individual Members eligible to participate in 3GPP;
- maintenance of the register of IPR declarations relevant to 3GPP, received by the Organizational Partners.

The PCG may decide to call a meeting of the full 3GPP membership if required.

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# Article 15: PCG participation

The following shall have a right to participate in the PCG:

- Typically, a maximum of five representatives of each Organizational Partner (not counting the Chairman and Vice-Chairmen);
- A maximum of three representatives of each Market Representation Partner. (MRPs are however urged to limit their participation to one representative wherever possible.);
- The Chairmen and Vice Chairmen of the TSGs as ex-officio members;
- A maximum of three ITU representatives;
- One representative of each Observer.

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# Article 16: PCG appointment of Chairman and Vice Chairman

The PCG shall appoint their Chairman and Vice Chairmen from amongst the Organizational Partner representatives.

The Chairman and Vice Chairmen shall be appointed for a one year term of office.

The Chairman and Vice Chairmen shall normally serve one term of office. If no other candidates are available, the Chairman or Vice Chairmen may be appointed for a further term.

Successive Chairmen and Vice Chairmen should not be from the same Organizational Partner, the same region or from the same group of companies, unless no other candidate is available.

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# Article 17: PCG Chairman and Vice Chairman Responsibilities

The PCG Chairman is responsible for the overall management of the co-ordination work within 3GPP.

The Chairman has the overall responsibility to ensure that the Partnership Project Agreement, Partnership Project Description and Partnership Project Working Procedures are followed.

The Chairman may nominate officials to assist in the work.

The Chairman may be assisted by the Support Team.

The Chairman may delegate tasks to the Vice Chairmen.

In performing their leadership role, the Chairman and Vice Chairmen shall maintain impartiality and act in the interests of 3GPP.

At the commencement of each meeting of the PCG, the group shall be reminded that:

(i) compliance with all applicable antitrust and competition laws is required; and

(ii) the leadership will conduct the meeting with impartiality and in the interests of 3GPP.

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## Article 18: PCG meetings

A meeting of the PCG shall be held at least twice per year.

At least thirty days before the due date, a calling notice, draft agenda and supporting documents shall be issued.

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## Article 19: PCG decision making

In any meeting of the PCG, the quorum required for decision making shall be 50% of the total number of Organizational Partners. Proxies shall not be permitted.

The PCG shall endeavour to reach consensus on all issues. The views and opinions of the Market Representation Partners and the Chairmen and Vice Chairmen of the TSGs shall be taken into account during the consensus building process. If consensus cannot be achieved, the Chairman can decide to take a vote. The vote may exceptionally be performed by a secret ballot if decided by the PCG.

Each Organizational Partner shall have one vote. A proposal shall be deemed to be approved if 71% of the votes cast are in favour. Abstentions or failure to submit a vote shall not be included in determining the number of votes cast.

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# SECTION F: TECHNICAL SPECIFICATION GROUPS

## Article 20: TSG tasks

The TSGs shall prepare, approve and maintain the 3GPP Technical Specifications and Technical Reports taking into account the market requirements provided by Market Representation Partners.

The TSGs shall also perform the following tasks:

- Propose to the PCG for appointment TSG Chairman and Vice Chairmen based on election results;
- Creation of TSG Working Groups and approval of their terms of reference;
- When a new Working Group is created, the appointment of TSG Working Group Convenor;

- Allocation of resources within the TSG;
- Allocation of voluntary human and financial resources provided by Market Representation Partners and Individual Members;
- Handling of appeals from Individual Members on technical matters;
- Preparation of a detailed time frame and management of detailed work progress;
- Management of work items;
- Technical Co-ordination;
- Proposal and approval of work items within the agreed scope and terms of reference of the TSG;
- Where a work item is outside the scope of the 3GPP, but a common global solution is desired, recommend an approach to the PCG;
- Assignment of work to Partners. (Specification development may be accomplished using various methods, including the assignment of work to Partners.);
- Maintenance of the list of Individual Members eligible to vote within the TSG (Voting Members).

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# Article 21: TSG participation

The following shall have a right to participate in the TSGs:

- Representatives of members of participating Organizational Partners (i.e. Individual Members);
- Representatives of Organizational Partners;
- Representatives of Market Representation Partners;
- Representatives of Observers;
- Representatives of Guests.

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# Article 22: TSG and WG election of Chairman and Vice Chairman

## 22.1 TSG elections

Regular TSG elections shall be held every two years in the first semester of odd numbered years.

The TSG Chairman and Vice Chairmen shall be elected by the Technical Specification Group from amongst the Individual Member representatives. Each TSG shall elect a maximum of three Vice Chairmen.

A candidate for election to a TSG Chairman or Vice Chairman position shall provide a letter of support from the Individual Member that he/she represents. The support letter from the Individual Member shall indicate that the candidate will avail or has availed themselves of 3GPP supplied antitrust and competition law training in order to comply with all applicable antitrust/competition laws and regulations while acting in his or her capacity as TSG Chairman or Vice Chairman.

Nominations may be made up to the point when an election takes place.

The Chairman and the Vice Chairmen shall be elected for a two year term of office. The Chairman and Vice Chairmen may offer themselves for election for a second consecutive term. The term "consecutive" is taken to mean terms one after the other without another person being elected to the position in the interim. Exceptionally, they may offer themselves for further consecutive terms, subject to the following:

- A two week deadline that expires at noon Central European Time on the Friday which falls between 20 and 14 days prior to the first day of the meeting at which elections are due to be held shall be established.
- A Chairman is not permitted to stand for another consecutive term if another candidate is announced via the 3GPP web site or via the relevant 3GPP email reflector prior to this deadline.
- A Chairman is not permitted to stand for another consecutive term until after this deadline.
- A Vice Chairman is not permitted to stand for another consecutive term in a Vice Chairman position for which there is a candidate announced via the 3GPP web site or via the relevant 3GPP email reflector prior to this deadline.
- A Vice Chairman is not permitted to stand for another consecutive term until after this deadline. If, by the deadline, the number of candidatures is less than the number of Vice Chairman positions, then any incumbent Vice Chairman may put forward his candidature.

There is no restriction on a Vice Chairman whose term of office is due to expire offering himself for the position of Chairman; neither is there any restriction on a Chairman whose term of office is due to expire offering himself as a Vice Chairman. There is no restriction of a retiring Chairman or Vice Chairman of one TSG offering himself for election as either Chairman or Vice Chairman of any other TSG (or WG).

Should the office of Chairman or Vice Chairman of a TSG become vacant for reasons other than expiration of term of office, a special election shall be conducted to fill the unexpired term. This special election shall be conducted at a meeting of the TSG, and shall be announced in the agenda according to the provisions of article 32.

When such a special election is held to fill the office of Chairman, and one or more of the Vice Chairmen of the TSG intends to stand for election to that position, the announcement shall also indicate that there will be an election to fill the position of Vice Chairman in the event that a Vice Chairman be elected to the office of Chairman. If at the special election the Vice Chairman is elected to the office of Chairman, that individual shall become Chairman immediately, and, the position of Vice Chairman thus being vacant, an election shall be held for the office of Vice Chairman.

Similarly, if an incumbent Chairman intends to stand for election to the position of Vice Chairman, the same applies, with the necessary changes to the text above.

If a Chairman or Vice Chairman changes the Individual Member that he/she represents (e.g., job change, merger or acquisition) during his/her term of office, a new letter of support shall be provided. In order to provide a new letter of support, a Chairman or Vice Chairman may request a grace period allowing their term to be extended the lesser of 6 weeks or until the day before the next scheduled regular term (e.g., every 2 years) election. Although the term is extended, under the rules of article 22, the chair or vice-chair can only chair meetings when representing an Individual Member. This rule continues to apply during the grace period. If the change of company affiliation is due to a move to another company, then the decision for the Chairman or Vice Chairman to continue in office to the end of the present term shall be made by consensus of the TSG. If consensus cannot be achieved, a special election shall be held for the office. The incumbent Chairman or Vice Chairman is permitted to offer their candidacy in a special election even if they have held the position for 2 terms or more.

The term of office for a Chairman or Vice Chairman elected at a special election is a partial term lasting until the end of the current term. If a new Chairman or Vice Chairman is elected at a special election then the partial term of office does not count towards the two consecutive term limit. If the previous Chairman or Vice Chairman is re-elected at a special election then the entire term (of two parts) is considered as a single term and does count towards the two consecutive term limit.

Chairman and Vice Chairmen should not be from the same region, Organizational Partner, or from the same group of companies, unless no other candidate is available.

Successive Chairmen should not be from the same Organizational Partner, the same region or from the same group of companies, unless no other candidate is available. This does not apply to special elections or to regular elections for a second or subsequent consecutive term of office .

When a new TSG is established, the Organizational Partners shall appoint a convenor for the first two TSG meetings. The election for TSG Chairman and Vice Chairmen shall take place at the second TSG meeting. If the election takes place other than at the normal time for TSG elections (see above), the elected Chairman and Vice Chairman shall serve until the next regular TSG election. This partial term of office does not count towards the two consecutive term limit. The provisions of this paragraph may be overridden by consensus of the PCG where a new TSG is formed by the merger of existing TSGs; under these circumstances, the PCG shall establish a set of ad hoc rules for the creation of the new TSG.

Following election by the TSG, the TSG Chairman and Vice Chairmen shall be appointed by the PCG on the proposal of the TSG.

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## 22.2 WG elections

The provisions concerning the election of WG Chairmen and Vice Chairmen shall be as for TSG Chairmen and Vice Chairmen as defined in 22.1 above, changing TSG to WG wherever TSG is mentioned, with the following differences.

Each WG shall elect a maximum of two Vice Chairmen.

WG elections shall be held when the corresponding terms of office expire or when an existing Chairman or Vice Chairman resigns. WG elections need not be synchronized within the WG (i.e. elections for Chairman and each Vice Chairmen may occur at different times), across different WGs of the same or other TSGs, nor with the regular TSG elections.

WG Chairmen and Vice Chairmen are always elected for a period of two years (and not, as is the case with special elections in TSGs, for the unexpired period of the present term of office). An exception to this is where the previous Chairman or Vice Chairman is re-elected in the special election. In this case the Chairman or Vice Chairman continues for the unexpired period of the present term of office.

Note: For this reason, elections for WG Chairmen and Vice Chairmen are likely to become spread over a period of time, rather than being grouped like the TSGs' regular elections.

When a new WG is established, the parent TSG is responsible for appointing a convenor for the first two meetings.

Following election by the WG, the Chairman and Vice Chairman hold office immediately, without need of appointment by TSG or PCG.

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# Article 23: TSG and WG Chairman and Vice Chairman responsibilities

The TSG Chairman is responsible for the overall management of the technical work within the TSG and its Working Groups. The Chairman has an overall responsibility to ensure that the activities of the TSG follow the Partnership Project Working Procedures.

The WG Chairman is responsible for the overall management of the technical work within the WG and its sub-groups.

The Chairman may nominate officials to assist in the work.

The Chairman may delegate tasks to the Vice Chairmen.

The Chairman may be assisted by the Support Team.

The Chairman shall form a Management Team, including the Vice Chairmen and Support Team, in order to assist in discharging his duties.

Recognizing the need to balance the requirement of rapid specification development with the limited resources of delegates, the Chairman should encourage a minimum number of meetings, especially parallel meetings, and maximize the use of electronic means to advance the work.

In performing their leadership role, the Chairman and Vice Chairmen shall maintain impartiality and act in the interests of 3GPP.

At the commencement of each meeting of a TSG or WG, the group shall be reminded that:

(i) compliance with all applicable antitrust and competition laws is required;

(ii) timely submissions of work items in advance of TSG or WG meetings are important to allow for full and fair consideration of such matters; and

(iii) the leadership will conduct the meeting with impartiality and in the interests of 3GPP.

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# Article 24: TSG and WG Chairman and Vice Chairmen dismissal

A secret ballot shall be taken for the proposal to dismiss a TSG or WG Chairman or Vice Chairman because of a failure to effectively perform their duties, if requested by 30% of the TSG or WG membership list. 71% of the votes cast are required to recommend dismissal.

The PCG shall dismiss a Chairman or Vice Chairman on the proposal of the TSG.

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# Article 25: TSG and WG decision making

TSGs and WGs shall endeavour to reach consensus on all issues, including decisions on Technical Specifications and Technical Reports. Informal methods of reaching consensus are encouraged (e.g., a show of hands). If consensus cannot be achieved, the Chairman can decide to take a vote. The vote may exceptionally be performed by a secret ballot if decided by the TSG or WG. A vote may be conducted during a TSG or WG meeting or by correspondence.

A proposal shall be deemed to be approved if 71% of the votes cast are in favour. Abstentions or failure to submit a vote shall not be included in determining the number of votes cast.

It is the responsibility of the Chairman to ensure that questions to be voted upon are phrased in a positive yes/no manner, with 71% required to approve the question. Questions should not be phrased as the TSG shall not do something. Examples of appropriate questions are; Shall the TSG approve the Specification and send it to the SDOs? Shall the liaison be approved? Shall the new WI be approved? Shall the existing WI be stopped? If the issue is to choose option A or B, the question should be split into two questions, with the Chairman selecting the order. First, shall the TSG take option A as the way forward? If this question fails the second question is, shall the TSG take option B as the way forward?

Contributions on which decisions will be based should be made available in good time before each meeting. TSGs may establish informal guidelines for dealing with late contributions.

Working Agreements may be used to establish tentative agreements in cases where consensus cannot be obtained. The working agreement process is described in annex G.

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# Article 26: TSG and WG voting during a meeting

The following procedures apply for voting during a TSG or WG meeting:

- before voting, a clear definition of the issues shall be provided by the Chairman;
- Voting Members shall only be entitled to one vote;

- if a Voting Member has more than one representative present, only one representative may vote;
- each Voting Member may only cast the vote once;
- each Voting Member may carry proxy votes for up to five other Voting Members. All proxy votes shall be accompanied by a letter of authority from the authorising Voting Member. Proxies will not be taken into account when determining the quorum;
- the quorum required for voting during a TSG or WG meeting shall be 30% of the total number of Voting Member companies on the TSG or WG voting list;
- the result of the vote shall be recorded in the meeting report.

For the determination of the quorum, see annex H.

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# Article 27: TSG or WG voting by correspondence

The following procedures apply for voting by correspondence:

- before voting, a clear definition of the issues shall be provided by the Chairman and disseminated to all on the TSG or WG membership list;
- Voting Members shall only be entitled to one vote;
- each Voting Member may only cast the vote once within the voting period;
- the voting period shall be 30 days;
- there are no quorum requirements;
- The result of the vote should be disseminated to the TSG or WG.

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# Article 28: TSG or WG voting for the election of TSG or WG Chairman and Vice Chairman

In the case where there is more than one candidate for TSG or WG Chairman or Vice Chairman, a secret ballot shall be used. For interpreting the result of the secret ballot the following procedure shall apply:

When, in the first ballot, no candidate has obtained 71% of the votes cast, a second ballot shall be held. In the second ballot, in cases where there are only two candidates, the candidate obtaining the higher number of votes is elected. In cases where there are more than two candidates, if none of them has obtained 71% of the votes, a third and final ballot shall be held among the two candidates who have obtained the highest number of votes in the second ballot. The candidate obtaining the higher number of votes in the third ballot is then elected.

The TSG or WG Chairman shall be responsible for the voting process and shall ensure that confidentiality is maintained.

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# Article 29: TSG or WG appeal process

An Individual Member of 3GPP who opposes a Chairman's ruling on a vote taken within a TSG or WG may submit its case to the PCG for decision. In such cases the Individual Member shall also inform the relevant TSG or WG Chairman.

When a TSG or WG Chairman has made a ruling, his decision shall be taken as the basis for future operations, unless or until overturned by the PCG.

If an Individual Member in a TSG or WG believes that a Chairman or Vice Chairman of any such group is acting without impartiality and not in the interests of 3GPP, such Individual Member may object to such actions within the relevant group, and may request that such objection be recorded in the minutes of the applicable group meeting and it shall be so recorded. The objecting Individual Member may ultimately take its objection to the PCG for consideration. In such cases the Individual Member shall also inform the relevant TSG or WG Chairman.

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# Article 30: TSG and WG meetings

TSGs and WGs shall meet as necessary to complete their work within the prescribed timeframe. TSGs should endeavour to hold their meetings at the same time and place to assist in the overall co-ordination of the work.

Meeting locations should reflect the geographical diversity of the TSG and WG delegates.

Further information on meetings is given in annex F.

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# Article 31: TSG and WG meeting invitation

The invitation to a TSG or WG meeting and the necessary logistical information should be disseminated as soon as practically possible, taking into account the need to obtain travel documentation. It shall be disseminated at least 28 days before the meeting to all on the TSG or WG membership list.

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# Article 32: TSG and WG meeting agenda

The draft agenda for a TSG or WG meeting shall be disseminated by the responsible Chairman to all on the TSG or WG membership list at least 21 days before a meeting. The draft agenda should indicate subject matters where voting may be required. The draft agenda shall indicate elections to be held (including known candidates).

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# Article 33: TSG and WG meeting registration

Every delegate shall register on arrival at each TSG or WG meeting. Each delegate who represents an Individual Member shall declare the precise name of that Individual Member. A delegate may only register to represent one Individual Member.

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# Article 34: TSG and WG meeting document and file naming

Documents for a TSG or WG meeting shall follow a consistent numbering system as shown in the following example:

**xminnzzzz**

This numbering system has six logical elements:

1) **x**: a single letter corresponding to the TSG;

   where x : **R** (Radio Access Network)

   **N** (Core Network) [TSG closed March 2005]

   **S** (Service and System Aspects)

   **T** (Terminals) [TSG closed March 2005]

   **G** (GSM/EDGE Radio Access Network)

   **C** (Core network and Terminals)

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 "-". May take on other values depending on the nature of the meeting at which the document is presented, eg the identity of a subgroup.

4) **nn**: two digits to indicate the year, i.e. 99, 00, 01, etc;

5) **zzzz**: unique number of the document

No provision is made for the use of revision numbers. Documents which are a revision of a previous version should indicate the document number of that previous version.

The filename of documents shall be the document number. Documents may be compressed to .Zip files (and thus bear a file extension ".zip"). For example, document **S1-060357** will be contained in file **S1-060357.zip**.

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# Article 35: TSG and WG Voting Membership List

## 35.1 Voting list

Each TSG and WG shall maintain a list of Individual Members eligible to vote in that group.

The voting list shall be used to establish quorum and for determining those eligible to take part in a vote.

NOTE 1: The term "membership list" has no particular significance in the context of TSG and WG meetings. The term "attendance list" is used for a list of individuals who attend a given meeting representing an Individual Member or other entity entitled to participate in meetings – see annex F.

For the determination of the quorum, see annex H.

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## 35.2 On creation of new TSG or WG

When a new TSG or WG is formed an Individual Member is added to the voting list at the first meeting at which it is represented, and may vote at the second meeting where it is represented.

Exceptionally, if inadequate notice (less than the period of time given in article 31) had been given for the first meeting of the new group, an Individual Member shall be added to the voting list on its delegate's attending the second meeting (the election meeting) and vote at that meeting even if it had not been represented at the group's first meeting.

Only an Individual Member that had been represented at the group's first meeting may provide a proxy for the second meeting.

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## 35.3 Established TSGs and WGs

To qualify for the voting list it is necessary for at least one delegate of an Individual Member to attend at least two meetings of the group concerned, without being removed according to the provisions of article 35.4..

An Individual Member having been represented at at least two ordinary meetings of the group has the right to cast a vote by proxy (see article 26). Thus an Individual Member may not cast a vote by proxy during a meeting at which it is not represented unless it had already been represented at two or more qualifying meetings of the group.

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## 35.4 Removal from and reinstatement to voting list

An Individual Member which is not represented at three consecutive meetings of the TSG or WG shall be removed from the voting list.

The right to vote is reinstated at the second meeting which a delegate of the Individual Member attends without missing the number of consecutive meetings mentioned in the previous paragraph (but see article 35.3 for eligibility to cast a proxy vote).

EXAMPLE 1: If Individual Member Z is represented at meeting K and K+3 (and is thus eligible to vote) but is not represented at meetings K+4, K+5 and K+6, it is removed from the voting list.

EXAMPLE 2: If Individual Member X, not previously having been represented at a meeting of the group, is represented at meetings N and N+3, it may cast a vote at meeting N+3.

NOTE: Individual Member X might choose to cast a vote by proxy at meeting N+3, even though its delegate is physically present. This is sometimes useful for coordinating company positions where one large company has several Individual Memberships, possibly via several different Organizational Partners.

EXAMPLE 3: If Individual Member Y, not previously having been represented at a meeting of the group, is represented at meeting N only, it may not cast a vote by proxy at meeting N+2.

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## 35.5 Meetings other than ordinary meetings

Any group that wants to call an electronic meeting (audio, video, document distribution by posting or e-mail, etc) may do so, although this works best with smaller groups. Therefore, all electronic meetings are allowed but only ordinary meetings (see annex F) count towards attendance. However, if a meeting is designated as face-to-face, provision of bridge and speakerphone capabilities for those requesting it would be at the discretion of the host. Those participating by speakerphone are not to be counted toward quorum or attendance, and are not allowed to vote.

For the determination of the quorum, see annex H.

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# Article 36: TSG Sub Working Groups

A Working Group may establish a Sub Working Group (SWG) with defined Terms of Reference. The Working Group shall appoint a SWG Chairman. The SWG shall work by consensus. The meeting notice requirements for a SWG meeting are the same as for TSGs and WGs.

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# SECTION G: WORK PROGRAMME AND TECHNICAL CO-ORDINATION

## Article 37: Work Programme

The 3GPP Work Programme shall consist of Work Items defined by the TSGs.

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## Article 38: Work Items

A 3GPP Work Item is a specification task defined in terms of the following principal parameters:

- title;
- intended output (i.e. Technical Specifications or Technical Reports);
- impact on other Technical Specifications and Technical Reports;
- technical scope, including the field of application of the intended output;
- impact on other 3GPP Work Items;
- the schedule of tasks to be performed;
- the identities of the supporting Individual Members;
- the identity of the Work Item Rapporteurs.

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## Article 39: Work Item creation

Each proposed new Work Item shall be supported by at least four Individual Members, and their names shall be recorded in the Work Item definition prepared for the TSG approval. One or more persons shall be named as Rapporteur for the proposed Work Item, and the Rapporteur shall act as the prime contact point on technical matters and for information on progress throughout the drafting phases. The supporting Individual Members are expected to contribute to and progress the new work item throughout the drafting phases.

In addition to the above, TSGs shall approve new Work Items, giving all essential parameters. The proposal shall be entered into the 3GPP work programme, clearly marked as a new entry, for which a unique reference identity shall be allocated.

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## Article 40: Work Item adoption by PCG

The 3GPP work programme shall be made available to all Individual Members. A new Work Item shall remain flagged as "new" until the end of the month following the month during which the 3GPP work item was entered into the 3GPP work programme. A new Work Item shall be adopted by the PCG unless a substantial objection is received from an Individual Member or Partner during this period. At the end of the period, the "new" flag shall be removed (even if there is an objection) and it is the responsibility of any objecting Individual Member or Partner to discuss their objections with the TSG Chairman. If it is not possible to resolve the objection, it is the responsibility of the Individual Member or Partner to raise the issue with the PCG.

The TSGs shall ensure that the 3GPP Work Item details are maintained at regular intervals.

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## Article 41: Work Item stopping

Prior to completion of the intended 3GPP output, the responsible TSG may conclude that a Work Item is no longer required. Any Work Item shall automatically be considered by a TSG for stopping, if no progress has been achieved in a given period of time, typically six months, e.g. due to a lack of contribution. In such cases, the Work Item shall be flagged as "stopped" in the Work Programme. The proposal to stop a Work Item shall be fully justified.

The Work Programme shall be updated accordingly, and shall show the Work Item as "stopped" until the end of the month following the month during which the Work Item was initially flagged.

The Work Item will be stopped by the PCG unless substantial objection is received from an Individual Member during this period. It is the responsibility of any objecting Individual Member to discuss their objections with the TSG Chairman. If it is not possible to resolve the objection, it is the responsibility of the Individual Member to raise the issue with the PCG.

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## Article 42: Technical co-ordination

The PCG shall be responsible for determining the overall time frame and for managing the overall work progress. The System Aspects TSG shall have a particular responsibility for the technical co-ordination of work being undertaken within 3GPP, and for overall system architecture and system integrity. Problems encountered in performing this technical co-ordination role shall be reported immediately to the PCG.

top

# SECTION H: DELIVERABLES

## Article 43: Deliverable types

3GPP shall prepare, approve and maintain documents known as Technical Specifications and Technical Reports. Such documents shall be drawn up by the TSGs and shall, following approval at that level, be submitted to the participating Organizational Partners to be submitted to their respective standardization processes.

top

## Article 44: Approval process

Approval of Technical Specifications and Technical reports by a TSG shall normally be by consensus.

Where consensus cannot be achieved in the TSG a vote may be taken.

When Technical Specifications and Technical Reports become sufficiently stable, they shall be put under change control of the relevant TSG. The further elaboration of these Technical Specifications and Technical Reports shall be achieved by change requests to be approved by the TSG.

top

## Article 45: Drafting rules

The Technical Specifications and Technical Reports drafted by the TSGs shall follow the 3GPP drafting rules, using document processing facilities, format, languages and notations agreed by the Organizational Partners, and on a medium suited for electronic document handling and publishing.

top

## Article 46: Copyright and ownership

The Organizational Partners will have joint ownership (including copyright) of the Technical Specifications and Technical Reports produced by 3GPP.

top

## Article 47: Conversion by Organizational Partners

Organizational Partners shall use their best endeavours to convert the Technical Specifications and Technical Reports approved by the Partnership Project into national/regional deliverables in a timely manner through their normal processes.

The Organizational Partners are urged not to change the technical parts of the Technical Specifications and Technical Reports; they may add non-technical parts required by their own deliverable schemes and they may add descriptions of options selected.

Organizational Partners should ensure that all unresolved comments raised during their public enquiry and approval phases are delivered to the appropriate TSG.

top

# SECTION I: REPORTING

## Article 48: Chairman’s reporting obligations

A report shall be prepared by the Chairman following all PCG and TSG meetings.

top

## Article 49: Changes to structure and officials

The Chairman of each TSG shall inform the PCG of all organizational changes concerning Working Groups and their officials. An up to date record of the 3GPP structure shall be maintained.

top

## Article 50: Calendar of meetings

The PCG and TSGs shall maintain an up to date calendar of the dates and venues for future meetings.

top

# SECTION J: EXTERNAL RELATIONS

## Article 51: Relationship with the ITU

3GPP results should be submitted to the ITU as appropriate.

For working groups, the following handling of communications toward ITU shall apply:

1 Working groups shall send ITU submissions which are destined to become part of ITU deliverables to their parent TSG for review.

2 Working group communications towards the ITU which are NOT destined to become part of an ITU deliverable must be reviewed by the TSG chairman and the appropriate ITU sector convener (if one exists for the given ITU sector). The working group's TSG chairman and ITU sector convener will determine if such a communication should be sent to the parent TSG for review. If for some reason either the TSG chairman or ITU sector convener is not available, then it is sufficient for the remaining person to review the document and determine if it should be escalated to the TSG or not.

3 If the working group communication does not require TSG review, then it shall be conveyed to the ITU from the WG using one of the mechanisms described below.

For TSGs, the following handling of communications toward ITU shall apply:

1 TSGs shall send ITU submissions which are destined to become part of ITU deliverables to the PCG for review.

2 TSGs communications towards the ITU which are deemed sensitive by the TSG shall be sent to the PCG for review.

3 If the TSG does not judge the communication as sensitive, then it shall be conveyed to the ITU from the WG using one of the mechanisms described below.

To convey a communications towards the ITU, one of the following mechanisms shall be used based upon determination of the sending body (a body may determine a default mechanism).

a) The communication shall be sent from the OPs as a deliverable from their organizations (applicable to PCG reviewed communications only)

b) The communication shall be made by Individual Members who are also members of the ITU. In such a circumstance, the appropriate ITU sector convener will coordinate and handle the administrative matters for the submission. 3GPP Technical Specifications and Technical Reports may be taken as the technical content of such contributions (applicable to PCG reviewed communications or TSG reviewed communications).

c) The communication shall be sent directly from the 3GPP liaison coordinator to the appropriate ITU receiver in the ITU (applicable to TSG reviewed communications or WG reviewed communications).

Representatives of ITU-D, ITU-R and ITU-T are invited to participate in the Project Coordination Group for the efficient coordination and exchange of information.

top

## Article 52: Relations with other groups

TSGs and WGs are encouraged to liaise directly with the relevant technical bodies within the 3GPP and Partners as appropriate.

A liaison statement shall clearly communicate what is expected from the receiver, i.e., which parts are for information, which questions are expected to be clarified and by whom (especially if there are multiple receivers), and also when an answer is needed, e.g., when is the next meeting of the group sending the liaison statement.

A TSG or any subtending Working Group may send individual liaisons to any external organization (other than ITU) without PCG approval, except if the statement is considered sensitive by the TSG Chairman, in which case PCG clearance is needed.

It is not necessary to have all external liaisons copied to the PCG and/or TSG SA. The liaison originating TSG should decide, at its own discretion, which should be copied. External liaisons that may have management implications such as schedules, organization, process, procedures, and policy shall be copied to the PCG, or approved by the PCG if sensitive.

Relations with the ITU are described in article 51.

top

# SECTION K: MISCELLANEOUS

## Article 53: Resources

The resources for the operation of 3GPP shall be managed by the Organizational Partners. The resources are allocated to the TSGs by the PCG.

top

## Article 54: Support Team

The Partners shall provide logistical support to, and assist in the operation of, 3GPP. The support shall be in the form of a Support Team which shall operate under the overall management of the PCG and the day to day management of TSGs.

top

## Article 55: Intellectual Property Rights (IPR) Policy

Individual Members shall be bound by the IPR Policy of their respective Organizational Partner.

Individual Members should declare at the earliest opportunity, any IPRs which they believe to be essential, or potentially essential, to any work ongoing within 3GPP. Declarations should be made by Individual Members to their respective Organizational Partners.

Organizational Partners should encourage their respective members to grant licences on fair, reasonable terms and conditions and on a non-discriminatory basis.

The PCG shall maintain a register of IPR declarations relevant to 3GPP, received by the Organizational Partners.

top

## Article 56: Working language

The working language for 3GPP shall be English.

Meetings of the PCG and TSGs shall be conducted in English.

3GPP Technical Specifications and Technical Reports shall be prepared in English (as defined by the Shorter Oxford English Dictionary).

top

# Article 57: Duration

3GPP shall be task oriented and on completion of the tasks the future of 3GPP shall be re-considered. The continuation of 3GPP shall therefore be confirmed by the Organizational Partners on an annual basis.

top

# Article 58: Review of activities

An evaluation of the activities of 3GPP should be made by the Organizational Partners at regular intervals.

top

# Article 59: Dissolution, winding up

In the event of a voluntary dissolution of 3GPP, the Partners shall determine the terms of liquidation by consensus. All issues shall be documented and distributed at least 30 days prior to decisions being made.

top

# Article 59A: Exhaustion of appeal procedures

In connection with any claim or dispute of an Individual Member arising from or relating to any activity of any 3GPP meeting or action, including in connection with a TSG or WG meeting, such Individual Member shall, prior to commencing any such legal proceeding against 3GPP, its leadership, support staff, or one or more Organizational Partners in a court, an arbitral panel or other adjudicatory body, exhaust all appeal procedures provided in the 3GPP Working Procedures. Exhaustion of appeal procedures shall be diligently expedited by both the appealing party and the appeal body.

top

# Article 60: Amendments to 3GPP Working Procedures

These Partnership Project Working Procedures may only be amended by decision taken by the PCG.

top

# Annex A: Definitions

| | |
|---|---|
| Consensus: | General agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interest and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments. (Note: consensus need not imply unanimity). |
| Conversion: | The transformation of a 3GPP output document into an Organizational Partners deliverable following the Organizational Partners' recognized processes. |
| Delegate: | An individual taking part in a TSG/WG meeting physically or by electronic means. |
| Drafting Rules: | A document approved by the Organizational Partners providing rules for the drafting of 3GPP Technical Specifications and Technical Reports. |
| Election: | The voting process used to identify an individual from a number of individuals. |
| Guest: | An entity fulfilling the criteria to become a future Individual Member, which has been granted temporary participation rights in the 3GPP |
| Individual Member: | A member of an Organizational Partner having participation rights within that Organizational Partner and which has registered to take part in 3GPP. |
| ITU Representative | Representatives of ITU-D, ITU-R and ITU-T invited to participate in the Project Coordination Group for the efficient coordination and exchange of information. |
| Leadership: | A Chairman, Vice-Chairman, or Convenor of an OP/PCG/TSG/WG/SWG/Ad-Hoc or any other 3GPP meeting. |
| Market Representation Partner: | A Partner invited by the Organizational Partners to participate in 3GPP to offer advice and to bring into 3GPP a consensus view of market requirements. |
| Observer: | An Organization fulfilling the criteria to become a future Partner which has been granted temporary participation rights in 3GPP. |
| Organizational Partner: | A recognized Standards Organization which has been accepted as a Partner in 3GPP. |
| Partner: | An Organizational Partner or a Market Representation Partner of 3GPP. |
| Partnership Project Agreement: | The document signed by 3GPP Partners defining their rights and obligations. |
| Partnership Project Description: | A document which describes the overall structure and operation of 3GPP. |
| Represent: | Attend on behalf of.<br>A person who attends a meeting on behalf of an Individual Member represents that Individual Member. The person is not necessarily employed by that Individual Member, but may be, for example, employed by a subsidiary company in the same group as the represented Individual Member; or the person may be an independent consultant under contract to the Individual Member. "Representation" sometimes influences the eligibility to vote – see article 35 and annexes A and F. |
| Sub Working Group | A subordinate body of a Working Group. |
| Support Team: | A number of persons dedicated to support 3GPP. |
| Technical Report: | A 3GPP output document containing mainly informative elements approved by a Technical Specification Group. |
| Technical Specification: | A 3GPP output document containing normative provisions approved by a Technical Specification Group. |
| Voting Member | An Individual Member who has voting rights within a TSG/WG. |
| Work Item: | The documented record of a specific technical activity of 3GPP. |
| Work Programme: | The documented record of the all technical activities of 3GPP. |

Working Group: A subordinate body of a Technical Specification Group.

top

# Annex B: Abbreviations

| | |
|---|---|
| 3GPP | Third Generation Partnership Project |
| ARIB | Association of Radio Industries and Businesses |
| ATIS | Alliance for Telecommunications Industry Solutions (successor to T1) |
| CCSA | China Communications and Standards Association (successor to CWTS) |
| CDMA | Code Division Multiple Access |
| CWTS | China Wireless Telecommunications Standards Group (superseded by CCSA) |
| ETSI | European Telecommunications Standards Institute |
| FDD | Frequency Division Duplex |
| GSM | Global System for Mobile Communication |
| IMT-2000 | International Mobile Telecommunication |
| ITU | International Telecommunication Union |
| MRP | Market Representation Partner |
| PCG | Project Co-ordination Group |
| SWG | Sub Working Group |
| T1 | Standards Committee T1 (superseded by ATIS) |
| TDD | Time Division Duplex |
| TSDSI | Telecommunications Standards Development Society, India |
| TSG | Technical Specification Group |
| TTA | Telecommunications Technology Association |
| TTC | Telecommunication Technology Committee |
| UIM | User Identity Module |
| UTRA | Universal Terrestrial Radio Access |
| UTRAN | Universal Terrestrial Radio Access Network |
| WG | Working Group |

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# Annex C: Individual member application form

**APPLICATION FORM**
for INDIVIDUAL MEMBERSHIP
of the THIRD GENERATION PARTNERSHIP PROJECT
Please complete this form and return it to your Organizational Partner

COMPANY NAME .....

Please indicate below which ORGANIZATIONAL PARTNER you are a member of

| | |
|---|---|
| ARIB | |
| CCSA | |
| ETSI | |
| ATIS | |
| TSDSI | |
| TTA | |
| TTC | |

Please indicate below which Technical Specification Groups you wish to participate in:

| | |
|---|---|
| Radio Access Network | |
| | |
| | |
| Core Network and Terminals | |
| Service and System Aspects | |
| GSM EDGE Radio Access Network (GERAN) | |

Upon your approval as an Individual Member of the Third Generation Partnership Project you agree that you will be bound by the Working Procedures of the Third Generation Partnership Project then in effect and as they may be amended from time to time.

| | |
|---|---|
| Signed by (Authorized Representative) (See Note 1) | |
| Print name | |
| Position | |
| Date | |
| Telephone | |
| Fax | |
| Email | |
| Company Website URL | |

| | |
|---|---|
| Contact person's family name (See Note 2) | |
| Contact person's given name | |
| Job title | |
| Mailing address | |
| Telephone | |
| Fax | |

| | |
|---|---|
| Email | |

Note 1: Is either the official contact person or voting contact of a company.

Note 2: People attending meetings and who can also have signing authority.

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# Annex D: (Void)

top

# Annex E: Guidance for MRP applicants

## E.1 Introduction

The conditions for the acceptance of Market Representation Partners (MRPs) in 3GPP are given in article 7 of these Working Procedures. This annex provides additional guidance to MRP Applicants.

top

## E.2 Guidance

During the application process, the Organizational Partners will need to be assured that an Applicant:

(a) Has a field of interest directly or indirectly related to the work being undertaken by 3GPP;

(b) Has attained a demonstrable level of recognition within this field of interest;

(c) Has an understanding of the market requirements relevant to 3GPP;

(d) Is willing to actively contribute to the work of 3GPP and has sufficient resources for this purpose;

(e) Fully supports the goals and objectives of 3GPP and does not take part in activities that conflict with these goals and objectives.

In processing an application, the Organizational Partners will peruse openly available documentation published by an Applicant, including material posted on its Website, in order to confirm that the points listed above have been satisfied.

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# Annex F: Guidance on meeting organization

## F.1 Meeting classification

TSG and WG Meetings are classified either:

- ordinary; or
- ad hoc.

- top

## F.2 Ordinary meetings

Ordinary meetings are ones where the regular business of the TSG or WG is conducted. Such meetings are normally chaired by the Group's chairman or, if unavailable, a vice-chairman. Ordinary meeting should be announced at least six months prior to the opening day of the meeting.

TSG and WG ordinary meetings shall follow an incrementing number sequence. If an additional ordinary meeting is required between two ordinary meetings, the sequence may be preserved, even though this means renumbering subsequent meetings, or the additional meeting may be numbered using the 'bis' suffix as a numbering scheme.

Attendance at an ordinary meeting counts towards an Individual Member's eligibility to cast a vote in the Group (see articles 26 and 27). The Support Team shall record the participation in an ordinary meeting (each person and organization represented) and the attendance list shall be included in the meeting report.

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## F.3 Ad hoc meetings

An ad hoc meeting of a WG or a TSG is one called to address one or more particular topics. The ad hoc meeting shall be called by decision of the WG (or its parent TSG) or TSG concerned; the decision to hold any subsequent ad hoc meetings on the same topic may be made by the ad hoc meeting participants themselves without reference to the parent WG or TSG, although the parent WG or TSG shall review any ad hoc activity at every Ordinary meeting and determine to either continue or to close the ad hoc activity, even if the previous ad hoc meeting suggested a further meeting. The scope of each subsequent ad hoc meeting shall be indicated by the chairman at least 21 days before the meeting. The ad hoc meeting shall not expand or change the scope originally determined by the parent group. An ad hoc meeting is allowed to make decisions only within its pre-defined remit, and any such decisions shall be ratified by the parent WG or TSG unless, in the case of a WG, a decision was previously explicitly delegated by the WG to the ad hoc meeting.

An ad hoc meeting may be chaired as described for an ordinary meeting above, or, with the agreement of the WG or TSG concerned, by a Work Item rapporteur, or other appropriate person. Although open to all 3GPP Individual Members, ad hoc meetings may attract only a subset of Individual Member representatives who would normally participate in ordinary meetings.

Ad hoc meetings shall not be considered when calculating voting rights. That is, attendance at (or absence from) an ad hoc meeting shall not influence voting rights, which are determined solely by attendance at "ordinary" meetings.

No voting shall occur at ad hoc meetings.

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# F.4 Attendance register

## F.4.1 Face to face meetings

A delegate is deemed to have attended a given meeting if the individual confirms his or her participation by signing the attendance list made available by the group's secretary during the meeting. If a delegate does not sign the attendance sheet during the meeting, the secretary shall assume that the individual did not attend.

A delegate, having registered and begun to participate in a meeting, is not allowed to change the organization he represents during the course of that meeting. An individual delegate is not allowed to simultaneously represent two or more Individual Members at a meeting.

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## F.4.2 Electronic meetings

Electronic meetings such as audio / video conferences, email exchanges considered as meetings, etc, are encouraged where appropriate. For such events, the Secretary will establish the attendance list on the basis of those actually participating in the meeting (those dialling in to the conference bridge, those issuing and responding to emails, etc.) Nevertheless, advance registration is strongly encouraged.

Fully electronic meetings are to be considered as "ad hoc" as defined above.

Participation by Individual Member in fully electronic meetings, or electronic participation in a face to face meeting (eg by phoning in) is not considered for the accrual or loss of voting rights.

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# Annex G: Working agreements

"Working agreements" are tentative decisions reached by 3GPP groups in order to make progress on matters where consensus (as defined in annex A) cannot be reached. It is intended to be used in situations where there is a clear majority in favour of one approach, but a small minority has sustained opposition to that approach.

The working agreement process has the following steps:

- Consensus cannot be reached on an issue. A substantial majority of individual members prefer a given approach, but there is sustained opposition by a small minority of individual members, preventing consensus.
- The chair declares a working agreement. The working agreement is documented in the meeting report
- The approach agreed to by the majority and documented in the working agreement can continue unimpeded.
- The working agreement is entered into the 3GPP working agreements page on the 3GPP web site. The window for challenging the working agreement is now open.
- Working agreements may be challenged, resulting in a formal vote. This potential vote would be held at the next meeting of the WG or parent TSG (whichever comes first). If the next meeting is less than 14 days after the establishment of the working agreement, then that meeting is skipped in determining the next meeting. The meeting for potential voting is documented on the 3GPP working agreements page of the 3GPP web site (http://www.3gpp.org/TSG-Working-Agreements).
- The challenge cut-off date is established. This is 7 days before the start of the meeting for potential voting. The cut-off date is documented on the 3GPP working agreements page of the 3GPP web site.
- Organizations wishing to challenge the working agreement may do so until the challenge window closes. A challenge may be made by informing the chair of the group which will do the voting. Any received challenge is documented on 3GPP working agreements page of the 3GPP web site.
- The group which will be voting is informed of the intention to have a working agreement challenge vote and the specific voting question.
- If no challenge is received by the challenge cut-off date, then the working agreement is confirmed. The confirmation of the working agreement is documented on the 3GPP working agreements page of the 3GPP web site. The issue is closed.
- If a challenge is received, then a formal vote on the working agreement will occur at the designated meeting. Voting on working agreements is a standing part of meeting agendas. Voting is as described in articles 25 & 26 of the working procedures.
- If the challenge fails (at least 71% in favour of the working agreement), then the working agreement is confirmed. The confirmation of the working agreement is documented on the 3GPP working agreements page of the 3GPP web site. The issue is closed.
- If the challenge succeeds (less than 71% in favour of the working agreement), then the working agreement fails. All changes which were made based on the working agreement shall be reversed and the group must continue to search for consensus. The overturning of the working agreement is documented on the 3GPP working agreements page of the 3GPP web site.
- Organizations may withdraw a challenge at any time in the process. If the last challenge is withdrawn after the challenge cut-off, then the working agreement is confirmed. The confirmation of the working agreement is documented on the 3GPP working agreements page of the 3GPP web site. The issue is closed.

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# Annex H: Calculation of quorum in TSGs and WGs

Where calculation of a quorum is required in the context of a vote conducted in a TSG or a WG, the quorum shall be deemed to have been met if:

$(B - P) / V >= Q$

Where:

B is the number of ballot papers issued;

P is the number of proxy votes exercised (i.e. the number of ballot papers issued to delegates bearing authorization to cast votes by proxy);

V is the number of Individual Members having the right to vote at the meeting (including those with only the right to vote “in person” and not by proxy);

Q is the required quorum value given in article 26.

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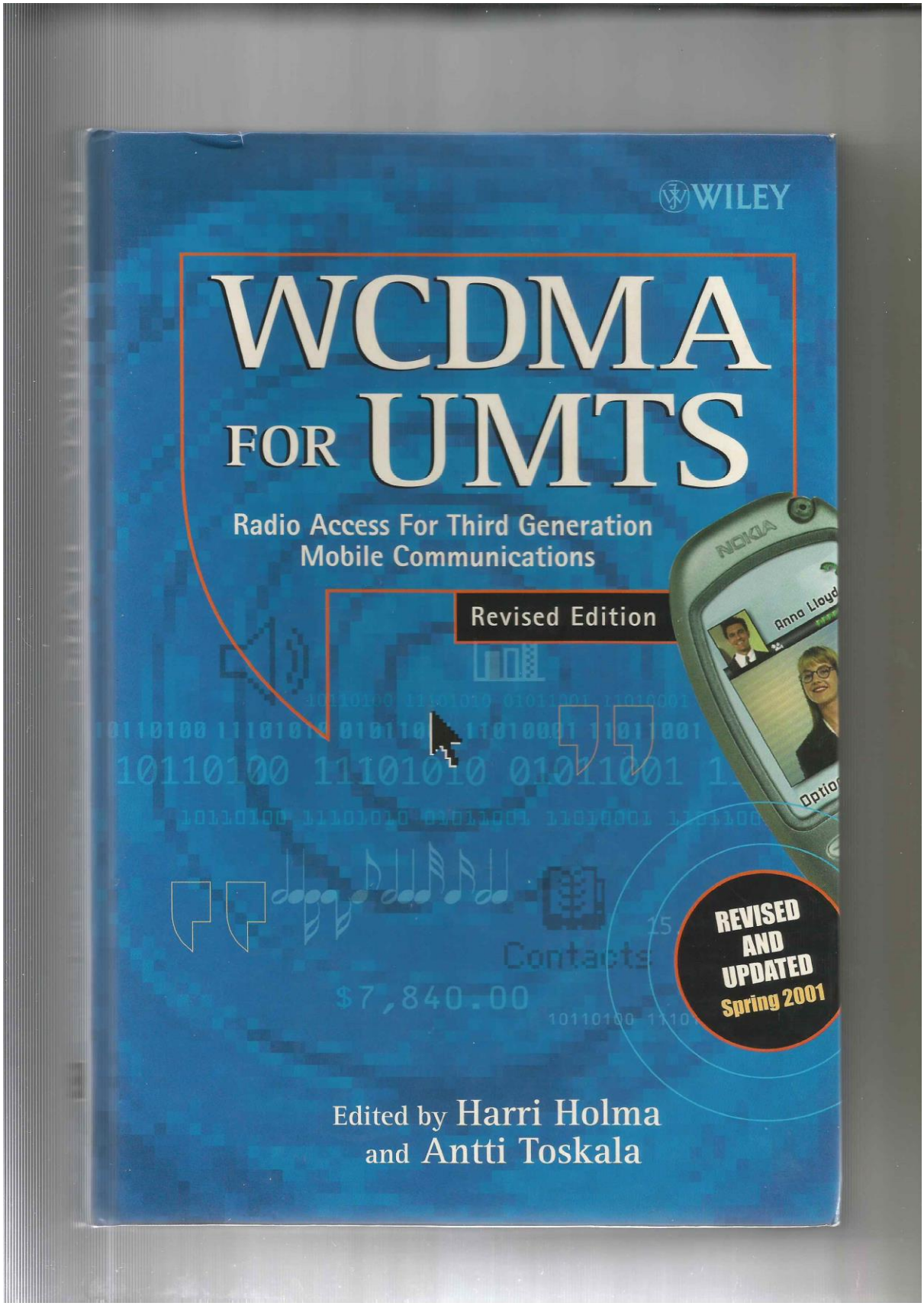
# Annex I: Change history

| Date | PCG # | PCG Doc. | CR | Rev | Subject/Comment |
|---|---|---|---|---|---|
| 2002-04-25 | 6 | | | | |
| 2005-03-01 | 13 | | | | Changes agreed at PCG meeting incorporated. [No formal change control system yet in place] |
| 2006-04-24 | 16 | PCG16_07 | 2 | | ETSI proposal: Article 10<br>Clarify the rights of observers and guests |
| | | | 3 | | ETSI proposal: Article 15<br>To allow leeway in the number of delegates representing each OP at PCG<br>(To reflect the decision already taken by PCG#14 on PCG participation) |
| | | | 9 | | ETSI proposal: Article 34<br>To cater for current TSG structure and to reflect common practice of Tdoc numbering |
| | | | 1 | 1 | Article 3<br>Reflect decision on regional options<br>(To incorporate PCG#7 decision) |
| | | | 4 | 1 | Article 22<br>Clarification and codification of the rights to stand for elected positions in TSGs and WGs |
| | | | 8 | | Article 30 & annex F<br>Inclusion of an annex giving guidance on meeting organization |
| 2006-10-27 | 17 | PCG17_15 r1 | 10 | | Article 35<br>Clarification of voting rights |
| 2009-05-18 | 22 | PCG22_18 | 11 | 5 | Changes resulting from the OP ad hoc group on improvements report and conclusions of OP#20.<br>Articles affected:<br>22<br>23<br>31<br>35<br>41<br>52<br>Annex D<br>plus sundry spelling corrections. |
| | | PCG22_19 | 12 | 2 | Rules on eligibility to cast votes at TSG and WG level. |
| | | PCG22_20 | 13 | | Bring statement of purpose of 3GPP up to date |
| | | PCG22_23 | 14 | | Adding Working Agreements to working procedures |
| | | PCG22_30 r3 | 15 | 3 | Change of ITU liaison process<br><br>Note: PCG meeting #22 approved contribution PCG22_30r1 but this was subsequently revised to r3 after the meeting with the apparent approval of the PCG. |
| | | | | | Decision PCG22/11: clause 22.1 changed wording from "in the March time frame in" to "in the first semester of". |
| 2009-08-12 | | | | | Editorial correction to implementation of CR15r3. (article 52). |
| 2010-04-23 | 24 | PCG24_11 | 16 | | TSG vs WG election |
| | | PCG24_12 | 17 | | Quorum |
| | | PCG24_13 | 18 | | Communication with ITU |
| | | PCG24_25 | 19 | | Attendance register for meetings |
| 2012-10-24 | | PCG29_17 | 20 | | Update to 3GPP Working Procedures article 22 |
| 2014-07-22 | 33 | PCG33_10 | 21 | | Anti-trust / competition law requirements<br>articles 12, 17, 22.1, 23, 29, 59A, annex C |
| 2014-12-31 | 34 | PCG34_14 | 22 | | Anti-trust recommendations v1.1. |
| | | | | | Addition of TSDSI to list of OPs in annexes B and C.<br><br>Minor formatting and spelling corrections, consistent capitalization. |

| | | | | | |
|---|---|---|---|---|---|
| 2016-11-15 | 35 | PCG37_14 | 22.1 | | Modification to clarify obligation on elected officials regarding antitrust/competition law training. |

top

# APPENDIX 6


WILEY
WCDMA
FOR UMTS
Radio Access For Third Generation
Mobile Communications
Revised Edition
NOKIA
Anna Lloyd
REVISED
AND
UPDATED
Spring 2001
Edited by Harri Holma
and Antti Toskala

# WCDMA FOR UMTS

Radio Access For Third Generation Mobile Communications

Revised edition

Edited by
**Harri Holma and Antti Toskala**
*Both of Nokia, Finland*

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in which at least two trees are planted for each one used for paper production.

### 4.5.3 *cdma2000*

The cdma2000 air interface proposal to ITU is the result of work in TR45.5 on the evolution of IS-95 towards the third generation. The cdma2000 proposal is based partly on IS-95 principles with respect to synchronous network operation, common pilot channels, and so on, but it is a wideband version with three times the bandwidth of IS-95. The ITU proposal contains further bandwidth options as well as the multi-carrier option for downlink. The cdma2000 proposal has a high degree of commonality with the Global CDMA 1 ITU proposal from TTA, Korea.

The cdma2000 multi-carrier option is covered in more detail in Chapter 13, as being currently standardised by 3GPP2.

### 4.5.4 *TR46.1*

The WIMS W-CDMA was not based on work derived from an existing second generation technology but was a new third generation technology proposal with no direct link to any second generation standardisation. It was based on the constant processing gain principle with a high number of multicodes in use, thus showing some fundamental differences but also a level of commonality with WCDMA technology in other forums.

### 4.5.5 *WP-CDMA*

WP-CDMA (Wideband Packet CDMA) resulted from the convergence between W-CDMA N/A of T1P1 and WIMS W-CDMA of TR46.1 in the US. The main features of the WIMS W-CDMA proposal were merged with the principles of W-CDMA N/A. The merged proposal was submitted to the ITU-R IMT-2000 process towards the end of 1998, and to the 3GPP process at the beginning of 1999. Its the most characteristic feature, compared with the other WCDMA-based proposals, was a common packet mode channel operation for the uplink direction, but there were also a few smaller differences.

## 4.6 Creation of 3GPP

As similar technologies were being standardised in several regions around the world, it became evident that achieving identical specifications to ensure equipment compatibility globally would be very difficult with work going on in parallel. Also, having to discuss similar issues in several places was naturally a waste of resources for the participating companies. Therefore initiatives were made to create a single forum for WCDMA standardisation for a common WCDMA specification.

The standardisation organisations involved in the creation of the 3rd Generation Partnership Project (3GPP) [9] were ARIB (Japan), ETSI (Europe), TTA (Korea), TTC (Japan) and T1P1 (USA) as shown in Figure 4.2. The partners agreed on joint efforts for the standardisation of UTRA, now standing for Universal Terrestrial Radio Access, as distinct from UTRA (UMTS Terrestrial Radio Access) from ETSI, also submitted to 3GPP. Companies such as manufacturers and operators are members of 3GPP through the respective standardisation organisation to which they belong.



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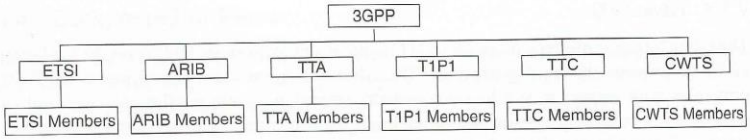



**Figure 4.2.** 3GPP organisational partners

Later during 1999, CWTS (the China Wireless Telecommunication Standard Group) also joined 3GPP and contributed technology from TD/SCDMA, a TDD-based CDMA third generation technology already submitted to ITU-R earlier.

3GPP also includes market representation partners: GSM Association, UMTS Forum, Global Mobile Suppliers Association, IPv6 Forum and Universal Wireless Communications Consortium (UWCC). In [9] there are up-to-date links to all participating organisations.

The work was initiated formally at the end of 1998 and the detailed technical work was started in early 1999, with the aim of having the first version of the common specification, called Release-99, ready by the end of 1999.

Within 3GPP, four different technical specification groups (TSG) were set up as follows:

- Radio Access Network TSG
- Core Network TSG
- Service and System Aspects TSG
- Terminals TSG

Within these groups the one most relevant to the WCDMA technology is the Radio Access Network TSG (RAN TSG), which has been divided into four different working groups as illustrated in Figure 4.3.

The RAN TSG will produce Release-99 of the UTRA air interface specification. The work done within the 3GPP RAN TSG working groups has been the basis of the technical description of the UTRA air interface covered in this book. Without such a global initiative, this book would have been forced to focus on a single regional specification, though with many similarities to those of other regions. Thus the references throughout this book are to the specification volumes from 3GPP.

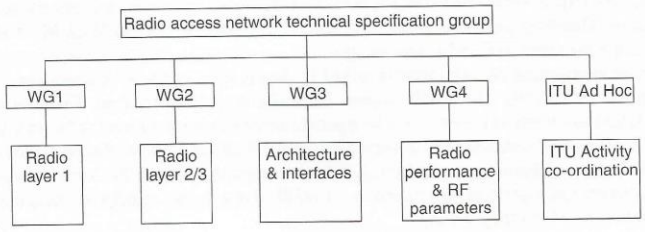



**Figure 4.3.** 3GPP RAN TSG working groups



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During the first half of 1999 the inputs from the various participating organisations were merged in a single standard, leaving the rest of the year to finalise the detailed parameters for the first full release, Release-99, of UTRA from 3GPP. The member organisations have undertaken individually to produce standard publications based on the 3GPP specification. Thus, for example, the Release-99 UMTS specifications from ETSI are identical to the Release-99 specifications produced by 3GPP. The latest specifications can be obtained from 3GPP [9].

During 2000, further work on GSM evolution was moved from ETSI and other forums to 3GPP, including work on GPRS and EDGE. A new TSG, TSG GERAN was set up for this purpose.

## 4.7 Creation of 3GPP2

Work done in TR45.5 and TTA was merged to form 3GPP2, focused on the development of cdma2000 Direct-Sequence (DS) and Multi-Carrier (MC) mode for the cdma2000 third generation component. This activity has been running in parallel with the 3GPP project, with participation from ARIB, TTC and CWTS as member organisations. Recently the main concentration has been on the MC mode work, due to decisions resulting from the global harmonisation efforts.

## 4.8 Harmonisation Phase

During the spring of 1999 several operators and manufacturers held series of meetings to seek further harmonisation and convergence between the CDMA-based third generation solutions, WCDMA and cdma2000. For the 3GPP framework the ETSI, ARIB, TTA and T1P1 concepts had already been merged to a single specification, while cdma2000 was still on its own in TR45.5. As a result of several meetings and telephone conferences, the manufacturers and operators agreed to adopt a harmonised global third generation CDMA standard consisting of three modes: Multi-Carrier (MC), Direct Spread (DS) and Time Division Duplex (TDD). The MC mode was based on the cdma2000 multi-carrier option, the DS mode on WCDMA (UTRA FDD), and the TDD mode on UTRA TDD. The agreement was to phase in a modular approach in which both core networks could be used with all air interface alternatives, as described in Figure 1.4 in Chapter 1.

The main technical impacts of these harmonisation activities were the change of UTRA FDD and TDD mode chip rate from 4.096 Mcps to 3.84 Mcps and the inclusion of a common pilot for UTRA FDD. The work in 3GPP2 focused on the MC mode, and the DS mode from cdma2000 was abandoned. The result is that globally there is only one Direct Spread (DS) wideband CDMA standard, WCDMA.

## 4.9 IMT2000 Process in ITU

In the ITU, recommendations have been developed for third generation mobile communications systems, the ITU terminology being called IMT-2000 [10], formerly FPLMTS. In the ITU-R, ITU-R TG8/1 has worked on the radio-dependent aspects, while the radio-independent aspects have been covered in ITU-T SG11.



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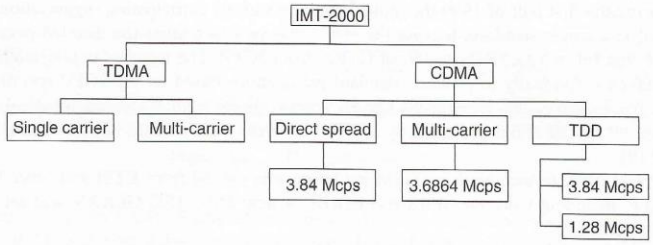



**Figure 4.4.** ITU-R IMT-2000 grouping

In the radio aspects, ITU-R TG8/1 received a number of different proposals during the IMT-2000 candidate submission process. In the second phase of the process, evaluation results were received from the proponent organisations as well as from the other evaluation groups that studied the technologies. During the first half of 1999 recommendation IMT.RKEY was created which describes the IMT-2000 multimode concept.

The ITU-R IMT-2000 process was finalised at the end of 1999, when the detailed specification (IMT-RSCP) was created and the radio interface specifications were approved by ITU-R [11]. The detailed implementation of IMT-2000 will continue in the regional standards bodies. The ITU-R process has been an important external motivation and timing source for IMT-2000 activities in regional standards bodies. The requirements set by ITU for an IMT-2000 technology have been reflected in the requirements in the regional standards bodies, for example in ETSI UMTS 21.01 [5], in order for the ETSI submission to fulfil the IMT-2000 requirements. The ITU-R interaction between regional standardisation bodies in the IMT-2000 process is reflected in Figure 4.5.

The ITU-R IMT-2000 grouping, with TDMA- and CDMA-based groups, is illustrated in Figure 4.4. The UTRA FDD (WCDMA) and cdma2000 are part of the CDMA interface, as CDMA Direct Spread and CDMA Multi-Carrier respectively. UWC-136 and DECT are part of the TDMA-based interface in the concept, as TDMA Single Carrier and TDMA Multi-Carrier respectively. The TDD part in CDMA consists of UTRA TDD from 3GPP and TD-SCDMA from CWTS. For the FDD part in the CDMA interface, harmonisation has been completed, and the harmonisation process is expected to continue for the CDMA TDD mode within 3GPP during 2000 and 2001.

## 4.10 Beyond 3GPP Release-99

Upon completion of the Release-99 specifications, work will concentrate on specifying new features as well as making the necessary corrections to Release-99. Typically such corrections arise as implementation proceeds and test systems are updated to include the latest changes in the specifications. As experience in various forums has shown, a major step forward in system capabilities with many new features requires a phasing-in period for the specifications. Fortunately, the main functions have been verified in the various test systems in operation since 1995, but only the actual implementation will reveal any errors and inconsistencies in the fine detail of the specifications.



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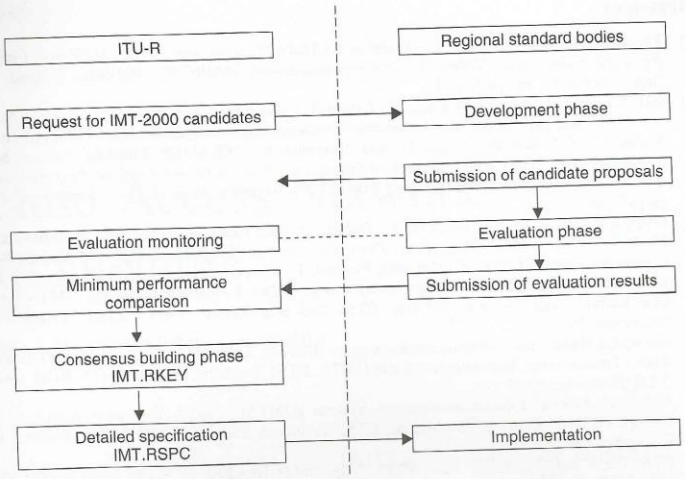



**Figure 4.5.** Relationship of ITU-R to the regional standards bodies

In 3GPP the next version of the specifications was originally considered as Release 2000, but since that the Release naming was adjusted so that next release is called Release 4 due to the 03/2001. Release 4 will contain only minor adjustment with respect to the Release'99. Bigger items are foreseen for inclusions in Release 5, including reaching for the data rates even up to the 10 Mbps in the downlink direction. Release 5 is due for the end of 2001. Release'99 specifications have a version number starting with 3 while Release 4 and 5 specifications have version number starting logically with 4 and 5 respectively.

During coming years, part of the process is to specify the extensions for connecting UTRA FDD to IS-41 based core networks. Work will be carried out on cdma2000 to allow connection to GSM-based core networks. This development will offer operators some degree of flexibility in selecting their third generation technology, assuming they are not aiming to launch such a service immediately, since Release-99 does not yet contain these options.

On the TDD side, further alignment is expected between the TDD mode in UTRA and the TDD mode from CWTS (China). This process is expected to continue after Release-99 is completed in 3GPP. 3GPP Release-4 is also planned to cover the lower chip rate (1.28 Mcps) TDD.

Other interesting developments are expected in the area of using IP based technology in UTRA. First step is going to be the IP based transport option in Release 4 and further releases are likely to see IP technology shaping the internal architecture of the UTRA Network (UTRAN). Also some of the protocols developed by the Internet Engineering Task Force (IETF) [12], such as robust IP header compression suitable for cellular transmission, are foreseen to be adopted as part the UTRA Rel'4 specifications.



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[10] http://www.itu.int/imt/

[11] ITU Press Release, ITU/99–22, 'IMT-2000 Radio Interface Specifications Approved in ITU Meeting in Helsinki', 5 November 1999.

[12] http://www.ietf.org




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# APPENDIX 7

**3GPP PCG#38**
**West Palm Beach, 25 April 2017**
**PCG38_20**

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# MCC Activity Report

Source

Adrian Scrase

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- Departures and Arrivals
- Resource Allocation
- Personnel Changes
- Workload
- 3GPP Membership
- Antitrust Compliance Training
- Summary and Outlook

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# Departures and Arrivals

Kyoungseok OH has joined MCC from the beginning of 2017 as the seconded expert from TTA. He has been allocated Working Group RAN4.



Hakim MKINSI has joined MCC from the beginning of February 2017 and has been allocated Working Group CT6 (as a part time assignment, the remainder of his time being allocated to ETSI TC SCP.)



As a result of these arrivals, Juha Korhonen has now been allocated Working Group RAN2, and Issam Toufik has been allocated Working Group RAN3.

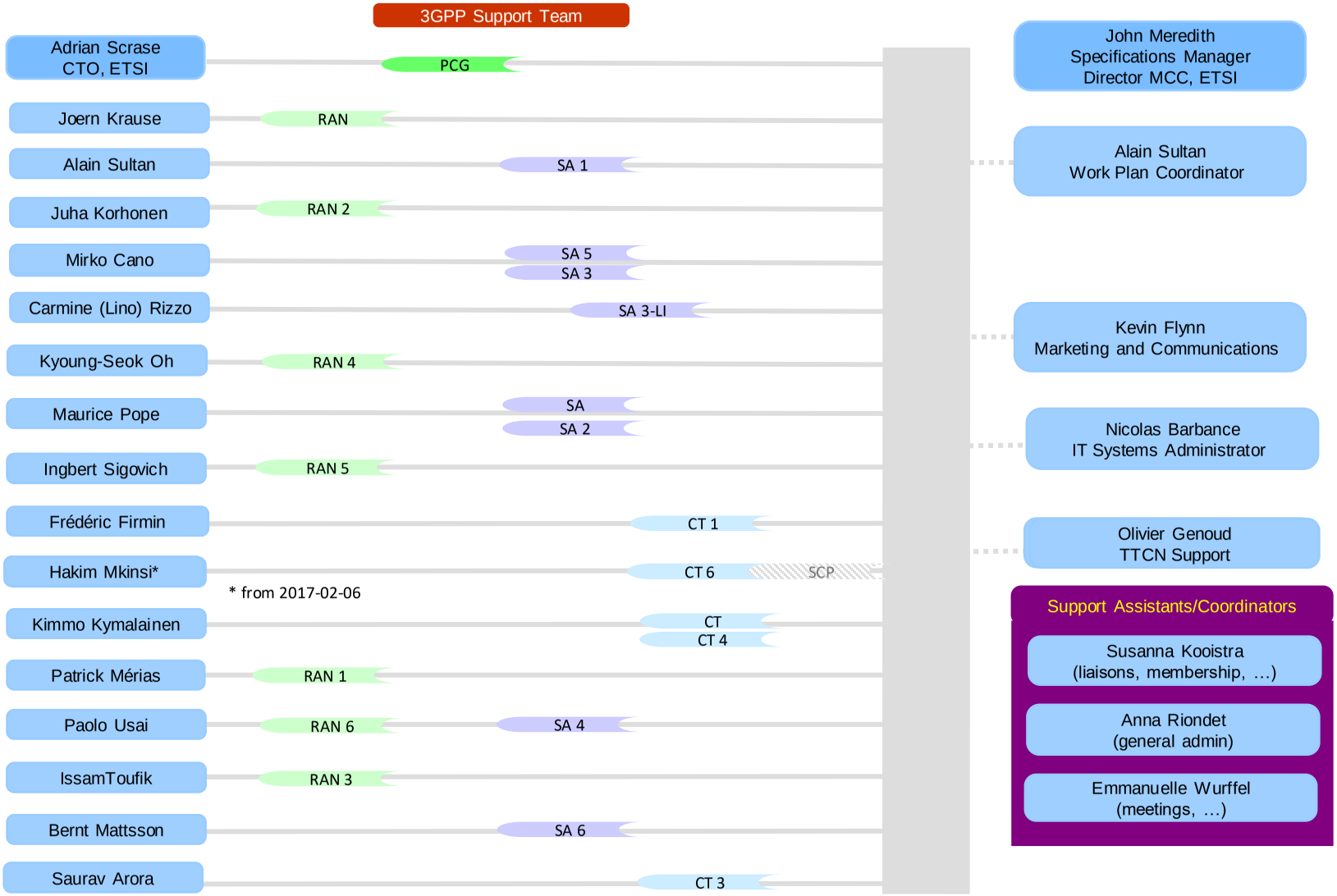


Due to the increasing number of additional meetings, a flexible assignment may be necessary on a case by case basis.



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# Resource Allocation




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# Workload: Change Requests

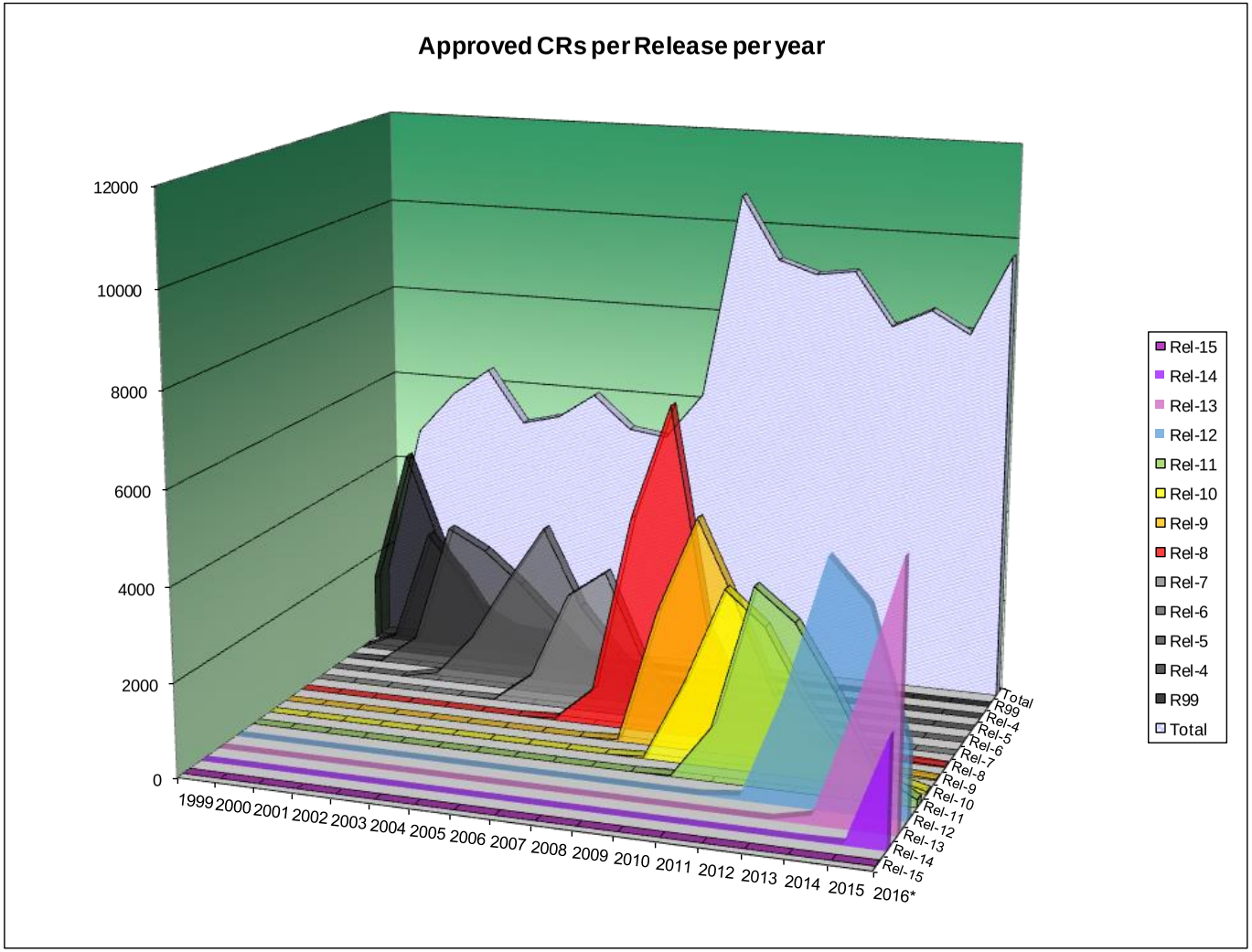
## Approved CRs per Release per Year

| Release | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016* | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R99 | 1408 | 4398 | 2266 | 1004 | 581 | 512 | 111 | 42 | 23 | 5 | 5 | 1 | 0 | | | | | | **10356** |
| Rel-4 | | 376 | 2828 | 1900 | 690 | 257 | 122 | 63 | 48 | 22 | 20 | 13 | 11 | 8 | 7 | 2 | | | **6367** |
| Rel-5 | | 27 | 644 | 3274 | 2842 | 2162 | 1357 | 509 | 94 | 25 | 22 | 7 | 7 | 5 | 3 | 2 | | | **10980** |
| Rel-6 | | | | 172 | 1088 | 2458 | 3721 | 2074 | 1078 | 212 | 74 | 19 | 17 | 10 | 4 | 4 | | | **10931** |
| Rel-7 | | | | | 1 | 20 | 663 | 2529 | 3132 | 1262 | 492 | 176 | 91 | 43 | 25 | 15 | | | **8449** |
| Rel-8 | | | | | | | | 49 | 777 | 4609 | 7073 | 2347 | 706 | 347 | 184 | 91 | 46 | 22 | **16251** |
| Rel-9 | | | | | | | | | | 49 | 2918 | 4991 | 3252 | 1366 | 376 | 165 | 70 | 26 | **13213** |
| Rel-10 | | | | | | | | | | | 47 | 1722 | 3800 | 3103 | 1636 | 584 | 267 | 50 | **11209** |
| Rel-11 | | | | | | | | | | | | 32 | 1152 | 4178 | 3525 | 2186 | 622 | 163 | **11858** |
| Rel-12 | | | | | | | | | | | | | 6 | 102 | 2254 | 5181 | 4287 | 1530 | **13360** |
| Rel-13 | | | | | | | | | | | | | | | 8 | 200 | 2648 | 5571 | **8427** |
| Rel-14 | | | | | | | | | | | | | | | | | 24 | 2315 | **2339** |
| Rel-15 | | | | | | | | | | | | | | | | | | 6 | **6** |
| Total | **1408** | **4801** | **5738** | **6350** | **5202** | **5409** | **5974** | **5266** | **5152** | **6184** | **10651** | **9308** | **9042** | **9162** | **8022** | **8430** | **7964** | **9683** | **123746** |

* It should be noted that **9683** Change Requests were processed during 2016, which represents the highest peak since 2009 (Release 8 (LTE) freeze). It is predicted that the Release 15 and Release 16 freezes (5G) will result in an even higher number of Change Requests to be processed (i.e., the Perfect Storm).

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# Workload: CRs




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# Workload: Committee Support

PCG#36 requested that MCC provide support to ad hoc meetings, bis meetings and workshops to the extent that this is possible within the overall budget. This request has been implement and, in most cases, such meetings have received support.

At PCG#37, I gave warning that the increasing workload was likely to become unsustainable and would necessitate an increase in MCC resources.

A proposal is therefore made at this PCG to increase MCC resources and this can be found in document PCG38_21.

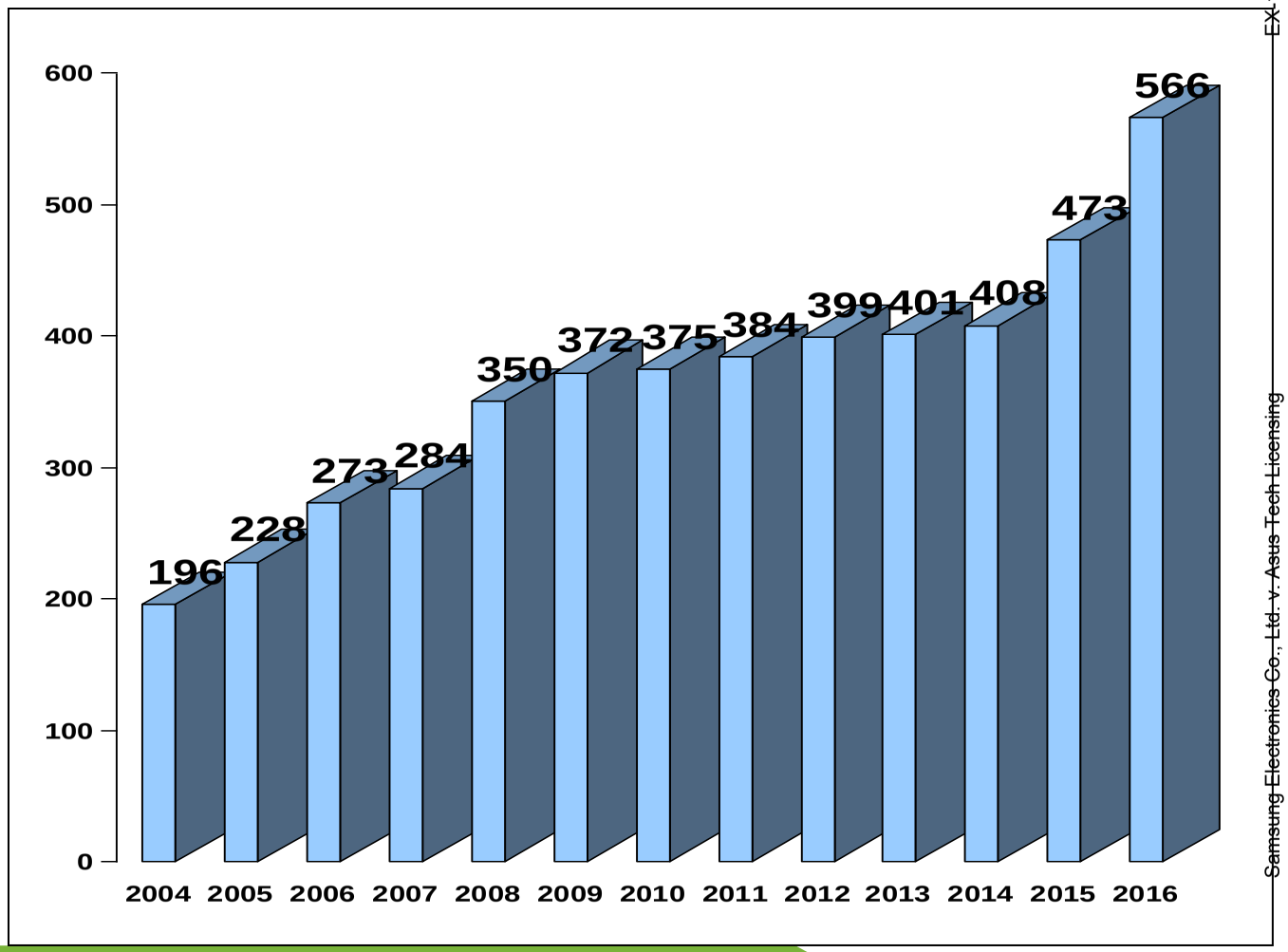
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# 3GPP Membership

3GPP Membership currently stands at *566* Individual Members. In addition, there are 26 companies having Guest Status, which are potential IMs

Number of Individual Members in 3GPP

3GPP Individual Members come from 45 Countries worldwide




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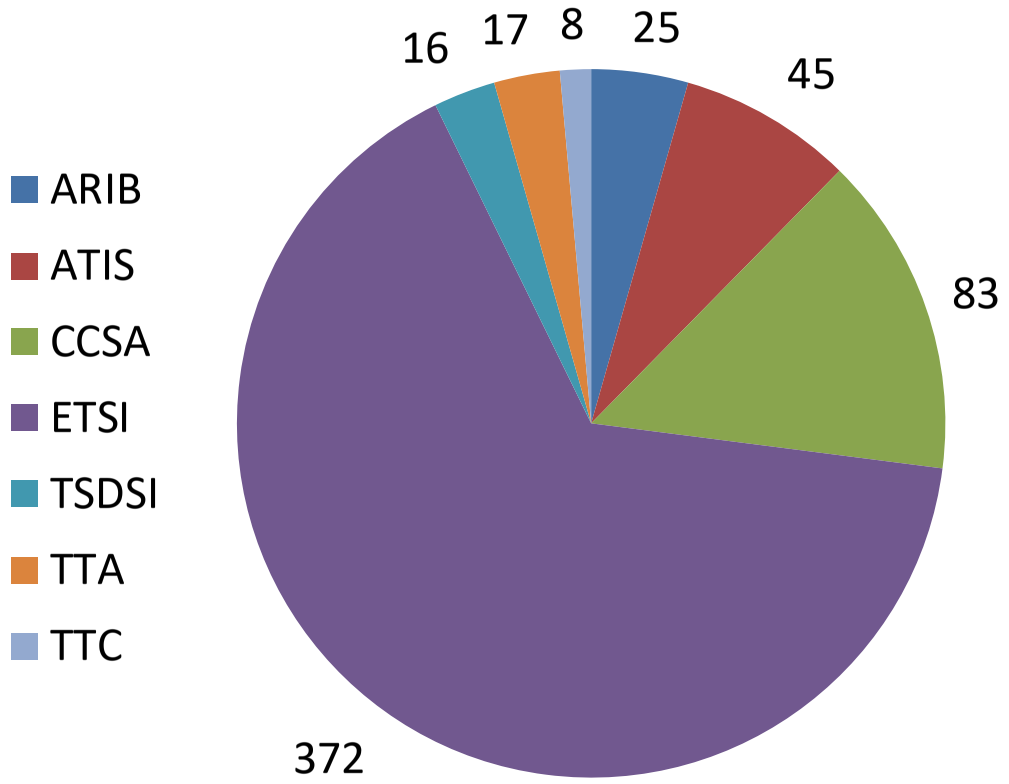
# 3GPP Member Territories

| | | | | |
|---|---|---|---|---|
| AUSTRALIA | DENMARK | ISRAEL | POLAND | SOUTH AFRICA |
| AUSTRIA | ESTONIA | ITALY | PORTUGAL | SPAIN |
| AZERBAIJAN | FINLAND | JAPAN | QATAR | SWEDEN |
| BELGIUM | FRANCE | KOREA (REPUBLIC OF) | ROMANIA | SWITZERLAND |
| BOTSWANA | GERMANY | LEBANON | RUSSIAN FEDERATION | TAIWAN, PROVINCE OF CHINA |
| BRAZIL | HONG KONG | LUXEMBOURG | SERBIA | TURKEY |
| CANADA | INDIA | MALAYSIA | SINGAPORE | UNITED ARAB EMIRATES |
| CHINA | INDONESIA | NETHERLANDS | SLOVAKIA | UNITED KINGDOM |
| CZECH REPUBLIC | IRELAND | NORWAY | SLOVENIA | UNITED STATES |

Note: Membership is growing substantially, and also outside of traditional 3GPP territories. This may well lead to proposals for 3GPP meetings to be held in such locations.

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# Individual Members in 3GPP




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# Antitrust Training

Three antitrust and competition law training sessions are planned for 2017:

| | |
|---|---|
| 27 March: | convenient for European based leaders |
| 03 May: | convenient for US based leaders |
| 01 June: | convenient for Asian based leaders |

Each session is delivered by trainers based in the specific region

These sessions are currently aimed at the TSG Leadership, MCC and OP staff. The question has been raised as to whether such training should be extended to delegates as well? Some advice from the PCG on this would be helpful.

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# Summary and Outlook

3GPP Membership continues to show a 20% annual growth and there is no indication that this will reduce. On the contrary, as 5G normative work has only just begun, further growth is expected

The workload within the TSGs is increasing and will continue to do so in order to meet the accelerated timeline for Release 15 and 16 delivery

The increasing workload within the TSGs places a higher workload on MCC which is now working at capacity with no margin for the unforeseen

3GPP has become *the* focal point for delivery of 5G standards and it is important to ensure that the workload within the TSGs (and therefore within MCC) remains manageable

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# APPENDIX 8

# The 3G IP Multimedia Subsystem (IMS)

## Merging the Internet and the Cellular Worlds

Gonzalo Camarillo and Miguel A. García-Martín

Both of
*Ericsson, Finland*



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# Chapter 2

# The History of the IMS Standardization

In Chapter 1 we mentioned that the IMS uses Internet protocols. When the IMS needs a protocol to perform a particular task (e.g., to establish a multimedia session), the standardization bodies standardizing the IMS take the Internet protocol intended for that task and specify its use in the IMS. Still, no matter how simple this may sound the process of choosing protocols to be used in the IMS can sometimes get tricky. Sometimes, the Internet protocol that is chosen lacks some essential functionality, or does not even exist at all. When this happens the IMS standardization bodies contact the standardization body developing Internet protocols to work together on a solution. We will cover this collaboration in Section 2.5. Nevertheless, before jumping into that we will introduce in Section 2.1 all the standardization bodies involved in IMS development. We need to know who is who and which functions of the IMS each of them performs.

## 2.1 Relations between IMS-related Standardization Bodies

The ITU (International Telecommunication Union) IMT-2000 (International Mobile Telecommunications-2000) is the global standard for 3G (third generation) networks. IMT-2000 is the result of the collaboration between different standards bodies and aims at providing access to telecommunication services using radio links, which include satellite and terrestrial networks.

We will focus on two of the standard bodies involved in IMT-2000: 3GPP (Third Generation Partnership Project) and 3GPP2 (Third Generation Partnership Project 2). Still, they are not the only ones working within IMT-2000. Other bodies, such as the ITU-R (ITU-Radiocommunication Sector), for instance, are also involved in IMT-2000 but on different areas than the IMS.

Both 3GPP and 3GPP2 have standardized their own IMS (IP Multimedia Subsystem). The 3GPP IMS and the 3GPP2 IMS are fairly similar, but, nevertheless, have a few differences (Appendix A lists the most important differences).



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An important similarity between the 3GPP IMS and the 3GPP2 IMS is that both use Internet protocols, which have been traditionally standardized by the IETF (Internet Engineering Task Force). Consequently, both 3GPP and 3GPP2 collaborate with the IETF in developing protocols that fulfill their requirements. The following sections introduce the IETF, 3GPP, and 3GPP2 and provide a brief history of the IETF-3GPP/3GPP2 collaboration.

In addition to the standard bodies we have just mentioned, OMA (Open Mobile Alliance [144]) will play an important role in developing IMS services in the near future. While 3GPP and 3GPP have standardized (or are standardizing) a few IMS services, such as basic video calls or conferencing, from now on OMA will focus on service standardization for the IMS (of course, other standard bodies and third parties besides OMA may also develop services for the IMS).

## 2.2 Internet Engineering Task Force (IETF)

The Internet Engineering Task Force (IETF) is a loosely self-organized collection of network designers, operators, vendors, and research institutions that work together to develop the architecture, protocols, and operation of the public Internet. The IETF is body that is open to any interested individual. The IETF is not a corporation and, therefore, does not have a board of directors, members, nor dues.

The IETF is the standardization body that has developed most of the protocols that are currently used on the Internet. The IETF does not standardize networks, architectures combining different protocols, the internal behaviour of nodes, nor APIs (Application Programming Interface). The IETF is the protocol factory for IP-related protocols.

### 2.2.1 Structure of IETF

Work in the IETF is organized in working groups. Each working group is chartered to perform specific tasks, such as the delivery of a precise set of documents. Each working group has from one to three chairs, who take care that the working group completes its chartered tasks in time. Working groups have a temporary lifetime; so, once they have delivered their documents, either they are rechartered or they cease to exist. Figure 2.1 shows a few, but not all, of the working groups in the IETF; there are more than 100 active working groups in the IETF. The complete up-to-date list of active working groups is available at:

`http://www.ietf.org/html.charters/wg-dir.html`

Working groups get an acronym name that identifies the chartered task. For instance, SIPPING is the acronym of "Session Initiation Protocol Investigation", SIMPLE is the acronym of "SIP for Instant Messaging and Presence Leveraging Extensions" or AAA for "Authentication, Authorization and Accounting".

A collection of working groups form an Area Directorate. There are currently eight areas, as illustrated in Figure 2.1.

Each area has one or two area directors who, together with the IETF chairman, form the IESG (Internet Engineering Steering Group). The IESG is the technical



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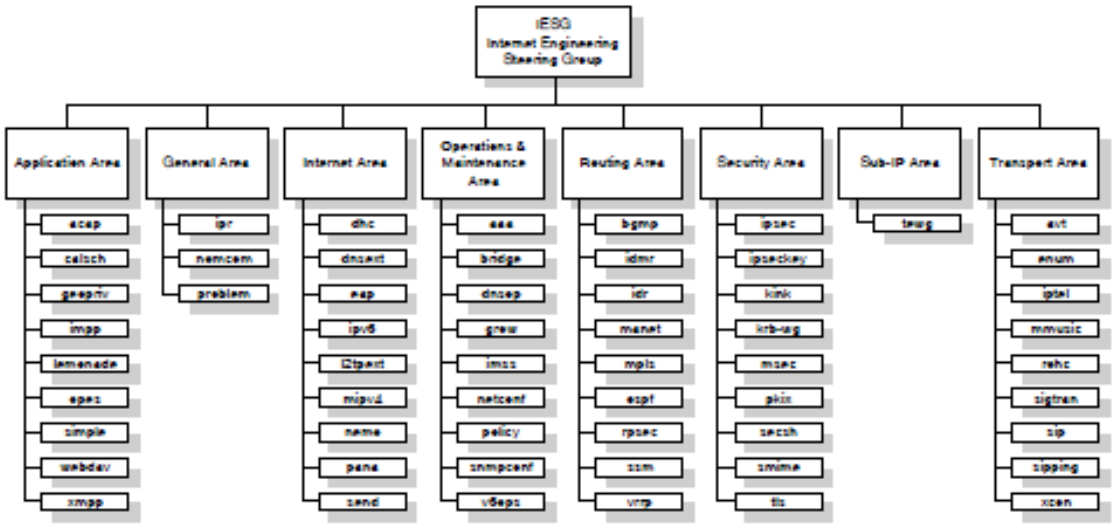



Figure 2.1: The structure of the IETF

management team of the IETF. They decide on which areas the IETF should work and review all the specifications that are produced.

The following web pages contain the complete list of the working groups of all areas and the charter of the SIPPING working group respectively.

`http://www.ietf.org/html.charters/wg-dir.html`
`http://www.ietf.org/html.charters/sipping-charter.html`

The IAB (Internet Architecture Board) is the body that provides technical leadership and handles appeals. Its web page is:

`http://www.iab.org/`

### 2.2.2 Working Group Operations

The technical work in the IETF is done within the working groups. Working groups do not have any kind of membership; they are formed by a number of volunteers that work as individuals. That is, they do not represent their companies when working for the IETF.

Most of the technical discussions within a working group take place in its mailing list. Even the decisions made at face-to-face meetings (held three times a year) have to be confirmed in the mailing list.

The technical documents used within the working groups are called Internet-Drafts. There are two types of them: individual submissions and working group items. Individual submissions are technical proposals submitted by an individual or individuals. If the working group decides that an individual submission is a good starting point to work on a particular topic, it becomes a working group item.



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Individual submissions and working group items can be distinguished by the name of the file where they are stored. Individual submissions start with:

```
draft-author's_name
```

while working group items start with:

```
draft-ietf-name_of_the_working_group
```

A list of all the Internet-Drafts can be found at:

```
http://www.ietf.org/internet-drafts/
```

When a working group feels that a working group item is ready for publication as an RFC the working group chairs send it to the IESG. The IESG may provide feedback to the working group (e.g., ask that working group to change something in the draft) and, eventually, decides whether or not a new RFC is published.

Although most of the Internet-Drafts that the IESG receives come from working groups an individual may also submit an Internet-Draft to the IESG. This usually happens with topics that are not large enough to grant the creation of a working group, but which, nevertheless, are of interest to the Internet community.

It is important to note that Internet-Drafts, even if they are working group items, represent work in progress and should only be referenced as such. Internet-Drafts are temporary documents that expire and cease to exist six months after they are issued. They can change at any time without taking into consideration backward compatibility issues with existing implementations. Only when a particular Internet-Draft becomes an RFC can it be considered a stable specification.

### 2.2.3 Types of RFCs

The technical documents produced by the IETF are called RFCs (Request For Comments). According to the contents of the document there are three main types of RFCs:

- Standards-track RFCs.
- Non-standards-track RFCs.
- BCP (Best Current Practise) RFCs.

Standards-track RFCs typically define protocols and extensions to protocols. According to the maturity of the protocol there are three levels of standards-track RFCs: proposed standard, draft standard, and Internet standard. Standards-track specifications are supposed to advance from proposed to draft and, finally, to Internet standard as they get more and more mature. An important requirement in this process is that a particular specification is implemented by several people to show that different independently built implementations that follow the same specification can successfully interoperate.

Nevertheless, in practise only a few RFCs reach the draft standard level and even fewer become Internet standards. At present, the specifications of many protocols that are used massively on the Internet are proposed standards.



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There are three types of non-standards-track RFCs: experimental, informational, and historical (which are called *historic* RFCs). Experimental RFCs specify protocols with a very limited use, while informational RFCs provide information for the Internet community about some topic, such as a requirements document or a process. When a standards-track RFC becomes obsolete, it becomes a historic RFC.

BCP RFCs record the best current practise known to the community to perform a particular task. They may deal with protocol issues or with administrative issues.

Figure 2.2 shows the relations between all the RFC types. A list of all the RFCs published so far and their status can be fetched from:

`http://www.ietf.org/iesg/1rfc_index.txt`

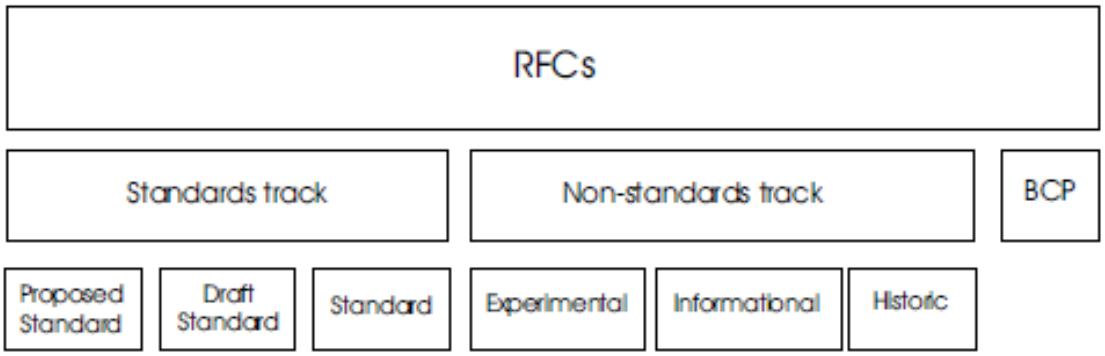



Figure 2.2: RFC types

RFCs can be downloaded from the following web page by just introducing the RFC number:

`http://www.ietf.org/rfc.html`

Additionally, the RFC Editor offers a web page that allows us to search for RFCs by title, number, author and keywords:

`http://www.rfc-editor.org/rfcsearch.html`

## 2.3 Third Generation Partnership Project (3GPP)

The Third Generation Partnership Project (3GPP) was born in 1998 as a collaboration agreement between a number of regional telecommunication standard bodies, known as *organizational partners*. The current 3GPP organizational partners are:

1. ARIB (Association of Radio Industries and Business) in Japan,

   `http://www.arib.or.jp/english/`

2. CCSA (China Communications Standards Associations) in China,

   `http://www.ccsa.org.cn/english/`



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3. ETSI (European Telecommunications Standards Institute) in Europe,

   `http://www.etsi.org/`

4. Committee T1 in the United States of America,

   `http://www.t1.org/`

5. TTA (Telecommunications Technology Association) of Korea

   `http://www.tta.or.kr/English/`

6. TTC (Telecommunication Technology Committee) in Japan,

   `http://www.ttc.or.jp/e/`

3GPP was originally chartered to develop globally applicable Technical Specifications and Technical Reports for a third-generation mobile system based on GSM. The scope has been reinforced to include maintenance and development of GSM specifications including the supported and evolved radio networks, technologies, and packet access technologies.

Besides the organizational partners, *market representation partners* provide the partnership with market requirements. Market representation partners include, among others, the UMTS Forum, 3G Americas, the GSM Association, the Global mobile Suppliers Association, the TD-SCDMA Forum, and the IPv6 Forum.

3GPP maintains an up-to-date web site at:

`http://www.3gpp.org/`

### 2.3.1 3GPP Structure

3GPP is organized in a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs), as illustrated in Figure 2.3. The PCG is responsible for the overall management of 3GPP, time plans, allocation of work, etc. The technical work is produced in the TSGs. At the moment there are five TSGs, responsible for the Core Network (CN), System and Services Aspects (SA), GSM EDGE Radio Access Network (GERAN), Radio Access Network (RAN), and Terminals (T). Each of the TSGs is further divided into Working Groups. Each of the Working Groups is allocated particular tasks. For instance, CN WG1 is responsible for all the detailed design of the usage of SIP and SDP in the IMS, CN WG3 for interworking aspects and CN4 for all the detailed design of the usage of Diameter. SA WG1 is responsible for the requirements, SA2 for the architecture, SA WG3 for the security aspects, SA WG4 for the codecs, and SA WG5 for the operation and maintenance of the network.

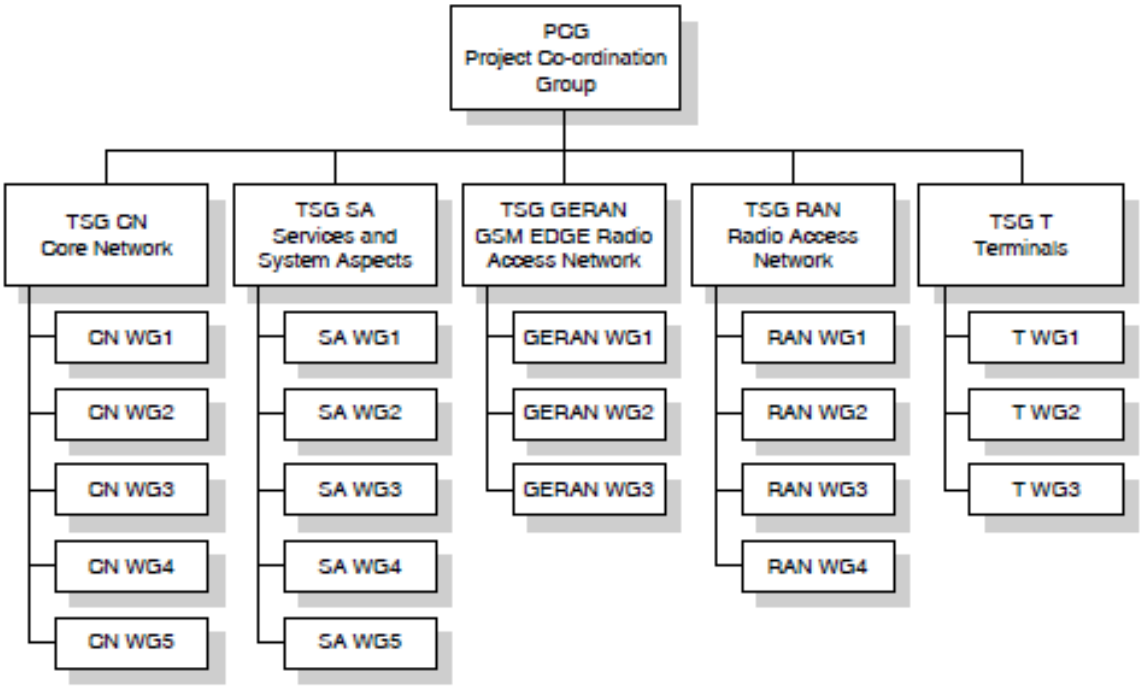



Figure 2.3: The structure of 3GPP

### 2.3.2 3GPP Deliverables

3GPP working groups do not produce standards. Instead, they produce Technical Specifications (TS) and Technical Reports (TR) that are approved by the TSGs. Once approved they are submitted to the organizational partners to be submitted to their respective standardization processes. The final part of the process is in the organizational partners' hands when they approve the TSs or TRs as part of their standards procedures. As a result, there is a set of globally developed standards that are ready to be used in a particular region.

3GPP TSs and TRs are numbered according to the sequence of four or five digits that follow the pattern "xx.yyy". The first two digits "xx" identify the series number, and the last two or three digits "yy" or "yyy" identify a particular specification within a series. For instance, 3GPP TS 23.228 [21] describes the architectural aspects of the IMS.

3GPP groups its specifications in what is called a *Release*. 3GPP Release 5 contains the first version of the IMS. 3GPP Release 6 contains enhancements to the IMS. The reader must note that the IMS is just a fraction of the 3GPP deliverables in a particular Release, as there are other non-IMS specifications included in a 3GPP Release. 3GPP TSs and TRs include a version number that follows the pattern "x.y.z", where "x" represents the 3GPP Release where the specification is published, "y" is the version number, and "z" is a sub-version number. So, 3GPP TS 23.228 version 5.8.0 means version 8.0 of the Release 5 version of TS 23.228.



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3GPP TSs and TRs are publicly available at the 3GPP web site at either of the following URIs:

`http://www.3gpp.org/specs/specs.htm`

`http://www.3gpp.org/ftp/Specs/archive/`

## 2.4 Third Generation Partnership Project 2 (3GPP2)

If 3GPP was born to evolve GSM specifications into a third-generation cellular system, the Third Generation Partnership Project 2 (3GPP2) was born to evolve North American and Asian cellular networks based on ANSI/TIA/EIA-41 standards and CDMA2000© radio access into a third-generation system. 3GPP2 like 3GPP is a partnership project whose members are also known as *organizational partners*. The current list of organizational partners include ARIB (Japan), CCSA (China), TIA (Telecommunications Industry Association) (North America), TTA (Korea), and TTC (Japan). Probably, the reader has noticed that most of them are also organizational partners of 3GPP.

Like 3GPP, 3GPP2 gets market requirements and advice from *market representation partners*. At the moment the list includes the IPv6 Forum and the CDMA Development Group.

### 2.4.1 3GPP2 Structure

The 3GPP2 structure mimics the structure of 3GPP, as illustrated in Figure 2.4. A Steering Committee (SC) is responsible for the overall standardization process and the planning. The technical work is done in Technical Specification Groups (TSGs). TSG-A is focused on the Access Network Interface, TSG-C on CDMA2000© technology, TSG-S on Service and System Aspects, and TSG-X in Intersystems Operations. TGS-X was born as a merger between the former TSG-N (Core Networks) and TSG-P (Packet Data) TSGs. The structure of TSN-X is not completely defined yet.

### 2.4.2 3GPP2 Deliverables

Like 3GPP, 3GPP2 does not produce standards but, instead, Technical Specifications (TSs) and Technical reports (TRs). The documents are created by the TSGs and approved by the SC. Then, they are submitted to the organizational partners to be submitted to their respective standardization processes.

3GPP2 TSs and TRs are numbered with a sequence of letters and digits that follows the scheme "A.Bxxxx-yyy-R" where "A" is a letter that represents the name of the TSG that delivers the document, "B" can be an "R" letter to indicate a TR or a requirements document, but it can also be an "S" letter to indicate a TS. "xxxx" is a sequential number allocated to the document. An optional "yyy" sequence of digits can further identify the chapter within a specification series. The "R" letter identifies the revision. The version number follows the specification and indicates a major and



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# APPENDIX 9

# 3GPP MEMBERSHIP

2024-02-19 Version 1.1

New Query

**Selected categories:**

- **Individual Members (all partners)**

Choose csv separator : , export to csv file

## INDIVIDUAL MEMBERS

| Organization | Country | Partner |
|---|---|---|
| 3in<br>(Industrial Internet Innovation Center (Shanghai) Co.,Ltd.) | CHINA | CCSA |
| 450connect GmbH<br>(450connect GmbH) | GERMANY | ETSI |
| A.S.T.R.I.D. SA/NV<br>(A.S.T.R.I.D. SA) | BELGIUM | ETSI |
| ABP, NRTA<br>(Academy of Broadcasting Planning, NRTA) | CHINA | CCSA |
| ABS<br>(Academy of Broadcasting Science) | CHINA | CCSA |
| AccelerComm Ltd<br>(AccelerComm Ltd) | UNITED KINGDOM | ETSI |
| Acer Incorporated<br>(Acer Incorporated) | TAIWAN, PROVINCE OF CHINA | ETSI |
| adare GmbH<br>(adare GmbH) | GERMANY | ETSI |
| Airbus<br>(Airbus DS SLC) | FRANCE | ETSI |
| albis-elcon system GermanyGmbH<br>(albis-elcon system Germany GmbH) | GERMANY | ETSI |
| Alibaba (China) Group., Ltd.<br>(Alibaba (China) Group., Ltd.) | CHINA | CCSA |
| Allot Ltd<br>(Allot Ltd) | ISRAEL | ETSI |
| Altan Redes S.A.P.I. de C.V.<br>(Altan Redes S.A.P.I. de C.V.) | MEXICO | ETSI |
| Amazon Web Services<br>(Amazon Web Services EMEA SARL) | LUXEMBOURG | ETSI |
| Amdocs Software Systems Ltd<br>(Amdocs Software Systems Limited) | IRELAND | ETSI |
| Analog Devices, Inc.<br>(Analog Devices, Inc.) | UNITED STATES | ATIS |
| Anemone Technology<br>(Anemone Technology) | DENMARK | ETSI |
| Anritsu Corporation<br>(ANRITSU CORPORATION) | JAPAN | ARIB |
| Anritsu EMEA Ltd<br>(Anritsu EMEA Ltd) | UNITED KINGDOM | ETSI |
| Anterix<br>(Anterix) | UNITED STATES | ATIS |
| Apple<br>(Apple Purchase Operation management) | CHINA | CCSA |
| Apple (Guizhou)<br>(Apple Technology Services (Guizhou) Ltd.) | CHINA | CCSA |

| | | |
|---|---|---|
| **Apple (UK) Limited**<br>**(Apple (UK) Limited)** | UNITED KINGDOM | ETSI |
| **Apple (Ulanqab)**<br>**(Apple Technology Services (Ulanqab) Ltd)** | CHINA | CCSA |
| **Apple AB Denmark**<br>**(Apple AB, filial AF Apple Aktiebolag, Sverige)** | DENMARK | ETSI |
| **Apple Benelux B.V.**<br>**(Apple Benelux B.V.)** | NETHERLANDS | ETSI |
| **Apple Benelux B.V. - Belgium**<br>**(Apple Benelux B.V. - Belgium Branch)** | BELGIUM | ETSI |
| **Apple Computer Trading Co. Ltd**<br>**(Apple Computer Trading (Shanghai) Co., Ltd.)** | CHINA | CCSA |
| **Apple Distribution Intl Ltd**<br>**(Apple Distribution International Limited)** | IRELAND | ETSI |
| **Apple France**<br>**(Apple France)** | FRANCE | ETSI |
| **Apple GmbH**<br>**(Apple GmbH)** | GERMANY | ETSI |
| **Apple Inc**<br>**(Apple Inc)** | UNITED STATES | ATIS |
| **Apple R&D**<br>**(Apple R&D)** | CHINA | CCSA |
| **Apple Solutions**<br>**(Apple Solutions Consulting Services (Beijing) Company Limited)** | CHINA | CCSA |
| **Apple Switzerland AG**<br>**(Apple Switzerland AG)** | SWITZERLAND | ETSI |
| **Apple Trading**<br>**(Apple Trading (Shanghai) Company Limited)** | CHINA | CCSA |
| **AQSACOM S.A.S.**<br>**(AQSACOM S.A.S.)** | FRANCE | ETSI |
| **Arriver Software AB**<br>**(Arriver Software AB)** | SWEDEN | ETSI |
| **ARTICLE19**<br>**(ARTICLE19)** | UNITED KINGDOM | ETSI |
| **ASELSAN**<br>**(ASELSAN Inc.)** | TÜRKIYE | ETSI |
| **AsiaInfo**<br>**(AsiaInfo Technologies (China), Inc.)** | CHINA | CCSA |
| **AsiaInfo Technologies Inc**<br>**(AsiaInfo Technologies Inc)** | CHINA | ETSI |
| **ASR**<br>**(ASR Microelectronics Co., Ltd.)** | CHINA | CCSA |
| **ASTRI**<br>**(Hong Kong Applied Science & Technology Research Institute)** | HONG KONG | ETSI |
| **Astrome Technologies Pvt Lt**<br>**(Astrome Technologies Pvt Lt)** | INDIA | TSDSI |
| **ASUSTEK COMPUTER (SHANGHAI)**<br>**(ASUSTEK COMPUTER (SHANGHAI) CO. LTD.)** | CHINA | CCSA |
| **AT&T**<br>**(AT&T)** | UNITED STATES | ATIS |
| **AT&T GNS Belgium SPRL**<br>**(AT&T Global Network Services Belgium SPRL)** | BELGIUM | ETSI |
| **AT&T Labs, Inc**<br>**(AT&T Labs, Inc)** | UNITED STATES | ATIS |
| **AT&T Services, Inc.**<br>**(AT&T Services, Inc.)** | UNITED STATES | ATIS |
| **ATEME**<br>**(ATEME SA)** | FRANCE | ETSI |
| **Avanti**<br>**(Avanti Communications Ltd)** | UNITED KINGDOM | ETSI |
| **BAE Systems AI Ltd**<br>**(BAE Systems Applied Intelligence Limited)** | UNITED KINGDOM | ETSI |
| **Baicells Technologies Co. Ltd**<br>**(Baicells Technologies Co. Ltd)** | CHINA | CCSA |
| **BBC** | UNITED KINGDOM | ETSI |

| | | |
|---|---|---|
| **(BRITISH BROADCASTING CORPORATION)** | | |
| **B-Com**<br>**(B-Com)** | FRANCE | ETSI |
| **BDBOS**<br>**(Federal Agency for Public Safety Digital Radio)** | GERMANY | ETSI |
| **BeammWave AB**<br>**(BeammWave AB)** | SWEDEN | ETSI |
| **Beijing Lenovo Software Ltd.**<br>**(Beijing Lenovo Software Ltd.)** | CHINA | CCSA |
| **BEIJING SAMSUNG TELECOM R&D**<br>**(BEIJING SAMSUNG TELECOM R&D CENTER)** | CHINA | CCSA |
| **Beijing Xiaomi Electronics**<br>**(Beijing Xiaomi Electronics)** | CHINA | CCSA |
| **Beijing Xiaomi Mobile Software**<br>**(Beijing Xiaomi Mobile Software Co., Ltd)** | CHINA | CCSA |
| **Beijing Xiaomi Mobile Software**<br>**(Beijing Xiaomi Mobile Software Co., Ltd.)** | CHINA | ETSI |
| **Beijing Xiaomi Software Tech**<br>**(Beijing Xiaomi Software Technology)** | CHINA | CCSA |
| **Bell Mobility**<br>**(Bell Mobility)** | CANADA | ETSI |
| **BfV**<br>**(Bundesamt für Verfassungsschutz)** | GERMANY | ETSI |
| **Bharti Airtel Limited**<br>**(Bharti Airtel Limited)** | INDIA | TSDSI |
| **BIFNC**<br>**(BRICS Institute of Future Network)** | CHINA | CCSA |
| **BIPT**<br>**(BIPT - Belgian Institute for Postal services & Telecommunications)** | BELGIUM | ETSI |
| **Bittium Wireless Ltd.**<br>**(Bittium Wireless Ltd.)** | FINLAND | ETSI |
| **BJTU**<br>**(Beijing Jiaotong University)** | CHINA | CCSA |
| **BKA**<br>**(Bundeskriminalamt)** | GERMANY | ETSI |
| **Bluetest AB**<br>**(Bluetest AB)** | SWEDEN | ETSI |
| **BMF**<br>**(Austrian Federal Ministry of Finance)** | AUSTRIA | ETSI |
| **BMWK**<br>**(Bundesministerium für Wirtschaft und Klimaschutz)** | GERMANY | ETSI |
| **BOCRA**<br>**(Botswana Communications Regulatory Authority)** | BOTSWANA | ETSI |
| **BOUYGUES Telecom**<br>**(BOUYGUES Telecom)** | FRANCE | ETSI |
| **Broadcom (EU)**<br>**(Broadcom Europe Ltd)** | UNITED KINGDOM | ETSI |
| **BSI (DE)**<br>**(Bundesamt für Sicherheit in der Informationstechnik)** | GERMANY | ETSI |
| **BSNL**<br>**(Bharat Sanchar Nigam Limited)** | INDIA | TSDSI |
| **BT plc**<br>**(British Telecommunications plc)** | UNITED KINGDOM | ETSI |
| **BTL Inc.**<br>**(BTL Inc.)** | CHINA | ETSI |
| **BTPDI**<br>**(Beijing Telecom Planning & Designing Institute Co.,LTD.)** | CHINA | CCSA |
| **BUPT**<br>**(Beijing University of Posts and Telecommunications)** | CHINA | CCSA |
| **Bureau Veritas ADT**<br>**(Bureau Veritas Consumer Products Services (Hong Kong) Limited, Taoyuan Branch)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **Bytedance**<br>**(Bytedance (Nanjing) Technology Research and Development Co., Ltd.)** | CHINA | CCSA |
| **C Spire Wireless**<br>**(C Spire Wireless)** | UNITED STATES | ATIS |

| | | |
|---|---|---|
| **CableLabs**<br>**(CableLabs)** | UNITED STATES | ETSI |
| **Cadence Design Systems Inc.**<br>**(Cadence Design Systems Inc.)** | UNITED STATES | ETSI |
| **CAICT.**<br>**(China Academy of Information and Communications Technology)** | CHINA | CCSA |
| **CALTTA**<br>**(CALTTA TECHNOLOGIES CO., LTD.)** | CHINA | CCSA |
| **Cambium Networks Limited**<br>**(Cambium Networks Limited)** | UNITED KINGDOM | ETSI |
| **CAMBRIDGE CONSULTANTS LTD**<br>**(CAMBRIDGE CONSULTANTS LTD)** | UNITED KINGDOM | ETSI |
| **CANON Research Centre France**<br>**(CANON Research Centre France SAS)** | FRANCE | ETSI |
| **Casa Systems Inc.**<br>**(Casa Systems Inc.)** | UNITED STATES | ETSI |
| **Catapult**<br>**(Satellite Applications Catapult Ltd)** | UNITED KINGDOM | ETSI |
| **CATT**<br>**(China Academy of Telecommunications Technology (CATT))** | CHINA | ETSI |
| **CATT**<br>**(China Academy of Telecommunication Technology - (Datang Telecom Technology and Industry Group))** | CHINA | CCSA |
| **CBN**<br>**(China Broadcasting Network Group Corporation Ltd.)** | CHINA | CCSA |
| **CCU**<br>**(National Chung Cheng University)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **C-DAC**<br>**(Centre for Development of Advanced Computing)** | INDIA | TSDSI |
| **C-DOT**<br>**(C-DOT)** | INDIA | TSDSI |
| **CEA**<br>**(Commissariat à l'Energie Atomique et aux Energies Alternatives)** | FRANCE | ETSI |
| **Cellnex**<br>**(Cellnex Telecom)** | SPAIN | ETSI |
| **CENC**<br>**(CETC Network & Communications Group Co., Ltd.)** | CHINA | CCSA |
| **CEPRI**<br>**(China Electric Power Research Institute)** | CHINA | CCSA |
| **Ceragon Networks AS**<br>**(Ceragon Networks AS)** | NORWAY | ETSI |
| **CERTH**<br>**(CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS)** | GREECE | ETSI |
| **cetecom advanced GmbH**<br>**(cetecom advanced GmbH)** | GERMANY | ETSI |
| **CEWiT**<br>**(Centre of Excellence in Wireless Technology (CEWiT))** | INDIA | TSDSI |
| **CGL**<br>**(CHAZAH GROUP LTD)** | UGANDA | ETSI |
| **Charter Communications, Inc**<br>**(Charter Communications, Inc)** | UNITED STATES | ATIS |
| **Chengdu OPPO Telecommunication**<br>**(Chengdu OPPO Mobile Telecommunications Corp., ltd.)** | CHINA | CCSA |
| **CHENGDU TD TECH LTD.**<br>**(CHENGDU TD TECH LTD.)** | CHINA | CCSA |
| **China Broadnet**<br>**(China Broadnet Mobile Communications Co., Ltd.)** | CHINA | CCSA |
| **China Mobile (Hangzhou) Inf.**<br>**(China Mobile (Hangzhou) Information Technology Co., Ltd.)** | CHINA | CCSA |
| **China Mobile (Suzhou) Software**<br>**(China Mobile (Suzhou) Software Technology Co., Ltd.)** | CHINA | CCSA |
| **China Mobile Com. Corporation**<br>**(China Mobile Communications Corporation (CMCC))** | CHINA | CCSA |
| **China Mobile E-Commerce Co.**<br>**(China Mobile E-Commerce Co.)** | CHINA | CCSA |
| **China Mobile Group Device Co.** | CHINA | CCSA |

| | | |
|---|---|---|
| **(China Mobile Group Device Co., Ltd)** | | |
| **China Mobile International Ltd**<br>**(China Mobile International Limited)** | CHINA | CCSA |
| **China Mobile M2M Company Ltd.**<br>**(China Mobile M2M Company Ltd.)** | CHINA | CCSA |
| **China Southern Power Grid Co.**<br>**(China Southern Power Grid Co., Ltd.)** | CHINA | CCSA |
| **China Telecom Corporation Ltd.**<br>**(China Telecom Corporation Ltd.)** | CHINA | CCSA |
| **China Telecommunications**<br>**(China Telecommunications Corporation)** | CHINA | ETSI |
| **China Telecomunication Corp.**<br>**(China Telecomunication Corporation)** | CHINA | CCSA |
| **China Unicom**<br>**(China Unicom)** | CHINA | CCSA |
| **Chinatelecom Cloud**<br>**(China Telecom Cloud Technology Co., Ltd)** | CHINA | CCSA |
| **Chongqing University**<br>**(Chongqing University)** | CHINA | CCSA |
| **Chosun University**<br>**(Chosun University)** | KOREA (REPUBLIC OF) | TTA |
| **CHTTL**<br>**(Chunghwa Telecommunication Laboratories, Chunghwa Telecommunication Co.)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **CICT**<br>**(China Information Communication Technologies Group)** | CHINA | ETSI |
| **CICT**<br>**(China Information Communication Technologies Group Corporation)** | CHINA | CCSA |
| **CICT Mobile**<br>**(CICT Mobile Communication Technology Co., Ltd.)** | CHINA | CCSA |
| **CICTCI**<br>**(CICT Connected and Intelligent Technologies Co., Ltd)** | CHINA | CCSA |
| **CIS**<br>**(Center for Internet Security)** | UNITED STATES | ETSI |
| **CISA ECD**<br>**(Cybersecurity and Infrastructure Security Agency (CISA) ECD)** | UNITED STATES | ATIS |
| **Cisco Systems**<br>**(Cisco Systems)** | UNITED STATES | ATIS |
| **Cisco Systems Belgium**<br>**(Cisco Systems Belgium)** | BELGIUM | ETSI |
| **Cisco Systems France**<br>**(Cisco Systems France)** | FRANCE | ETSI |
| **CITC**<br>**(CHINA INFORMATION TECHNOLOGY DESIGNING&CONSULTING INSTITUTE CO.,LTD.)** | CHINA | CCSA |
| **CKH IOD UK LIMITED**<br>**(CKH IOD UK LIMITED)** | UNITED KINGDOM | ETSI |
| **CMDI**<br>**(China Mobile Group Design Institute Co., Ltd)** | CHINA | CCSA |
| **CNC**<br>**(CLAP-N-CLANK)** | JAPAN | ETSI |
| **CNES**<br>**(CNES - Centre National d'Etudes Spatiales)** | FRANCE | ETSI |
| **Cobham SatCom A/S**<br>**(Thrane & Thrane A/S)** | DENMARK | ETSI |
| **Cognyte**<br>**(Cognyte Technologies Israel Ltd.)** | ISRAEL | ETSI |
| **Cohere Technologies**<br>**(Cohere Technologies)** | UNITED STATES | ATIS |
| **Comba**<br>**(Comba Network Systems Company Limited)** | CHINA | CCSA |
| **Comcast**<br>**(Comcast)** | UNITED STATES | ATIS |
| **Comprion GmbH**<br>**(Comprion GmbH)** | GERMANY | ETSI |
| **Comtech Telecommunications Cor**<br>**(Comtech Telecommunications Corp)** | UNITED STATES | ATIS |

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| **Consort Digital**<br>**(Consort Digital Private Limited)** | INDIA | ETSI |
| **Continental Automotive**<br>**(Continental Automotive Technologies GmbH)** | GERMANY | ETSI |
| **Convida Wireless**<br>**(Convida Wireless, LLC)** | UNITED STATES | ETSI |
| **Cosmian**<br>**(Cosmian Tech SAS)** | FRANCE | ETSI |
| **COSMOTE S.A.**<br>**(COSMOTE MOBILE TELECOMMUNICATIONS S.A.)** | GREECE | ETSI |
| **CQUPT**<br>**(Chongqing University of Posts and Telecommunications)** | CHINA | CCSA |
| **Crosscall**<br>**(Crosscall)** | FRANCE | ETSI |
| **CSA**<br>**(Cyber Security Agency of Singapore)** | SINGAPORE | ETSI |
| **CSCN**<br>**(CHINA SATELLITE NETWORK GROUP CO., LTD.)** | CHINA | CCSA |
| **CSIRO**<br>**(Commonwealth Scientific and Industrial Research Organisation)** | AUSTRALIA | ETSI |
| **cstconsultancy**<br>**(CyberSecurity & Technology Consultancy LTD)** | UNITED KINGDOM | ETSI |
| **CTSI**<br>**(China Telecom System Integration Co., Ltd)** | CHINA | CCSA |
| **CTTC**<br>**(Centre tecnologic de Telecomunicacions de Catalunya)** | SPAIN | ETSI |
| **CU Digital Technology**<br>**(China Unicom Digital Technology Co., Ltd.)** | CHINA | CCSA |
| **CUC**<br>**(Communication University of China)** | CHINA | CCSA |
| **CUG**<br>**(China Unicom Global Limited)** | CHINA | CCSA |
| **Cybercore**<br>**(Beijinig Cybercore Technology Co., Ltd.)** | CHINA | CCSA |
| **Cygnusemi**<br>**(Cygnusemi)** | CHINA | CCSA |
| **Czech Telecommunication Office**<br>**(Czech Telecommunication Office)** | CZECH REPUBLIC | ETSI |
| **DAC-UPC**<br>**(Departamento de Arquitectura de Computadores de la Universidad Politecnica de Cataluna (DAC-UPC))** | SPAIN | ETSI |
| **DanKook University**<br>**(DanKook University)** | KOREA (REPUBLIC OF) | TTA |
| **DARS TELECOM S.L.**<br>**(DARS TELECOM S.L.)** | SPAIN | ETSI |
| **Datang Linktester Technology**<br>**(Datang Linktester Technology Co., Ltd.)** | CHINA | CCSA |
| **Datang Mobile Com. Equipment**<br>**(Datang Mobile Communications Equipment Co., Ltd)** | CHINA | CCSA |
| **DEKRA**<br>**(DEKRA testing and Certification, S.A.U.)** | SPAIN | ETSI |
| **Dell Technologies**<br>**(Dell Technologies)** | UNITED STATES | ATIS |
| **DENSO CORPORATION**<br>**(DENSO CORPORATION)** | JAPAN | ARIB |
| **Department of Telecom**<br>**(Department of Telecommunications)** | INDIA | TSDSI |
| **Dept of Home Affairs**<br>**(Department of Home Affairs)** | AUSTRALIA | ETSI |
| **Deutsche Telekom AG**<br>**(Deutsche Telekom AG)** | GERMANY | ETSI |
| **DIGG**<br>**(Agency for Digital Government)** | SWEDEN | ETSI |
| **DISA**<br>**(Defense Information Systems Agency)** | UNITED STATES | ATIS |
| **Dish Network** | UNITED STATES | ATIS |

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| **(Dish Network)** | | |
| **DLR**<br>**(Deutsches Zentrum für Luft- und Raumfahrt e.V.)** | GERMANY | ETSI |
| **DOCOMO Beijing Labs**<br>**(DOCOMO Beijing Communications Laboratories Co., Ltd)** | CHINA | CCSA |
| **DOCOMO Communications Lab.**<br>**(DOCOMO Communications Laboratories Europe GmbH)** | GERMANY | ETSI |
| **Dolby France SAS**<br>**(Dolby France SAS)** | FRANCE | ETSI |
| **Dolby Germany GmbH**<br>**(Dolby Germany GmbH)** | GERMANY | ETSI |
| **Dolby Sweden AB**<br>**(Dolby Sweden AB)** | SWEDEN | ETSI |
| **Douyin**<br>**(Beijing Douyin Information Service Co., Ltd.)** | CHINA | CCSA |
| **DP**<br>**(DigitalPlatforms SpA)** | ITALY | ETSI |
| **DSIT**<br>**(Department for Science, Innovation and Technology)** | UNITED KINGDOM | ETSI |
| **DTCY**<br>**(Deloitte Tohmatsu Cyber LLC)** | JAPAN | TTC |
| **DTS Licensing Limited**<br>**(DTS Licensing Limited)** | IRELAND | ETSI |
| **EBU**<br>**(EBU - European Broadcasting Union)** | SWITZERLAND | ETSI |
| **ECTL**<br>**(Enhanced Communications & Technologies Pvt Ltd)** | INDIA | TSDSI |
| **EDF Recherche et Développement**<br>**(EDF)** | FRANCE | ETSI |
| **EFORT**<br>**(Etudes et Formations en Telecommunication)** | FRANCE | ETSI |
| **Elbit Systems**<br>**(Elbit Systems C4I and Cyber Ltd)** | ISRAEL | ETSI |
| **Element Materials Technology**<br>**(Element Materials Technology Warwick Ltd)** | UNITED KINGDOM | ETSI |
| **Elena**<br>**(Elena Geo Systems Pvt Ltd)** | INDIA | TSDSI |
| **Embotech AG**<br>**(Embotech AG)** | SWITZERLAND | ETSI |
| **EMITE**<br>**(EMITE Ingenieria S.L.)** | SPAIN | ETSI |
| **ENENSYS**<br>**(ENENSYS Technologies SA)** | FRANCE | ETSI |
| **Ericsson España S.A.**<br>**(Ericsson España S.A.)** | SPAIN | ETSI |
| **Ericsson France S.A.S**<br>**(Ericsson France S.A.S)** | FRANCE | ETSI |
| **Ericsson GmbH, Eurolab**<br>**(Ericsson GmbH, Eurolab - Unternehmensbereich Forschung und Entwicklung)** | GERMANY | ETSI |
| **Ericsson Hungary Ltd**<br>**(Ericsson Hungary Ltd)** | HUNGARY | ETSI |
| **Ericsson Inc.**<br>**(Ericsson Incorporated)** | UNITED STATES | ATIS |
| **Ericsson India Private Limited**<br>**(Ericsson India Private Limited)** | INDIA | TSDSI |
| **Ericsson Japan K.K.**<br>**(Ericsson Japan K.K.)** | JAPAN | ARIB |
| **Ericsson Limited**<br>**(Ericsson Limited)** | UNITED KINGDOM | ETSI |
| **Ericsson LM**<br>**(Ericsson Telefonaktiebolaget LM)** | SWEDEN | ETSI |
| **Ericsson Telecomunicazioni SpA**<br>**(Ericsson Telecomunicazioni SpA)** | ITALY | ETSI |
| **Ericsson-LG Co., LTD**<br>**(Ericsson-LG Co., LTD)** | KOREA (REPUBLIC OF) | TTA |

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| **Erillisverkot**<br>**(Suomen Erillisverkot Oy)** | FINLAND | ETSI |
| **ERNET India**<br>**(ERNET India)** | INDIA | TSDSI |
| **ESA**<br>**(ESA - European Space Agency)** | NETHERLANDS | ETSI |
| **E-SPACE**<br>**(E-SPACE SAS)** | FRANCE | ETSI |
| **ESSEN INNOVATION**<br>**(ESSEN INNOVATION COMPANY LIMITED)** | CHINA | CCSA |
| **E-surfing Digital**<br>**(E-surfing Digital Life Technology Co., Ltd)** | CHINA | CCSA |
| **Esurfing IoT**<br>**(Esurfing IoT Tech Co., Ltd)** | CHINA | CCSA |
| **ETELM**<br>**(Electronique Telematique ETELM)** | FRANCE | ETSI |
| **Etherstack Wireless Limited**<br>**(Etherstack Wireless Limited)** | UNITED KINGDOM | ETSI |
| **ETRI**<br>**(Electronics & Telecommunications Research Institute)** | KOREA (REPUBLIC OF) | TTA |
| **ETS-Lindgren Europe**<br>**(ETS-Lindgren Europe)** | FINLAND | ETSI |
| **EURECOM**<br>**(EURECOM)** | FRANCE | ETSI |
| **Eurofins KCTL**<br>**(Eurofins KCTL Co. Ltd)** | KOREA (REPUBLIC OF) | ETSI |
| **European Commission**<br>**(EC - European Commission)** | BELGIUM | ETSI |
| **European Patent Organisation**<br>**(European Patent Organisation)** | GERMANY | ETSI |
| **EUTC**<br>**(European Utilities Telecom Council (EUTC))** | BELGIUM | ETSI |
| **Eutelsat Group**<br>**(Eutelsat S.A.)** | FRANCE | ETSI |
| **EVE Compliancy Solutions**<br>**(EVE Compliancy Solutions)** | NETHERLANDS | ETSI |
| **Everactive**<br>**(Everactive)** | UNITED STATES | ATIS |
| **F5**<br>**(F5, Inc.)** | UNITED STATES | ETSI |
| **Fabasoft AG**<br>**(Fabasoft AG)** | AUSTRIA | ETSI |
| **Facebook Japan G.K.**<br>**(Facebook Japan G.K.)** | JAPAN | ARIB |
| **Fastweb S.p.A.**<br>**(Fastweb S.p.A.)** | ITALY | ETSI |
| **FAU**<br>**(Friedrich-Alexander-Universität Erlangen-Nürnberg)** | GERMANY | ETSI |
| **FBK**<br>**(Fondazione Bruno Kessler)** | ITALY | ETSI |
| **FCC**<br>**(Federal Communications Commission)** | UNITED STATES | ATIS |
| **Fiberhome Technologies Group**<br>**(Fiberhome Technologies Group)** | CHINA | CCSA |
| **FirstNet**<br>**(FirstNet)** | UNITED STATES | ATIS |
| **FORCE Technology**<br>**(FORCE Technology)** | DENMARK | ETSI |
| **Ford**<br>**(Ford Motor Company)** | UNITED STATES | ETSI |
| **Fraunhofer FOKUS**<br>**(Fraunhofer Institute for Open Communication Systems FOKUS)** | GERMANY | ETSI |
| **Fraunhofer HHI**<br>**(Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute)** | GERMANY | ETSI |
| **Fraunhofer IIS** | GERMANY | ETSI |

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| **(Fraunhofer Institut für Integrierte Schaltungen IIS)** | | |
| **Frequentis AG**<br>**(Frequentis AG)** | AUSTRIA | ETSI |
| **Fujitsu Limited**<br>**(Fujitsu Limited)** | JAPAN | ETSI |
| **Fujitsu Limited.**<br>**(Fujitsu Limited.)** | JAPAN | TTC |
| **Fujitsu Limited..**<br>**(Fujitsu Limited..)** | JAPAN | ARIB |
| **Futurewei**<br>**(Futurewei Technologies Inc.)** | UNITED STATES | ETSI |
| **Futurewei Technologies**<br>**(Futurewei Technologies)** | UNITED STATES | ATIS |
| **G+D MS**<br>**(Giesecke+Devrient Mobile Security Germany GmbH)** | GERMANY | ETSI |
| **Gatehouse Satcom A/S**<br>**(Gatehouse Satcom A/S )** | DENMARK | ETSI |
| **GDCNI**<br>**(Guangdong Communications and Networks Institute)** | CHINA | CCSA |
| **GE Network Technologies, LLC**<br>**(GE Network Technologies, LLC)** | UNITED STATES | ATIS |
| **GEESPACE**<br>**(ZHE JIANG GEESPACE TECHNOLOGY CO., LTD.)** | CHINA | CCSA |
| **Gigaset Communications GmbH**<br>**(Gigaset Communications GmbH)** | GERMANY | ETSI |
| **Gilat**<br>**(Gilat Satellite Networks Ltd)** | ISRAEL | ETSI |
| **GLOBALSTAR Inc.**<br>**(GLOBALSTAR Inc.)** | UNITED STATES | ETSI |
| **GM - ATCI**<br>**(General Motors - ATCI)** | ISRAEL | ETSI |
| **Google Inc.**<br>**(Google Inc.)** | UNITED STATES | ATIS |
| **Group 2000**<br>**(Group 2000 Nederland B.V.)** | NETHERLANDS | ETSI |
| **GTRC**<br>**(Georgia Tech Research Corporation)** | UNITED STATES | ETSI |
| **GUANGDONG GENIUS TECHNOLOGY CO**<br>**(GUANGDONG GENIUS TECHNOLOGY CO., LTD. )** | CHINA | CCSA |
| **Guangdong OPPO Mobile Telecom.**<br>**(Guangdong OPPO Mobile Telecommunications Corp., Ltd)** | CHINA | CCSA |
| **GW**<br>**(Greenerwave)** | FRANCE | ETSI |
| **HA/ST**<br>**(HARTING Stiftung & Co. KG)** | GERMANY | ETSI |
| **Hangzhou Douku**<br>**(Hangzhou Douku Software Technologies Co., Ltd.)** | CHINA | CCSA |
| **Hangzhou Mengyuxiang**<br>**(Hangzhou Mengyuxiang Network Technology Corp., Ltd.)** | CHINA | CCSA |
| **Harman GmbH**<br>**(Harman Becker Automotive Systems GmbH)** | GERMANY | ETSI |
| **HEAD acoustics GmbH**<br>**(HEAD acoustics GmbH)** | GERMANY | ETSI |
| **Hewlett-Packard Enterprise**<br>**(Hewlett-Packard Enterprise)** | FRANCE | ETSI |
| **HiSilicon Technologies Co. Ltd**<br>**(HiSilicon Technologies Co.Ltd)** | CHINA | CCSA |
| **HISPASAT SA**<br>**(HISPASAT SA)** | SPAIN | ETSI |
| **HOME OFFICE**<br>**(HOME OFFICE)** | UNITED KINGDOM | ETSI |
| **Honda Motor Co., Ltd**<br>**(Honda Motor Co., Ltd)** | JAPAN | ARIB |
| **Honor**<br>**(Honor Device Co., Ltd)** | CHINA | ETSI |

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| **Honor**<br>**(Honor Device Co., Ltd.)** | CHINA | CCSA |
| **Huawei Device Co., Ltd**<br>**(Huawei Device Co., Ltd)** | CHINA | CCSA |
| **HUAWEI TECH. GmbH**<br>**(HUAWEI TECHNOLOGIES Duesseldorf GmbH)** | GERMANY | ETSI |
| **Huawei Tech.(UK) Co.. Ltd**<br>**(Huawei Technologies (UK) Co., Ltd.)** | UNITED KINGDOM | ETSI |
| **Huawei Technologies (Korea)**<br>**(Huawei Technologies (Korea))** | KOREA (REPUBLIC OF) | TTA |
| **HUAWEI TECHNOLOGIES Co. Ltd.**<br>**(Huawei Technologies Co. Ltd.)** | CHINA | ETSI |
| **HuaWei Technologies Co., Ltd**<br>**(HuaWei Technologies Co., Ltd)** | CHINA | CCSA |
| **Huawei Technologies France**<br>**(Huawei Technologies France)** | FRANCE | ETSI |
| **Huawei Technologies Japan K.K.**<br>**(Huawei Technologies Japan K.K.)** | JAPAN | TTC |
| **HUAWEI Technologies Japan K.K.**<br>**(HUAWEI Technologies Japan K.K.)** | JAPAN | ARIB |
| **Huawei Technologies R&D UK**<br>**(Huawei Technologies Research & Development (UK) Limited)** | UNITED KINGDOM | ETSI |
| **Huawei Technologies Sweden AB**<br>**(Huawei Technologies Sweden AB)** | SWEDEN | ETSI |
| **Huawei Telecommunication India**<br>**(Huawei Telecommunication (India) Co. Pvt. Ltd.)** | INDIA | TSDSI |
| **HUGHES Network Systems Ltd**<br>**(HUGHES Network Systems Ltd)** | UNITED KINGDOM | ETSI |
| **Husqvarna AB**<br>**(Husqvarna AB (publ))** | SWEDEN | ETSI |
| **Hytera Communications Corp.**<br>**(Hytera Communications Corporation Limited)** | CHINA | CCSA |
| **Hyundai Motor Company**<br>**(Hyundai Motor Company)** | KOREA (REPUBLIC OF) | TTA |
| **IBM Europe**<br>**(IBM Europe)** | GERMANY | ETSI |
| **ICS**<br>**(Institute for Communication Systems - University of Surrey)** | UNITED KINGDOM | ETSI |
| **IDEMIA**<br>**(IDEMIA)** | FRANCE | ETSI |
| **IDRBT**<br>**(Institute for Development and Research in Banking Technology)** | INDIA | TSDSI |
| **III**<br>**(Institute for Information Industry)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **IIIT Bangalore**<br>**(International Institute of Information Technology - Bangalore)** | INDIA | TSDSI |
| **IIIT Naya Raipur**<br>**(International Institute of Information Technology, Naya Raipur)** | INDIA | TSDSI |
| **IISc, Bangalore**<br>**(Indian Institute of Science, Bangalor)** | INDIA | TSDSI |
| **IIT Bhilai**<br>**(Indian Institute of Technology Bhilai)** | INDIA | TSDSI |
| **IIT Bombay**<br>**(Indian Institute of Technology Bombay)** | INDIA | TSDSI |
| **IIT Delhi**<br>**(Indian Institute of Technology Delhi)** | INDIA | TSDSI |
| **IIT Gandhinagar**<br>**(Indian Institute of Technology Gandhinagar)** | INDIA | TSDSI |
| **IIT JODHPUR**<br>**(Indian Institute of Technology Jodhpur)** | INDIA | TSDSI |
| **IIT Kanpur**<br>**(Indidan Institute of Technology Kanpur)** | INDIA | TSDSI |
| **IIT Mandi**<br>**(Indian Institute of Technology Mandi)** | INDIA | TSDSI |
| **IIT Patna** | INDIA | TSDSI |

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| **(Indian Institute of Technology Patna)** | | |
| **IIT, Kharagpur**<br>**(IIT, Kharagpur)** | INDIA | TSDSI |
| **IMDA**<br>**(Infocomm Media Development Authority)** | SINGAPORE | ETSI |
| **IMU**<br>**(Istanbul Medipol University)** | TÜRKIYE | ETSI |
| **Indian Institute of Tech (H)**<br>**(Indian Institute of Technology Hyderabad)** | INDIA | TSDSI |
| **Indian Institute of Tech (M)**<br>**(Indian Institute of Technology Madras)** | INDIA | TSDSI |
| **INFINEON TECHNOLOGIES**<br>**(Infineon Technologies)** | GERMANY | ETSI |
| **Inmarsat**<br>**(Inmarsat)** | UNITED KINGDOM | ETSI |
| **Institut Mines-Telecom**<br>**(Institut Mines-Telecom)** | FRANCE | ETSI |
| **Institute VEDECOM**<br>**(Institute VEDECOM)** | FRANCE | ETSI |
| **Intel**<br>**(Intel)** | UNITED STATES | ATIS |
| **Intel Belgium SA/NV**<br>**(Intel Belgium SA/NV)** | BELGIUM | ETSI |
| **Intel China Ltd.**<br>**(Intel China Ltd.)** | CHINA | CCSA |
| **Intel Corporation (UK) Ltd**<br>**(Intel Corporation (UK) Ltd)** | UNITED KINGDOM | ETSI |
| **Intel Corporation Italia SpA**<br>**(Intel Corporation Italia SpA)** | ITALY | ETSI |
| **Intel Corporation SAS**<br>**(Intel Corporation SAS)** | FRANCE | ETSI |
| **Intel Deutschland GmbH**<br>**(Intel Deutschland GmbH)** | GERMANY | ETSI |
| **Intel Ireland**<br>**(Intel Ireland Ltd)** | IRELAND | ETSI |
| **Intel K.K.**<br>**(Intel K.K.)** | JAPAN | ARIB |
| **Intel Sweden AB**<br>**(Intel Sweden AB)** | SWEDEN | ETSI |
| **Intel Technology India Pvt Ltd**<br>**(Intel Technology India Pvt. Ltd.)** | INDIA | TSDSI |
| **Intel Technology Poland SP Zoo**<br>**(Intel Technology Poland SP Zoo)** | POLAND | ETSI |
| **Intelsat**<br>**(Intelsat)** | UNITED STATES | ATIS |
| **InterDigital Belgium. LLC**<br>**(InterDigital Belgium, LLC)** | BELGIUM | ETSI |
| **InterDigital Canada**<br>**(InterDigital Canada)** | CANADA | ATIS |
| **InterDigital Communications**<br>**(InterDigital Communications Corporation)** | UNITED STATES | ATIS |
| **InterDigital Finland Oy**<br>**(InterDigital Finland Oy)** | FINLAND | ETSI |
| **InterDigital France R&D, SAS**<br>**(InterDigital France R&D, SAS)** | FRANCE | ETSI |
| **InterDigital New York**<br>**(InterDigital New York)** | UNITED STATES | ATIS |
| **InterDigital Pennsylvania**<br>**(InterDigital Pennsylvania)** | UNITED STATES | ATIS |
| **InterDigital, Europe, Ltd.**<br>**(InterDigital, Europe, Ltd.)** | UNITED KINGDOM | ETSI |
| **InterDigital, Inc.**<br>**(InterDigital, Inc.)** | UNITED STATES | ETSI |
| **Intersec**<br>**(Intersec SA)** | FRANCE | ETSI |

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| **Intertek**<br>**(Intertek)** | UNITED KINGDOM | ETSI |
| **IPCom GmbH & Co.KG**<br>**(IPCom GmbH & Co.KG)** | GERMANY | ETSI |
| **IPLOOK**<br>**(IPLOOK Networks Co., Ltd.)** | CHINA | CCSA |
| **iQoo**<br>**(iQoo Software Technology (Shanghai) Co., Ltd.)** | CHINA | CCSA |
| **Iridium Satellite LLC**<br>**(Iridium Satellite LLC)** | UNITED STATES | ATIS |
| **IRT Saint Exupery**<br>**(Institut de recherche technologique Saint Exupery)** | FRANCE | ETSI |
| **ISED**<br>**(Innovation, Science and Economic Development Canada)** | CANADA | ETSI |
| **ISRO**<br>**(Indian Space Research Organisation)** | INDIA | TSDSI |
| **ISSDU**<br>**(Information Security Service Digital United Inc.)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **ITL**<br>**(Innovative Technology Lab Co., Ltd)** | KOREA (REPUBLIC OF) | TTA |
| **ITOCHU Techno-Solutions Corp**<br>**(ITOCHU Techno-Solutions Corporation)** | JAPAN | TTC |
| **ITRI**<br>**(Industrial Technology Research Institute)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **ITRON SAS**<br>**(ITRON SAS)** | FRANCE | ETSI |
| **Ittiam System Pvt Ltd**<br>**(Ittiam System Pvt Ltd)** | INDIA | TSDSI |
| **Japan Radio Co., Ltd**<br>**(Japan Radio Co., Ltd)** | JAPAN | ARIB |
| **Jetflow**<br>**(Jetflow Technologies Co., Ltd)** | CHINA | CCSA |
| **Jio**<br>**(Jio Estonia OÜ)** | ESTONIA | ETSI |
| **JMA Wireless**<br>**(JMA Wireless)** | UNITED STATES | ATIS |
| **John Deere GmbH & Co. KG**<br>**(John Deere GmbH & Co. KG)** | GERMANY | ETSI |
| **Johns Hopkins University APL**<br>**(Johns Hopkins University Applied Physics Laboratory)** | UNITED STATES | ATIS |
| **JSI GmbH**<br>**(JSI GmbH)** | GERMANY | ETSI |
| **Juniper Networks**<br>**(Juniper Networks)** | UNITED STATES | ETSI |
| **Kapsch TrafficCom AG**<br>**(Kapsch TrafficCom AG)** | AUSTRIA | ETSI |
| **KDDI Corporation**<br>**(KDDI Corporation)** | JAPAN | TTC |
| **KDDI Corporation**<br>**(KDDI Corporation)** | JAPAN | ARIB |
| **Kepler**<br>**(Kepler Communications GmbH)** | GERMANY | ETSI |
| **Keysight Technologies UK Ltd**<br>**(Keysight Technologies UK Ltd)** | UNITED KINGDOM | ETSI |
| **KIPO**<br>**(Korean Intellectual Property Office)** | KOREA (REPUBLIC OF) | TTA |
| **Kontron Transportation France**<br>**(Kontron Transportation France S.A.S)** | FRANCE | ETSI |
| **Korea Testing Laboratory**<br>**(Korea Testing Laboratory)** | KOREA (REPUBLIC OF) | TTA |
| **KPN N.V.**<br>**(Koninklijke KPN N.V.)** | NETHERLANDS | ETSI |
| **KRRI**<br>**(Korea Railroad Research Institute)** | KOREA (REPUBLIC OF) | TTA |
| **KT Corp.** | KOREA (REPUBLIC OF) | TTA |

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| **(KT Corporation)** | | |
| **Kymeta Corporation**<br>**(Kymeta Corporation)** | UNITED STATES | ETSI |
| **Kyocera Corporation**<br>**(Kyocera Corporation)** | JAPAN | ARIB |
| **Kyonggi University**<br>**(Kyonggi University)** | KOREA (REPUBLIC OF) | TTA |
| **Kyoto University**<br>**(Kyoto University)** | JAPAN | ETSI |
| **L.M. Ericsson Limited**<br>**(L.M. Ericsson Limited)** | IRELAND | ETSI |
| **L3Harris Technologies**<br>**(L3Harris Technologies)** | UNITED STATES | ATIS |
| **Langbo**<br>**(Shanghai Langbo Communication Technology Co., Ltd.)** | CHINA | CCSA |
| **Lansus**<br>**(Lansus Technologies Inc.)** | CHINA | CCSA |
| **LEGRAND FRANCE**<br>**(LEGRAND FRANCE ISERE)** | FRANCE | ETSI |
| **Lekha Wireless Solutions**<br>**(Lekha Wireless Solutions Pvt Ltd)** | INDIA | TSDSI |
| **Lenovo (Beijing) Ltd**<br>**(Lenovo (Beijing) Ltd)** | CHINA | CCSA |
| **Lenovo Future Communications**<br>**(Lenovo Future Communications Technology (Chongqing) Co., Ltd.)** | CHINA | CCSA |
| **Lenovo Information Technology**<br>**(Lenovo (Beijing) Information Technology Co., Ltd.)** | CHINA | CCSA |
| **Leonardo SpA**<br>**(Leonardo SpA)** | ITALY | ETSI |
| **LG Electronics Deutschland**<br>**(LG Electronics Deutschland GmbH)** | GERMANY | ETSI |
| **LG Electronics Finland**<br>**(LG Electronics Finland Lab Oy)** | FINLAND | ETSI |
| **LG Electronics France**<br>**(LG Electronics France)** | FRANCE | ETSI |
| **LG Electronics Inc.**<br>**(LG Electronics Inc.)** | KOREA (REPUBLIC OF) | TTA |
| **LG Electronics Polska**<br>**(LG Electronics Polska Sp. z.o.o.)** | POLAND | ETSI |
| **LG Electronics UK**<br>**(LG Electronics UK Ltd)** | UNITED KINGDOM | ETSI |
| **LG Uplus**<br>**(LG Uplus)** | KOREA (REPUBLIC OF) | TTA |
| **Ligado Networks**<br>**(Ligado Networks)** | UNITED STATES | ETSI |
| **LKA Niedersachsen**<br>**(Landeskriminalamt Niedersachsen)** | GERMANY | ETSI |
| **Locaila**<br>**(Locaila)** | UNITED STATES | ATIS |
| **Lockheed Martin**<br>**(Lockheed Martin)** | UNITED STATES | ATIS |
| **Lynk Global**<br>**(Lynk Global)** | UNITED STATES | ATIS |
| **Magister Solutions Ltd**<br>**(Magister Solutions Ltd)** | FINLAND | ETSI |
| **Maketh Secure Limited**<br>**(Maketh Secure Limited)** | UNITED KINGDOM | ETSI |
| **MATRIXX Software**<br>**(MATRIXX Software, Inc.)** | UNITED STATES | ETSI |
| **Mavenir**<br>**(Mavenir Systems, Inc)** | UNITED STATES | ETSI |
| **MaxWave Micro**<br>**(MaxWave Microelectronics Ltd.)** | CHINA | CCSA |
| **MediaTek (Chengdu) Inc.**<br>**(MediaTek (Chengdu) Inc.)** | CHINA | CCSA |

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| **MediaTek (Hefei) Inc.**<br>**(MediaTek (Hefei) Inc.)** | CHINA | CCSA |
| **MediaTek (Shenzhen) Inc.**<br>**(MediaTek (Shenzhen) Inc.)** | CHINA | CCSA |
| **MediaTek (Wuhan) Inc.**<br>**(MediaTek (Wuhan) Inc.)** | CHINA | CCSA |
| **MediaTek Beijing Inc.**<br>**(MediaTek Beijing Inc.)** | CHINA | CCSA |
| **MediaTek Inc.**<br>**(MediaTek Incorporated)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **Mediatek India Technology Pvt.**<br>**(Mediatek India Technology Pvt. Ltd.)** | INDIA | TSDSI |
| **MediaTek Korea Inc.**<br>**(MediaTek Korea Inc.)** | KOREA (REPUBLIC OF) | TTA |
| **MediaTek UK**<br>**(MTK Wireless Ltd)** | UNITED KINGDOM | ETSI |
| **MeitY**<br>**(Ministry of Electronics & Information Technology)** | INDIA | TSDSI |
| **Meizu Technology**<br>**(Meizu Technology)** | CHINA | CCSA |
| **Mercedes-Benz AG**<br>**(Mercedes-Benz AG)** | GERMANY | ETSI |
| **Mesaqin.com s.r.o (Ltd.)**<br>**(Mesaqin.com s.r.o (Ltd.))** | CZECH REPUBLIC | ETSI |
| **Meta India**<br>**(Meta India Online Services Pvt Ltd)** | INDIA | TSDSI |
| **Meta Ireland**<br>**(Meta Platforms Ireland Ltd.)** | IRELAND | ETSI |
| **Meta USA**<br>**(Meta USA)** | UNITED STATES | ATIS |
| **Microchip Technology, Inc.**<br>**(Microchip Technology, Inc.)** | UNITED STATES | ATIS |
| **Microsoft Europe SARL**<br>**(Microsoft Europe SARL)** | FRANCE | ETSI |
| **MidWave Wireless**<br>**(MidWave Wireless)** | UNITED STATES | ATIS |
| **MIMIT**<br>**(Ministry of Enterprises and Made in Italy)** | ITALY | ETSI |
| **MinEA**<br>**(Ministry of Economic Affairs and Climate Policy)** | NETHERLANDS | ETSI |
| **MINECO**<br>**(MINISTRY OF ECONOMIC AFFAIRS AND DIGITAL TRANSFORMATION)** | SPAIN | ETSI |
| **MINISTERE DE L'INTERIEUR**<br>**(MINISTERE DE L'INTERIEUR)** | FRANCE | ETSI |
| **Ministère Economie et Finances**<br>**(Ministère de l'Economie et des Finances)** | FRANCE | ETSI |
| **Ministry of Transport SR**<br>**(Ministry of Transport of the Slovak Republic)** | SLOVAKIA | ETSI |
| **MITRE Corporation**<br>**(MITRE Corporation)** | UNITED STATES | ETSI |
| **Mitsubishi Electric Co.**<br>**(Mitsubishi Electric Co.)** | JAPAN | ARIB |
| **Mitsubishi Electric Corp**<br>**(Mitsubishi Electric Corporation)** | JAPAN | TTC |
| **Mitsubishi Electric RCE**<br>**(Mitsubishi Electric R&D Centre Europe)** | FRANCE | ETSI |
| **Motorola Mobile Com Technology**<br>**(MOTOROLA MOBILE COMMUNICATION TECHNOLOGY LTD.)** | CHINA | CCSA |
| **Motorola Mobility España SA**<br>**(Motorola Mobility España SA)** | SPAIN | ETSI |
| **Motorola Mobility France S.A.S**<br>**(Motorola Mobility France S.A.S)** | FRANCE | ETSI |
| **Motorola Mobility Germany GmbH**<br>**(Motorola Mobility Germany GmbH)** | GERMANY | ETSI |
| **Motorola Mobility UK Ltd.** | UNITED KINGDOM | ETSI |

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| **(Motorola Mobility UK Ltd.)** | | |
| **Motorola Solutions Germany**<br>**(Motorola Solutions Germany GmbH)** | GERMANY | ETSI |
| **Motorola Solutions UK Ltd.**<br>**(Motorola Solutions UK Ltd.)** | UNITED KINGDOM | ETSI |
| **MTCC**<br>**(Mobile Technology Convergence Center)** | KOREA (REPUBLIC OF) | TTA |
| **Murata Manufacturing Co Ltd.**<br>**(Murata Manufacturing Co Ltd.)** | JAPAN | ARIB |
| **MVG Industries**<br>**(MVG Industries)** | FRANCE | ETSI |
| **Nanjing Ericsson Panda Com Ltd**<br>**(NANJING ERICSSON PANDA COMMUNICATIONS LTD)** | CHINA | CCSA |
| **Nanjing Weibo**<br>**(Nanjing Weibo Software Technology Co., Ltd.)** | CHINA | CCSA |
| **National Instruments Corp.**<br>**(National Instruments Corporation)** | UNITED STATES | ETSI |
| **National Radio Research Agency**<br>**(National Radio Research Agency)** | KOREA (REPUBLIC OF) | TTA |
| **National Spectrum Consortium**<br>**(National Spectrum Consortium)** | UNITED STATES | ATIS |
| **National Technical Assistance**<br>**(National Technical Assistance Centre)** | UNITED KINGDOM | ETSI |
| **nbn co Limited**<br>**(nbn co Limited (ABN 86 136 533 741))** | AUSTRALIA | ETSI |
| **NCI Agency**<br>**(NATO Communication and Information Agency)** | NETHERLANDS | ETSI |
| **NCIS**<br>**(National Criminal Investigation Service)** | NORWAY | ETSI |
| **NCSC**<br>**(National Cyber Security Centre)** | UNITED KINGDOM | ETSI |
| **NDRE**<br>**(National Defence Radio Establishment)** | SWEDEN | ETSI |
| **NEC Corporation**<br>**(NEC Corporation)** | JAPAN | ARIB |
| **NEC Corporation**<br>**(NEC Corporation)** | JAPAN | ETSI |
| **NEC Corporation.**<br>**(NEC Corporation)** | JAPAN | TTC |
| **NEC Europe Ltd**<br>**(NEC Europe Ltd)** | UNITED KINGDOM | ETSI |
| **NEC Telecom MODUS Ltd.**<br>**(NEC Telecom MODUS Ltd.)** | UNITED KINGDOM | ETSI |
| **NEMERGENT**<br>**(NEMERGENT SOLUTIONS SL)** | SPAIN | ETSI |
| **NERCDTV**<br>**(Shanghai National Engineering Research Center of Digital Television Co.,Ltd.)** | CHINA | CCSA |
| **Netherlands Police**<br>**(Netherlands Police, Division MDC)** | NETHERLANDS | ETSI |
| **Netscout Systems Inc.**<br>**(Netscout Systems Inc.)** | UNITED STATES | ETSI |
| **Network Rail**<br>**(Network Rail infrastructure limited)** | UNITED KINGDOM | ETSI |
| **New H3C Technologies Co., Ltd.**<br>**(New H3C Technologies Co., Ltd.)** | CHINA | CCSA |
| **NextNav**<br>**(NextNav)** | UNITED STATES | ATIS |
| **NHK**<br>**(NHK (Japan Broadcasting Corporation))** | JAPAN | ARIB |
| **NICT**<br>**(National Institute of Information and Communications Technology)** | JAPAN | ARIB |
| **Niral**<br>**(Niral Networks Private Limited)** | INDIA | TSDSI |
| **NIST**<br>**(National Institute of Standards and Technology)** | UNITED STATES | ATIS |

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| **Nkom**<br>**(Norwegian Communications Authority)** | NORWAY | ETSI |
| **Nokia**<br>**(Nokia)** | UNITED STATES | ATIS |
| **Nokia Belgium**<br>**(Nokia Bell N.V.)** | BELGIUM | ETSI |
| **Nokia Corporation**<br>**(Nokia Corporation)** | FINLAND | ETSI |
| **Nokia Denmark**<br>**(Nokia Denmark A/S)** | DENMARK | ETSI |
| **Nokia France**<br>**(Nokia Networks France)** | FRANCE | ETSI |
| **Nokia Germany**<br>**(Nokia Solutions and Networks GmbH & Co. KG)** | GERMANY | ETSI |
| **Nokia Hungary**<br>**(Nokia Solutions and Networks Kft.)** | HUNGARY | ETSI |
| **Nokia Japan**<br>**(Nokia Japan)** | JAPAN | ARIB |
| **Nokia Korea**<br>**(Nokia Korea)** | KOREA (REPUBLIC OF) | TTA |
| **Nokia Poland**<br>**(Nokia Solutions and Networks Sp. z.o.o.)** | POLAND | ETSI |
| **Nokia Shanghai Bell**<br>**(Nokia Shanghai Bell Co., Ltd)** | CHINA | CCSA |
| **Nokia Solutions & Networks (I)**<br>**(Nokia Solutions and Networks India Pvt. Ltd.)** | INDIA | TSDSI |
| **Nokia UK**<br>**(Nokia UK Ltd.)** | UNITED KINGDOM | ETSI |
| **Nordic Semiconductor ASA**<br>**(Nordic Semiconductor ASA)** | NORWAY | ETSI |
| **NOVAMINT**<br>**(NOVAMINT)** | UNITED KINGDOM | ETSI |
| **NTIA**<br>**(National Telecommunications and Information Administration)** | UNITED STATES | ATIS |
| **NTPU**<br>**(National Taipei University)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **NTT**<br>**(Nippon Telegraph and Telephone Corporation (NTT))** | JAPAN | TTC |
| **NTT corporation**<br>**(Nippon Telegraph and Telephone Corporation)** | JAPAN | ETSI |
| **NTT DOCOMO INC.**<br>**(NTT DOCOMO INC.)** | JAPAN | TTC |
| **NTT DOCOMO INC..**<br>**(NTT DOCOMO INC.)** | JAPAN | ARIB |
| **NTT-AT Corp.**<br>**(NTT Advanced Technology Corporation)** | JAPAN | TTC |
| **NTU**<br>**(National Taiwan University)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **Nubia Technology Co.,Ltd**<br>**(Nubia Technology Co.,Ltd)** | CHINA | CCSA |
| **NUFRONT**<br>**(Nufront (Beijing) Technology Co., Ltd.)** | CHINA | CCSA |
| **NVIDIA**<br>**(NVIDIA Corporation)** | UNITED STATES | ATIS |
| **NXP Semiconductors Netherlands**<br>**(NXP Semiconductors Netherlands B.V.)** | NETHERLANDS | ETSI |
| **NYCU**<br>**(National Yang Ming Chiao Tung University)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **Odido**<br>**(Odido Netherlands B.V.)** | NETHERLANDS | ETSI |
| **Ofcom (CH)**<br>**(Ofcom (CH))** | SWITZERLAND | ETSI |
| **Ofcom (U.K.)**<br>**(Ofcom - Office of Communications (U.K.))** | UNITED KINGDOM | ETSI |
| **Oki Electric Industry Co. Ltd.** | JAPAN | TTC |

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| **(OKi Electric Industry Co., Ltd)** | | |
| **Omnispace**<br>**(Omnispace)** | UNITED STATES | ATIS |
| **ONE Media 3.0 LLC**<br>**(ONE Media 3.0 LLC)** | UNITED STATES | ATIS |
| **one2many B.V.**<br>**(one2many B.V.)** | NETHERLANDS | ETSI |
| **OnePlus**<br>**(OnePlus (Shenzhen) Technology Co., LTD)** | CHINA | CCSA |
| **OPPO**<br>**(Guangdong OPPO Mobile Telecommunications Corp.,Ltd.)** | CHINA | ETSI |
| **OPPO (chongqing) Intelligence**<br>**(OPPO (chongqing) Intelligence Technology Limited)** | CHINA | CCSA |
| **OPPO Beijing**<br>**(Beijing OPPO Telecommunications Corp., ltd.)** | CHINA | CCSA |
| **OptM Media**<br>**(OptM Media Solutions Private Limited)** | INDIA | TSDSI |
| **OQTEC**<br>**(OQ TECHNOLOGY)** | LUXEMBOURG | ETSI |
| **Oracle Corporation**<br>**(Oracle Corporation)** | UNITED STATES | ETSI |
| **Orange**<br>**(Orange)** | FRANCE | ETSI |
| **Orange Romania**<br>**(Orange Romania)** | ROMANIA | ETSI |
| **Orange Spain**<br>**(France Telecom España S.A.U.)** | SPAIN | ETSI |
| **Orange UK**<br>**(Orange Brand Services Ltd)** | UNITED KINGDOM | ETSI |
| **ORS**<br>**(Österreichische Rundfunksender GmbH & Co KG)** | AUSTRIA | ETSI |
| **OTD_US**<br>**(OTD_US)** | UNITED STATES | ATIS |
| **OTECH**<br>**(OTECH Germany GmbH)** | GERMANY | ETSI |
| **P.I. WORKS**<br>**(P.I. WORKS TR BILISIM HIZMETLERI A.S.)** | TÜRKIYE | ETSI |
| **Panasonic Holdings Corporation**<br>**(Panasonic Holdings Corporation)** | JAPAN | ARIB |
| **PANASONIC R&D Center Germany**<br>**(PANASONIC R&D Center Germany GmbH)** | GERMANY | ETSI |
| **PCCW Global B.V.**<br>**(PCCW Global B.V.)** | FRANCE | ETSI |
| **Peking University**<br>**(Peking University)** | CHINA | CCSA |
| **Pengcheng laboratory**<br>**(Pengcheng laboratory)** | CHINA | CCSA |
| **Peraton Labs**<br>**(Peraton Labs)** | UNITED STATES | ATIS |
| **Philips International B.V.**<br>**(Philips International B.V.)** | NETHERLANDS | ETSI |
| **PHY Wireless**<br>**(PHY Wireless)** | UNITED STATES | ATIS |
| **PIDS**<br>**(PIDS)** | NETHERLANDS | ETSI |
| **Pivotal Commware**<br>**(Pivotal Commware)** | UNITED STATES | ATIS |
| **Plan-S**<br>**(Plan S Uydu ve Uzay Teknolojileri A.S)** | TÜRKIYE | ETSI |
| **PML**<br>**(Purple Mountain Laboratories: Networking, Communications and Security)** | CHINA | CCSA |
| **Polaris Wireless**<br>**(Polaris Wireless)** | UNITED STATES | ATIS |
| **Polisen**<br>**(Polismyndigheten)** | SWEDEN | ETSI |

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| **POST Luxembourg**<br>**(POST Luxembourg)** | LUXEMBOURG | ETSI |
| **Prasar Bharati**<br>**(Prasar Bharati)** | INDIA | TSDSI |
| **Proximus Plc**<br>**(Proximus Plc)** | BELGIUM | ETSI |
| **PSCE**<br>**(Public Safety Communication Europe Forum)** | BELGIUM | ETSI |
| **PT PORTUGAL SGPS SA**<br>**(PT Portugal SGPS SA)** | PORTUGAL | ETSI |
| **PTS**<br>**(Swedish Post and Telecom Authority)** | SWEDEN | ETSI |
| **Public Safety Canada**<br>**(Public Safety Canada)** | CANADA | ETSI |
| **Qihoo 360**<br>**(Qihoo 360 Technology Co., Ltd.)** | CHINA | CCSA |
| **Qorvo**<br>**(Qorvo)** | UNITED STATES | ETSI |
| **Qualcomm Austria RFFE GmbH**<br>**(Qualcomm Austria RFFE GmbH)** | AUSTRIA | ETSI |
| **QUALCOMM Europe Inc. - Italy**<br>**(QUALCOMM Europe Inc. - Italy Branch Office)** | ITALY | ETSI |
| **QUALCOMM Europe Inc. - Spain**<br>**(QUALCOMM Europe Inc. - Spain Branch Office)** | SPAIN | ETSI |
| **Qualcomm Finland RFFE Oy**<br>**(Qualcomm Finland RFFE Oy)** | FINLAND | ETSI |
| **Qualcomm France**<br>**(Qualcomm France SARL)** | FRANCE | ETSI |
| **Qualcomm Germany**<br>**(Qualcomm Germany GmbH)** | GERMANY | ETSI |
| **Qualcomm Incorporated**<br>**(Qualcomm Incorporated)** | UNITED STATES | ATIS |
| **Qualcomm India Pvt Ltd**<br>**(Qualcomm India Pvt Ltd)** | INDIA | TSDSI |
| **QUALCOMM JAPAN LLC.**<br>**(QUALCOMM JAPAN LLC.)** | JAPAN | ARIB |
| **Qualcomm Korea**<br>**(Qualcomm Korea)** | KOREA (REPUBLIC OF) | TTA |
| **Qualcomm Tech. Netherlands B.V**<br>**(Qualcomm Technologies Netherlands B.V.)** | NETHERLANDS | ETSI |
| **Qualcomm Technologies Int**<br>**(Qualcomm Technologies International, Ltd)** | UNITED KINGDOM | ETSI |
| **Qualcomm Technologies Ireland**<br>**(QT Technologies Ireland Limited)** | IRELAND | ETSI |
| **Quanray**<br>**(Shanghai Quanray Electronics Co., Ltd.)** | CHINA | CCSA |
| **Quectel**<br>**(Quectel Wireless Solutions Co., Ltd.)** | CHINA | CCSA |
| **RadiSys**<br>**(RadiSys Inc.)** | CANADA | ETSI |
| **Rakuten Mobile, Inc**<br>**(Rakuten Mobile, Inc)** | JAPAN | ARIB |
| **RATEL**<br>**(Regulatory Authority For Electronic Communications and Postal Services)** | SERBIA | ETSI |
| **Reliance Jio**<br>**(Reliance Jio)** | INDIA | TSDSI |
| **RICHTEK KOREA**<br>**(RICHTEK KOREA)** | KOREA (REPUBLIC OF) | TTA |
| **RISE**<br>**(RISE Research Institutes of Sweden)** | SWEDEN | ETSI |
| **ROBERT BOSCH GmbH**<br>**(ROBERT BOSCH GmbH)** | GERMANY | ETSI |
| **Rogers Communications Canada**<br>**(Rogers Communications Canada Inc.)** | CANADA | ETSI |
| **ROHDE & SCHWARZ** | GERMANY | ETSI |

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| **(ROHDE & SCHWARZ GmbH & Co.KG)** | | |
| **Ruijie Network Co. Ltd**<br>**(Ruijie Network Co. Ltd)** | CHINA | CCSA |
| **SAICT**<br>**(Shenzhen Academy of Information and Communication Technology)** | CHINA | CCSA |
| **Samsung Electronics Co., Ltd**<br>**(Samsung Electronics Co., Ltd.)** | KOREA (REPUBLIC OF) | TTA |
| **Samsung Electronics Czech**<br>**(Samsung Electronics Czech)** | CZECH REPUBLIC | ETSI |
| **Samsung Electronics France SA**<br>**(Samsung Electronics France SA)** | FRANCE | ETSI |
| **Samsung Electronics GmbH**<br>**(Samsung Electronics GmbH)** | GERMANY | ETSI |
| **Samsung Electronics Iberia SA**<br>**(Samsung Electronics Iberia SA)** | SPAIN | ETSI |
| **Samsung Electronics Nordic AB**<br>**(Samsung Electronics Nordic AB)** | SWEDEN | ETSI |
| **Samsung Electronics Polska**<br>**(Samsung Electronics Polska)** | POLAND | ETSI |
| **Samsung Guangzhou Mobile R&D**<br>**(Samsung Guangzhou Mobile R&D Center)** | CHINA | CCSA |
| **Samsung Nanjing**<br>**(Samsung Electronic (China) R&D Center)** | CHINA | CCSA |
| **Samsung R&D Institute India**<br>**(Samsung R&D Institute India - Bangalore Pvt. Ltd)** | INDIA | TSDSI |
| **SAMSUNG R&D INSTITUTE JAPAN**<br>**(SAMSUNG R&D INSTITUTE JAPAN)** | JAPAN | ARIB |
| **Samsung R&D Institute UK**<br>**(Samsung R&D Institute UK)** | UNITED KINGDOM | ETSI |
| **Samsung Research America**<br>**(Samsung Research America)** | UNITED STATES | ATIS |
| **Samsung Shenzhen**<br>**(Samsung Network R&D Center-Shenzhen)** | CHINA | CCSA |
| **Sandvine Incorporated**<br>**(Sandvine Incorporated)** | CANADA | ETSI |
| **Sanechips**<br>**(Sanechips Technology Co. , Ltd.)** | CHINA | CCSA |
| **Sateliot**<br>**(Satelio IoT Services)** | SPAIN | ETSI |
| **Schindler**<br>**(Schindler Elevator Ltd)** | SWITZERLAND | ETSI |
| **SDI Squared**<br>**(SDI Squared LLC)** | UNITED STATES | ETSI |
| **Sectra Communications AB**<br>**(Sectra Communications AB)** | SWEDEN | ETSI |
| **Security Service**<br>**(Swedish Security Service)** | SWEDEN | ETSI |
| **Semtech Neuchatel SA**<br>**(Semtech Neuchatel SA)** | SWITZERLAND | ETSI |
| **Sennheiser Electronic GmbH**<br>**(Sennheiser Electronic GmbH & Co. KG)** | GERMANY | ETSI |
| **Sensus UK**<br>**(Sensus UK Systems Limited)** | UNITED KINGDOM | ETSI |
| **Sepura Ltd**<br>**(Sepura Limited)** | UNITED KINGDOM | ETSI |
| **Sequans Communications**<br>**(Sequans Communications)** | FRANCE | ETSI |
| **SES S.A.**<br>**(SES S.A.)** | LUXEMBOURG | ETSI |
| **SETS**<br>**(Society for Electronic Transactions and Security)** | INDIA | TSDSI |
| **SEU**<br>**(Southeast University)** | CHINA | CCSA |
| **SGDSN**<br>**(Secrétariat Général de la Défense et de la Sécurité Nationale (SGDSN))** | FRANCE | ETSI |

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| **SGITG**<br>**(State Grid Information & Telecommunication Group Co., Ltd.)** | CHINA | CCSA |
| **SGS Wireless**<br>**(SGS Wireless)** | UNITED KINGDOM | ETSI |
| **Shanghai Chen Si Electronics**<br>**(Shanghai Chen Si Electronics Technology Co., Ltd)** | CHINA | CCSA |
| **Shanghai Jiao Tong University**<br>**(Shanghai Jiao Tong University)** | CHINA | CCSA |
| **Shanghai Tejet Com Technology**<br>**(Shanghai Tejet Communications Technology Co., Ltd.)** | CHINA | CCSA |
| **SHARP Corporation**<br>**(SHARP Corporation)** | JAPAN | ARIB |
| **Shenzhen Heytap**<br>**(Shenzhen Heytap Technology Corp.,Ltd.)** | CHINA | CCSA |
| **ShenZhen Zhongxing Shitong**<br>**(ShenZhen Zhongxing Shitong Tech. Co.,Ltd.)** | CHINA | CCSA |
| **SIA**<br>**(Shenyang Institute of Automation, Chinese Academy of Sciences)** | CHINA | CCSA |
| **Siemens AG**<br>**(Siemens AG)** | GERMANY | ETSI |
| **Signalchip Innovations Pvt.**<br>**(Signalchip Innovations Pvt. Ltd.)** | INDIA | TSDSI |
| **SIST**<br>**(Slovenian Institute for Standardisation)** | SLOVENIA | ETSI |
| **Sisvel**<br>**(Sisvel International S.A.)** | LUXEMBOURG | ETSI |
| **SK Telecom**<br>**(SK TELECOM)** | KOREA (REPUBLIC OF) | TTA |
| **SKY Perfect JSAT Corporation**<br>**(SKY Perfect JSAT Corporation)** | JAPAN | ARIB |
| **Skylo Technologies**<br>**(Skylo Technologies)** | UNITED STATES | ATIS |
| **Skyworks Solutions Inc.**<br>**(Skyworks Solutions Inc.)** | UNITED STATES | ETSI |
| **SmarterMicro Inc.**<br>**(Smarter Microelectronics(Guangzhou) Co.,Ltd)** | CHINA | CCSA |
| **SnT - University of Luxembourg**<br>**(Interdisciplinary Centre for Security, Reliability and Trust/University of Luxembourg)** | LUXEMBOURG | ETSI |
| **SoftBank Corp.**<br>**(SoftBank Corp.)** | JAPAN | ARIB |
| **Softel Systems**<br>**(Softel Systems Pty Ltd)** | AUSTRALIA | ETSI |
| **Softil Ltd**<br>**(Softil Ltd)** | ISRAEL | ETSI |
| **Sony Corporation**<br>**(Sony Corporation)** | JAPAN | ARIB |
| **Sony Europe B.V.**<br>**(Sony Europe B.V.)** | UNITED KINGDOM | ETSI |
| **Sony Group Corporation**<br>**(Sony Group Corporation)** | JAPAN | ARIB |
| **Sooktha Consulting Pvt Ltd**<br>**(Sooktha Consulting Pvt Ltd)** | INDIA | TSDSI |
| **Southern Linc.**<br>**(Southern Linc.)** | UNITED STATES | ATIS |
| **Southwest Jiaotong university**<br>**(Southwest Jiaotong university)** | CHINA | CCSA |
| **SpaceX**<br>**(SpaceX Netherlands B.V)** | NETHERLANDS | ETSI |
| **Spark NZ Ltd**<br>**(Spark NZ Ltd)** | NEW ZEALAND | ATIS |
| **Spirent Communications**<br>**(Spirent Communications)** | UNITED STATES | ETSI |
| **Sporton International Inc**<br>**(Sporton International Inc.)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **Spreadtrum Communications** | CHINA | CCSA |

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| **(Spreadtrum Communications (Shanghai) Co., Ltd.)** | | |
| **SRTC**<br>**(The State Radio_monitoring_center Testing Center)** | CHINA | CCSA |
| **SS8**<br>**(SS8 Networks Inc.)** | UNITED STATES | ETSI |
| **SSNS**<br>**(Special Service for the National Security of Hungary)** | HUNGARY | ETSI |
| **Starpoint**<br>**(Beijing Starpoint Technology Company Limited)** | CHINA | CCSA |
| **STE IDIRECT IRELAND LTD**<br>**(ST ENGINEERING IDIRECT (IRELAND) LIMITED)** | IRELAND | ETSI |
| **Stellar**<br>**(Stellar telecommunications)** | FRANCE | ETSI |
| **STMicroelectronics**<br>**(STMicroelectronics International NV)** | SWITZERLAND | ETSI |
| **Sumitomo Elec. Industries, Ltd**<br>**(Sumitomo Electric Industries, Ltd.)** | JAPAN | ARIB |
| **SUTD**<br>**(Singapore University of Technology and Design)** | SINGAPORE | ETSI |
| **Swift Navigation**<br>**(Swift Navigation)** | UNITED STATES | ATIS |
| **SWISSCOM**<br>**(SWISSCOM SA)** | SWITZERLAND | ETSI |
| **SWR**<br>**(Südwestrundfunk)** | GERMANY | ETSI |
| **SyncTechno Inc.**<br>**(SyncTechno Inc.)** | KOREA (REPUBLIC OF) | TTA |
| **Syniverse**<br>**(M/s Syniverse Technologies Services India Pvt. Ltd.)** | INDIA | TSDSI |
| **TA**<br>**(Tantra Analyst)** | UNITED STATES | ETSI |
| **Tait Europe Limited**<br>**(Tait Europe Limited)** | AUSTRIA | ETSI |
| **Tata Elxsi Limited.**<br>**(Tata Elxsi Limited.)** | INDIA | TSDSI |
| **TCL**<br>**(Shenzhen TCL New Technology Company Ltd.)** | CHINA | CCSA |
| **TCS**<br>**(TATA Consultancy Services)** | INDIA | TSDSI |
| **TD Tech Ltd**<br>**(TD Tech Ltd)** | CHINA | CCSA |
| **TDF**<br>**(TDF SAS)** | FRANCE | ETSI |
| **Tech Mahindra Limited**<br>**(Tech Mahindra Limited)** | INDIA | TSDSI |
| **Tejas Network Limited**<br>**(Tejas Network Limited)** | INDIA | TSDSI |
| **Tektronix GmbH**<br>**(Tektronix GmbH)** | GERMANY | ETSI |
| **TELECOM ITALIA S.p.A.**<br>**(Telecom Italia S.p.A.)** | ITALY | ETSI |
| **Telefonica Germany GmbH**<br>**(Telefónica Germany GmbH & Co OHG)** | GERMANY | ETSI |
| **TELEFONICA S.A.**<br>**(TELEFONICA S.A.)** | SPAIN | ETSI |
| **Telekom Deutschland GmbH**<br>**(Telekom Deutschland GmbH)** | GERMANY | ETSI |
| **TELENOR ASA**<br>**(Telenor ASA)** | NORWAY | ETSI |
| **Telesat International Limited**<br>**(Telesat International Limited)** | UNITED KINGDOM | ETSI |
| **Telia Company AB**<br>**(Telia Company AB)** | SWEDEN | ETSI |
| **Telit Communications S.p.A.**<br>**(Telit Communications S.p.A.)** | ITALY | ETSI |

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| **Telstra Limited**<br>**(Telstra Limited)** | AUSTRALIA | ETSI |
| **TELUS**<br>**(TELUS)** | CANADA | ATIS |
| **Tencent**<br>**(Shenzhen city Tencent computer system Co. Ltd.)** | CHINA | CCSA |
| **Tencent Cloud**<br>**(Tencent cloud computing Beijing Co., Ltd)** | CHINA | CCSA |
| **Teradyne**<br>**(Teradyne)** | UNITED STATES | ATIS |
| **TerreStar Solutions Inc.**<br>**(TerreStar Solutions Inc.)** | CANADA | ATIS |
| **Texas A&M University**<br>**(Texas A&M University)** | UNITED STATES | ETSI |
| **TEXAS Instruments**<br>**(Texas Instruments France)** | FRANCE | ETSI |
| **THALES**<br>**(THALES)** | FRANCE | ETSI |
| **THURAYA TELECOM CO.**<br>**(THURAYA TELECOMMUNICATIONS COMPANY)** | UNITED ARAB EMIRATES | ETSI |
| **Tiami Networks**<br>**(Tiami Networks)** | UNITED STATES | ATIS |
| **TII**<br>**(Technology Innovation Institute)** | UNITED ARAB EMIRATES | ETSI |
| **T-Mobile Austria GmbH**<br>**(T-Mobile AUSTRIA GmbH)** | AUSTRIA | ETSI |
| **T-Mobile Polska S.A.**<br>**(T-Mobile Polska Spolka Akcyjna)** | POLAND | ETSI |
| **T-Mobile USA**<br>**(T-Mobile USA, Inc.)** | UNITED STATES | ETSI |
| **T-Mobile USA Inc.**<br>**(T-Mobile USA Inc.)** | UNITED STATES | ATIS |
| **TNO**<br>**(TNO)** | NETHERLANDS | ETSI |
| **Tongji University**<br>**(Tongji University)** | CHINA | CCSA |
| **Toshiba**<br>**(Toshiba)** | UNITED KINGDOM | ETSI |
| **TOWE Wireless**<br>**(Sushi TOWE Wireless Testing (Shenzhen) Co.,Ltd.)** | CHINA | ETSI |
| **TOYOTA Info Technology Center**<br>**(TOYOTA Info Technology Center USA, Inc.)** | UNITED STATES | ETSI |
| **TOYOTA MOTOR CORPORATION**<br>**(TOYOTA MOTOR CORPORATION)** | JAPAN | TTC |
| **TRAFICOM**<br>**(The Finnish Transport and Communications Agency)** | FINLAND | ETSI |
| **Trafikverket**<br>**(Trafikverket)** | SWEDEN | ETSI |
| **Transsion Holdings**<br>**(Transsion Holdings)** | CHINA | CCSA |
| **TransUnion**<br>**(TransUnion)** | UNITED STATES | ATIS |
| **Trimble**<br>**(Trimble)** | UNITED STATES | ATIS |
| **Tron Future Tech Inc.**<br>**(Tron Future Tech Inc.)** | TAIWAN, PROVINCE OF CHINA | ETSI |
| **TTP plc**<br>**(TTP plc)** | UNITED KINGDOM | ETSI |
| **Turk Telekomunikasyon A.S.**<br>**(Turk Telekomunikasyon A.S.)** | TÜRKIYE | ETSI |
| **TURKCELL**<br>**(Turkcell Iletisim Hizmetleri A.S.)** | TÜRKIYE | ETSI |
| **U.S. Department of Defense**<br>**(U.S. Department of Defense)** | UNITED STATES | ATIS |
| **U.S. Department of Transport.** | UNITED STATES | ATIS |

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| **(U.S. Department of Transportation)** | | |
| **U.S. National Security Agency**<br>**(US National Security Agency)** | UNITED STATES | ATIS |
| **Uangel**<br>**(Uangel Corporation)** | KOREA (REPUBLIC OF) | TTA |
| **ubinexus**<br>**(Beijing Ubinexus Technology Development Co., Ltd)** | CHINA | CCSA |
| **u-blox AG**<br>**(u-blox AG)** | SWITZERLAND | ETSI |
| **UESTC**<br>**(University of Electronic Science and Technology of China)** | CHINA | CCSA |
| **UL VS Ltd**<br>**(UL VS Ltd)** | UNITED KINGDOM | ETSI |
| **UMA**<br>**(Universidad de Malaga)** | SPAIN | ETSI |
| **umlaut**<br>**(umlaut communications GmbH)** | GERMANY | ETSI |
| **UNIBO**<br>**(ALMA MATER STUDIORUM Università di Bologna)** | ITALY | ETSI |
| **UniBw M**<br>**(University of the Bundeswehr Munich)** | GERMANY | ETSI |
| **Unicom Broadband Online**<br>**(Unicom Broadband Online Co., Ltd.)** | CHINA | CCSA |
| **Unicompay**<br>**(Unicompay Co., Ltd.)** | CHINA | CCSA |
| **Union Inter. Chemins de Fer**<br>**(Union Internationale des Chemins de Fer)** | FRANCE | ETSI |
| **Union Telephone Company**<br>**(Union Telephone Company)** | UNITED STATES | ATIS |
| **Unisoc**<br>**(Unisoc (Shanghai) Technologies Co., Ltd.)** | CHINA | CCSA |
| **Unisoc Beijing**<br>**(Beijing Unisoc Communications Technology Co., Ltd.)** | CHINA | CCSA |
| **UPV/EHU**<br>**(Universidad del País Vasco/Euskal Herriko Unibertsitatea)** | SPAIN | ETSI |
| **US Cellular Corporation.**<br>**(US Cellular Corporation/TDS.)** | UNITED STATES | ATIS |
| **UTIMACO TS GmbH**<br>**(UTIMACO TS GmbH)** | GERMANY | ETSI |
| **UTokyo**<br>**(The University of Tokyo)** | JAPAN | ETSI |
| **Vaan Megam**<br>**(Vaan Megam Networks)** | INDIA | TSDSI |
| **Valeo**<br>**(Valeo Telematik und Akustik GmbH)** | GERMANY | ETSI |
| **VALID SOLUCIONES TECNOLÓGICAS**<br>**(VALID SOLUCIONES TECNOLÓGICAS S.A.U)** | SPAIN | ETSI |
| **Valid8**<br>**(Valid8.com, Inc.)** | UNITED STATES | ETSI |
| **Vanchip**<br>**(Vanchip (Tianjin) Technology Co., Ltd.)** | CHINA | CCSA |
| **Verizon Denmark**<br>**(Verizon Denmark A/S)** | DENMARK | ETSI |
| **Verizon Spain**<br>**(Verizon Spain S.L.)** | SPAIN | ETSI |
| **Verizon Sweden**<br>**(Verizon Sweden Aktiebolag 2116)** | SWEDEN | ETSI |
| **Verizon Switzerland AG**<br>**(Verizon Switzerland AG)** | SWITZERLAND | ETSI |
| **Verizon UK Ltd**<br>**(Verizon UK Ltd)** | UNITED KINGDOM | ETSI |
| **Vestel**<br>**(Vestel Elektronik Sanayi ve Ticaret A.S)** | TÜRKIYE | ETSI |
| **ViaSat Satellite Holdings Ltd**<br>**(ViaSat Satellite Holdings Ltd)** | UNITED KINGDOM | ETSI |

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| **VIAVI Solutions**<br>**(Viavi Solutions UK Ltd.)** | UNITED KINGDOM | ETSI |
| **vivo Mobile Com. (Chongqing)**<br>**(vivo Mobile Communication (Chongqing) Co., Ltd)** | CHINA | CCSA |
| **vivo Mobile Communication (H)**<br>**(vivo Mobile Communication (Hangzhou) Co., Ltd.)** | CHINA | CCSA |
| **vivo Mobile Communication (S)**<br>**(vivo Mobile Communication (Shenzhen) Co., Ltd.)** | CHINA | CCSA |
| **vivo Mobile Communication Co.,**<br>**(vivo Mobile Communication Co., Ltd)** | CHINA | CCSA |
| **VIVO TECH GmbH**<br>**(VIVO TECH GmbH)** | GERMANY | ETSI |
| **Vodafone GmbH**<br>**(Vodafone GmbH)** | GERMANY | ETSI |
| **VODAFONE Group Plc**<br>**(Vodafone Group Plc)** | UNITED KINGDOM | ETSI |
| **Vodafone Ireland Plc**<br>**(Vodafone Ireland Plc)** | IRELAND | ETSI |
| **Vodafone Italia SpA**<br>**(Vodafone Italia SpA)** | ITALY | ETSI |
| **Vodafone Romania S.A.**<br>**(Vodafone Romania S.A.)** | ROMANIA | ETSI |
| **Vodafone Telekomünikasyon A.S.**<br>**(Vodafone Telekomünikasyon A.S.)** | TÜRKIYE | ETSI |
| **VoiceAge Corporation**<br>**(VoiceAge Corporation)** | CANADA | ETSI |
| **Volkswagen AG**<br>**(Volkswagen AG)** | GERMANY | ETSI |
| **VSENS**<br>**(Unicom Vsens Telecommunications Co., Ltd)** | CHINA | CCSA |
| **VTT**<br>**(VTT Technical Research Centre of Finland)** | FINLAND | ETSI |
| **WE Certification Oy**<br>**(WE Certification Oy)** | FINLAND | ETSI |
| **Wiliot Ltd.**<br>**(Wiliot Ltd.)** | ISRAEL | ETSI |
| **WILUS Inc.**<br>**(WILUS Inc.)** | KOREA (REPUBLIC OF) | TTA |
| **Wipro GE**<br>**(Wipro GE Healthcare Private Limited)** | INDIA | TSDSI |
| **Wisig Networks Pvt Ltd**<br>**(Wisig Networks Pvt Ltd)** | INDIA | TSDSI |
| **Wuhan CICT Mobile**<br>**(Wuhan CICT Mobile Communications Technology Co., Ltd.)** | CHINA | CCSA |
| **Wuhan Hongxin Technical**<br>**(Wuhan Hongxin Technical Services Co., Ltd.)** | CHINA | CCSA |
| **Wuhan Hongxin Technology**<br>**(Wuhan Hongxin Technology Development Co., Ltd.)** | CHINA | CCSA |
| **Xiaomi Communications**<br>**(Xiaomi Communications)** | CHINA | CCSA |
| **Xiaomi EV Technology**<br>**(Xiaomi EV Technology Co., Ltd.)** | CHINA | CCSA |
| **Xiaomi Technology**<br>**(Xiaomi Technology)** | CHINA | CCSA |
| **Xidian University**<br>**(Xidian University)** | CHINA | CCSA |
| **Xilinx Ireland**<br>**(Xilinx Ireland)** | IRELAND | ETSI |
| **Zhejiang Lab**<br>**(Zhejiang Lab)** | CHINA | CCSA |
| **Zhejiang University**<br>**(Zhejiang University)** | CHINA | CCSA |
| **ZITiS**<br>**(Central Office for Information Technology in the Security Sector)** | GERMANY | ETSI |
| **Zollkriminalamt (ZKA)** | GERMANY | ETSI |

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| **(Zollkriminalamt (ZKA))** | | |
| **ZONSON**<br>**(ZONSON SAMRT AUTO CORPORATION)** | CHINA | CCSA |
| **ZTE**<br>**(ZTE Telecom India Pvt Ltd)** | INDIA | TSDSI |
| **ZTE Corporation**<br>**(ZTE Corporation)** | CHINA | CCSA |
| **ZTE Corporation**<br>**(ZTE Corporation)** | CHINA | ETSI |
| **ZTE FRANCE SASU**<br>**(ZTE FRANCE SASU)** | FRANCE | ETSI |
| **ZTE Italia**<br>**(ZTE Italia S.R.L)** | ITALY | ETSI |
| **ZTE JAPAN K.K.**<br>**(ZTE JAPAN K.K..)** | JAPAN | TTC |
| **ZTE Japan K.K.**<br>**(ZTE Japan K.K.)** | JAPAN | ARIB |
| **ZTE Korea Limited**<br>**(ZTE Korea Limited)** | KOREA (REPUBLIC OF) | TTA |
| **ZTE Photonics**<br>**(ZTE Photonics Technology Co.,Ltd.)** | CHINA | CCSA |
| **ZXNE**<br>**(ZXNE CORPORATION)** | CHINA | CCSA |

Total : 781 Individual Members

Any comments or problems with this application? Please let us know...

# APPENDIX 10

The Wayback Machine - https://web.archive.org/web/20170510190630/http://www.3gpp.org:80/about-3gpp/3gpp-faqs



# 3GPP FAQs

## 3GPP FAQs

Questions about 3GPP Membership
Questions about 3GPP email exploder lists
Questions about Legal Matters
Questions about 3GPP Specifications
Questions about Technical Specification Group/Working Group
Questions about Documents and TSG/WG Meetings
Questions about Work Items and Deliverables
Miscellaneous
Technical topics

## Questions about 3GPP Membership

Who can become an Individual Member of 3GPP and how much does it cost?
Who may participate in 3GPP meetings?
Who shall fill in the 3GPP Individual Member Application form?
What shall I do if a 3GPP company or official contact details change?
What are the different membership categories?
Who may become an observer?
Who may become a Guest Member and do guests have to pay any fees?
Who can apply for market representative Partnership?
Can an ETSI Observer become an Individual Member of 3GPP?
Can an ETSI Applicant apply for 3GPP Membership?
Can an ETSI Member apply for 3GPP Guest status?

## Questions about 3GPP email exploder lists

Are there discussion archives for the 3GPP exploder lists?
How do I subscribe to the 3GPP exploder lists?

## Questions about Legal Matters

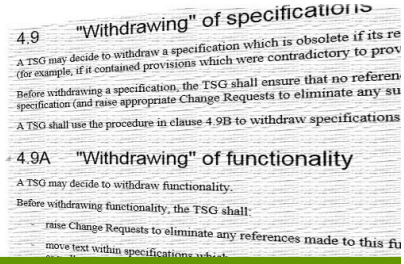
What is the 3GPP IPR Policy?
What is the 3GPP policy on licensing?
Who owns the Technical Specifications and the Technical Reports approved by 3GPP?
Are meeting contributions to ETSI TC SMG publically available?
Is permission needed to use the 3GPP logo in marketing collaterals or on a web site?
Can I use computer code included with a 3GPP TS to implement a product?

## Questions about 3GPP Specifications

How do I create the next Release version of a TS or TR?
Where can the rules, protocols or software needed to develop applications for UMTS be found?
What is the correlation between Stage 1, Stage 2 and Stage 3?
Are the 3GPP specifications produced only in word?
Which group works with specifications covering the use of the GSM codec (either in C or Java based)?
Where can I find documents produced by the GSM MoU Group / GSM Association?
Where would I find a document (e.g. UMTS 30.03 version 3.1.0) which does not appear on the status list?
Where are all the Change Requests (CRs) located?
Where are all the current ETSI SMG specs located?
Which group works on Physical Layer aspects of UMTS/LTE?
Where can I find the list of Abstract syntax notation (ASN.1) object identifiers?
Where can I find the 3GPP Confidentiality and Integrity algorithms?
What is a Release - how does specification version numbering work?
Where can I find information on the current status of 3GPP specifications?
What is the system for numbering specifications?
What is the meaning of the text at the foot of the TS/TR cover page?

## Questions about Technical Specification Group/Working Group




4.9 "Withdrawing" of specifications

A TSG may decide to withdraw a specification which is obsolete if its re
(for example, if it contained provisions which were contradictory to prov

Before withdrawing a specification, the TSG shall ensure that no referen
specification (and raise appropriate Change Requests to eliminate any su

A TSG shall use the procedure in clause 4.9B to withdraw specifications

4.9A "Withdrawing" of functionality

A TSG may decide to withdraw functionality.

Before withdrawing functionality, the TSG shall:

- raise Change Requests to eliminate any references made to this fu
- move text within specifications

Proposal to withdraw TR 38.900
(channel model for spectrum above 6GHz)
at RAN#76

Who are the TSG/WG Officials and Support team and where can I find their contact details?
Where can I find the Terms of Reference for my TSG/WG?
May I become an Official?
Where are my TSG/WGs documents stored?

## Questions about Documents and TSG/WG Meetings

How do I register for a meeting?
Who can submit a change proposal on any 3GPP specifications to 3GPP?
If a change proposal is submitted how long does it take for it to get approved?
How to get a user name and password for "Reserve a Document Number"?
How do I obtain a document number for my contribution?
Where can I download documents for an upcoming meeting?
Where can I find a temporary document template?

## Questions about Work Items and Deliverables

What is my role when my TSG/WGs has to approve a deliverable?
What are the different types of deliverables?
Can I write an 3GPP Document myself?
Do I and my company have to support my TSG/WGs Work Items?

## Miscellaneous

Do I need a password and user name to access the 3GPP Web site ?
Can you give me information about which companies manufacture particular types of equipment. (...)
How can I determine when a meeting contribution document (TDoc) became publicly available?
Is it possible to determine the date and time of publication of a particular version of a 3GPP specification?

## Technical topics

What formalities do I have to go through to get type approval for terminal equipment in Europe? Is there a single point of contact? What standards does my equipment need to conform to in order that I can place it on the market?
Where can I find a list of technical terms and abbreviations used in 3GPP documents?
What is the difference between a SIM and a USIM? What is a UICC?
I have transferred a video file from my phone to my PC. Where can I find a player for 3gp files?
Where can I find the specification of the SIM Lock feature?

## Who can become an Individual Member of 3GPP and how much does it cost?

Individual Members are by definition members of the Organizational Partners of 3GPP. This means that members of standardization bodies such as ETSI, ARIB, TTA, TTC, ATIS and CCSA have a right to take part in 3GPP. If your company becomes an ETSI member, please be informed that for participation in 3GPP you need to pay 3 units of contribution as a minimum except SMEs, Users, Universities, Public Research Bodies who should pay 2 units (instead of 1).

ETSI Members' and associate members' fees are calculated by class. The class is derived from the member company's annual ECRT band (Electronics Communications Related Turnover) – see ECRT definition.
Each class corresponds to a number of units. This number determines the contribution payable.

Example: If your organization declares an annual ECRT of up to 135€ million, you would need to pay 2 Units of Contribution (corresponding to 9380€ per year) plus an additional UoC for participation in 3GPP of 3380€ (see fees table). Members joining ETSI during the 2nd half of the year benefit from a 50% rebate on the membership fee of the current year. In this case, you would pay 12760€ minus 50% = 6380€ for yyyy.

## Who may participate in 3GPP meetings?

To attend a 3GPP meeting, you must be a 3GPP Individual Member (i.e., you must be a Member of one of the Organizational Partners involved in the project; ARIB, CCSA, ETSI, ATIS, TTA , TTC or TSDSI). A non-member company should seek membership with one of the above partners to be eligible to contribute and participate at 3GPP Meetings.

## Who shall fill in the 3GPP Individual Member Application form?

The person legally responsible for the requesting company shall fill in the form.

## What shall I do if a 3GPP company or official contact details change?

All changes of correspondence should be notified to ETSI Membership and 3GPPMembership.
In case of change of official contact an ETSI Online (EOL) account will be created for the new contact.
Please note that as official contact person you can view and modify your personal and organization's contact details via the "Manage my membership" web interface.

## What are the different membership categories?

The different membership categories of 3GPP are described in Article 4 of the 3GPP Working Procedures.

## Who may become an observer?

The status of Observer may be granted by the Organizational Partners to an entity which has the qualifications to become a future Partner (see also 3GPP Working Procedures Article 10)

## Who may become a 3GPP Guest Member and do guests have to pay any fees?

The 3GPP Guest status is for potential Individual Members who may be granted permission to participate in 3GPP for a maximum period of 6 months. Guest status is granted on a case-by-case basis by the Organizational Partners (see also 3GPP Working Procedures Article 10). If you like to apply for a Guest status, please complete the on-line 3GPP Application form.

No membership fees are requested for Guest applications. The Guest status is a one time only membership which is used to enable a company to decide whether or not they wish to become a full member (by joining one of the Partners).

## Who can apply for market representative Partnership?

Organisation who have the ability to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g., services, features and functionality) falling within the 3GPP scope (see also 3GPP Working Procedures, Article 7).

## Can an ETSI Observer become an Individual Member of 3GPP?

An ETSI Observer cannot become an Individual Member of 3GPP. An ETSI Observer may "observe" all activities, but their participation is limited to the ETSI General Assembly only. Therefore, ETSI Observers have no participation rights in 3GPP. ETSI Observers have access to ETSI documentation and of course to 3GPP documentation since that is openly published on the web.

3GPP does have it's own category called "Observer" but that is entirely different and is used for potential Partners.

## Can an ETSI Applicant apply for 3GPP Membership?

YES, an ETSI Applicant means that your request to become an ETSI Member will be addressed (and normally approved) at the next General Assembly and that the company has specified they want to participate in 3GPP activities. See also above regarding 3GPP fees.

## Can an ETSI Member apply for 3GPP Guest status?

Yes, any ETSI Member can apply for a 3GPP Guest status by filling in the on-line 3GPP Application form.

## Are there discussion archives for the 3GPP exploder lists?

Yes! To see the complete list please have a look here: Home page of listserv and scroll down until you find the list you are interested in. For example, the archives for the main RAN email list.

## How do I subscribe to the 3GPP exploder lists?

All 3GPP email exploder lists can be found at list.3gpp.org. In order to subscribe to any of the lists, scroll down until you find the list you are interested in, then click on the link and on the right side of the page you will find Subscribe or Unsubscribe. Click on the link and follow the simple instructions. Delegates who already have an ETSI username and password should use the list management application on the ETSI site.

## What is the 3GPP IPR Policy?

The 3GPP Organizational Partners have agreed that their IPR policies should be respected and that their respective members should be encouraged to declare "their willingness to grant licenses on fair, reasonable terms and conditions and on non discriminatory basis" (Article 3.1 of the Third Generation Partnership Project). For more information, look here >>>

The above-mentioned principles are further reflected in Article 55 of the 3GPP Working Procedures which request that each Individual Members should declare "at the earliest opportunity, any IPR which they believe to be essential, or potentially essential, to any work ongoing within 3GPP".

## What is the 3GPP policy on licensing?

Some aspects of 3GPP systems are covered by essential Intellectual Property Rights (IPR) - that is, patented technologies without which equipment cannot be implemented. The IPR vests in - i.e. the patents are held by - individual companies, and not by 3GPP itself or any of its Organizational Partners (OPs). All Individual Members of 3GPP abide by the IPR policies of the OP to which they belong; all such policies are broadly similar see also "What is the 3GPP IPR Policy", and require IPR holders to make licences available to all third parties, whether or not they are 3GPP Individual Members, under fair, reasonable and non-discriminatory (FRAND) terms.

Neither 3GPP nor its component OPs offer an IPR search service. It is the responsibility of each manufacturer / system implementor to seek and obtain its own licenses from the individual IPR holders. For more information, and a guide to the IPRs declared to each 3GPP OP, look here>>>

## Who owns the Technical Specifications and the Technical Reports approved by 3GPP?

According to the Article 3.2.2 of the Third Generation Partnership Project Agreement, the 3GPP Organizational Partners jointly own copyright on the Technical Specifications and the Technical Reports approved by 3GPP.

## Are meeting contributions to ETSI TC SMG publically available?

ETSI TC SMG meeting documents can be found on the ETSI docbox file server. Access is limited to bona fide representatives of ETSI member organizations. These, together with early versions of the GSM specifications, have been gathered together into a set of DVDs "A Technical History of GSM" available to ETSI members via the ETSI WEB store.

The GSM standardization work was transferred from CEPT to ETSI in 1991. TC SMG was closed at meeting #32 and TC MSG created to continue the work. Like almost all ETSI Technical Committees, participation in TC SMG and its working groups was open to all ETSI member organizations. That is, any bona fide representative of an ETSI member was free to participate. Exceptionally, other individuals could participate by express invitation of the chairman. Each meeting report contains a list of participants with their corporate affiliations.

Until the late 1990s, all meeting documents were circulated in paper form. Electronic files started to take over from paper in around 1997. Meeting documents ("TDocs") were distributed by post (later, by fax) in batches prior to the meeting, to those persons registered as regular participants in SMG or the appropriate working group, and many more documents were produced during the course of the meeting itself. Although a provision existed (and still exists) in the context of the IPR Policy for contributors to place restrictions on the distribution of TDocs via a formal notification at the time the document was provided, this was seldom if ever invoked. In the absence of such a condition, all TDocs were free of any restriction on subsequent distribution. Thus no restriction has ever been placed on how meeting participants dispose of the documents subsequent to their distribution before, during, or after the meeting. There were no non-disclosure agreements.

ETSI maintains a paper archive of the SMG TDocs, and bona fide representatives of current ETSI members can, by appointment, make an accompanied search of the archives. This facility extends to members which may not have been members at the time the document was originally produced.

TC-approved versions of ETSI “deliverables” (see ETSI Directives for formal definition of this term) would have been transferred by the support officer of the committee to the secretariat team responsible for publishing ETSI deliverables. That team would have made cosmetic (non-technical) modifications to the draft deliverables before issuing them. Depending on the type of “deliverable”, those documents would have been issued via National Standards Organizations (NSOs) either for immediate publication, or first via either a one-step or two-step national public enquiry and vote process prior to final publication by ETSI. In ETSI parlance, “publication” of a deliverable is the final step in the development cycle of a technical standard, and has a precise meaning. That meaning is not “making publically available”, since draft deliverables released for public enquiry or for vote are "publically available" but not yet "published".

If the confidentiality conditions described above had been imposed on a TDoc by its authors, if the text of that TDoc was in due course incorporated into an ETSI "deliverable", then those conditions are regarded as annulled from the date on which the deliverable is published.

Collections of TDocs / meeting reports have from time to time been made available to ETSI members in CD or DVD form, look here >>>

## Is permission needed to use the 3GPP logo in marketing collaterals or on a web site?

ETSI (European Telecommunications Standards Institute) is the sole owner of the following acronyms:

ETSI,
DECT,
UMTS,
3GPP and
TIPHON,

as well as the ETSI, TIPHON, 3GPP and LTE logos. ETSI Members are authorized to use these Trade Marks in accordance with Collective Letter 1943. Authorization is needed to use the above mentioned acronyms and logos.

For further information contact the ETSI Legal Team or see http://www.3gpp.org/about-3gpp/legal-matters/logo-use.

## Can I use computer code included with a 3GPP TS to implement a product?

Yes, but read this clause carefully. Some 3GPP Technical Specifications include computer code such as ASN.1 or XML (protocols), ANSI-C language (codecs), ...; and some include test vectors (codecs) for verifying implementations. These are published to allow users of these TSs to implement real-world products. No permission is required from 3GPP or its Organizational Partners (OPs) to use this code in the design of products - e.g. to compile the C to implement a codec in machine code.

Nevertheless, there may be essential IPR involved with such a design, and implementers are obliged to seek licences from IPR owners to use that technology. See also What is the 3GPP policy on licensing?

Moreover, the copyright of all 3GPP TSs and TRs vests jointly by all the 3GPP OPs. Other than for in-house copies for the purpose of further development of the 3GPP standard or for product design purposes, etc. you may not reproduce any part of a 3GPP TS or TR without seeking permission from 3GPP (e.g. from the ETSI Legal Team): use the procedure described on the legal area of this site. This means that you must not provide verbatim copies of source code (or lightly modified copies) without seeking permission from 3GPP.

Finally, you are reminded that 3GPP TSs and TRs have no legal status, and you should not design products directly to them. See the advice notice on the cover page of every 3GPP TS and TR. Instead, use the technically identical publication of one of the OPs.

## How do I create the next Release version of a TS or TR?

There are three ways of upgrading a Release X spec to Release X+1:

1. Write a CR to the latest Release X version to incorporate technical changes to satisfy a Release X+1 work item, and on the cover sheet showing the WI code for that work item and the Release code for Release X+1. If the CR is approved at TSG level, this will automatically create the first instance of the next Release of the spec.
2. Make a specific request to the TSG to upgrade the latest version of the spec from Release X to Release X+1. This might be needed if the functionalities of the two Releases diverge, though backwards-incompatibility is to be avoided if possible.
3. Do nothing. If a spec has survived unchanged throughout the period during which Release X+1 was developed, when Release X+1 is frozen, all such specs will automatically be upgraded from Release X to Release X+1 without technical change.

## Where can the rules, protocols or software needed to develop applications for UMTS be found?

A good place to start is on the 3GPP website, and particularly the specifications list.

## What is the correlation between Stage 1, Stage 2 and Stage 3?

A three-stage methodology as defined in ITU T Recommendation I.130 is applied in 3GPP according TR 21.900 clause 4.1:

Stage 1 is an overall service description from the user's standpoint.
Stage 2 is an overall description of the organization of the network functions to map service requirements into network capabilities.
Stage 3 is the definition of switching and signalling capabilities needed to support services defined in stage 1.

## Are the 3GPP specifications produced only in word?

The 3GPP specs are published as ETSI deliverables, and these are available in PDF form http://www.etsi.org/standards-search. But you can download a free Word viewer (i.e. read only) from the Microsoft web site. PDF is inherently secure (more so than html, in fact), and because WordViewer is very simple (it can not handle macros, for example), it is pretty safe too. ETSI has no plans at present to publish specifications in plain text or in html.

## Which group works with specifications covering the use of the GSM codec (either in C or Java based)?

The SMG STC SMG11 and 3GPP SA4 specifications, available from http://www.3gpp.org, respectively deal with this. It gives you a list of specifications via the status list (look for the GSM specs in the MS-Access database at : http://www.3gpp.org/ftp/Information/Databases/Spec_Status/)

and you can then download the specs you need. If you do not have an ETSI EOL account, you can download the ETSI equivalent standards from http://www.etsi.org/standards-search.

## Where can I find documents produced by the GSM MoU Group / GSM Association?

These documents are not available via 3GPP or its Organizational Partners. You must address this question to the GSM Association.

## Where would I find a document (e.g. UMTS 30.03 version 3.1.0) which does not appear on the 3GPP Status List?

Look at http://www.3gpp.org/DynaReport/3003U.htm. It is a document stemming from the initial TC-SMG studies on UMTS, not a product of 3GPP. It was, in fact, published as an ETSI deliverable, TR 101 112, and this may be downloaded via http://www.etsi.org/standards-search.

## Where are all the Change Requests (CRs) located?

The CR database can be downloaded under: http://www.3gpp.org/ftp/Information/Databases/Change_Request/

Or you select the specification under:
http://www.3gpp.org/specifications/79-specification-numbering

The information is classed by series so it is very easy to locate the particular specification which interests you. After selecting a series and a specification you will find a line "Change Requests for this spec: click here." which provides a web list of the CRs for this specification.

If, for example, you are looking for CRs on GSM 08.18 then you would use this link:
http://www.3gpp.org/ftp/Specs/html-info/0818-CRs.htm
http://www.3gpp.org/DynaReport/0818http://www.3gpp.org/ftp/Specs/html-info/0818-CRs.htm
-CRs.htm

## Where are all the current ETSI SMG specs located?

All the ETSI SMG specs are located here archives for the GSM documentation. An ETSI On-Line account is needed to access these documents. You can apply for an ETSI online account.
In general, the cross-referencing between GSM and ETSI deliverables, and between 3GPP and ETSI deliverables may be found at http://webapp.etsi.org/key/queryform.asp

## Which group works on Physical Layer aspects of UMTS/LTE?

The radio aspects are standardised in TSG-RAN. The technical work is done in the 5 Working Groups of RAN (WG1 radio layer 1, WG2 radio layer 2/3, WG3 interfaces, WG4 RF measurements, WG5 Mobile Terminal Conformance Testing).
So Physical Layer aspects are addressed by TSG RAN WG1. Their UMTS specifications are numbered 25.2xx and their LTE specifications are numbered 36.2xx.
The temporary documents (meeting documents etc.) of WG1 are stored on ftp://ftp.3gpp.org/TSG_RAN/WG1_RL1.

## Where can I find the list of Abstract syntax notation (ASN.1) object identifiers?

The expandable list of object identifiers is available here >>>. To see the formal definition of the object identifiers, see the document cited on the right. The tree is not necessarily complete; further extensions may be included in the referenced document. For more information look here >>>.

## Where can I find the 3GPP Confidentiality and Integrity algorithms?

The 3GPP Confidentiality and Integrity algorithms F8 & F9 (KASUMI) have been developed through the collaborative efforts of the 3GPP Organizational Partners. For more information and in order to download the algorithms look here >>>.

## What is a Release - how does specification version numbering work?

To meet new market requirements, 3GPP specifications are continually being enhanced with new features. In order to provide developers with a stable platform for implementation while at the same time allowing the addition of new features, the 3GPP uses a system of parallel "releases". For more information look here >>>.

## Where can I find information on the current status of 3GPP specifications?

New versions of many 3GPP specifications are made available shortly after the 3GPP TSG plenary meetings which take place four times a year (March, June, September and December). In order to identify what the current version is or and how to find information about older versions of specifications look here >>>.

## What is the system for numbering specifications?

All 3G and GSM specifications have a 3GPP specification number consisting of 4 or 5 digits. (e.g., 09.02 or 29.002). For a more complete description and examples look here >>>.

## Who are the TSG/WG Officials and Support team and where can I find their contact details?

Each TSG/WG has a Chairman, up to two Vice-Chairmen (three Vice-Chairmen) in the case of TSGs and a secretary who is a member of the support team. From the 3GPP structural organization page, click on the TSG or WG of interest to reach its home page. From there, click on the "officials" entry in the table.

## Where can I find the Terms of Reference for my TSG/WG?

The current Terms of Reference for each TSG/WG appear on the web pages of each TSG/WG.

## May I become an Official?

The TSG Chairman and Vice Chairmen are elected by the Technical Specification Group from amongst the Individual Member representatives. Each TSG can elect a maximum of two Vice Chairmen. Once elected, these candidates are proposed to the PCG for appointment.
The Working Group Chairman and Vice Chairmen are elected by the Working Group from amongst the Individual Member representatives. Each Working Group can elect a maximum of two Vice Chairmen.
A candidate for TSG or Working Group election shall provide a letter of support from his Organization and nominations may be made up to the point when an election takes place.
The TSG Chairman and Vice-Chairmen shall be appointed by the PCG on the proposal of the TSG.
The Chairman and the Vice-Chairmen shall be appointed for a two year term of office. The Chairman and Vice-Chairmen may be appointed for one further consecutive term. If, at the end of a Chairman or Vice Chairmans second term, no other candidates are available, the Chairman or Vice Chairmen may be appointed for a further term.
Chairman and Vice Chairmen should not be from the same region, Organizational Partner, or from the same group of companies, unless no other candidate is available.
Successive Chairmen should not be from the same Organizational Partner, the same region or from the same group of companies, unless no other candidate is available

## How do I register for a meeting?

To register to any 3GPP TSG/WG meeting, please go to the Meetings tab on the 3GPP Ultimate portal (3GU) at https://portal.3gpp.org/, log in with your EOL credentials, and click "Not registered" in the Registration column of the meeting in question. When registration is complete, you will receive a confirmation email. Keep this email, it contains important information,

without which you will not be able to confirm your presence!

Once you are at the meeting you have to "Check-in" to confirm your presence at the meeting itself. To check in, open the registration confirmation email and click on the check-in URL. This will take you to a page on the local meeting server (not the Internet). After you have checked in, your token will be sent to the main 3GPP server, and the web-based participants list will now show "yes" in the Participated column. Obviously you must be physically present at the meeting venue to be able to reach the local server.

## Who can submit a change proposal on any 3GPP specifications to 3GPP?

Any bona fide representative of any 3GPP Individual Member (see list via the first sentence at http://www.3gpp.org/membership) can present a technical contribution - for example, a Change Request - to any 3GPP TSG or WG meeting.

## If a change proposal is submitted how long does it take for it to get approved?

The usual procedure is that the responsible Working Group will examine a CR and agree it (or revise it until such time as it be agreeable - or not!). Having been agreed at WG level, it is packaged with related CRs and sent to the TSG plenary, where it will be discussed if necessary and then - if appropriate - formally approved. Within a matter a few weeks at most, a new version of the Specification is produced, which includes the contents of the TSG-approved CR.

TSGs meet every three months, and WGs meet at least once between each TSG meeting (sometimes two or occasionally even more times). Thus from inception of a CR to its approval is normally a matter of a few weeks, depending on the point in the meeting schedule of the WG and TSG concerned.

## How to get a user name and password for "Reserve a Document Number"?

You need to request an EOL account via: http://webapp.etsi.org/createaccount/form.asp (username and password will then be sent to you by separate email).

## How do I obtain a document number for my contribution?

Delegates wishing to make contributions must first obtain a document number either from the secretary or automatically via an on-line application "Automatic Document Numbering (ADN)" which is used by some groups.

You need a user name and password to "Reserve a Document Number" (see above).

## Where can I download documents for an upcoming meeting?

Each TSG/WG has a specific area allocated on the 3GPP ftp server. For example TSG SA look here ftp://ftp.3gpp.org/tsg_sa/TSG_SA/. It is advisable for delegates attending a meeting to download the documents available prior to the meeting from the ftp server and onto their personal computers.

## Where can I find a temporary document template?

The document template is made available by each TSG/WG in the meeting respective folder on the ftp server (see above).

## What is my role when my TSG/WGs has to approve a deliverable?

Approval of Technical Specifications and Technical reports by a TSG shall normally be by consensus. Where consensus cannot be achieved in the TSG a vote may be taken.
When Technical Specifications and Technical Reports become sufficiently stable, they shall be put under change control of the relevant TSG. The further elaboration of these Technical Specifications and Technical Reports shall be achieved by Change Requests (CRs) to be approved by the TSG.

## What are the different types of deliverables?

3GPP shall prepare, approve and maintain documents known as Technical Specifications and Technical Reports. Such documents shall be drawn up by the TSGs and shall, following approval at that level, be submitted to the participating Organizational Partners to be submitted to their respective standardization processes.

## Can I write an 3GPP Document myself?

Why not?! If you wish to propose a deliverable then bring it to the attention of your chairman and the other members of the TSG/WG in order to discuss the subject.
Each proposed new Work Item shall be supported by at least four Individual Members, and their names shall be recorded in the Work Item definition prepared for the TSG approval. One or more persons shall be named as Rapporteur for the proposed Work Item, and the Rapporteur shall act as the prime contact point on technical matters and for information on progress throughout the drafting phases. The supporting Individual Members are expected to contribute to and progress the new work item throughout the drafting phases.
In addition to the above, TSGs shall approve new Work Items, giving all essential parameters. The proposal shall be entered into the 3GPP work programme, clearly marked as a new entry, for which a unique reference identity shall be allocated.

## Do I and my company have to support my TSG/WGs Work Items?

Neither you or your company is obliged to support the work items of your TSG/WG, however it is normal that if you and your company are supporting members of a Work Item that you be in agreement with their work and will normally support the production of the related deliverable.

## Do I need a password and user name to access the 3GPP Web site ?

No password is needed to access any information on the 3GPP Web site, all information is openly published.

## Can you give me information about which companies manufacture particular types of equipment. Or about what services are available on particular networks?

No. The 3GPP Support Team must remain neutral and must not show bias to any of its Individual Members. Such information may be available from the Global Mobile Suppliers Association (www.gsacom.com) where you will find a statistics area which could be of help.

## How can I determine when a meeting contribution document (TDoc) became publicly available?

TDoc numbers start to be allocated some weeks before a 3GPP meeting, and the authors then create them and they or the group's secretary uploads them to the public file server as soon as possible. Some may have been distributed to the group's members in draft form for review, using the email exploder, in advance of the final one becoming available, and for some groups, it is normal to distribute even the final TDoc via the exploder, where the secretary picks it up and copies it to the public server. Typically, at the start of a meeting, around 50% of the TDocs are available.

This distribution on the group's email exploder is important, because once that happens, the document is effectively in the public domain, since membership of the exploder is open to all and is unpoliced.

During the meeting, further TDocs are created, mostly revisions of ones available before the meeting, but probably some brand new ones too – for example, outgoing liaison statements. These are uploaded to the meeting server, but (until recently) may or may not be uploaded to the public server during the meeting. (Since 2014, for most meetings, meeting server contents have been mirrored to a folder on the public server, but these copies are deleted shortly after the end of the meeting.)

Soon after the end of the meeting – same day, or at worst within a few days – the TDocs created during the meeting are uploaded by the secretary to the public server. Occasionally, some matters from the meeting cannot be resolved until maybe one week later, and these might result in some very late TDocs which are produced well after the end of the meeting, and thus uploaded onto the public server correspondingly late.

When the secretary copies from the meeting server (or from his own PC) to the public server, he may opt to only copy the missing files (i.e. the new ones), which is the best approach; or he may decide to overwrite everything and thus do a complete refresh of the files on the public server, which will now get an upload date/time-stamp of the new upload. This latter approach is now deprecated but has sometimes happened; you can detect this most easily when a meeting shows the same date/time-stamp for all TDoc files.

In cases such as this, one has to descend to greater subterfuge to narrow down the likely "public availability" moment. The zip file for a TDoc typically contains a Word file which has a particular date/time-stamp, which puts an absolute limit on the earliest moment that the TDoc could have become available in that form.

Searching the group's email exploder archive (http://list.etsi.org/scripts/wa.exe?INDEX) on or about the suspected production date gleaned from the file date/time-stamp may well reveal the message in which the TDoc was first distributed, or perhaps the message by which the group's secretary announced that it was available on the server. Note however that this technique does not reveal any earlier versions of the TDoc which might have been circulated, either as draft versions of the identified TDoc or as other Tdocs which were ultimately revised into the actual TDoc of interest. In order to identify this latter case, it is necessary to refer to the official secretary's report of the meeting, where the train of revisions will be evident.

## Is it possible to determine the date and time of publication of a particular version of a 3GPP Spec?

During the drafting phase (versions lower than 3.0.0), 3GPP TSs and TRs ("Specs") are under the control of their authors ("rapporteurs") and are handled like normal meeting contributions (see above). Revised versions incorporating text agreed by the responsible working group are often made available by the rapporteur via the group's email exploder shortly after the end of the meeting at which such text was discussed. Again, consultation of the exploder archives can reveal this. Alternatively, a revised draft may be sent directly to the 3GPP Support Team, and it will be uploaded to the public file server (specs archive directory) shortly afterwards. Again, the time stamp of the Zip file can be relied upon to indicate when the upload occurred.

After formal approval by the TSG (versions 3.0.0 or greater), Specs are edited only by the Support Team. The first approved version is based upon the draft version formally approved by the TSG, and thereafter versions are generated whenever Change Requests are approved by the TSG. These versions are made available shortly after the TSG meeting at which such approval occurred. The date (year and month) shown at the top of the Spec's cover page indicates either the date of (the last day of) the meeting, or the month in which the new version was prepared. However a more precise indication of the date of availability can be obtained from the Spec's web page (via the table at http://www.3gpp.org/specifications/) where a precise date is shown in the "available" column.

More information on the procedures relating to Spec handing can be found in 3GPP TR 21.900.

Note that, in accordance with the statement at the foot of the cover page of all 3GPP Specs, 3GPP does not "publish" its Specs per se. Formal publication is the responsibility of the individual Standards Development Organizations which comprise the Organizational Partners of 3GPP. For further information, see http://www.3gpp.org/specifications/63-official-publications.

## What formalities do I have to go through to get type approval for terminal equipment in Europe? Is there a single point of contact? What standards does my equipment need to conform to in order that I can place it on the market?

The legal requirements for the marketing of electrical products in Europe are governed by various EU Directives, depending on the nature of the equipment. Conformity with any of these Directives can be demonstrated by the use of Harmonized Standards, whose title has been cited in the Official Journal of the European Union. The lists of relevant standards can be found on the Commission web site which can be accessed via http://www.newapproach.org/Directives/DirectiveList.asp.

General electrical equipment is covered by the EMC Directive & Low Voltage Directives, see http://ec.europa.eu/enterprise/sectors/electrical/documents/index_en.htm.
The harmonized standards are listed at http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/index_en.htm
More general information on procedures to declare conformity and how equipment should be marked are contained on the web sites related to the two Directives.

Radio Equipment and Telecommunications Terminal Equipment is covered by the Radio and Telecommunications Terminal Equipment Directive, see http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/rtte/index_en.htm, which also includes a link to the one-stop procedure for "placing on the market" (http://ec.europa.eu/enterprise/sectors/rtte/documents/guidance/one-stop-procedure_en.htm).

Further information on EU harmonized standards relevant to telecommunications can be found on the ETSI site at http://www.etsi.org/standards/looking-for-an-etsi-standard/list-of-harmonized-standards, and the published standards themselves can be downloaded via http://pda.etsi.org/pda/queryform.asp.

## Where can I find a list of technical terms and abbreviations used in 3GPP documents?

Individual terms are defined in each 3GPP Technical Specification and Technical Report. A compendium of terms and abbreviations can be found in 3GPP TR 21.905. ETSI maintains a list of all terms and abbreviations defined in its publications in "TEDDI".

## What is the difference between a SIM and a USIM? What is a UICC?

The Universal Integrated Circuit Card (UICC) is the removable card bearing a silicon chip which holds 3GPP system subscriber information. The UICC is a general purpose card having both non-volatile memory and a general-purpose processor. Thus while it is used, in a 3GPP terminal, to hold (U)SIM information / applications, it is can also be used for other purposes, possibly unrelated to telecommunications. A common use of UICCs is in the well-known credit card format, and there is no reason why a single card could not hold (U)SIM functionality in addition to electronic purse / credit card functionality, or indeed any other application / data.

The Subscriber Identity Module (SIM) is the collection of functions which personalize a 3GPP terminal. The SIM contains static information about the services subscribed to, the phone number, the identity of the home network, a list of preferred roaming networks, and so on. The SIM also contains storage capacity for the subscriber's contacts' phone numbers. The term "SIM" is often misused for "UICC". The SIM concept was created during the early development of the GSM standards, and second-generation (based on GERAN) terminals up to and including Release 4 use SIM functionality.

For third generation systems (based on UTRAN), more complex functionality was called for, and the SIM evolved into the USIM or Universal Subscriber Identity Module. Release 99 3rd generations onwards use USIMs rather than SIMs. From Release 5 onwards, both second and third generation terminals use USIMs (though to maintain backwards compatibility with older networks and terminals, later Release 2nd generation USIMs are likely to implement Rel-4 SIM functionality in addition to Rel-5 or later USIM functionality).

For further information on the 3GPP Release system, see the Release page.

## I have transferred a video file from my phone to my PC. Where can I find a player for 3gp files?

The 3gp file format is defined in 3GPP TS 26.244 and in 3GPP TS 26.412. However, 3GPP has not defined a specific decoder. Your phone manufacturer may have supplied a player (check the CD-ROM which came with your phone) or look on its web site. Alternatively, search the Internet: a number of commercial players exist, and trial versions of some may be downloaded without charge.

## Where can I find the specification of the SIM Lock feature?

In clause 8 of 3GPP TS 22.022.

## What is the meaning of the text at the foot of the TS/TR cover page?

The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP..
The present document has not been subject to any approval process by the 3GPPOrganizational Partners and shall not be implemented.
This Specification is provided for future development work within 3GPPonly. The Organizational Partners accept no liability for any use of this Specification.

Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices.

3GPP is not a legally incorporated body, and its technical work is conducted under the auspices of its Organizational Partners, each of which transposes relevant 3GPP specifications as its own publications. Thus the "raw" 3GPP TSs and TRs have no legal status per se. Under an agreement with the ITU at the time 3GPP was created, the ITU would not publish the output of 3GPP but would make reference to the publications of the participating Organizational Partners from its Recommendations; this state of affairs accounts for the text found on the cover of each 3GPP TS and TR. More information can be found here.

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Revision histoory:

2016-11-16: Correction of minor typo. (JMM)


**ABOUT RELEASES**

Release 15
Release 14
Release 13
Release 12
Release 11
Release 10
Release 9
Release 8
Release 7
Release 6
Release 5
Release 4
Release 1999

**FULL MEETING CALENDAR**

| | | | |
|---|---|---|---|
| **GERAN** | **74** | | 15-19 May 2017 |
| **CT** | **76** | **West Palm Beach, Florida** | 05-06 Jun 2017 |
| **RAN** | **76** | **West Palm Beach, Florida** | 05-08 Jun 2017 |
| **SA** | **76** | **West Palm Beach, Florida** | 07-09 Jun 2017 |
| **GERAN** | **75** | **Berlin (TBC)** | 21-25 Aug 2017 |
| **CT** | **77** | **Sapporo** | 11-12 Sep 2017 |
| **RAN** | **77** | **Sapporo** | 11-14 Sep 2017 |
| **SA** | **77** | **Sapporo** | 13-15 Sep 2017 |
| **GERAN** | **76** | **US** | 27 Nov-01 Dec 2017 |
| **CT** | **78** | **Lisbon** | 18-19 Dec 2017 |
| **RAN** | **78** | **Lisbon** | 18-21 Dec 2017 |
| **SA** | **78** | **Lisbon** | 20-22 Dec 2017 |
| **CT** | **79** | **India** | 19-20 Mar 2018 |
| **RAN** | **79** | **India** | 19-22 Mar 2018 |
| **SA** | **79** | **India** | 21-23 Mar 2018 |

**BROWSE TECHNOLOGIES**

LTE-Advanced
LTE
Carrier Aggregation Explained
HetNet/Small Cells
NAS
The Evolved Packet Core
HSPA
UMTS
W-CDMA
GPRS & EDGE


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# APPENDIX 11

The Wayback Machine - https://web.archive.org/web/20170509045639/http://www.3gpp.org:80/specifications/specifications

The Mobile Broadband Standard

A GLOBAL INITIATIVE



# Specifications Home

3GPP specifications are published - free of charge - up to four times a year following the quarterly Technical Specification Group (TSG) plenary meetings. At each TSG round, specs can be

- Newly brought under change control (i.e. at least 80% complete)
- Unchanged from their previous versions
- Revised as a result of incorporating approved Change Requests (either in existing Releases or in the latest Release)
- At Release-freeze time, upgraded to that Release with no technical change

The 3GPP Mobile Competence Centre (MCC) aims to make all Specs available following a TSG round as soon as possible. The target dates are shown in the table below. Where very many CRs have to be implemented, or very many specifications are to be produced, a further week beyond the above deadlines may be required. These dates are agreed by the TSG Chairmen. Over the Christmas and New Year period, when the winter TSG round finishes shortly before the holiday period, an extra week or so is normally added to the final deadlines.

## Quick link to the specifications file server area

The link above takes you straight to the specifications, but you need to know what you are looking for.

To find a particular specification by series, look at the Numbering page.

## 3GPP specifications

The term "3GPP specification" covers all GSM (including GPRS and EDGE), W-CDMA (including HSPA) and LTE (including LTE-Advanced and LTE-Advanced Pro) specifications, and the emerging 5G specifications.

Revised versions of many of these specifications are produced up to four times a year following the quarterly TSG plenary meetings.

**The table below leads to information about:**

- Specifications arising from each plenary TSG meeting, including the latest versions of each specification that was not changed at that meeting. i.e. each directory holds a complete set of specifications.
- The month of the meeting and the meeting number
- The Status List (ZIPped RTF or Word format) summarizing the current version number for every release of every 3GPP specification following each TSG plenary meeting.
- Details of each specification (working group, rapporteur, the Project Manager in MCC (Mobile Competence Centre), the meeting at which it was, or is expected to be, "frozen" (i.e. the point after which only corrections are allowed) - all are in the Status lists.

Full details of the Specifications, their history and current status can be found in the 3GPP Specifications Status database.

| year-month | remark<br>click here to see list of specs awaiting upload | latest status | specs directory | TSG CN # | TSG RAN* # | TSG T # | TSG SA # | TSG GERAN # | TSG CT # |
|---|---|---|---|---|---|---|---|---|---|
| 2017-03 | Target for availablilty of all new/revised specs:<br>TSG CT, SA = 2017-03-24<br>TSG RAN = 2017-03-31 | StatusList | 2017-03 | | 75 | | 75 | | 75 |
| 2016-12 | | StatusList | 2016-12 | | 74 | | 74 | | 74 |
| 2016-09 | | StatusList | 2016-09 | | 73 | | 73 | | 73 |
| 2016-06 | | StatusList | 2016-06 | | 72 | | 72 | 70 | 72 |

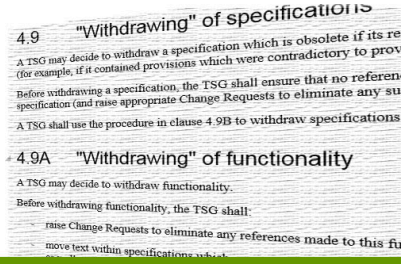
### Search

3GPP Website: Search for...

*Search and download specs, docs, CRs and more from the 3GPP FTP Server:*

ADVANCED FTP SEARCH

### More news...


4.9 "Withdrawing" of specifications

A TSG may decide to withdraw a specification which is obsolete if its re
(for example, if it contained provisions which were contradictory to prov

Before withdrawing a specification, the TSG shall ensure that no referen
specification (and raise appropriate Change Requests to eliminate any su

A TSG shall use the procedure in clause 4.9B to withdraw specifications

4.9A "Withdrawing" of functionality

A TSG may decide to withdraw functionality.

Before withdrawing functionality, the TSG shall:

- raise Change Requests to eliminate any references made to this fu
- move text within specifications which

Proposal to withdraw TR 38.900 (channel model for spectrum above 6GHz) at RAN#76

### News Feeds

- 3GPP News
- 3GPP tweets

| year-month | remark<br>click here to see list of specs awaiting upload | latest status | specs directory | TSG CN # | TSG RAN* # | TSG T # | TSG SA # | TSG GERAN # | TSG CT # |
|---|---|---|---|---|---|---|---|---|---|
| 2016-03 | | StatusList | 2016-03 | | 71 | | 71 | 69 | 71 |
| 2015-12 | | StatusList | 2015-12 | | 70 | | 70 | 68 | 70 |
| 2015-09 | | StatusList | 2015-09 | | 69 | | 69 | 67 | 69 |
| 2015-06 | | StatusList | 2015-06 | | 68 | | 68 | 66 | 68 |
| 2015-03 | | StatusList | 2015-03 | | 67 | | 67 | 65 | 67 |
| 2014-12 | | StatusList | 2014-12 | | 66 | | 66 | 64 | 66 |
| 2014-09 | | StatusList | 2014-09 | | 65 | | 65 | 63 | 65 |
| 2014-06 | | StatusList | 2014-06 | | 64 | | 64 | 62 | 64 |
| 2014-03 | | StatusList | 2014-03 | | 63 | | 63 | 61 | 63 |
| 2013-12 | | StatusList | 2013-12 | | 62 | | 62 | 60 | 62 |
| 2013-09 | | StatusList | 2013-09 | | 61 | | 61 | 59 | 61 |
| 2013-06 | | StatusList | 2013-06 | | 60 | | 60 | 58 | 60 |
| 2013-03 | | StatusList | 2013-03 | | 59 | | 59 | 57 | 59 |
| 2012-12 | | StatusList | 2012-12 | | 58 | | 58 | 56 | 58 |
| 2012-09 | | StatusList | 2012-09 | | 57 | | 57 | 55 | 57 |
| 2012-06 | | StatusList | 2012-06 | | 56 | | 56 | 54 | 56 |
| 2012-03 | | StatusList | 2012-03 | | 55 | | 55 | 53 | 55 |
| 2011-12 | | StatusList | 2011-12 | | 54 | | 54 | 52 | 54 |
| 2011-09 | | StatusList | 2011-09 | | 53 | | 53 | 51 | 53 |
| 2011-06 | | StatusList | 2011-06 | | 52 | | 52 | 50 | 52 |
| 2011-03 | | StatusList | 2011-03 | | 51 | | 51 | 49 | 51 |
| 2010-12 | | StatusList | 2010-12 | | 50 | | 50 | 48 | 50 |
| 2010-09 | | StatusList | 2010-09 | | 49 | | 49 | 47 | 49 |
| 2010-06 | | StatusList | 2010-06 | | 48 | | 48 | 46 | 48 |
| 2010-03 | | StatusList | 2010-03 | | 47 | | 47 | 45 | 47 |
| 2009-12 | | StatusList | 2009-12 | | 46 | | 46 | 44 | 46 |
| 2009-09 | | StatusList | 2009-09 | | 45 | | 45 | 43 | 45 |
| 2009-06 | | StatusList | 2009-06 | | 44 | | 44 | 42 | 44 |
| 2009- | | StatusList | 2009-03 | | 43 | | 43 | 41 | 43 |

| year-month<br><br>click here to see list of specs awaiting upload<br><br>03 | remark | latest status | specs directory | TSG CN # | TSG RAN* # | TSG T # | TSG SA # | TSG GERAN # | TSG CT # |
|---|---|---|---|---|---|---|---|---|---|
| 2008-12 | | StatusList | 2008-12 | | 42 | | 42 | 40 | 42 |
| 2008-09 | | StatusList | 2008-09 | | 41 | | 41 | 39 | 41 |
| 2008-06 | | StatusList | 2008-06 | | 40 | | 40 | 38 | 40 |
| 2008-03 | | StatusList | 2008-03 | | 39 | | 39 | 37 | 39 |
| 2007-12 | | StatusList | 2007-12 | | 38 | | 38 | 36 | 38 |
| 2007-09 | | StatusList | 2007-09 | | 37 | | 37 | 35 | 37 |
| 2007-06 | | StatusList | 2007-06 | | 36 | | 36 | 34 | 36 |
| 2007-03 | | StatusList | 2007-03 | | 35 | | 35 | 33 | 35 |
| 2006-12 | | StatusList | 2006-12 | | 34 | | 34 | 32 | 34 |
| 2006-09 | GERAN henceforward meets synchronously with other TSGs, so no further "delta" directories necessary. | StatusList | 2006-09 | | 33 | | 33 | 31 | 33 |
| 2006-06 | New at GERAN only. | | 2006-06 | | | | | 30 | |
| 2006-06 | | StatusList | 2006-06 | | 32 | | 32 | | 32 |
| 2006-04 | New at GERAN only. | | 2006-04 | | | | | 29 | |
| 2006-03 | | StatusList | 2006-03 | | 31 | | 31 | | 31 |
| 2006-01 | New at GERAN only. | | 2006-01 | | | | | 28 | |
| 2005-12 | | StatusList | 2005-12 | | 30 | | 30 | | 30 |
| 2005-11 | New at GERAN only. | | 2005-11 | | | | | 27 | |
| 2005-09 | | StatusList | 2005-09 | | 29 | | 29 | | 29 |
| 2005-08/09 | New at GERAN only. | | 2005-09 | | | | | 26 | |
| 2005-06 | New at GERAN only. | | 2005-06 | | | | | 25 | |
| 2005-06 | | StatusList | 2005-06 | | 28 | | 28 | | 28 |
| 2005-04 | New at GERAN only. | | 2005-04 | | | | | 24 | |
| 2005-03 | RAN closed and RANnew opened, CN and T closed, CT opened. | StatusList | 2005-03 | 27 | 27bis, 27 | 27 | 27 | | 27 |
| 2005-01 | New at GERAN only. | | 2005-01 | | | | | 23 | |
| 2004-12 | | StatusList | 2004-12 | 26 | 26 | 26 | 26 | | |
| 2004-11 | New at GERAN only. | | 2004-11 | | | | | 22 | |
| 2004- | | StatusList | 2004-09 | 25 | 25 | 25 | 25 | | |

| year-month<br><br>click here to see list of specs awaiting upload<br><br>09 | remark | latest status | specs directory | TSG CN # | TSG RAN* # | TSG T # | TSG SA # | TSG GERAN # | TSG CT # |
|---|---|---|---|---|---|---|---|---|---|
| 2004-08 | New at GERAN only. | | 2004-08 | | | | | 21 | |
| 2004-06 | New at GERAN only. | | 2004-06 | | | | | 20 | |
| 2004-06 | | StatusList | 2004-06 | 24 | 24 | 24 | 24 | | |
| 2004-04 | New at GERAN only. | | 2004-04 | | | | | 19 | |
| 2004-03 | | StatusList | 2004-03 | 23 | 23 | 23 | 23 | | |
| 2004-02 | New at GERAN only. | | 2004-02 | | | | | 18 | |
| 2003-12 | | StatusList | 2003-12 | 22 | 22 | 22 | 22 | | |
| 2003-11 | New at GERAN only. | | 2003-11 | | | | | 17 | |
| 2003-09 | | StatusList | 2003-09 | 21 | 21 | 21 | 21 | | |
| 2003-09 | New at GERAN only. | | 2003-09 | | | | | 16 | |
| 2003-06 | New at GERAN only. | | 2003-06 | | | | | 15 | |
| 2003-06 | | StatusList | 2003-06 | 20 | 20 | 20 | 20 | | |
| 2003-04 | New at GERAN only. | | 2003-04 | | | | | 14 | |
| 2003-02 | | StatusList | 2003-03 | 19 | 19 | 19 | 19 | | |
| 2003-02 | New at GERAN only. | | 2003-02 | | | | | 13 | |
| 2002-12, 2002-11 | | StatusList | 2002-12 | 18 | 18 | 18 | 18 | 12 | |
| 2002-09 | | StatusList | 2002-09 | 17 | 17 | 17 | 17 | 11 | |
| 2002-06 | Rel-5 GERAN features content functionally frozen | | 2002-06 | | | | | 10 | |
| 2002-06 | Rel-5 features content functionally frozen (remainder, non-GERAN) | StatusList | 2002-06 | 16 | 16 | 16 | 16 | | |
| 2002-04 | | | 2002-04 | | | | | 9 | |
| 2002-03 | Rel-5 features content functionally frozen (part) | StatusList | 2002-03 | 15 | 15 | 15 | 15 | | |
| 2002-02 | | | | | | | | 8 | |
| 2001-12 | | StatusList | 2001-12 | 14 | 14 | 14 | 14 | | |
| 2001-11 | | | | | | | | 7 | |
| 2001-09 | | StatusList | 2001-09 | 13 | 13 | 13 | 13 | | |
| 2001-08 | | | | | | | | 6 | |
| 2001-06 | | StatusList | 2001-06 | 12 | 12 | 12 | 12 | 5 | |

| year-month | remark<br>click here to see list of specs awaiting upload | latest status | specs directory | TSG CN # | TSG RAN* # | TSG T # | TSG SA # | TSG GERAN # | TSG CT # |
|---|---|---|---|---|---|---|---|---|---|
| 2001-06 | Rel-4 GERAN features content functionally frozen | | | | | | | 4 | |
| 2001-03 | Rel-4 non-GERAN features content functionally frozen | StatusList | 2001-03 | 11 | 11 | 11 | 11 | | |
| 2001-01 | | | | | | | | 3 | |
| 2000-12, 2000-11 | | StatusList | 2000-12 | 10 | 10 | 10 | 10 | 2 | |
| 2000-11 | | | | | | | | | |
| 2000-09 | | StatusList | 2000-09 | 9 | 9 | 9 | 9 | 1 | |
| 2000-06 | | StatusList | 2000-06 | 8 | 8 | 8 | 8 | | |
| 2000-03 | | | | 7 | 7 | 7 | 7 | | |
| 1999-12 | R99 features content functionally frozen | | | 6 | 6 | 6 | 6 | | |
| 1999-10 | | | | 5 | 5 | 5 | 5 | | |
| 1999-06 | | | | | 4 | 4 | 4 | | |
| 1999-05 | | | | 4 | | | | | |
| 1999-04 | | | | 3 | 3 | 3 | 3 | | |
| 1999-03 | | | | 2 | 2 | 2 | 2 | | |
| 1998-12 | | | | 1 | 1 | 1 | 1 | | |

** TSG RAN was closed at the end of meeting 27 and re-opened for meeting 27 bis.*

If you plan to download a large number of specifications we recommend using an FTP client software tool such as:

- Ipswitch WS_FTP Pro
- FTPSync
- Filezilla

For additional information relating to 3GPP Specifications, their creation and maintenance, etc. go here.

## Confidential Algorithms

3GPP confidentiality and integrity algorithms The 3GPP Confidentiality and Integrity algorithms F8 & F9 (KASUMI) have been developed through the collaborative efforts of the 3GPP Organizational Partners. They may be used only for the development and operation of 3G Mobile Communications and services. Every Beneficiary must sign a Restricted Usage Undertaking with a Custodian and (...)
more »

## ASN.1

ASN.1 Object Identifiers Abstract syntax notation (ASN.1) object identifiers maintained by ETSI. ETSI is a recognized organization under the ITU-T (formerly CCITT) arc. The formal rules governing assignment of object identifier values are given in ETSI EG 200 351. Since the 3GPP technical specifications are based on GSM specifications, which use object identifiers under the ETSI node, it (...)
more »

## Drafting Rules

The Specification drafting rulesTR 21.801 are the rules for the structure and drafting of documents intended to become a 3GPP Technical Specification or Technical Report. These rules are intended to ensure that such documents are drafted in as uniform a manner as is practicable, irrespective of the technical content. 21.801 is based on the ISO/IEC Directives, Part 3, but is a self-contained (...)
more »

## Official Publications

The 3GPP Technical Specifications and Technical Reports have, in themselves, no legal standing. They only become "official" when transposed into corresponding publications of the Partner Organizations (or the national / regional standards body acting as publisher for the Partner). At this point, the specifications are referred to as UMTS within ETSI and FOMA within ARIB/TTC. Some TRs (...)
more »

Page reviewed and updated every 3 months

## ABOUT RELEASES

- Release 15
- Release 14
- Release 13
- Release 12
- Release 11
- Release 10
- Release 9
- Release 8
- Release 7
- Release 6
- Release 5
- Release 4
- Release 1999

## FULL MEETING CALENDAR

| | | | |
|---|---|---|---|
| **GERAN** | **74** | | 15-19 May 2017 |
| **CT** | **76** | **West Palm Beach, Florida** | 05-06 Jun 2017 |
| **RAN** | **76** | **West Palm Beach, Florida** | 05-08 Jun 2017 |
| **SA** | **76** | **West Palm Beach, Florida** | 07-09 Jun 2017 |
| **GERAN** | **75** | **Berlin (TBC)** | 21-25 Aug 2017 |
| **CT** | **77** | **Sapporo** | 11-12 Sep 2017 |
| **RAN** | **77** | **Sapporo** | 11-14 Sep 2017 |
| **SA** | **77** | **Sapporo** | 13-15 Sep 2017 |
| **GERAN** | **76** | **US** | 27 Nov-01 Dec 2017 |
| **CT** | **78** | **Lisbon** | 18-19 Dec 2017 |
| **RAN** | **78** | **Lisbon** | 18-21 Dec 2017 |
| **SA** | **78** | **Lisbon** | 20-22 Dec 2017 |
| **CT** | **79** | **India** | 19-20 Mar 2018 |
| **RAN** | **79** | **India** | 19-22 Mar 2018 |
| **SA** | **79** | **India** | 21-23 Mar 2018 |

## BROWSE TECHNOLOGIES

- LTE-Advanced
- LTE
- Carrier Aggregation Explained
- HetNet/Small Cells
- NAS
- The Evolved Packet Core
- HSPA
- UMTS
- W-CDMA
- GPRS & EDGE

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# APPENDIX 12

The Wayback Machine - https://web.archive.org/web/20170422110018/http://www.3gpp.org:80/specifications/79-specification-numbering



# Specification Numbering

All 3GPP specifications have a specification number consisting of 4 or 5 digits. (e.g. 09.02 or 29.002).

The first two digits define the series, followed by 2 further digits for the 01 to 13 series or 3 further digits for the 21 to 55 series.

The full title, specification number and latest version number for every specification can be found in the current status list (warning: large file!).

An automated list of Specification numbers - with the Title and details of the Specification Group responsible.

| Subject of specification series | 3G and beyond / GSM (R99 and later) | GSM only (Rel-4 and later) | GSM only (before Rel-4) |
|---|---|---|---|
| General information (long defunct) | | | 00 series |
| 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 | - | - |

Note (1): The 13 series GSM specifications relate to European-Union-specific regulatory standards. On the closure of ETSI TC SMG, responsibility for these specifications was transferred to ETSI TC MSG, (Mobile Specification Group) and they do not appear on the 3GPP file server.

Note (2): The specifications of these aspects are spread throughout several series.

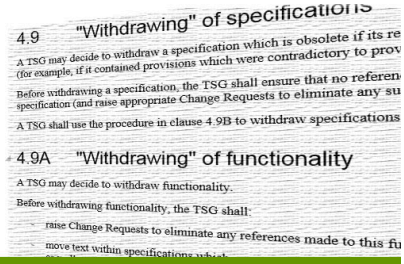
## Search

3GPP Website: Search for...

*Search and download specs, docs, CRs and more from the 3GPP FTP Server:*

ADVANCED FTP SEARCH

## More news...


4.9 "Withdrawing" of specifications

A TSG may decide to withdraw a specification which is obsolete if its re
(for example, if it contained provisions which were contradictory to prov

Before withdrawing a specification, the TSG shall ensure that no referen
specification (and raise appropriate Change Requests to eliminate any su

A TSG shall use the procedure in clause 4.9B to withdraw specifications

4.9A "Withdrawing" of functionality

A TSG may decide to withdraw functionality.

Before withdrawing functionality, the TSG shall:

- raise Change Requests to eliminate any references made to this fu
- move text within specifications

Proposal to withdraw TR 38.900 (channel model for spectrum above 6GHz) at RAN#76

## News Feeds

3GPP News

3GPP tweets

Note (3): Algorithms may be subject to export licensing conditions. See the relevant 3GPP page. See also the relevant ETSI pages.

Note (4): The original GSM algorithms are not published and are controlled by the GSM Association.

Technical Reports are of two classes:

> Those intended to be transposed and issued by the Organizational Partners as their own publications; and
>
> Those not intended for publication but which are simply 3GPP internal working documents, used, for example, for documenting planning and scheduling of work, or for holding the interim results of feasibility studies.

The first category have numbers of the form: xx.9xx

The second category have numbers of the form:
xx.8xx (feasibility study reports, etc) or, more rarely,
30.xxx / 50.xxx (planning and scheduling)
For some spec series, the stock of xx.8xx TRs has been exhausted, and in these cases, further internal TRs are allocated xx.7xx numbers.

Missing Specs: Click here to see those Specs not yet available following the most recent round of TSG meetings.

The 3GPP Specifications are stored on the file server as zipped MS-Word files. The filenames have the following structure:

SM[-P[-Q]]-V.zip

where the character fields have the following significance ...

S = series number - 2 characters (see the table above)
M = mantissa (the part of the spec number after the series number) - 2 or 3 characters (see above)
P = optional part number - 1 or 2 digits if present
Q = optional sub-part number - 1 or 2 digits if present
V = version number, without separating dots - 3 digits (6 digits when any component of the three-digit range has been exhausted - see the fifth example below)

So for example:

> 21900-320.zip is 3GPP TR 21.900 version 3.2.0
> 0408-6g0.zip is 3GPP TS 04.08 version 6.16.0
> 32111-4-410 is 3GPP TS 32.111 part 4 version 4.1.0
> 29998-04-1-100 is 3GPP TS 29.998 part 4 sub-part 1 version 1.0.0
> 29898-133601 is 3GPP TR 29.898 version 13.36.1

Further information:

**Latest version**
The latest versions of the approved specifications in the "latest" directory. The latest version of draft specs (i.e. those not yet under change control) are in the "latest-drafts" directory. See also the page on version numbering.

**Particular version**
All older versions of specifications (where available) are stored in the archive subdirectory. All versions of all releases of a given specification are placed directly under the name of the specification.

**Title or subject**
If you only know the title or the subject, but not the specification number, the best place to start looking is the complete list of all 3GPP specification numbers and titles. This list also shows the most recent version in each Release.

**Specs related to a particular working group**
Each 3GPP TSG Working Group has a home page, which lists the specifications under its responsibility. Follow the links from here, or use the main menu item "Specification Groups".

**Official versions published by recognized Standards Development Organizations**
The 3GPP Technical Specifications (and Technical Reports) which are publicly available from this site have, in themselves, no legal standing. They only become "official" when transposed into corresponding publications of the Partner Organizations. If you are looking for the official versions, see the official publications page.

## Yet more information:

**Work plan**
The 3GPP Work plan describes the new functionality currently being elaborated in the TSG working groups. It also indicates the expected timescales for their finalization.

**Releases (and phases, stages)**
An introduction to the 3GPP mechanism for specifications releases can be found here.

**Historical information**
If you need to look for old / superseded specifications or change requests, start here.

**TSG working methods**
The procedures for creating, enhancing and maintaining specifications are described in TR 21.900. A presentation outlining the release and change request process can be found here.

**3GPP Drafting rules**
The rules for drafting specifications are described in TR 21.801.

**Change Requests**
The change request mechanism is used when a correction or new functionality is required for an existing specification.

**Version numbering**
More information on the version numbering page.

Issuing new TS/TR numbers. More information on this page.

---

Page updated:

2016-12-08: Spec file structure caters for the six-character version format used for specs where the three-character limit has been exhausted.
2016-01-12: Mention of TRs numbered xx.7xx as overflow of xx.8xx allocations (JMM)
2015-10-01: Fix broken link to specification groups (JMM)


**ABOUT RELEASES**

Release 15
Release 14
Release 13
Release 12
Release 11
Release 10
Release 9
Release 8
Release 7
Release 6
Release 5
Release 4
Release 1999

**FULL MEETING CALENDAR**

| | | | |
|---|---|---|---|
| GERAN | 74 | | 15-19 May 2017 |
| CT | 76 | West Palm Beach, Florida | 05-06 Jun 2017 |
| RAN | 76 | West Palm Beach, Florida | 05-08 Jun 2017 |
| SA | 76 | West Palm Beach, Florida | 07-09 Jun 2017 |
| GERAN | 75 | Berlin (TBC) | 21-25 Aug 2017 |
| CT | 77 | Sapporo | 11-12 Sep 2017 |
| RAN | 77 | Sapporo | 11-14 Sep 2017 |
| SA | 77 | Sapporo | 13-15 Sep 2017 |
| GERAN | 76 | US | 27 Nov-01 Dec 2017 |
| CT | 78 | Lisbon | 18-19 Dec 2017 |
| RAN | 78 | Lisbon | 18-21 Dec 2017 |
| SA | 78 | Lisbon | 20-22 Dec 2017 |
| CT | 79 | India | 19-20 Mar 2018 |
| RAN | 79 | India | 19-22 Mar 2018 |
| SA | 79 | India | 21-23 Mar 2018 |

**BROWSE TECHNOLOGIES**

LTE-Advanced
LTE
Carrier Aggregation Explained
HetNet/Small Cells
NAS
The Evolved Packet Core
HSPA
UMTS
W-CDMA
GPRS & EDGE


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# APPENDIX 13

The Wayback Machine - https://web.archive.org/web/20170422204855/http://www.3gpp.org:80/specifications/Releases

The Mobile Broadband Standard
EDGE

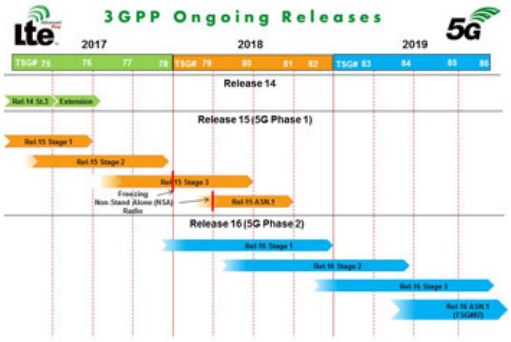
A GLOBAL INITIATIVE



# Releases

3GPP uses a system of parallel "Releases" which provide developers with a stable platform for the implementation of features at a given point and then allow for the addition of new functionality in subsequent Releases. You can learn more about 3GPP Releases by looking in to the following resources:

- A brief description of each Release can be found in the footer of this page, in the 'About Releases' section.
- Full details of the specifications needed for each 3GPP Release can be found in the "Release Description" folder of the ftp site.
- A table of the features, by Release, can also be found in the 3GPP Work Plan.
- There is also a 3GPP Specification Release version matrix which is a listing (with links) of the Specifications - showing the Release in which each specification was first developed.




Click to enlarge this view...

## Start, Freeze and End dates:

The table below is extracted from the data on the 3GPP Ultimate portal at https://portal.3gpp.org/ "Releases" tab. Please refer to that data for the most up-to-date information.

Future dates are proposals, subject to change.

| Name | Status [Note 3] | Start date [Note 2a] | End date | Closure date |
|---|---|---|---|---|
| Release 15 | Open | 2016-06-01 | 2018-09-14 (SA#81) | |
| Release 14 | Open | 2014-09-17 | 2017-06-09 (SA#76) | |
| Release 13 | Frozen | 2012-09-30 | 2016-03-11 (SP-71) | |
| Release 12 | Frozen | 2011-06-26 | 2015-03-13 (SP-67) | |
| Release 11 | Frozen | 2010-01-22 | 2013-03-06 (SP-59) | |
| Release 10 | Frozen | 2009-01-20 | 2011-06-08 (SP-52) | |
| Release 9 | Frozen | 2008-03-06 | 2010-03-25 (SP-47) | |
| Release 8 | Frozen | 2006-01-23 | 2009-03-12 (SP-43) | |
| Release 7 | Closed | 2003-10-06 | 2008-03-13 (SP-39) | 2014-09-17 (SP-65) |
| Release 6 | Closed | 2000-03-28 | 2005-09-28 (SP-29) | 2014-09-17 (SP-65) |
| Release 5 | Closed | 2000-05-01 [Note 2a] | 2002-09-12 (SP-17) | 2014-09-17 (SP-65) |

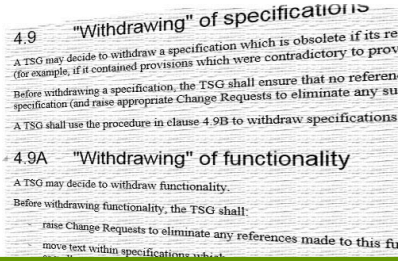
## Search

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Proposal to withdraw TR 38.900
(channel model for spectrum above 6GHz)
at RAN#76

## News Feeds

- 3GPP News
- 3GPP tweets

| | | | | |
|---|---|---|---|---|
| Release 4 | Closed | 1998-08-01 | 2001-06-21 (SP-12) | 2014-09-17 (SP-65) |
| Release 2000 [Note 1] | Closed | 1999-03-30 [Note 2a] | | 1999-12-17 (SP-06) |
| Release 1999 | Closed | 1996-11-01 | 1999-12-17 (SP-06) | 2008-06-05 (SP-40) |
| UMTS | Closed | 1994-08-18 | 1999-02-12 (SMG-28) | 2005-06-08 (SP-28) |
| Release 1998 | Closed | 1996-03-26 | 1999-02-12 (SMG-28) | 2005-06-08 (SP-28) |
| Release 1997 | Closed | 1996-04-15 [Note 2a] | | 2005-06-08 (SP-28) |
| Release 96 / Phase 2+ | Closed | 1995-07-20 | | 2004-09-16 (SP-25) |
| Phase 2 | Closed | 1993-03-25 | | 2004-09-16 (SP-25) |
| Phase 1 extension | Closed | 1994-10-01 | | |
| Phase 1 DCS-1800 | Closed | 1992-12-03 | | |
| Phase 1 | Closed | 1987-01-01 | | |

## GSM Phases and Version numbers

| GSM Release | TS/TR version [Note 2, 4] | 3GPP Release | TS/TR version |
|---|---|---|---|
| GSM Phase 1 | 3.x.y | | |
| GSM Phase 2 | 4.x.y | | |
| GSM Phase 2+ | 5.x.y | | |
| GSM Phase 2+ Release 97 | 6.x.y | | |
| GSM Phase 2+ Release 98 | 7.x.y | | |
| GSM Phase 2+ Release 99 | 8.x.y | UMTS Release 99 | 3.x.y |
| *GSM Phase 2+ Release 00* | *9.x.y* | | |

## 3GPP Releases and Version numbers

| Release | TS/TR version |
|---|---|
| Release 4 | 4.x.y |
| Release 5 | 5.x.y |
| Release 6 | 6.x.y |
| ... | |
| Release 14 | 12.x.y |
| ... | |

## Other associated terms

**Stages**

The term "Stage" derives from the ITU-T (originally CCITT) method for categorizing specifications (Recommendation I.130).

"Stage 1" refers to the service description from a service-user's point of view.
"Stage 2" is a logical analysis, devising an abstract architecture of functional elements and the information flows amongst them across reference points between functional entities.

"Stage 3" is the concrete implementation of the functionality and of the protocols appearing at physical interfaces between physical elements onto which the functional elements have been mapped.

In addition, 3GPP often performs feasibility studies the results of which are made available in Technical Reports (normally 3GPP-internal TRs, numbered xx.8xx, not intended for transposition by the Organizational Partner SDOs). The feasibility study might be considered as a sort of "Stage 0". Furthermore, some Stage 3 specifications require test specifications to be prepared: effectively a "Stage 4".

**Phases**

This term has two distinct usages within the 3GPP:

in reference to GSM specifications, Phase 1, Phase 2 and Phase 2+ referred to releases of specifications (see table above);
some features within GSM/3G specifications have been enhanced over the years. For example, enhancements to the original CAMEL functionality are referred to as CAMEL phase 2, CAMEL phase 3 and CAMEL phase 4.

**Further information**

The mechanisms for creating and maintaining specifications are described in TR 21.900. A presentation outlining the release and change request process can be found here.

---

*Note 1*: The term "Release 2000" was used only temporarily and was eventually replaced by "Release 4" and "Release 5" (most elements originally in Release 2000 were renamed Release 4, but some were deferred until Release 5).

*Note 2*: A Specification with a version number of 0.x.y, 1.x.y or 2.x.y indicates that it is a new, draft, specification which has not yet been approved. The anticipated release is normally shown on the cover of the document.

*Note 2a*: The start date for a Release is an indication of when the first work item for that Release was approved at TSG level. In fact, it is somewhat approximate because often work items started in an earlier Release, but not completed, are "promoted" to the next Release. The end date for a Release is an indication of when the detailed protocols become stable. However, see Note 3 below.

*Note 3*: After "freezing", a Release can have no further additional functions added. However, detailed protocol specifications (stage 3) may not yet be complete. "Freezing" is applied successively for each of the three stages (see below), with stage 3 normally being frozen one or two TSG meetings earlier than the "end" date. The "end" date shown on the 3GU portal is indicative only, since for each Release, a considerable number of refinements and corrections can be expected for at least two years following this date. In addition, OA&M specs and test specs may lag by some considerable time. A "frozen" Technical Specification is one which can have no further category B or C (new or modified functionality) Change Requests, other than to align earlier stages with later stages. The individual stage freeze dates can only be seen by 3GU account holders (delegates, officials, secretariat).

*Note 4*: In the version number of a 3GPP TS or TR, the first field (before the first dot) indicates the Release number according to the table below. The field "x" is incremented at each change in the spec resulting from one or more Change Requests approved by the responsible TSG. Field "y" is incremented whenever an editorial change is made to a specification; editorial changes are those which cannot in any way change the technical interpretation of the spec, and are introduced at the discretion of the Support Team. Exceptionally, field "y" is incremented when a newly-provided version of a spec is found to be flawed due to, for example, misimplementation of a newly-approved CR; however, this circumstance is only permitted during the three-week period following the end of a TSG plenary round, during which new versions of specs are produced. Every change of version is documented in the "change history" annex of the spec. When "x" is incremented, field "y" is reset to zero. When the Release field (the first digit) is incremented, fields "x" and "y" are reset to zero. Version numbering was unified from Release 4 onwards, regardless of radio access technology. This implied a renumbering of the GSM-only specifications (see the Specification Numbering page).


**ABOUT RELEASES**

Release 15
Release 14
Release 13
Release 12
Release 11
Release 10
Release 9
Release 8
Release 7
Release 6
Release 5
Release 4
Release 1999

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| GERAN | 74 | | 15-19 May 2017 |
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| RAN | 78 | Lisbon | 18-21 Dec 2017 |
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# APPENDIX 14

The Wayback Machine - https://web.archive.org/web/20170509050236/http://www.3gpp.org:80/specifications-groups/ran-plenary/ran2-radio-layer-2-and-radio-layer-3-rr



# RAN2 - Radio layer 2 and Radio layer 3 RR

RAN WG2 is in charge of the Radio Interface architecture and protocols (MAC, RLC, PDCP), the specification of the Radio Resource Control protocol, the strategies of Radio Resource Management and the services provided by the physical layer to the upper layers.
Within the scope of TSG RAN, RAN WG2 is responsible for the development of specifications dealing with UTRA, Evolved UTRA, and beyond.

## Terms of Reference

The latest terms of reference were approved at RAN#53 in document RP-110964.

RAN WG2 is responsible for:

- Specification of the radio interface architecture and protocol termination
- Specification of radio interface protocols between UE and RAN,
- Specification of radio interface protocols common to RAN and GERAN
- Maintaining the specifications for the protocol used to configure UE loop back functionality for UTRAN
- Specification of radio interface parameters to be exchanged between RNCs and between RNCs and BSCs in case of SRNS relocation
- For EUTRAN, specification of the radio interface parameters to be exchanged between eNodeBs in case of inter eNodeB handover, and between eNodeB and RNC/BSC in case of inter-RAT handovers
- Stage 2 Specifications of the services offered by the physical layer to upper layers
- Specification of Cell selection and re-selection procedures
- Specification of UE capabilities for UE - RAN interface (in collaboration with RAN WG1 for Layer 1 capabilities)
- Definition of RRM strategies to be supported by RAN
- Definition of protocol methodology in RAN specifications
- Identification of the requirements for UE protocol tests to be defined by TSG RAN WG5, for new functions under RAN WG2 responsibility
- For EUTRAN, specification of radio interface protocols between UE and positioning server
- Specification of radio measurements reported to the OAM domain and the radio interface protocols used to collect them

## Useful links and information

| | |
|---|---|
| *About RAN WG2* | List of elected officials |
| *Documents* | Meeting documents |
| | Specifications |
| | Work items |
| *Meetings* | Next meeting information & previous meeting reports and documents |
| | Liaisons Statements |
| | Full RAN WG2 meeting calendar |
| *General info* | Email exploder lists |

| | |
|---|---|
| RAN Working groups and Ad Hoc groups | |
| TSG RAN Plenary | |

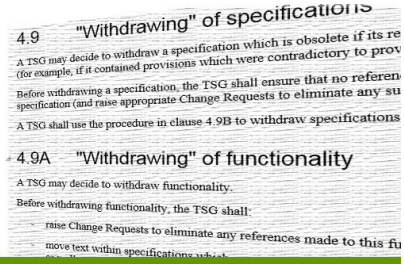
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4.9 "Withdrawing" of specifications
A TSG may decide to withdraw a specification which is obsolete if its re
(for example, if it contained provisions which were contradictory to prov
Before withdrawing a specification, the TSG shall ensure that no referen
specification (and raise appropriate Change Requests to eliminate any su
A TSG shall use the procedure in clause 4.9B to withdraw specifications
4.9A "Withdrawing" of functionality
A TSG may decide to withdraw functionality.
Before withdrawing functionality, the TSG shall:
raise Change Requests to eliminate any references made to this fu

Proposal to withdraw TR 38.900 (channel model for spectrum above 6GHz) at RAN#76

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| | |
|---|---|
| RAN Working groups and Ad Hoc groups | |
| TSG RAN WG1 | Radio Layer 1 specification |
| TSG RAN WG2 | Radio Layer 2 and Radio Layer 3 RR specification |
| TSG RAN WG3 | Iub Iur and Iu specification - UTRAN O&M requirements |
| TSG RAN WG4 | Radio performance and protocol aspects (system) - RF parameters and BS conformance |
| TSG RAN WG5 | Mobile terminal conformance testing |
| TSG RAN WG6 | Legacy RAN radio and protocol |
| TSG RAN AHG1 | Ad-hoc group on ITU (internal) co-ordination |


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# roups Home

*rt below - to go to that Group's home page to find information on its elected officials, its nd Specifications for which it is responsible, etc.*

## Project Co-ordination Group (PCG)

| TSG RAN<br>Radio Access Network | TSG SA<br>Service & Systems Aspects | TSG CT<br>Core Network & Terminals |
|---|---|---|
| RAN WG1<br>Radio Layer 1 spec | SA WG1<br>Services | CT WG1<br>MM/CC/SM (Iu) |
| RAN WG2<br>Radio Layer 2 spec<br>Radio Layer 3 RR spec | SA WG2<br>Architecture | CT WG3<br>Interworking with external networks |
| RAN WG3<br>Iub spec, Iur spec, Iu spec<br>UTRAN O&M requirements | SA WG3<br>Security | CT WG4<br>MAP/GTP/BCH/SS |
| RAN WG4<br>Radio Performance<br>Protocol aspects | SA WG4<br>Codec | CT WG6<br>Smart Card Application Aspects |
| RAN WG5<br>Mobile Terminal<br>Conformance Testing | SA WG5<br>Telecom Management | |
| RAN WG6<br>Legacy RAN radio and protocol | SA WG6<br>Mission-critical applications | |

## RAN

3G systems should be based on new wide band, multimode, flexible radio access. This approach will ensure that systems based on 3GPP specifications will be capable of rapid development and deployment of competitive service offerings while still enabling global roaming.

TSG Radio Access Network (TSG RAN) is responsible for the definition of the functions, requirements and interfaces of the UTRA/E-UTRA network in its two modes, FDD & TDD. More precisely: radio performance, physical layer, layer 2 and layer 3 RR specification in UTRAN/E-UTRAN; specification of the access network interfaces (Iu, Iub, Iur, S1 and X2); definition of the O&M requirements in UTRAN/E-UTRAN and conformance testing for User Equipment and Base Stations...more

## SA

The TSG Service and System Aspects (TSG-SA) is responsible for the overall architecture and service capabilities of systems based on 3GPP specifications and, as such, has a responsibility for cross TSG co-ordination...more

## CT

The TSG Core Network and Terminals (TSG CT) is responsible for specifying terminal interfaces (logical and physical), terminal capabilities (such as execution environments) and the Core network part of 3GPP systems...more

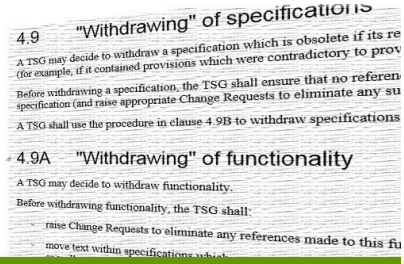
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(for example, if it contained provisions which were contradictory to prov

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specification (and raise appropriate Change Requests to eliminate any su

A TSG shall use the procedure in clause 4.9B to withdraw specifications

4.9A "Withdrawing" of functionality

A TSG may decide to withdraw functionality.

Before withdrawing functionality, the TSG shall:

- raise Change Requests to eliminate any references made to this fu
- move text within specifications

Proposal to withdraw TR 38.900
(channel model for spectrum above 6GHz)
at RAN#76

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## Historical Information (Incl. Closed groups)

The original specification work started in 1987, with the first Phase of GSM specifications. If you have an ETSI On-Line account (ETSI Members), you can access the ETSI Technical Committee SMG documents (including Change Requests) via the On-line archive. For past & present 3GPP group's meeting documents (including Change Requests) choose the appropriate Technical Specification Group's (...)
more »

## TSG Working Agreements

"Working Agreements" are tentative decisions reached by 3GPP groups in order to make progress on matters where consensus [1] cannot be reached. See the 3GPP Working Procedures, article 25. See document PCG20_04 (slides 4 & 5) for further background information. To propose additions to this page: 3GPPcontact@3gpp.org. Only working agreements explicitly documented in meeting reports (...)
more »

## 3GPP E-mail Exploder Lists

A full list of the 3GPP email exploder lists is available at http://list.3gpp.org/ This also contains all the ETSI exploder lists, however the majority of the 3GPP lists are located right at the top. In order to subscribe to any of these lists please scroll down until you find the list you are interested in, click on the link and follow the simple instructions. Those delegates who already (...)
more »

## Uniform Resource Identifier (URI) list

Uniform Resource Name values maintained by 3GPP: The tables below list URIs registered by 3GPP. Applications for new entries must be made via email to the TSG CT WG1 Secretary. Applications must contain: a proposal for the URN value; a brief description of its functionality; a reference to the specification or other publicly available document (if any) containing the definition; the (...)
more »

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[To Parent Directory]

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The Wayback Machine - https://web.archive.org/web/20170509042359/http://www.3gpp.org:80/ftp/tsg_ran/

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The Wayback Machine - https://web.archive.org/web/20170414213726/http://www.3gpp.org:80/ftp/TSG_…

# www.3gpp.org - /ftp/TSG_RAN/WG2_RL2/

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 2/14/2017 10:46 AM       <dir> TSGR2_99
 3/15/2017  3:34 PM       <dir> TSGR2_AHs
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---

# APPENDIX 19

The Wayback Machine - https://web.archive.org/web/20180425115708/http://www.3gpp.org:80/ftp/TSG_…

# www.3gpp.org - /ftp/TSG_RAN/WG2_RL2/TSGR2_100/

---

[To Parent Directory]

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11/10/2017  6:55 PM        <dir> Agenda
 2/14/2018 10:57 AM        <dir> Docs
  4/5/2017  5:30 PM        <dir> Invitation
 12/2/2017  6:23 AM        <dir> LSin
 12/2/2017  6:23 AM        <dir> LSout
 2/27/2018  5:32 PM        <dir> Report
 12/2/2017  7:06 AM        <dir> Tdoclists
```

---

# APPENDIX 20



# 3GPP_TSG_RAN_WG2 Archives

November 2017, Week 1

## 3GPP_TSG_RAN_WG2@LIST.ETSI.ORG



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Topic: [<< First] [< Prev] [Next >] [Last >>]
Author: [<< First] [< Prev] [Next >] [Last >>]





Subject: Draft agenda and schedule for RAN2#100, Reno
From: "Burbidge, Richard C" <[log in to unmask]>
Reply To: Burbidge, Richard C
Date: Tue, 7 Nov 2017 12:20:44 +0000
Content-Type: multipart/mixed
Parts/Attachments: text/plain (6 kB) , text/html (18 kB) , R2-17xxxxx-RAN2-100-Reno-Proposed-Agenda-v1.0.docx (285 kB) , RAN2-100-Reno-schedule-v1.0.docx (254 kB)

Dear All

Please find attached my draft agenda and meeting week schedule for our RAN2#100 meeting in Reno. The guidelines below are the similar to those provide at last meeting but I still request that you read carefully and respect these guidelines - they are intended to improve the efficiency and effectiveness of the meeting for everyone.

**Deadlines**

- Document number request deadline and document submission deadline: **Thursday, 2017-November-16, 23:59 Pacific time**.
- Upload announcements on the RAN2 email reflector are not required for tdocs submitted before the submission deadline. In the exceptional case that you upload a document after the submission deadline, an announcement is required to be sent on the RAN2 email reflector. Late submissions might not be reviewed, treated or even included in the chair's skeleton.
- Juha will provide instruction for requesting tdoc numbers using the 3GU tool. Please read and follow his instructions carefully.

**Identifying Revisions/Resubmissions:**

The purpose of this process is to make it quicker and easier for us all to review documents that are resubmission or revisions.

Please mark all document that are revisions or resubmissions by including 'Resubmission of R2-17xxxxx' or 'Revision of R2-17xxxxx' in second line of the document, immediately below the tdoc number. Use resubmission in the case the document has no technical changes (editorial corrections are ok), and use revision in the case that there are technical changes. The changes should also be briefly summarised in the introduction of the document.

In addition, when requesting the tdoc number for a **resubmission (not for a revision) of a discussion document** via 3GU, please tick the 'Is a revision of' box, enter the tdoc number of the document that was submitted to the previous meeting, and click the prefill button. 3GU will then automatically populate the fields with the same information as the previously submitted document. You will then be free change any of the info if you need to - in particular please check that the agenda item is correct for the forthcoming meeting. If you use the bulk tdoc request then you should fill the column with the heading 'Is revision of' (column Q) but the other document information will not be automatically populated for you. In the 3GU generated tdoc list, column Q will show the previously submitted tdoc number. The content of column Q will also be included for each tdoc in the report skeleton. In this way you will be able to easily know from the tdoc list or skeleton that a document is an unchanged resubmission.

The above instructions **do not apply for CRs.** For CRs please follow the normal process where a tdoc request must always be marked as a revision (irrespective of what type of change is made to the content) in order to be given the same CR number (and incremented revision number).

**Email discussions**

Please provide your company views to the email discussion and refrain from submitting a contributions to the next meeting on the topics that have been adequately addressed by the email discussion. In cases where a particular aspect of an email discussion was not conclusive, and hence a single proposal for a way forward cannot be made, then the rapporteur should provide a proposal to discuss, identifying the key question to be answered and the main options to select between. The email discussion report should be the only document that needs to be treated on the subject, and other tdocs on the same top should not be necessary.

**Responsibilities**

- Please read the agenda carefully and follow the guidance within each agenda item (do not assume the agenda will be same as previous meetings).
- Submit documents to the correct agenda item.
- Consider carefully whether your document is stage 2 or stage 3 (consider whether for LTE the related aspects are captured in 36.300 or in a stage 3 spec)
- Respect the "Maximum 1 tdoc per company" if indicated

Samsung Electronics Co., Ltd. v. Asus Computer Int. EX-1016, 269 of 1750

- Do not submit multiple documents with overlapping proposals.
- Do not submit documents on topics that we have agreed not to discuss until we have made progress in other areas.
- Corrections to draft TSs should first be communicated to the specification rapporteur for possible inclusion in a rapporteur's update, and only submitted as a separate contribution to the meeting if you and the rapporteur conclude it needs to be first discussed by the group. For the NR stage 2 TSs there is a specific agenda item for this purpose.
- Text proposals should be incorporated in supporting contributions, at least for cases where related specification text already exists (i.e. separate TP documents are discouraged).
- For user plane session, contributions with more than 7 proposals are not encouraged (particularly for agenda items with max 1 contribution)

**CR quality and isolated impact statements:**

- Please focus on high quality CRs and CR coversheets
- Isolated impact statements, following the agreed guidelines, should be provided for all CRs up to

ATOM RSS1 RSS2

# APPENDIX 21

# 3GPP_TSG_RAN_WG2 Archives

December 2017, Week 3

## 3GPP_TSG_RAN_WG2@LIST.ETSI.ORG

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Message: [<< First] [< Prev] [Next >] [Last >>]
Topic: [<< First] [< Prev] [Next >] [Last >>]
Author: [<< First] [< Prev] [Next >] [Last >>]

Subject: Draft RAN2#100 meeting report (v1)
From: Juha Korhonen <[log in to unmask]>
Reply To: Juha Korhonen <[log in to unmask]>
Date: Mon, 18 Dec 2017 15:19:46 +0000
Content-Type: multipart/mixed
Parts/Attachments: text/plain (102 bytes) , text/html (2086 bytes) ,
Draft_RAN2#100_Meeting_Report_v1.zip (1022 kB)

Dear All,

I have attached the first draft version of RAN2#100 meeting report.
Comments are welcome.

BR,
Juha

ATOM RSS1 RSS2

# APPENDIX 22

**3GPP TSG-RAN WG2 meeting #101** **R2-1800xxx**

**Athens, Greece, 26 February - 2 March, 2018**

**Agenda Item:** 2.2

**Source:** ETSI MCC

**Title:** Report of 3GPP TSG RAN2#100 meeting, Reno, Nevada, USA

---

**Document for:** Approval

# Report of 3GPP TSG RAN WG2 meeting #100
# Reno, Nevada, USA
# 27 November - 1 December, 2017

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# Organisation of the meeting

| | | |
|---|---|---|
| Meeting: | 3GPP TSG RAN2#100 | |
| Meeting location: | Reno, Nevada, USA | |
| Duration: | 27.11 - 1.12.2017 | |
| Host: | EF3 | |
| TSG RAN WG2 Chairman: | Richard Burbidge (Intel Corporation) (richard.c.burbidge@intel.com) | |
| TSG RAN WG2 Vice chairman: | Hu Nan (CMCC) (hunan@chinamobile.com) | |
| TSG RAN WG2 Vice chairman: | Johan Johansson (MediaTek) (johan.johansson@mediatek.com) | |
| TSG RAN WG2 MCC Support: | Juha Korhonen (ETSI MCC) (juha.korhonen@etsi.org) | |
| Email reflector: | 3GPP_TSG_RAN_WG2@LIST.ETSI.ORG | |
| Technical documents: | ftp://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_100/Docs | |
| Next meetings: | TSG RAN#78 | 18.12 - 21.12.2017, Lisbon, Portugal |
| | TSG RAN2#NR_1801 | 22.01 - 26.01.2018, Vancouver, Canada |
| | TSG RAN2#101 | 26.02 - 03.02.2018, Athens, Greece |

# Statistics/Executive Summary

TSG RAN2#100 was held in Prague, Czech Republic, hosted by European Friends of 3GPP (EF3). The meeting had 5 breakout sessions in addition to the main session. The main session was mainly about NR and NR control plane. The parallel sessions were:

- LTE and NR User Plane;
- LTE
- NB-IoT and MTC
- Rel-15 V2X
- Rel-15 MTC

The statistics fom this meeting are:

- 285 participants checked in (registered: 362 participants).
- 2187 Tdoc numbers allocated with 2086 available contributions. (See the attached tdoc list)
- 97 incoming liaison statements, out of which 96 were noted and 1 was withdrawn (was treated already in the previous meeting).
- 29 outgoing liaison statements.
- 45 email approvals/discussions scheduled after RAN2#100 meeting, see Annex F for details.
- Number of CRs submitted 326. Out of these, 104 were agreed . See Annex E for details.

# 1 Opening of the meeting (9 AM)

## 1.1 Call for IPR

The attention of the delegates of this Working Group is drawn to the fact that **3GPP Individual Members have the obligation** under the IPR Policies of their respective Organizational Partners **to inform their respective Organizational Partners of Essential IPRs** they become aware of.

The delegates were asked to take note that they were 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 Statement and the Licensing declaration forms (http://webapp.etsi.org/Ipr/).

*NOTE: IPRs may be declared to the Director-General or Chairman of the SDO, but not to the RAN WG2 Chairman.*

## 1.2 Network usage conditions

*The PCG has laid down the following network usage conditions*

1. **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.**

2. **Users shall not engage in non-work related activities that consume excessive bandwidth** or cause significant degradation of the performance of the network.

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

**1. DON'T place your WiFi device in ad-hoc mode**

**2. DON'T set up a personal hotspot in the meeting room**

**3. DO try 802.11a if your WiFi device supports it**

**4. DON'T manually allocate an IP address**

**5. DON'T be a bandwidth hog by streaming video, playing online games, or downloading huge files**

**6. DON'T use packet probing software which clogs the local network (e.g., packet sniffers or port scanners)**

## 1.3 Other

In accordance with the Working Procedures it is reaffirmed that:

(i) compliance with all applicable antitrust and competition laws is required;

(ii) timely submissions of work items in advance of TSG or WG meetings are important to allow for full

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| and fair consideration of such matters; and<br>(iii) the chairman will conduct the meeting with strict impartiality and in the interests of 3GPP |

*Note on (i): In case of question please contact your legal counsel.*

*Note on (ii): WIDs don't need to be submitted to the RAN2 meeting and will typically not be discussed here either.*

# 2. General

*THANK YOU to companies that request TDoc numbers and submit contributions early before deadline (really appreciated). Will start to refrain from treating late documents.*

## 2.1 Approval of the agenda

*A draft schedule for the week is provided as a separate document, distributed via the RAN2 email reflector and made available during the meeting week in the RAN2\Inbox\Chairmans_Notes folder.*

R2-1712100 Agenda for RAN2#100 Chairman agenda
=> Approved

## 2.2 Approval of the report of the previous meeting

R2-1712101 RAN2#99bis Meeting Report MCC report
=> Approved

## 2.3 Reporting from other meetings

## 2.4 Others

R2-1713911 RAN2 Compendium MCC other
=> Noted

**Rapporteur changes**

**Spec former rapporteur proposed new rapporteur**

**Isolated impact analysis**

Note that an isolated impact analysis is required for Rel-8 to Rel-14 CRs from Q3 2017 onwards.

Only corrections where there is a proven problem are allowed for frozen releases (Rel-8 to Rel-14).

**RAN2 WG compendium**

Latest version can always be found at ftp://ftp.3gpp.org/tsg_ran/WG2_RL2/Org/RAN2_Compendium/

**Drafting rules**

Note that specification drafting rules in TR 21.801 must be followed when drafting a CR and draft TS/TR.

Latest version can always be found at http://www.3gpp.org/ftp/specs/archive/21_series/21.801/

**Time Budget**

The time budget endorsed at RAN-77 is available in RP-172116

**Offline discussion during RAN2 meeting**

Chairs will allocate a number of offline discussions during the meeting. Create a folder starting with this number within inbox/drafts and use this to share any documents relating to the offline discussion (please use format "*nnn*-...", i.e. a 3 digit number). Also use this number in the title of any reflector emails relating to this offline discussion. (please use format "[100 Offline#*nnn*].....). Do not share documents over the reflector during the meeting

# 3 Incoming liaisons

*Note: LSs are moved to the respective agenda items if any.*
*Liaisons to RAN2*

R2-1712107 Reply LS on the number of bearers (C1-174658; contact: Samsung) CT1 LS in Rel-15 TEI15 To:SA2, RAN2 Cc:CT4, RAN, CT, SA, SA1
=> We will wait for SA2 to respond before taking more action on this.
=> Noted

R2-1712110 LS on 2Gbps category (R1-1719084; contact: Qualcomm) RAN1 LS in Rel-14 TEI14 To:RAN2, RAN
- Qualcomm confirm that the CR RAN1 looked at is identical to what we agreed in principle last meeting.
- Nokia think that there is an error with the fallback category in the CRs seen last meeting. The CRs provided into this meeting are already updated.

=> Noted

R2-1712135 Reply to Reply LS on LTE call redirection to GERAN (S3c0011; contact: Nokia) SA3 LS in Rel-15 TEI15 To:CT1, RAN2, RAN3
=> Noted

R2-1712151 Reply LS to RAN 2 on QCIs for EPC based ULLC (S2-178150; contact: Vodafone) SA2 LS in Rel-15 LTE_sTTIandPT, EDCE5, LTE_HRLLC, NR_newRAT-Core To:RAN2, RAN3, SA1 Cc:RAN1, SA4, CT4
- Ericsson think this should be discussed but not sure which agenda item.

=> Contributions to be treated after lunch ion Monday to see if anything can be responded to SA2.
=> Noted

*Liaisons with RAN2 in CC*
R2-1712147 Reply LS on MBMS bearer event notification (S2-177582; contact: Ericsson) SA2 LS in Rel-15 MBMS_Mcservices To:SA6, RAN3 Cc:RAN2
R2-1712160 LS answer to LS on EUTRAN sharing enhancement (S5-175461; contact: Ericsson) SA5 LS in Rel-14 TEI14 To:SA2 Cc:RAN2, RAN3, RAN, SA
R2-1712299 Reply LS on the number of bearers (C4-175345; contact: Nokia) CT4 LS in Rel-15 TEI15 To:SA2 Cc:CT1, RAN2, RAN, CT, SA, SA1
=> LSs above are all noted

*New LS in (during RAN2#100)*
R2-1714180 Reply LS on the number of bearers (S2-179536; contact: Samsung) SA2 LS in Rel-15 TEI15 To:RAN2, CT1, CT4, RAN, SA, CT Cc:SA1
=> Noted

*Contributions related to incoming LSs*
R2-1713349 On QCIs for EPC based ULLC Ericsson discussion Rel-15 NR_newRAT-Core, LTE_HRLLC, LTE_sTTIandPT, EDCE5
- Vodafone explain the LS was only addressed requirement for normal latency, not directed at URLLC. There is also a separate SA2 WI on URLLC and will look at the 1ms delay requirement and most likely SA2 will add a QCI for that case.
- Qualcomm think we need to target SA1 requirement. Vodafone think RAN is not addressing this requirement in Rel-15.

P2
- Samsung think we did not agree this for NR and so wonder if it is needed for LTE. Ericsson think this is not concluded for 5G yet but think it will be needed.



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P4
- Nokia think we should focus on interfaces that support inter vendor.
- Samsung wonder if this is up to RAN2 to discuss, and also it should not be vendor specific.
- DT think this should be discussed in RAN3.
- Ericsson think RAN2 could indicate that the container approach is feasible.
- Vodafone think that previous RAN2 request parameters on various things it is difficult for the CN to provide. Also the eNB can pick up the traffic pattern quite easily and store the info in the CN which can then be provided back to the RAN.
- Huawei is not sure how the traffic pattern can be learnt by the RAN, as this should be transparent to the RAN.

**Agreement**
1 Respond to SA2 that RAN2 preference is that at least one PDB value expressing tighter latency requirements (include value of reliability/packet size/radio delay related to what can be achieved with sTTI) should be added to the set of standardized QCI(s) for URLLC.
2 Respond to SA2 that RAN2 preference is that for the GBR QCI's for URLLC, a maximum burst size is defined. It defines the largest amount of data that the application can expect to be transmitted within the radio delay requirement.
FFS: Whether the maximum burst size needs to be considered for NR as well.
3 Respond to SA2 that RAN2 preference is that GBR QCI's are defined for the discrete automation use case.

=> Draft LS response in R2-1714075 (Offline discussion #06, Ericsson)

R2-1714075 [DRAFT] Reply LS on QCIs for EPC based ULLC Ericsson LS out Rel-15 NR_newRAT-Core To:SA2
=> Approved in R2-1714136

# 4-5 Void

# 6 LTE: Rel-12 and earlier releases

*Including corrections related to the following WIs:*
*(LTE-L23, leading WG: RAN2, REL-8, started: Sep. 06, closed: Dec. 08, WID: RP-080747)*
*(LTE_CA-Core, leading WG: RAN1, REL-10, started: Dec. 09, closed: June 11, WID: RP-100661)*
*(LTE_UL_MIMO-Core, leading WG: RAN1, REL-10, started: Dec.09, closed: June 11, WID: RP-100959)*
*(LTE_eDL_MIMO-Core, leading WG: RAN1, REL-10, started: Dec.09, closed: March 11, WID: RP-100196)*
*(LTE_Relay-Core, leading WG: RAN1, REL-10, started: Dec. 09, closed: June 11, WID: RP-110911)*
*(MBMS_LTE_enh-Core, leading WG: RAN2, REL-10, started: June 10, closed: March 11, WID: RP-101244)*
*(MDT_UMTSLTE-Core, leading WG: RAN2, REL-10, started: Dec. 09, closed: June 11, WID: RP-100360)*
*(eICIC_LTE-Core, leading WG: RAN1, REL-10, started: March 10, closed: June 11, WID: RP-100383)*
*(SONenh_LTE-Core, leading WG: RAN3, REL-10, started: March 10, closed: June 11, WID: RP-101004)*
*(LTE_CA_enh-Core, leading WG: RAN1, REL-11, started: March 11, closed: Mar.13, WID: RP-121999)*
*(MBMS_LTE_SC-Core, leading WG: RAN2, REL-11, started: June 10, closed: Sep.12, WID: RP-120258)*
*(LTE_eDDA-Core, leading WG: RAN2, REL-11, started: March 11, closed: Dec.12, WID: RP-120256)*
*(LCS_LTE-NBPS-Core, leading WG: RAN2, REL-11, started: March 09, closed: June. 13, WID: RP-131259)*
*(eICIC_enh_LTE-Core, leading WG: RAN1, REL-11, started: March 11, closed: Dec. 12, WID: RP-120860)*
*(SPIA_IDC_LTE-Core, leading WG: RAN2, REL-11, started: Sep.11, closed: Dec. 12, WID: RP-111355)*
*(COMP_LTE_DL-Core, leading WG: RAN1, REL-11, started: Sep.11, closed: Dec.12, WID: RP-111365)*
*(COMP_LTE_UL-Core, leading WG: RAN1, REL-11, started: Sep.11, closed: Dec.12, WID: RP-111365)*
*(LTE_TDD_add_subframe, leading WG: RAN1, REL-11, started: March 12; closed: Sep. 12, WID: RP-120384)*
*(FS_HetNet_eMOB_LTE, leading WG: RAN2, REL-11, started: March 11, closed: Sep. 12, WID: RP-110709)*
*(LTE_enh_dl_ctrl-Core, leading WG: RAN1, REL-11, started: Dec. 11, closed: Dec. 12, WID: RP-120871)*
*(LTE_SC_enh_dualC-Core, leading WG: RAN2, REL-12, started: Dec.13, closed: Dec.14, WID: RP-141797)*
*(LTE_SC_enh_L1-Core, leading WG: RAN1, REL-12, started: Dec.13, closed: Dec.14, WID: RP-132073)*
*(LTE_D2D_Prox-Core, leading WG: RAN1, REL-12, started: Mar.14, closed: Mar.15, WID: RP-142043)*
*(MBMS_LTE_OS-Core, leading WG: RAN2, REL-12, started: Sep.13, closed: Dec.14, WID: RP-140282)*
*(LTE_NAICS-Core, leading WG: RAN1, Rel-12, started: Mar 14, closed: Dec.14, WID: RP-140519)*
*(LC_MTC_LTE-Core, leading WG: RAN1, REL-12, started: Jun 13, closed: Dec 14, WID: RP-140522)*
*(GCSE_LTE-MBMS_CM-Core, leading WG: RAN3, started: Sep. 14, closed: Mar. 2015, WID: RP-141035)*
*(LTE_CA_TDD_FDD-Core, leading WG: RAN1, REL-12, started: Jun 13, closed: Jun 14, WID: RP-140465)*

*(LCS_BDS-LTE-Core, leading WG: RAN2, REL-12, started: Mar 13, closed: Dec 13, WID: RP-130416)*
*(LTE_eDL_MIMO_enh-Core, leading WG: RAN1, REL-12, started: Sep 12, closed: June 14, WID: RP-121416)*
*(HetNet_eMOB_LTE-Core, leading WG: RAN2, REL-12, started: Dec.12, , closed: Sep 14, WID: RP-122007)*
*(Cov_Enh_LTE-Core, leading WG: RAN1, REL-12, started: Jun.13, closed: Jun.14, WID: RP-130833)*
*(LTE_TDD_eIMTA-Core, leading WG: RAN1, REL-12, started: Dec 12, closed: Jun.14, WID: RP-121772)*
*(SCM_LTE-Core, leading WG: RAN2, REL-12, started: Mar.14, closed: Sep.14, WID: RP-140434)*

*Including any LTE corrections related to the following joint UMTS/LTE WIs:*
*(SIMTC-RAN_OC-Core, leading WG: RAN2, REL-11, started: Sep.11, closed: Sep. 12, WID: RP-111373)*
*(eMDT_UMTSLTE-Core, leading WG: RAN2, REL-11, started: Sep.11, closed: Dec.12, WID: RP-121204)*
*(SONenh2_LTE_UTRA-Core, leading WG: RAN3, REL-11, started: Sep.11, closed: Dec.12, WID: RP-120314)*
*(rSRVCC-GERAN, leading WG: GERAN2, REL-11, started: Sep.11, closed: Nov.13, WID: GP-111290)*
*(EHNB_enh3-Core, leading WG: RAN3, REL-12, started: Sep.12, closed: Dec 13, WID: RP-130741)*
*(MTCe_RAN-Core, leading WG: RAN2, REL-12, started: Dec.13, closed: Sep.14, WID: RP-132053)*
*(UTRA_LTE_WLAN_interw-Core, leading WG: RAN2, REL-12, started: Dec.13, closed: Sep.14, WID: RP-132101)*
*(LTE_UTRA_IncMon-Core, leading: RAN4, REL-12, started: Dec.13, closed: Dec. 14, WID: RP-132061)*

# 6.0 In principle agreed CRs

*Documents in this agenda item will be handled in a break out session*

R2-1713540 DCI monitoring subframes for eIMTA 12 Huawei Technologies Sweden AB CR Rel-12 36.331 12.15.1 3188 - F LTE_TDD_eIMTA-Core
=> The CR is agreed

R2-1713542 DCI monitoring subframes for eIMTA 13 Huawei Technologies Sweden AB CR Rel-13 36.331 13.7.1 3189 - A LTE_TDD_eIMTA-Core
=> The CR is agreed

R2-1713545 DCI monitoring subframes for eIMTA 14 Huawei Technologies Sweden AB CR Rel-14 36.331 14.4.0 3190 - A LTE_TDD_eIMTA-Core
=> The CR is agreed

# 6.1 Other

*Including output of email discussion [99bis#45][LTE/IDC] – UL CA IDC problems- Nokia*

R2-1712311 UE capabilities for Tx antenna selection Qualcomm Incorporated, Ericsson, SoftBank CR Rel-13 36.331 13.7.0 3080 2 F LTE_CA_TDD_FDD-Core R2-1710551
- Nokia asks if it known what switchtogether means. We can clarify or refer to a RAN1 spec.
- Nokia asks if we need to notify RAN4

=> The CR is revised in R2-1714036

R2-1714036 UE capabilities for Tx antenna selection Qualcomm Incorporated, Ericsson, SoftBank CR Agreement R2-1710551, R2-1712311 Rel-13 36.331 13.7.0 LTE_CA_TDD_FDD-Core 3080 3 F
[CB 500]

R2-1712312 UE capabilities for Tx antenna selection Qualcomm Incorporated, Ericsson, SoftBank CR Rel-14 36.331 14.4.0 3081 1 A LTE_CA_TDD_FDD-Core R2-1710552

R2-1712313 UE capabilities for Tx antenna selection Qualcomm Incorporated, Ericsson, SoftBank CR Rel-13 36.306 13.7.0 1510 2 F LTE_CA_TDD_FDD-Core R2-1711846
=> The CR is revised in R2-1714037

R2-1714037 UE capabilities for Tx antenna selection CR Agreement R2-1711846, R2-1712313 Rel-13 36.306 13.7.0 LTE_CA_TDD_FDD-Core 1510 3 F
[CB]

R2-1712314 UE capabilities for Tx antenna selection Qualcomm Incorporated, Ericsson, SoftBank CR Rel-14 36.306 14.4.0 1511 1 A LTE_CA_TDD_FDD-Core R2-1710554

R2-1712348 Report of email discussion 99bis#45 LTE UL CA IDC problems Nokia, Nokia Shanghai Bell report Rel-11

**RAN2 common understanding**
**1:** *The UE* always sets the complete assistance information, i.e. complete set of frequencies affected by IDC problems.



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**2:** The UE-generated *affectedCarrierFreqCombList* IE does not link its validity to the time of current UL CA configuration, but to actual IDC problem for the configured measurement object.
**3:** If the UE is no longer experiencing UL CA IDC problems it shall send empty *InDeviceCoexIndication-r11* message with omitted *InDeviceCoexIndcation- 11d0-IEs*.
**4:** There is converged understanding on expected UE behaviour for handling UL CA IDC problems and no need for specification clarification was identified.
**5:** No specification updates are required

R2-1713154 Releasing CQI-ReportConfig Nokia, Nokia Shanghai Bell discussion Rel-10
- Qualcomm thinks nothing is broken so we don't need to go to Rel-10
- Nokia's intention is to have a CR for Rel-14 only.

=> The intention is that cqi-ReportConfig Indicates the currently use CQI reportinc configuration for the serving cell. NOTE 1.
=> Noted

R2-1713549 Tabel 8.2-2 reformatting Ericsson CR Rel-12 36.302 12.8.0 1189 - F TEI12
- Qualcomm asks what happens if we add more rows – do we have to clarify that the NOTE doesn't apply to the row.

=> The CR is not pursued
R2-1713550 Tabel 8.2-2 reformatting Ericsson CR Rel-13 36.302 13.6.0 1190 - A TEI12
=> The CR is not pursued

R2-1713551 Tabel 8.2-2 reformatting Ericsson CR Rel-14 36.302 14.3.0 1191 - A TEI12
=> Update to category F and WI code should be TEI14
=> The CR is updated to include the changes of R2-1713492
=> The CR is revised in R2-1714038
R2-1714038 Tabel 8.2-2 reformatting CR R2-1713551 Rel-14 36.302 14.3.0 TEI12 1191 1 F
[CB 504]

*This will be treated in main session*
R2-1712402 Secured redirect to GERAN Ericsson discussion Rel-12 TEI12
R2-1712403 Draft Reply LS on LTE call redirection to GERAN Ericsson discussion Rel-12 TEI12
R2-1712404 Reject of unprotected redirect to GERAN Ericsson CR Rel-14 36.331 14.4.0 3132 - F TEI14
R2-1713152 Resolving the unsecured GERAN redirection issue Nokia, Nokia Shanghai Bell discussion Rel-13 TEI13
R2-1713153 Resolving the GERAN redirection security issue Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 3170 - F TEI13

# 7 LTE: Rel-13

## 7.1 WI: Further LTE Physical Layer Enhancements for MTC

*(LTE_MTCe2_L1-Core, leading WG: RAN1, REL-13; started: Sep. 14, closed: Mar. 16, WID: RP-150492)*
*Documents in this agenda item will be handled in a break out session*

**LS in**

R2-1712111 LS on MBSFN subframe configuration in handover signalling for eMTC (R1-1719091; contact: Qualcomm) RAN1 LS in Rel-13 LTE_MTCe2_L1 To:RAN2
- QC think that R2 need to make the correction that Rel-13 assumption is used when MBSFN subframe config is not provided. There is a CR.



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⇒ **noted**

## 7.1.0 In principle agreed CRs

R2-1713088 Corrections on paging monitoring in RRC_CONNECTED in Rel-13 eMTC Huawei, HiSilicon
CR Rel-13 36.331 13.7.0 3045 3 F LTE_MTCe2_L1-Core R2-1711881
- Ericsson think that the summary of change only indicates one of the affected subclauses and is thus not fully correct.
- Work with Ericsson to produce a good summary.

⇒ **Revised in R2-1713963 (rev 4) which is agreed unseen**

R2-1713089 Corrections on paging monitoring in RRC_CONNECTED in Rel-13 eMTC Huawei, HiSilicon
CR Rel-14 36.331 14.4.0 3046 2 A LTE_MTCe2_L1-Core R2-1711211

⇒ **Revised in R2-1713964 (rev 3) which is agreed unseen**

R2-1713222 Corrections on paging monitoring in RRC_CONNECTED in Rel-13 eMTC Huawei, HiSilicon
CR Rel-13 36.300 13.9.0 1054 3 F LTE_MTCe2_L1-Core R2-1711882

⇒ **Agreed**

R2-1713091 Corrections on paging monitoring in RRC_CONNECTED in Rel-13 eMTC Huawei, HiSilicon
CR Rel-14 36.300 14.4.0 1055 3 A LTE_MTCe2_L1-Core R2-1711213

⇒ **Tick the RAN box, Revised in R2-1713965 (rev 4), agreed unseen**

R2-1713094 Correction to description of uplink and downlink shared channel physical layer model for MTC and NB-IoT. Huawei, HiSilicon CR Rel-13 36.302 13.6.0 0116 2 F
LTE_MTCe2_L1-Core, NB_IOT-Core R2-1711887

⇒ **agreed**

R2-1713095 Correction to description of uplink and downlink shared channel physical layer model for MTC and NB-IoT. Huawei, HiSilicon CR Rel-14 36.302 14.3.0 0117 1 A
LTE_MTCe2_L1-Core, NB_IOT-Core R2-1711233

⇒ **agreed**

R2-1713624 Alignment of FGI4 (Short DRX) for Cat M1 Ericsson CR Rel-13 36.331 13.7.1 3119 1 F LTE_MTCe2_L1-Core R2-1711644
- Huawei think the date is wrong.

⇒ **agreed**

R2-1713625 Alignment of FGI4 (Short DRX) for Cat M1 and M2 Ericsson CR Rel-14 36.331 14.4.0 3120 1 F LTE_MTCe2_L1-Core R2-1711645

⇒ **agreed**

*Withdrawn*

R2-1713090 Corrections on paging monitoring in RRC_CONNECTED in Rel-13 eMTC Huawei, HiSilicon
CR Rel-13 36.300 13.9.0 1055 2 F LTE_MTCe2_L1-Core R2-1711213

## 7.1.1 Other

**Terminology and CE barring**

R2-1712634 Introducing a definition for the term UE in CE Intel Corporation, Ericsson, Huawei, HiSilicon, LG CR Rel-13 36.331 13.7.0 3139 - F LTE_MTCe2_L1-Core
- Ericsson think that the main part of the issue is whether a normal UE in normal coverage can access a network in CE mode, e.g. due to power consumption saving, so Ericsson think this opens up an agreement from the past.
- QC think that “intends to” means that the UE want to also do the RACH in CE mode.
- Sequans think that the “intends to” changes previous definitions.
- Intel think that if “intends to” is problematic we can remove it.



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- Intel think that in the situation that the UE is configured it is clear. Huawei point out that the RACH procedure alternative is determined by the S crtieria in 36.304. ZTE agrees with this. Gemalto agrees that the standard is clear.
- Thus. there is currently no ambiguity in Stage-3 w.r.t. “intends to”. The UE intention at RACH is fully defined by radio measurement comparison to S criteria.
- Chair wonders if we should have identical definitions in 36.300 and 36.331
- Ericsson think this definition is better than the current one in 36.300, but would prefer to not use “intends to”

⇒ **Use the following definition: “UE in CE: Refers to a UE that is capable of using coverage enhancement, and requires coverage enhancement mode to access a cell or is configured in a coverage enhancement mode.”**

⇒ **Revised in R2-1713967, which is agreed unseen.**

R2-1712635 Introducing a definition for the term UE in CE Intel Corporation, Ericsson, Huawei, HiSilicon, LG CR Rel-14 36.331 14.4.0 3140 - A LTE_MTCe2_L1-Core

⇒ **Revised in R2-1713968, which is agreed unseen.**

R2-1713100 Correction to cell barring for coverage enhancement Huawei, HiSilicon, Intel Corporation
CR Rel-13 36.304 13.7.0 0396 - F LTE_MTCe2_L1-Core

- Ericsson suggests to edit offline
- ZTE think this is not needed. ZTE are concerned that this may involve additional requirement to check the radio conditions of a cell.
- QC think there are no additional requirements.

⇒ **No intention to impose additional requirements on the UE**

Work offline (302), revisions in R2-1713969 & 70 (Huawei).

R2-1713969 Correction to cell barring for coverage enhancement Huawei, HiSilicon, Intel Corporation
CR Rel-13 36.304 13.7.0 0396 - F LTE_MTCe2_L1-Core

⇒ **agreed**

R2-1713101 Correction to cell barring for coverage enhancement Huawei, HiSilicon, Intel Corporation
CR Rel-14 36.304 14.4.0 0397 - A LTE_MTCe2_L1-Core

⇒ **revised**

R2-1713970 Correction to cell barring for coverage enhancement Huawei, HiSilicon, Intel Corporation
CR Rel-14 36.304 14.4.0 0397 - A LTE_MTCe2_L1-Core

⇒ **agreed**

R2-1713223 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC
CR Rel-13 36.331 13.7.0 3095 3 F LTE_MTCe2_L1-Core R2-1711886

- Ericsson proposes further changes.
- ZTE think we might need to change SIB5 as well. There is no field description for SIB5. Sequans agrees and think explanations can be added for absence.
- Intel think these parameters are both for intra and inter-frequency. Huawei think that also inter-frequency values are needed, but they are different than these.
- QC agrees with this change, and think that the proposal gives the possibility to use configuration for intrafreq neighbours that is different to serving cell.
- Intel think we should say that the fields in SIB3 are for intra and inter-freq, but if SIB5 value is provided then SIB3 values don’t apply to interfreq.
- Huawei think that there are cases when CE is provided only on the current frequency, and would for such cases not like to have a common value for intra and inter-freq.
- Intel wonders what happens if values are absent. Intel indicate that for legacy the qrxlevmin is always provided.

⇒ **Values in SIB3 is for intra-freq, SIB5 is used for Inter-freq**

⇒ **The behaviour at absence need to be specified.**

Offline (303), revisions in R2-1713971 & 72 (Huawei).



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R2-1713971 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC
CR Rel-13 36.331 13.7.0 3095 4 F LTE_MTCe2_L1-Core R2-1711886
- ZTE think that for the parameters CE1 the field description text is different for the SIBs.

⇒ **Revised, make field descriptions consistent**

Revisions in R2-1713997 & 98 (Huawei)

R2-1713997 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC
CR Rel-13 36.331 13.7.0 3095 5 F LTE_MTCe2_L1-Core R2-1711886
- ZTE think that for the parameters CE1 the field description text is different for the SIBs.

⇒ **agreed**

R2-1713224 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC
CR Rel-14 36.331 14.4.0 3096 2 A LTE_MTCe2_L1-Core R2-1711231

⇒ **revised**

R2-1713972 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC
CR Rel-14 36.331 14.4.0 3096 3 A LTE_MTCe2_L1-Core R2-1711231

⇒ **revised**

R2-1713998 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC
CR Rel-14 36.331 14.4.0 3096 4 A LTE_MTCe2_L1-Core R2-1711231

⇒ **agreed**

**PDCCH**

R2-1713671 Correction on PDCCH-subframe NTT DOCOMO INC. CR Rel-13 36.321 13.7.0 1200 - F LTE_MTCe2_L1-Core
- LG think that the current spec is ok and that this may impact also legacy LTE. Docomo clarifies that for legacy LTE the current text is ok, but for MTC with repetitions, the UE doesn't monitor PDCCH in every subframe and think thus that the clarification is needed.
- QC think that the UE cannot know which subframe is with PDCCH. Intel agrees. QC think that what could be clarified is possible the relation between DRX and partial PDCCH monitoring.
- Docomo are concerned about misunderstandings and the interpretation of DRX timers.
- Docomo think that the text can be changed somewhat ..
- Blackberry think that the first sentence “Refers to a subframe with PDCCH” makes it clear.
- Chair poitn out that if more specific problems can be identified they can be resolved of course.

⇒ **Not pursued**

R2-1713672 Correction on PDCCH-subframe NTT DOCOMO INC. CR Rel-14 36.321 14.4.0 1201 - A LTE_MTCe2_L1-Core

⇒ **Not pursued**

**Handover**

R2-1713102 Correction to Radio Resource common configuration during CE->NC Handover for Rel-13 eMTC Huawei, HiSilicon CR Rel-13 36.331 13.7.0 3167 - F LTE_MTCe2_L1-Core
- Sequans think that a UE not configured to use CE mode A/B would not apply this configuration at all.
- QC think that if OR is applied then the information need to be provided very often which makes the HO cmd larger. LG agrees.
- Nokia wonders if the full configuration can be used. LG agrees and think that the target knows the SRC configuration. Intel agrees that full config can be used and point out that for RRC we don’t use “non used / dangling configuration”
- Blackberry think that anyway this CR may not work as it will not be clear what behaviour a specific UE applies.
- Intel confirms that full configuration will work, and the previous configuration in the UE is completely removed, i.e. the CE related configuration will not remain if a UE is handed over to a eNB/cell that doesn’t support CE and uses full configuration.
- There is not much support to do any change.



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Report after offline (307)
- There seems to be mixed opinions, some companies think that full configuration is sufficient, some companies want to optimize.
- Huawei would like to extend the proposal in the tdoc to also cover actual handover.
- QC think there is a value in this and would like to make change to procedure text.
- Intel still think this is not needed.
- Huawei point out that delta configuration is very much desirable in this case as we are in CE and do repetitions etc. LG think we could make conditions to make this work. QC point out that this is an useful optimization.
- Blackberry wonders how the network knows if the UE has implemented this.
- Chair: there seems to be significant support to be able to use delta configuration

⇒ **postponed**

R2-1713103 Correction to Radio Resource common configuration during CE->NC Handover for Rel-13 eMTC Huawei, HiSilicon CR Rel-14 36.331 14.4.0 3168 - A LTE_MTCe2_L1-Core

⇒ **Not pursued**

R2-1712292 MBSFN subframes for target cell during handover to CE cell Qualcomm Incorporated CR Rel-13 36.331 13.7.1 3128 - F LTE_MTCe2_L1-Core
- Intel think this is already clear from the field description.
- LG think the text is needed but think that the word "may" should be "shall". QC indicates that the "may" is for backwards compatibility.
- Huawei think this clarification is needed for the HO case.
- QC indicates that there is a typo

⇒ **Use the text: "If the field is present when *SystemInformationBlockType1-BR-r13* is transmitted in *RRCConnectionReconfiguration,* the UE may assume the valid subframes in *fdd-DownlinkOrTddSubframeBitmapBR* are not indicated as MBSFN subframes."**

⇒ **Revised in R2-1713985 (rev1), which is agreed unseen**

R2-1712293 MBSFN subframes for target cell during handover to CE cell Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3129 - F LTE_MTCe2_L1-Core

⇒ **Use the text: "If the field is present when *SystemInformationBlockType1-BR-r13* is transmitted in *RRCConnectionReconfiguration,* and if *RRCConnectionReconfiguration* does not include *systemInformationBlockType2Dedicated,* the UE may assume the valid subframes in *fdd-DownlinkOrTddSubframeBitmapB* are not indicated as MBSFN subframes."**

⇒ **Revised in R2-1713986 (rev1), which is agreed unseen**

R2-1712294 Reply LS on Issue with handovers in eMTC Qualcomm Incorporated discussion Rel-13 LTE_MTCe2_L1-Core

⇒ **Respond to the R1 question**

⇒ **Attach agreed CRs**

⇒ **Revised in R2-1713973**

R2-1713973 Reply LS on Issue with handovers in eMTC Qualcomm Incorporated discussion Rel-13 LTE_MTCe2_L1-Core

⇒ **Approved, final version in R2-1713999**

### UE Capabilities

R2-1713041 TM6 capabilities in CE mode Ericsson, Sequans, Qualcomm Incorporated CR Rel-13 36.306 13.7.0 1527 - F LTE_MTCe2_L1-Core
- QC think that CR number of affected spec should be added

⇒ **Revised in R2-1713974 (rev 1), which is agreed unseen**

R2-1713042 TM6 capabilities in CE mode Ericsson, Sequans, Qualcomm Incorporated CR Rel-14 36.306 14.4.0 1528 - A LTE_MTCe2_L1-Core

⇒ **Revised in R2-1713975 (rev 1), which is agreed unseen**



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R2-1713043 TM6 capabilities in CE mode Ericsson, Sequans, Qualcomm Incorporated CR Rel-13 36.331 13.7.1 3159 - F LTE_MTCe2_L1-Core

- In the first added IE, QC think we don't need the first three OPTIONAL indications, and in the second added IE, the OPTIONAL is not needed.
- QC think we should insert the numbers rather than xy.

⇒ **Revised in R2-1713976 & 77 (rev 1)**

R2-1713976 TM6 capabilities in CE mode Ericsson, Sequans, Qualcomm Incorporated CR Rel-13 36.331 13.7.1 3159 1 F LTE_MTCe2_L1-Core

⇒ **agreed**

R2-1713044 TM6 capabilities in CE mode Ericsson, Sequans, Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3160 - A LTE_MTCe2_L1-Core

⇒ **revised**

R2-1713977 TM6 capabilities in CE mode Ericsson, Sequans, Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3160 - A LTE_MTCe2_L1-Core

⇒ **agreed**

*Above 4 tdocs moved from 7.2*

*Withdrawn*

R2-1713092 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC CR Rel-13 36.331 13.7.0 3096 1 F LTE_MTCe2_L1-Core R2-1711231

R2-1713093 Corrections on field description of cellSelectionInfoCE for eMTC Huawei, HiSilicon, CMCC CR Rel-14 36.331 14.4.0 3095 2 A LTE_MTCe2_L1-Core R2-1711886

# 7.2 WI: Narrowband IOT

*(NB_IOT-Core; leading WG: RAN1; started: Sep. 15; target: Jun. 16; WID: RP-152284)*
*Documents in this agenda item will be handled in a break out session*

**LS in**

R2-1712146 LS on no dedicated bearer support over NB-IoT (S2-176723; contact: MediaTek) SA2 LS in Rel-13 CIoT To:RAN5, RAN2, CT1
- There is a CR

⇒ **Was already treated last meeting in the common session**

**36.300**

R2-1712291 Clarification early contention resolution not supported in NB-IoT Qualcomm Incorporated CR Rel-14 36.300 14.4.0 1070 - F NB_IOT-Core, TEI14
- Ericsson think that we had a MAC CR and decided to not change.
- Huawei think this is clear in R1 specifications.
- Chair think that R1 specification determining when the UE switches to USS makes early contention resolution impossible. QC agrees. Nokia also think this is the case
- Ericsson wonders if this is also for Rel-13. Huawei think it is also for Rel-13 but we don't need a CR for Rel-13. QC agrees. Nokia think we need a CR for Rel-13.
- Huawei would be ok with a Rel-13 CR if it says on the cover sheet that this is just removing an inconsistency between Stage-3 and Stage-2.

Check offline.
- QC reports that Early contention resolution cannot be done and cannot be changed for Rel-13 and Rel-14 and there is compatibility concerns so if this is to be changed it need to be done carefully. Nokia agrees and think we might need to send and LS to R1.
- Ericsson think that the R1 specifications allows early contention resolution.
- Chair think that the UE will start monitor USS when USS configuration is received.
- QC think that for Rel-13 at least we need this clarification.
- ZTE think we can agree this for Rel-13 but hopes that we can have early contention resolution for Rel-14
- Chair think it is unavoidable to introduce this clarification for Rel-13

⇒ **It seems agreeable to clarify that early contention resolution is not supported for Rel-13, two UE vendors confirm that this has been the assumption, one network vendor want to check further.**

⇒ **Postpone to e.g. confirm the Rel-13 assumption and what can be done for Rel-14 and later**

**36.331**

R2-1712983 NRS-CRS power offset configuration for NB-IoT ZTE Corporation, Sanechips discussion Rel-13
- Chair wonders why R2 should discuss this as it was specified according to R1 decisions. Huawei also think this is a R1 issue. Ericsson think there is an issue that need to be fixed, and that R2 can fix this. Nokia are also not sure, but would refer to discuss first in R1. QC also think we need R1 updates.

Check offline.

⇒ **noted**

R2-1712994 NRS-CRS power offset configuration for NB-IoT ZTE Corporation, Sanechips CR Rel-13 36.331 13.7.1 3152 - F NB_IOTenh-Core

⇒ **Not pursued**

R2-1713001 NRS-CRS power offset configuration for NB-IoT ZTE Corporation, Sanechips CR Rel-14 36.331 14.4.0 3153 - F NB_IOTenh-Core

⇒ **revised**

R2-1713996 NRS-CRS power offset configuration for NB-IoT ZTE Corporation, Sanechips CR Rel-14 36.331 14.4.0 3153 - F NB_IOTenh-Core
- Ericsson wonders if the R1 CR has been agreed.



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- Ericsson wonders if the R1 CR also includes other deployment cases, anchor SA – non-Anchor in-band. ZTE think this cases is covered.
- ZTE think that the most important case is Anchor-GuardBand and Non-Anchor inband.
- Huawei think this is ok, but think we could have a one week email check.
- Ericsson are ok with the R2 CR, but think the R1 CR need to be checked.
- Chair: The CR seems agreeable.

✉ **[NB-IoT R14] email discussion one week CR approval, NRS-CRS power offset configuration, mainly to check R1-R2 consistency (ZTE)**

R2-1713215 NB-IoT UE capability extension correction Nokia, Nokia Shanghai Bell CR Rel-13
36.331 13.7.1 3174 - F NB_IOT-Core
R2-1713221 NB-IoT UE capability extension correction Nokia, Nokia Shanghai Bell CR Rel-14
36.331 14.4.0 3177 - F NB_IOT-Core

**36.304**

R2-1713129 Clarification on eDRX in NB-IoT Nokia CR Rel-13 36.304 13.7.0 0398 - F
NB_IOT-Core

- QC and LG think that some wording need to be changed.

⇒ **We need an update as the current text seems wrong.**

⇒ **Revised, revisions in R2-1713960 & 61**

Perfect the wording offline (301) (Nokia).

R2-1713960 Clarification on eDRX in NB-IoT Nokia CR Rel-13 36.304 13.7.0 0398 1 F
NB_IOT-Core

⇒ **agreed**

R2-1713180 Clarification on eDRX in NB-IoT Nokia CR Rel-14 36.304 14.4.0 0399 - A
NB_IOT-Core

⇒ **revised**

R2-1713961 Clarification on eDRX in NB-IoT Nokia CR Rel-14 36.304 14.4.0 0399 1 A
NB_IOT-Core

⇒ **agreed**

# 7.3 Other LTE Rel-13 WIs

*Including corrections related to the following WIs:*
*(LTE_LAA-Core, leading WG: RAN1, REL-13; started: June 15, closed: Dec. 15, WID: RP-151045)*
*(LTE_CA_enh_b5C-Core, leading WG: RAN1, REL-13; started: Dec. 14, closed: Dec. 15, WID: RP-151984)*
*(LTE_SC_PTM-Core, leading WG: RAN2, REL-13; started: June 15, closed: Dec. 15, WID: RP-151110)*
*(LTE_eD2D_Prox-Core, leading WG: RAN2, REL-13; started: Dec. 14, closed: Mar. 16, WID: RP-150441)*
*(LTE_MC_load-Core, leading WG: RAN2, started: Mar. 15, closed: Dec. 15, WID: RP-152181)*
*(LTE_dualC_enh-Core, leading WG: RAN2, started: Mar. 15, closed: Dec. 15, WID: RP-151739)*
*(LTE_extDRX-Core; leading WG: RAN2; started: Mar. 15; closed: Mar. 16; WID: RP-150493)*
*(LTE_EBF_FDMIMO-Core; leading WG: RAN1; started: June. 15; closed: Dec. 15; WID: RP-151085)*
*(LTE_eMDT2-Core; leading WG: RAN2; started: Sep. 15; closed: Dec 15; WID: RP-151611)*
*(UTRA_LTE_iPos_enh-Core; leading WG: RAN2; started: Sep. 15; closed: Dec 15; WID: RP-152251)*
*(LTE_WLAN_radio-Core, leading WG: RAN2, started: Mar. 15, closed: Mar. 16, WID: RP-152213)*
*(LTE_WLAN_radio_legacy-Core; leading WG: RAN2; started: Sep. 15; closed: Mar 15; WID: RP-151615)*

*Including any LTE corrections related to the following joint UMTS/LTE WIs:*
*(ACDC-RAN-Core; leading WG: RAN2; REL-13; started: Mar. 15; closed: Dec. 15; RP-150662)*

*Documents in this agenda item will be handled in a break out session*



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### 7.3.0 In principle agreed CRs

R2-1712288 Define requirement for reception of number of simultaneous SC-PTM services Qualcomm Incorporated CR Rel-13 36.331 13.7.1 3106 2 F LTE_SC_PTM-Core R2-1711444
=> The CR is agreed

R2-1712289 Define requirement for reception of number of simultaneous SC-PTM services Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3108 1 A LTE_SC_PTM-Core R2-1711453
=> The CR is agreed

R2-1713664 SFN desynchronizaion between eNB and eDRX UE NTT DOCOMO INC. CR Rel-14 36.331 14.4.0 3194 - F LTE_extDRX-Core
=> The CR is agreed

### 7.3.1 Other

R2-1713155 Clarification to WLAN status monitoring Nokia, Nokia Shanghai Bell CR Rel-13 36.331 13.7.1 3171 - F LTE_WLAN_radio-Core
=> The CR is not pursued

R2-1713156 Clarification to WLAN status monitoring Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 3172 - F LTE_WLAN_radio-Core
=> The CR is not treated

R2-1713559 Clarification on csi-RS-ConfigNZPId Qualcomm Incorporated, Ericsson CR Rel-13 36.331 13.7.1 3111 1 F LTE_EBF_FDMIMO-Core R2-1711467
=> The CR is revised in R2-1714054

R2-1714054 Clarification on csi-RS-ConfigNZPId Qualcomm Incorporated, Ericsson CR Rel-[CB 524]

R2-1713564 Clarification on csi-RS-ConfigNZPId Qualcomm Incorporated, Ericsson CR Rel-14 36.331 14.4.0 3112 1 A LTE_EBF_FDMIMO-Core R2-1711471
=> The CR is revised in R2-1714055

R2-1714055 Clarification on csi-RS-ConfigNZPId Qualcomm Incorporated, Ericsson CR Rel-[CB 524]

R2-1713561 Signaling of NCSG Support for Inter-F Measurement Qualcomm Incorporated, Ericsson CR Rel-14 36.331 14.4.0 3110 2 B LTE_meas_gap_enh-Core R2-1711466 Withdrawn

R2-1713626 Missing optionality bit in UE capability signalling Ericsson CR Rel-13 36.331 13.7.1 3191 - F LTE_CA_enh_b5C-Core
- Nokia thinks that this that this is a non-backward compatible change
- Intel explains that there is a 12-13% increase
- Qualcomm doesn't think that we are gaining much as we would just send an empty IE.

=> The CR is not pursued

R2-1713627 Missing optionality bit in UE capability signalling Ericsson CR Rel-14 36.331 14.4.0 3192 - A LTE_CA_enh_b5C-Core
=> The CR is not treated

# 8 LTE Rel-14

## 8.1 WI: Enhanced LAA for LTE

*(LTE_eLAA-Core; leading WG: RAN1; REL-14; started: Dec. 15; closed: Mar. 17; WID:RP-162229)*
*This agenda item is for correction CRs to the closed WI.*
*Documents in this agenda item will be handled in a break out session*



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## 8.2 WI: Support for V2V services based on LTE sidelink

*(LTE_SL_V2V-Core; leading WG: RAN1; started: Dec. 15; closed: Sept 16; WID: RP-161603)*
*Documents in this agenda item will be handled in a break out session*

### 8.2.1 User plane

### 8.2.2 Control plane

## 8.3 Void

## 8.4 Void

## 8.5 WI: Enhanced LTE-WLAN Aggregation (eLWA)

*(LTE_WLAN_aggr-Core; leading WG: RAN2; REL-14; started: Mar. 16; closed: Mar. 17; WID: RP-160923)*
*Documents in this agenda item will be handled in a break out session*

R2-1712954 Correction to RLC UM for LWA Ericsson CR Rel-14 36.323 14.4.0 0210 - F TEI14
=> The CR is agreed

## 8.6 WI: Further mobility enhancements in LTE

*(LTE_eMob-Core; leading WG: RAN2; REL-14; started: Mar. 16; closed: Mar. 17; WID:RP-162503)*
*Documents in this agenda item will be handled in a break out session*

## 8.7 WI: Further Indoor Positioning enhancements for UTRA and LTE

*(UTRA_LTE_iPos_enh2-Core; leading WG: RAN2; REL-14; started: Mar. 16; closed: Dec. 16; WID: RP-162026)*
*Documents in this agenda item will be handled in a break out session*

## 8.8 WI: L2 latency reduction techniques for LTE

*(LTE_LATRED_L2-Core; leading WG: RAN2; REL-14; started: Mar. 16; closed: Sep. 16; WID: RP-160667)*
*Documents in this agenda item will be handled in a break out session*

## 8.9 Void

## 8.10 WI: eMBMS enhancements for LTE

*(MBMS_LTE_enh2-Core; leading WG: RAN1; REL-14; started: Mar. 16; closed: Sep. 17; WID:RP-162231)*
*Documents in this agenda item will be handled in a break out session*

R2-1714120 Reply LS on CR for Reference Signals for MBSFN with 1.25kHz and 7.5khz sub-carrier spacing (R1-1721431; contact: Intel) RAN1 LS in Rel-14 MBMS_LTE_enh2-Core RAN2
- Intel think a CR is required.
=> Check whether a CR is available (Qualcomm)
=> The previous in principle agree CR from previous meeting is incorrect and was not submitted to this meeting. It will corrected and submitted to next meeting

### 8.10.0 In principle agreed CRs

### 8.10.1 Other

## 8.11 WI: Enhancements of NB-IoT

*(NB_IOTenh-Core; leading WG: RAN1; REL-14; started: June 16; closed: Jun. 17; WID: RP-171060)*



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*Note: SC-PTM for eNB-IoT is handled under 8.12.1*
*Documents in this agenda item will be handled in a break out session*

LS in
R2-1714202 LS on correction of interference in NB-IoT RACH procedure - Crs exists, We treat them by email RAN1 LS in

⇒ **noted**

## 8.11.0 In principle agreed CRs

R2-1713040 Clarification on Interference Randomisation in NB-IoT in 36.331 Ericsson, Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3090 2 F NB_IOTenh-Core R2-1711879

⇒ **Agreed**

R2-1713039 Removal of FFS for RAI in 36.321 Ericsson CR Rel-14 36.321 14.4.0 1186 1 F NB_IOTenh-Core R2-1710748

⇒ **Agreed**

## 8.11.1 Other

*Including output of email discussion [99bis#33][NB-IoT R14] UE-Capability-NB extension (Sequans)*

**UE capability-NB extension**

R2-1713532 Report of [99bis#33][NB-IoT R14] UE-Capability-NB extension discussion NB_IOTenh-Core Sequans Communications

DISCUSSION

P1: Nokia think that Rel-14 proposal is ok but is not sufficient and we need to do a corresponding change for Rel-13 (change to dummy and not to use). Huawei think we don't need this. Nokia indicate that if we ever want to extend the Rel-13 we anyway need to use the R-14 extension and it will be uglier. Ericsson think there no strict need to update Rel-13. Sequans think the main part for the Rel-13 CR if we agree to it is the latenoncritical exension

P2: Sequans indicate that the intention is to make indication on 3GPP website. QC support this.

P4: Huawei and Nokia think we can use the r14 naming as this is anyway the first usable version for Rel-14. Nokia think it may be understood that we then indicate that r13 cannot be used together with r14. Sequans think that if we use R14 naming we can modify the name to …ext. Sequans wonders if we need to change - *ue-CapabilityContainer-r13* into *ue-Capability-r13.* Nokia think that if we do this, we also need to have a CR to Rel-13.

P5: QC think we don't need yet latenoncriticalextension in Rel 14 as we don't have rel-15 specs yet. Sequans think we didn't do this for rel-13 when we did Rel-14. Huawei think we need this for the handover preparation message. Nokia think we should have this for Rel-13 and for later releases we don't necessarily need it. LG agrees with Nokia. QC think we have sufficient possibility to extend in Rel-13 and don't think this is needed. Nokia proposes to go offline.

⇒ ***UE-Capability-NB-r13*** **non-critical extension mechanism shall be deactivated as proposed in [1]**

⇒ **Clarify on the cover-sheet that earlier versions of release 14 shall not be used by the UE to signal REL-14 UE capabilities, and there is a non-backwards compatibility. MCC can indicate the issue of non-usable versions on the 3GPP web-site as well.**

⇒ **The NOTE is not needed.**

⇒ **Include the whole *UECapabilityInformation-NB* message in U*ERadioAccessCapabilityInformation-NB-IEs* non-critical extension (in a container), from Rel-14.**

⇒ **Use r14 style naming.**

⇒ **Keep *ue-CapabilityContainer-r13***

⇒ **On P5, we don't introduce release-14 latenoncritical extension now**

Offline 300, discuss details, on the need for R13 additional extension, arrive at an agreeable CR revision (as below) (sequans).



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R2-1713355 Correction to UE-Capability-NB extension Sequans Communications CR Rel-14 36.331 14.4.0 3113 2 F NB_IOTenh-Core R2-1711830

⇒ **Revised, revision in R2-1713959**

R2-1713959 Correction to UE-Capability-NB extension and provision for late rel-13 corrections CR Rel-14 36.331 14.4.0 3113 2 F NB_IOTenh-Core R2-1711830

- Nokia think we now have to inform ETSI,
- QC and Huawei think we need to update the interoperatbility statement on the coversheet.

⇒ **No "-" between Info and Ext**

⇒ **Same Field description for ue-RadioAccessCapabilityInfo-Ext and ue-RadioAccessCapabilityInfo**

⇒ **update the interoperability statement on the coversheet (discuss offline, QC, Huawei)**

⇒ **Chair to include in report that indication on 3GPP website is needed.**

⇒ **Revised in R2-1714000**

R2-1714000 Correction to UE-Capability-NB extension and provision for late rel-13 corrections CR Rel-14 36.331 14.4.0 3113 4 F NB_IOTenh-Core R2-1711830

⇒ **agreed**

R2-1714175 Correction to UE-Capability-NB extension and provision for late rel-13 corrections CR Rel-13 36.331 F NB_IOT-Core

⇒ **agreed**

**Dedicated bearer**

R2-1713038 No dedicated bearer support in NB-IoT Ericsson CR Rel-14 36.300 14.4.0 1075 - F NB_IOTenh-Core

- Huawei think that we need no change to R2 this is a purely Core Network issue.
- Nokia wonders if this means that we can have only 1 bearer.
- Ericsson think we discuss default and dedicated bearers in CH 13, and we should be consistent.
- LG think the CR could be ok but could say "dedicated EPS bearer" if clarification is needed.
- QC think we don't need it as it doesn't impact AS.

⇒ **Not pursued**

**36.321**

R2-1713216 Clarification on carrier index in PDCCH order Huawei, HiSilicon CR Rel-14 36.321 14.4.0 1188 2 F NB_IOTenh-Core R2-1711883

- Ericsson clarifies that there is a 36.213 CR that has been agreed in R1 and that fixes this problem.
- Huawe think only the last change is now needed and reference to R1 CR to be added to the cover page

⇒ **Revised in R2-1714001**

R2-1714001 Clarification on carrier index in PDCCH order Huawei, HiSilicon CR Rel-14 36.321 14.4.0 1188 3 F NB_IOTenh-Core R2-1711883

⇒ **Update the coversheet, incomplete impact analysis**

⇒ **Revised in R2-1714007, revision agreed unseen.**

**36.331**

R2-1713217 Small corrections for NB-IoT enhancements Huawei, HiSilicon CR Rel-14 36.331 14.4.0 3175 - F NB_IOTenh-Core

- LG wonders about the intention to remove nonAnchor. Huawei explains that in Rel14 the eNB can decide to move a UE to and configure the anchor carrier using these IEs.
- QC think that we could also just introduce "Anchor / nonAnchor" instead and be more compatible towards the Rel-13 spec. Huawei would be ok with this.
- Blackberry think that it would be good to have a better Title.



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- Change the title to “Small Corrections to CarrierConfigDedicated, T322 and t-reordering default configuration”

⇒ **Change the title to “Small Corrections to CarrierConfigDedicated, T322 and t-reordering default configuration”**

⇒ **Use “anchor / nonAnchor” instead.**

Revision in R2-1713962

R2-1713962 Small corrections to CarrierConfigDedicated, T322 and t-reordering default configuration Huawei, HiSilicon CR Rel-14 36.331 14.4.0 3175 1 F NB_IOTenh-Core

⇒ **agreed**

**Radio Issues**

R2-1713218 Correction of interference in NB-IoT RACH procedure Huawei, HiSilicon CR Rel-14 36.306 14.4.0 1534 - F NB_IOTenh-Core

R2-1713219 Correction of interference in NB-IoT RACH procedure Huawei, HiSilicon CR Rel-14 36.321 14.4.0 1199 - F NB_IOTenh-Core

R2-1713220 Correction of interference in NB-IoT RACH procedure Huawei, HiSilicon CR Rel-14 36.331 14.4.0 3176 - F NB_IOTenh-Core

Comeback later wait for R1.

- Huawei indicates that there is an LS from R1
- QC think we should change the title of the CRs and they should be called “introduction of blabla” instead.
- Huawei indicates that two of the CRs above need to be updated acc to R1 agreements.

✉ **[NB-IoT R14] Interference in RACH procedure, CR approval 1 week (revisions of R2-1713218, 19, 20), update CRs based on R1 LS (Huawei)**

R2-1713239 DL and UL CE level non-corresponding issue in NB-IoT CMCC discussion Rel-14 NB_IOTenh-Core

- Chair wonders if we cannot configure UL and DL differently for a specific CE level? ZTE think there may be some problems.
- ZTE think there cannot be a CE level for the UL as the UE cannot know the UL interference. LG agrees with ZTE and think this can be handled by the eNB, i.e. to configure more UL repetitions for a high UL interference situation.
- Mediatek wonders is the repetition levels for UL and DL cannot be decoupled. CMCC think this punishes UEs in good coverage.
- QC think that the max number of repetitions is not changed during a connection.
- LG would like to understand whether RSRQ can be useful.
- Nokia think that after the RACH procedure the eNB can do link adaptations. Nokia think that the RACH problem can be resolved by different configuration. CMCC think this is not possible and that the UE would need to do ramping.
- Chair think we need to understand the character of the problem in more detail.
- Ericsson think this is interesting and would like to better understand, but have concerns on some solutions e.g. further RACH resource partitioning.
- Huawei think that this is also related to current R1 discussions, and in several cases it can be resolved by configuration.
- QC wonders if this is a R1 issue. Huawei agrees this is mainly R1. Ericsson agrees and think this shall be discussed with RACH interference disc in R1. LG think that also R4 should be in the loop.
- CMCC think we can have an email discussion.

⇒ **R2 suggest the discussion to continue in R1.**

R2-1713240 Introduction of DL CE level estimation for NB-IoT CMCC CR Rel-14 36.331 14.4.0 3179 - F NB_IOTenh-Core

R2-1713241 Introduction of Measurement Report for NB-IoT CMCC discussion Rel-14 NB_IOTenh-Core



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Proposal 1: NB-IoT UE reports the latest serving cell's measurements in MSG3 or MSG5.
Proposal 2：At least the serving cell's NRSRP is reported. NRS-SINR is also report if available.
Proposal 3： Measurement reporting threshold is broadcasted in SI or unicast transmitted in MSG4.

DISCUSSION

- MTK has sympathy for this but as NB-IoT don't have support for mobility, will the impact be large? Is the RSRP for serving cell enough? CMCC want low impact and think the proposals represents a very small impact that is also useful, e.g. no new requirements for measurements. CMCC think that the UE will anyway always measure RSRP and SINR.
- Ericsson think this is good, but think it can be more related RACH reporting in UMTS than e.g. Measurement reporting in LTE
- LG think that measurements can be reported by the application and think we already agreed to not support measurement reporting in Rel-14 and think it can maybe be a point in Rel-15
- QC think that serving cell measurements are ok from security point of view.
- QC think that interference could indeed be interesting.
- QC think that for e.g. EDT think can maybe not be done, and think we need to consider the size of MSG3.
- Gemalto think that if this is about reporting of available measurements this can be ok.
- Huawei think we have already discussed this.
- CMCC think that the granularity of "CE level" is too course information.
- ZTE support that the UE can report serving cell measurements. Blackberry also support.
- Huawei think we at least need to check with SA3. CMCC think we already have CQI reporting without security in all systems so we can do this without SA3 involvement.
- LG wonders whether the signalling would be RRC or physical layer. Chair wonders if there is a principal difference?
- Nokia point out that there is work ongoing on early CA activation where early measurements are needed.

⇒ **There seems to be interest, at least if only a) serving cell measurements and b) "available" measurements are considered.**

✉ **[NB-IoT R14] Email discussion for next meeting on Measurement Report for NB-IoT, what could be the possible solution(s), which release, pave the way for decisions, (CMCC).**



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# 8.12 WI: Further Enhanced MTC for LTE

*(LTE_feMTC-Core; leading WG: RAN1; REL-14; started: June 16; closed: Jun. 17; WID: RP-170532)*
*Documents in this agenda item will be handled in a break out session*

**LS in**

R2-1712106 Reply LS on Restricted Use of Enhanced Coverage (C1-174627; contact: Nokia) CT1 LS in Rel-15 CIoT_Ext To:RAN6, SA2 Cc:RAN2
⇒ **Noted**

R2-1712112 LS on Comb 2 SRS enhancements for BL/CE UEs (R1-1719093; contact: Qualcomm) RAN1 LS in Rel-14 LTE_feMTC-Core To:RAN2
⇒ **Take into account**
⇒ **Noted**

R2-1712153 Data support for "voice centric" UE supporting CE mode B (S2-178179; contact: Intel) SA2 LS in Rel-14 CIoT_Ext To:RAN2, RAN3
⇒ **Take into account**
⇒ **Noted**

## 8.12.0 In principle agreed CRs

R2-1712290 Target cell optional PBCH repetition status indication Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3037 3 F LTE_feMTC-Core R2-1711889
- Ericsson point out that there are several spelling errors on the cover page, and think the interoperability text can be somewhat enhanced
- Huawei think that the (revision of R2-xxxx) notation is not for CRs and should be removed. QC think that Juha has checked this and is ok. QC to decide if to keep or remove.

⇒ **Revision in R2-1713978, which is agreed unseen**

R2-1713096 Correction on downlink reception type combination for SC-PTM in feMTC Huawei, HiSilicon CR Rel-14 36.302 14.3.0 0115 2 F LTE_feMTC-Core R2-1711884
- Ericsson think now that the change is wrong

Offline discussion (304) Huawei.
⇒ **revised**

R2-1713991 Correction on downlink reception type combination for SC-PTM in feMTC Huawei, HiSilicon CR Rel-14 36.302 14.3.0 0115 3 F LTE_feMTC-Core R2-1711884
⇒ **agreed**

R2-1713098 Correction on TS 36.300 for support of larger maximum PDSCH/PUSCH channel bandwidth for feMTC Huawei, HiSilicon CR Rel-14 36.300 14.4.0 1066 1 F LTE_feMTC-Core R2-1711227
⇒ **agreed**

R2-1713225 Minor correction on the IE of pusch-EnhancementsConfig in feMTC Huawei, HiSilicon CR Rel-14 36.321 14.4.0 1187 1 F LTE_feMTC-Core R2-1711225
⇒ **agreed**

*Withdrawn*
R2-1713097 Minor correction on the IE of pusch-EnhancementsConfig in feMTC Huawei, HiSilicon CR Rel-14 36.302 14.3.0 1187 1 F LTE_feMTC-Core R2-1711225

## 8.12.1 Multicast for feMTC and eNB-IoT

## 8.12.2 Other

**SRS enhancement**

R2-1712235 UE capability for support of SRS enhancements without support of comb 4 Qualcomm Incorporated, Ericsson CR Rel-14 36.331 14.4.0 3127 - F LTE_feMTC-Core

⇒ **agreed**

R2-1712236 UE capability for support of SRS enhancements without support of comb 4 Qualcomm Incorporated, Ericsson CR Rel-14 36.306 14.4.0 1514 - F LTE_feMTC-Core

- Huawei wonders if they are mutually exclusive. QC confirms that this is the case.

⇒ **agreed**

**Dynamic Change of CE mode B Restriction**

R2-1712638 Discussion on CE mode B restriction change in RRC connected mode Intel Corporation discussion Rel-14 LTE_feMTC-Core

- Proposal: RAN2 agree to provide feedback to SA2 in a reply LS that there is no issue in updating the CE mode B restriction parameter at eNB by MME in RRC connected mode.
- QC think there may be R2 TS impact for Idle mode. LG think there is no impact at UE side. In Idle mode and Scriterion is enough. Intel think we can focus on connected mode as the question is about connected mode.
- Ericsson wonders what is exactly the scenario for the change in connected mode.
- Nokia wonders if the AS capability is dependent on data / voice centric setting. Intel think this is independent.
- It seems agreeable that “R2 has found no issue in updating the CE mode B restriction parameter at eNB by MME in RRC connected mode.” But there is confusion as to how the feature is supposed to work and concerns expressed that there may be an impact in Idle.

Offline discussion (305) (Intel) to address concerns and arrive at an agreeable LS. Companies that have concerns are required to clarify their concerns.

⇒ **noted**

R2-1712637 [DRAFT] Reply LS on Data support for "voice centric" UE supporting CE mode B Intel Corporation LS out Rel-14 LTE_feMTC-Core To:SA2

⇒ **revised**

R2-1713995 [DRAFT] Reply LS on Data support for "voice centric" UE supporting CE mode B Intel Corporation LS out Rel-14 LTE_feMTC-Core To:SA2

- Ericsson think that companies should review the whole mechanism, i.e. NAS + AS, for both connected and Idle to ensure that there are no problems. QC agrees that we need to check this also in connected mode. Gemalto agrees. Intel think that for connected mode there is no problem, just eNB implementation.
- Huawei think we can wait.
- Chair think that this can be discussed next meeting based on contributions.
- Chair: So far we have not found any issues for connected mode, but it seems that some companies want more time to check and understand.

⇒ **postponed**

**36.321**

R2-1712938 Correction on mac-ContentionResolutionTimer for FeMTC and eNB-IoT Nokia, Nokia Shanghai Bell CR Rel-14 36.321 14.4.0 1194 - F LTE_feMTC-Core, NB_IOTenh-Core

- LG think there is still a problem. What happens if the PDU is not successfully decoded.
- Intel think that extending the timer is preferable to making this change.
- Nokia think that the transmission procedure is now changed compared to LTE, as PDCCH and PDSCH is transmitted one after the other, and this motivates the change of behaviour.
- The current CR anyway need update to cover the case of non-correctly decoded MAC PDU.
- 3 options
  - a) Do Nothing, 1
  - b) increase the timer, 2
  - c) change the scope of the timer to cover the time of the PDCCH 5



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Work offline (306) to find an agreeable CR taking into the case of non-correctly decoded MAC PDU (Nokia),

⇒ **Revision in R2-1713979**

R2-1713979 Correction on mac-ContentionResolutionTimer for FeMTC and eNB-IoT Nokia, Nokia Shanghai Bell CR Rel-14 36.321 14.4.0 1194 - F LTE_feMTC-Core, NB_IOTenh-Core

- LG agrees with the intention of the CR but think this can be resolved in a more compact way. QC agrees
- QC point out that the Styles used in the CR seems wrong.

⇒ **Agree to do the change as functionally done in the CR, but can consider changes to make the CR more compact**

✉ **[NB-IoT/MTC R14] CR approval One Week, Contention Resolution Timer (Nokia).**

**36.331**

R2-1712939 Correction on FGI bit-13 for FeMTC Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 3150 - F LTE_feMTC-Core

- Ericsson think we should not do this change. This would be a RP decision.
- Chair understands that with the current text Rel14 Cat M1 M2 UE can indicate Yes or No for this FGI, and if we do the proposed change it means that Cat M1 M2 UEs are no longer allowed to indicate non-support for Rel-14.

⇒ **Not Pursued**

R2-1713104 Correction on the field description of ce-PDSCH-TenProcesses Huawei, HiSilicon CR Rel-14 36.331 14.4.0 3169 - F LTE_feMTC-Core

- Should tick the RAN box

⇒ **Revision in R2-1713980, which is agreed unseen.**

R2-1712632 Clarification on srs-UpPtsAdd in SRS coverage enhancement Intel Corporation CR Rel-14 36.331 14.4.0 3137 - F LTE_feMTC-Core

- Impact analysis should be moved to summary of change.
- QC think that the Interoperability statement should be updated. Intel think this is not needed, as also today without the change, the network should not configure different values as this is not reasonable.

⇒ **Revision in R2-1713981, move the impact analysis, which is agreed unseen.**

R2-1712633 Scheduling information of SIB1-BR when skipping MIB during HO Intel Corporation CR Rel-14 36.331 14.4.0 3138 - F LTE_feMTC-Core

- QC are ok with the CR but wonders why there is a new CR number (the previous CR in R2-1711893 was postponed)
- Huawei think that the text in the Field description should be changes to .."If absent when *sameSFN-Indication* is present, UE assumes that *SystemInformationBlockType1-BR* scheduling information in target cell may be different from source cell". (change is to may be).
- OQ point out that the interoperability statement should be in the summary of change.
- Nokia wonders what is the impact if this is not provided.

⇒ **Field description should be changed to .."If absent when *sameSFN-Indication* is present, UE assumes that *SystemInformationBlockType1-BR* scheduling information in target cell may be different from source cell". (change is to may be).**

⇒ **interoperability statement should be in the summary of change**

⇒ **Revision in R2-1713982, with above changes, revision agreed unseen**

R2-1712470 Correction to actions related to InterFreqRSTDMeasurementIndication message Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3135 - F LTE_feMTC-Core

- Huawei think that the consequences if not approved is not consistent with the impact analysis, and think that TEI14 should be added to the WI code.

⇒ **Remove the text on the coversheet saying this is a typo, keep text saying it is an error.**



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⇒ **Add TEI14 to the WI code**
⇒ **Revised in R2-1713983, agreed unseen**

**36.355**

R2-1713099 Correction on PRS hopping configuration Huawei, HiSilicon CR Rel-14 36.355 14.3.0 0187 1 F LTE_feMTC-Core R2-1711229
- In the impact analysis, include the word “Rel-14” when indicating the non-usable versions of specifications, use capitals when writing ASN.1

⇒ **Revision in R2-1713984, which is agreed unseen.**

# 8.13 WI: LTE-based V2X Services

*(LTE_V2X-Core, leading WG: RAN1; REL-14; started: June 16; closed: Mar. 17; WID: RP-162519)*
*Documents in this agenda item will be handled in a break out session*

## 8.13.0 In principle agreed CRs

R2-1712192 CR on SIB21 reading OPPO, Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3073 3 F LTE_V2X-Core R2-1711860
=> the CR is agreed
R2-1712558 Correction on SubframeBitmap Configuration in Band 47 Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3085 2 F LTE_V2X-Core R2-1711848
=> the CR is agreed
R2-1712741 Corrections to V2X in TS 36.300 Huawei, HiSilicon CR Rel-14 36.300 14.4.0 1062 3 F LTE_V2X-Core R2-1711859
=> The CR is agreed
R2-1713413 Correction to UE capabilities Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 3107 2 F LTE_V2X-Core R2-1711854
=> The CR is agreed

## 8.13.1 Stage 2

R2-1712742 Correction to V2X descriptions in TS 36.302 Huawei, HiSilicon CR Rel-14 36.302 14.3.0 0114 1 F LTE_V2X-Core R2-1710099
=> The CR is revised R2-1714051
R2-1714051 Correction to V2X descriptions in TS 36.302 Huawei, HiSilicon CR Rel-14 36.302 14.3.0 0114 1 F LTE_V2X-Core R2-1710099
=> The CR is agreed

R2-1713509 Clarification to Mapping Between Service Types and V2X Frequencies Ericsson CR Rel-14 36.300 14.4.0 1083 - F LTE_V2X-Core
=> The CR is revised in R2-1714053
R2-1714053 Clarification to Mapping Between Service Types and V2X Frequencies Ericsson CR R2-1713509 Rel-14 36.300 14.4.0 LTE_V2X-Core
=> The CR is agreed

R2-1713510 Clarification to Mapping Between Service Types and V2X Frequencies Ericsson discussion Rel-14 LTE_V2X-Core
=> Not treated

## 8.13.2 User plane

*Including output of email discussion [99bis#46][LTE/V2X] CR to 36.321 - LG*
R2-1713817 Corrections to V2X functionality LG Electronics Inc. CR Rel-14 36.321 14.4.0 1190 2 F LTE_V2X-Core R2-1711852
=> the CR is agreed



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## 8.13.3 Control plane

R2-1712622 Clarifications on V2X SL communications Intel Corporation discussion Rel-14 LTE_V2X-Core
=> The CR is revised in R2-1714011

R2-1714011 Clarifications on V2X SL communications Intel Corporation discussion Rel-14 LTE_V2X-Core
=> Noted

*[Proposal1]: RAN2 is asked to discuss and confirm total number of SL processes for V2X transmissions is "8"*

- LG confirms
- Nokia thinks that 2 were sufficient for Rel-14 and 2 were decided during WI phase. Intel thought that 2 were for booking processes but we may have one-shot transmission as well.
- Ericsson thinks that we should clarify booking process applies to all cases.
- Ericsson doesn't see why we should change the 2.
- LG explains that the UE has to support up to 8 SL SPS so to support this we would need at least 8 HARQ process

*[Proposal3]: RAN2 is asked to discuss and confirm how to select TX resource pool when UE's positioning information is not available and zone specific TX resource pool is configured for the concerned frequency:*

*Option1: Select the first TX resource pool*

*Option2: Select the exceptional TX resource pool*

- Qualcomm ask if the UE doesn't have positioning information why is it sending information
- Intel explains that there are regulatory requirements/test that the UE should transmit within a few second after powering up and at that point the UE may not have positions info.
- Qualcomm thinks that we can leave itup to UE implementation as it is a temporary situation.
- Ericsson thinks that the UE should just fallback to use the normal pool
- Huawei thinks UE implementation is sufficient. LG thinks this is a very rare case and there is no need to specify anything.

**Agreements**

1 We will support up to 8 SL processes (e.g. HARQ) for V2X transmission
2 Clarify in MAC that the restriction of 2 SL booking processes per carrier is applicable for transmission of multiple MAC PDUs (e.g. not just with sensing)
3 It is up to UE implementation which resource within allowed pools to select in case positioning information is not available. We will add a NOTE in 36.331.
4 CR will be prepared for next meeting

R2-1712740 Correction to Inter-frequency reception for V2X sidelink communication Huawei, HiSilicon CR Rel-14 36.331 14.4.0 3072 1 F LTE_V2X-Core R2-1710100
=> check the ME and RAN box

- Intel asks if we can configure v2x-InterFreqInfoList in the handover case outside the mobilityInfo IE

=> The v2x-InterFreqInfoList will not be included in dedicated signalling except in the handover command
=> The CR is revised in R2-1714039

R2-1714039 Correction to Inter-frequency reception for V2X sidelink communication Huawei, HiSilicon CR Approval R2-1710100, R2-1712740 Rel-14 36.331 14.4.0 LTE_V2X-Core 3072 2 F
=> Add: This field is absent within *v2x-InterFreqInfoList* included in *RRCConnectionReconfiguration* except if received with *MobilityControlInfo* or *MobilityControlInfoV2X*.
=> The CR is agreed in R2-1714064

R2-1713377 Correction on zone configuration in transmission pool selection Qualcomm IncorporatedCR Rel-14 36.331 14.4.0 3184 - F LTE_V2X-Core

- Spirent asks if it is ok that that zones are strangely shaped. Qualcomm doesn't see a problem with that. Companies think that as long as there is a uniform UE behaviour there should be no problem.



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- Qualcomm explains that we should use a predictable model, the one use by 3GPP, WGS84. Spirent agrees and indicates that this is only for zone calculations.
- Huawei would like to have some more time to check

✉ **[LTE/V2X] – agree to CR – Qualcomm**
- confirm the earth model used, WGS84
- agree to CR
- one week after the meeting

R2-1713384 Transmission of P2X sidelink communication in Exceptional Pool Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3084 1 F LTE_V2X-Core R2-1710686
- Intel is ok with the intention but there are duplication and some bullets can be combined
- Nokia thinks we should update the coverpage to reference an agreement

=> The CR is updated in R2-1714035

R2-1714035 Transmission of P2X sidelink communication in Exceptional Pool Qualcomm Incorporated 49530 CR Agreement R2-1710686, Rel-14 36.331 14.4.0 LTE_V2X-Core 3084 1 F

=> change “transmit” to “perform” in all the instances

=> The CR is agreed in R2-1714065

R2-1713385 UE behavior for using provisioned ITS carrier Qualcomm Incorporated discussion LTE_V2X-Core R2-1710688

*Proposal 1: The UE shall be allowed to use pre-configuration for V2X sidelink communication in non-operator-controlled frequency (e.g., ITS carrier) if no normal resource on that carrier is provided in SIB21 nor in dedicated signalling by the serving eNB, even though the carrier frequency is included in v2x-InterFreqInfoList within SIB21 by the cell.*

*Proposal 2: it is left to UE implementation how UE evaluate whether TX resource in provisioned carrier is provided or not by the serving eNB.*

*Proposal 3: RAN2 to agree the change in subclause 5.10.13.1 as shown in the associated CR in* R2-1710689*.*

- Intel agrees with intention
- Oppo and Ericsson don’t think this is a valid scenario and SA2 already covered this scenario. Huawei agrees.
- Samsung agrees with Intel. Huawei thinks we can trust the network. The network can just deconfigure carrier frequency in SIB21 if it can’t provide resources for the UE.

=> Noted

R2-1713386 Correction on transmission of V2X sidelink communication in provisioned frequency Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3086 1 F LTE_V2X-Core R2-1710689

R2-1713825 SLSS resource configuration LG Electronics Inc. discussion Rel-14 LTE_V2X-Core

=> RAN2 acknowledges that there may be a problem and there is a strong preference to try to solve this in RAN1 without ASN.1 impact

=> Noted

R2-1713826 Correction to SLSS resource configuration LG Electronics Inc. discussion Rel-14 36.331 LTE_V2X-Core Withdrawn

R2-1713835 Correction to SLSS resource configuration LG Electronics Inc. CR Rel-14 36.331 14.4.0 3200 - F LTE_V2X-Core

=> Not treated

# 8.14 WI: SRS switching between LTE component carriers

*(LTE_SRS_switch; leading WG: RAN1; REL-14; started: Mar.16: closed: Dec. 16; WID: RP-160935)*
*Documents in this agenda item will be handled in a break out session*



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### 8.14.0 In principle agreed CRs

R2-1712327 Correction on SRS switching capabilities field description Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3088 1 F LTE_SRS_switch R2-1710891
=> The CR is agreed

### 8.14.1 Other

## 8.15 WI: Measurement Gap Enhancement for LTE

*(LTE_meas_gap_enh-Core; leading WG: RAN4; REL-14; started: Mar. 16; closed: Jun. 17; WID: RP-160912)*

R2-1713541 Signaling of NCSG Support for Inter-F Measurement Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3110 1 B LTE_meas_gap_enh-Core R2-1711466
Withdrawn
R2-1713566 Signaling of NCSG Support for Inter-F Measurement Qualcomm Incorporated, Ericsson,Nokia CR Rel-14 36.331 14.4.0 3110 3 B LTE_meas_gap_enh-Core R2-1711466
=> The CR is agreed

## 8.16 Void

## 8.17 WI: Performance enhancements for high speed scenario in LTE

*(LTE_high_speed-Core; leading WG: RAN4; REL-14; started: Dec. 15. 16; closed: Dec. 16; WID: RP-160172)*
*Documents in this agenda item will be handled in a break out session*

## 8.18 WI: Voice and Video enhancement for LTE

*(LTE_VoLTE_ViLTE_enh; leading WG: RAN2; REL-14; started: Sep. 16; closed: Mar. 17: WID: RP-161856)*
*Documents in this agenda item will be handled in a break out session*

R2-1713875 Clarification on averaging window for RAN assisted codec rate adaptation Qualcomm Incorporated CR Rel-14 36.321 14.4.0 1202 - F LTE_VoLTE_ViLTE_enh
=> Add reference
=> Remove the last sentence
=> Correct the typo
=> With these changes, the CR is agreed in R2-1714177.

## 8.19 New UE category with single receiver based on Category 1 for LTE

*(LTE_UE_cat_1Rx-Core; leading WG: RAN4; REL-14; started: Sep. 16; closed: Jun. 17: WID: RP-171149)*
*Documents in this agenda item will be handled in a break out session*

## 8.20 Uplink Capacity Enhancements for LTE

*LTE_UL_CAP_enh-Core; leading WG: RAN1; REL-14; started: Mar. 16; closed: Mar. 17: WID: RP-162488*
*Documents in this agenda item will be handled in a break out session*

R2-1712119 LS on higher layer signalling for special subframe configuration 10 (R1-1719204; contact: CMCC) RAN1 LS in Rel-14 LTE_UL_CAP_enh-Core To:RAN2
=> Noted

R2-1713242 Introduction of a new UE capability for ssp10 with less CRS CMCC CR Rel-14 36.306 14.4.0 1536 - B LTE_UL_CAP_enh-Core
=> The CR is revised in R2-1714040



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R2-1714040 Introduction of a new UE capability for ssp10 with less CRS CR R2-1713242
Rel-14 36.306 14.4.0 LTE_UL_CAP_enh-Core 1536 1 B
[CB]
R2-1713243 Introduction of a new configuration for ssp10 with less CRS CMCC CR Rel-14
36.331 14.4.0 3180 - B LTE_UL_CAP_enh-Core
- Qualcomm thinks that TDD-Config-v14xy should be one bit only.
=> Change the TDD-Config-v14xy to be a single one bit IE and fix where we put the optional capabilities
=> The CR is revised in R2-1714041
R2-1714041 Introduction of a new configuration for ssp10 with less CRS CR R2-1713243
Rel-14 36.331 14.4.0 LTE_UL_CAP_enh-Core 3180 1 B
[CB 502]

## 8.21 WI: Enhancements on Full-Dimension (FD) MIMO for LTE

*(LTE_eFD_MIMO-Core; leading WG: RAN1; REL-14; started: Mar. 2016; closed: Mar. 17: WID: RP-160623)*
*Documents in this agenda item will be handled in a break out session*

## 8.22 Void

## 8.23 WI: Downlink Multiuser Superposition Transmission for LTE

*(LTE_MUST-Core; leading WG: RAN1; REL-14; started: Mar. 16; closed: Dec. 16: WID: RP-161019)*
*Documents in this agenda item will be handled in a break out session*

R2-1713081 MUST capability MediaTek Inc. CR Rel-14 36.331 14.4.0 3091 1 F
LTE_MUST-Core R2-1710986
=> The CR is agreed

R2-1713128 MUST capability MediaTek Inc. CR Rel-14 36.306 14.4.0 1533 - F
LTE_MUST-Core
=> The CR is agreed

## 8.24 Other LTE Rel-14 WIs

*This agenda item may be used for documents relating to Rel-14 WIs with no allocated RAN2 time but which might have minor RAN2 impact.*
*Including any LTE corrections related to the following joint UMTS/LTE WI:*
*(eDECOR-UTRA_LTE-Core; leading WG: RAN3; REL-14; started: Dec. 16; closed: Mar. 17: WID: RP-162543)*
*Documents in this agenda item will be handled in a break out session*

R2-1712644 Introduction of Enhanced CRS and SU-MIMO Interference Mitigation Performance Requirements for LTE Intel Corporation CR Rel-14 36.331 14.4.0 3141 - B TEI14
Withdrawn
R2-1712645 Introduction of Enhanced CRS and SU-MIMO Interference Mitigation Performance Requirements for LTE Intel Corporation CR Rel-14 36.306 14.4.0 1518 - B
LTE_eCRSIM_eSUMIMO
=> Add receive “antenna” port
=> Add reference to 36.101 in 4.3.4.49a
=> The CR is agreed with the changes above in R2-1714042

### 8.24.0 In principle agreed CRs

R2-1713453 UE capability, retrieval of fallback combinations Samsung Telecommunications CR Rel-14 36.331 14.4.0 3117 1 F LTE_CA_enh_b5C-Core, TEI14 R2-1711512
- Nokia thinks this is not needed and there is text before that already covers this issue
=> the CR is not pursued

## 8.25 LTE TEI14 enhancements

*Small Technical Enhancements affecting LTE Rel-14 that do not belong to any Rel-14 WI.*

*Note: A TEI enhancement proposal should be treated for only one meeting cycle and involve only one WG. Otherwise, a WI should be proposed at RAN plenary!*
*This agenda item is for items already discussed under TEI14. New proposals should be submitted to TEI15, AI 9.19.*

## 8.25.0 In principle agreed CRs

*Overheating*

R2-1712555 Introduction of the overheating indication Huawei Device, Huawei, HiSilicon, IPCom, Nokia, Nokia Shanghai Bell CR Rel-14 36.300 14.4.0 1048 6 B TEI14 R2-1712039
*moved from 8.25.1 to 8.25.0*
=> Revised in R2-1714009 (Offline discussion #03)

R2-1714009 Introduction of the overheating indication Huawei Device, Huawei, HiSilicon, IPCom, Nokia, Nokia Shanghai Bell CR Rel-14 36.300 14.4.0 1048 7 B TEI14
=> Agreed

R2-1712556 Introduction of the UE capability for overheating indication Huawei Device, Huawei, HiSilicon, IPCom, Nokia, Nokia Shanghai Bell CR Rel-14 36.306 14.4.0 1490 5 B TEI14 R2-1711878
*moved from 8.25.1 to 8.25.0*
=> Agreed

R2-1712557 Introduction of the overheating indication Huawei Device, Huawei, HiSilicon, IPCom CR Rel-14 36.331 14.4.0 2982 7 B TEI14 R2-1712053
*moved from 8.25.1 to 8.25.0*
=> Minor wording issues to be corrected
=> UE capability to be added
=> Revised in R2-1714010 (Offline discussion #03)

R2-1714010 Introduction of the overheating indication Huawei Device, Huawei, HiSilicon, IPCom CR Rel-14 36.331 14.4.0 2982 8 B TEI14
=> Agreed

*Other*
*Documents under this 'Other' sub heading will be handled in a break out session*

R2-1713489 Restructuring of CQI-ReportConfig (email discussion 99#21) Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 2968 4 F TEI14 R2-1711930
=> The CR is agreed

R2-1713578 Introduction of DL 2Gbps Category Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3071 3 B TEI14 R2-1710246
=> The CR is technically endorsed

R2-1713587 Introduction of DL 2Gbps Category Qualcomm Incorporated CR Rel-14 36.306 14.4.0 1508 2 B TEI14 R2-1710247
=> UL 15 with DL 20 category has been removed from this version of the CR
=> The CR is technically endorsed

R2-1713712 Deliver stored PDCP SDUs for LWA bearer with RLC UM at PDCP re-establishment LG Electronics France CR Rel-15 36.323 14.4.0 0216 - F LTE_WLAN_aggr-Core
=> The CR is agreed

*Withdrawn*

R2-1713157 Restructuring of CQI-ReportConfig (email discussion 99#21) Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 3173 - F TEI14 Withdrawn

## 8.25.1 Other

*Overheating*

R2-1712399 Stage 2 text for UE overheating Ericsson, Deutsche Telekom discussion Rel-14 TEI14



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- Intel think the proposal is quite similar to what was previously not agreed. Ericsson confirm it is the same as that previously proposed, and think it is not clear from the stage 3
- Vodafone would like this statement in the stage 2. It is the UE responsibility to avoid harm to the customer. The network provides the option for the UE to avoid just switching off.
- Intel think the UE will trigger this indication when there is nothing the UE can do without network action, but if there is no support of the feature in the network at all then the UE must handle it itself.
- LG think the UE may be prepared to resolve the problem itself but reluctant to mention this in the stage 2.
- MediaTek think this sentence is not in the scope of 3GPP. OPPO share the view of LG and MediaTek.
- DT thinks everyone understands that ultimately the UE has to resolve it itself if the network does not do it
- Qualcomm think the problem is that we referred to overheating and this is causing the problem.

=> Keep the first sentence reworded to say "UE is not dependent on specific network response when indicating overheating problems". Further detail wording can be discussed offline.
=> To be included in revision of the 36.300 CR.

*Other*
*Documents under this 'Other' sub heading will be handled in a break out session*

R2-1712349 MIMO spatial multiplexing continuity Nokia, Nokia Shanghai Bell CR Rel-14 36.331 14.4.0 3130 - F TEI10
- Qualcomm thinks that the benefits are limited. Nokia indicates that there are operator papers that show that there is a problem.
- Ericsson thinks that we would need a UE capability and then it is getting complex for something that may not be too useful.

=> The CR is not pursued

R2-1713020 Segmentation of LPP messages Qualcomm Incorporated discussion
- Nokia asks if we can change the procedural part. Qualcomm explains that it would be non-backward compatible so we would need a new IT.
- Nokia would like more time to understand the use cases and maybe see if we can do this as part of another WI. Qualcomm explains that this is independent of the positioning method.

=> Noted

R2-1713021 Segmentation of LPP Messages Qualcomm Incorporated CR Rel-14 36.355 14.3.0 0189 - F TEI14
=> Not treated

R2-1712400 Bandwidths in fallback band combinations Ericsson discussion Rel-14 TEI14
- Nokia supports the proposal
- Qualcomm thinks that Option 2 defeats the purpose. Intel also prefers to stick to option 1. Nokia thinks that with Option 1 now the eNB has to request the UE about capability and the signalling will end up being increased.

=> Noted

R2-1712401 Supported bandwidths in Fallback band combination Ericsson CR Rel-14 36.306 14.4.0 1515 - F TEI14
=> Not treated

R2-1713246 Addition of missing figure for R-PDCCH Ericsson India Private Limited CR Rel-10 36.300 10.12.0 1077 - F TEI10
=> Not treated

R2-1713249 Addition of missing figures for R-PDCCH and EPDCCH Ericsson India Private Limited CR Rel-11 36.300 11.14.0 1078 - F TEI11
=> Not treated



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R2-1713252 Addition of missing figures for R-PDCCH and EPDCCH Ericsson India Private Limited CR Rel-12 36.300 12.10.0 1079 - A TEI12
=> Not treated

R2-1713254 Addition of missing figures for R-PDCCH, EPDCCH and MPDCCH Ericsson India Private Limited CR Rel-13 36.300 13.9.0 1080 - F TEI13
=> Not treated

R2-1713261 Addition of missing figures for R-PDCCH, EPDCCH and MPDCCH Ericsson India Private Limited CR Rel-14 36.300 14.4.0 1081 - A TEI14
=> The CR is postponed and will be implemented for Rel-15 specs only

R2-1713492 Correction of the remarks for DL reception type of Sidelink and FeMBMS Ericsson CR Rel-14 36.302 14.3.0 1188 - F TEI14
=> The changes of this CR will be combined with R2-1713551
=> The CR is not pursued

R2-1713717 Reduce LTE UECapabilityInformation signaling size Qualcomm Korea discussion Rel-14
- Nokia is concerned that this would introduce some complexity related to storing the capabilities
=> Noted

R2-1713718 Reduction of LTE UECapabilityInformation signaling size Qualcomm Korea CR Rel-14 36.331 14.4.0 3197 - C TEI14
=> Not treated

# 9 LTE Rel-15

## 9.1 SI: Further Enhancements to LTE Device to Device, UE to Network Relays for IoT and Wearables

*(FS_feD2D_IoT_relay_wearable; leading WG: RAN2; REL-15; started: Mar. 16; target: Dec. 17; SID: RP-170295)*
*Time budget: 0.5TU*
*Documents in this agenda item will be handled in a break out session*

R2-1712148 LS on FS_REAR SI conclusion (S2-177943; contact: Huawei) SA2 LS in Rel-15 FS_REAR To:RAN, RAN1, RAN2, RAN3, SA3, CT1, SA3-LI
=> RAN2 considers that it has addressed SA2 concerns/key issues and doesn't expect any additional issues to be discussed for this SI
=> Noted

### 9.1.0 In principle agreed CRs

R2-1712553 Clarification that bearers are distinguished by LCID on PC5 Huawei, HiSilicon CR Rel-15 36.746 15.0.0 0001 1 F FS_feD2D_IoT_relay_wearable R2-1710547
=> The CR is not pursued.
R2-1713576 Introduction of DL 2Gbps Category Qualcomm Incorporated CR Rel-14 36.331 14.4.0 3071 2 B TEI14 R2-1710246 Withdrawn

### 9.1.1 Other

R2-1712184 Discussion on target scenarios for 1PRB bandwdith limited UE OPPO discussion Rel-15 FS_feD2D_IoT_relay_wearable
=> Capture in the TR: RAN2 did not evaluate RAN2 related impacts of 1PRB bandwidth limited UE
R2-1712185 Discussion on path switch options OPPO discussion Rel-15 FS_feD2D_IoT_relay_wearable



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- Intel asks if we should look at the options separately for different cases or have one aligned behaviour. Oppo sees benefits of Option 2 from indirect to direct and we should wait to de-select it.

=> Downscoping of Option 2 may take place during the WI phase
=> Noted

R2-1712631 Discussion on path switching option 2 Intel Corporation discussion Rel-15 FS_feD2D_IoT_relay_wearable
Proposal: Option 2 for path switching is considered to be aligned with SA2 assumptions on service continuity
=> Noted

R2-1712884 Feasibility evaluation on path switch option 2 LG Electronics Inc. discussion Rel-15 FS_feD2D_IoT_relay_wearable
=> Noted

R2-1713411 UE initiated path switch Nokia, Nokia Shanghai Bell discussion Rel-15 FS_feD2D_IoT_relay_wearable
=> Noted

R2-1712554 Signalling for association of PC5 radio resources Huawei, HiSilicon discussion Rel-15 FS_feD2D_IoT_relay_wearable
=> Noted

## 9.2 WI: Shortened TTI and processing time for LTE

*(LTE_STTIandPT-core; leading WG: RAN1; REL-15; started: June 16; target: Dec. 17; WID: RP-171468)*
*Time budget: 0.5 TU*
*Documents in this agenda item will be handled in a break out session*

*Including output of email discussion [99bis#47][LTE/sTTI] CR to 36.300 – Ericsson*
*Including output of email discussion [99bis#48][LTE/sTTI] CR to 36.321 – Ericsson*
*Including output of email discussion [99bis#49][LTE/sTTI] CR to 36.331 – Ericsson*
*Including output of email discussion [99bis#50][LTE/sTTI] CR to 36.302 – Ericsson*
*Including output of email discussion [99bis#51][LTE/sTTI] CR to 36.306 – Ericsson*
*Including output of email discussion [99bis#52][LTE/sTTI] – Remaining open issues on sTTI – Ericsson*

R2-1712116 LS reply on SPS for short TTI (R1-1719154; contact: Huawei) RAN1 LS in Rel-15 LTE_sTTIandPT To:RAN2
=> Noted

R2-1712120 LS on updates to TS36.300 for short TTI and short processing time (R1-1719205; contact: Ericsson) RAN1 LS in Rel-15 LTE_sTTIandPT To:RAN2
=> the TP will be included in the running CR

R2-1712138 Reply LS on UE capability signalling for sTTI configurations (R4-1711726; contact: Ericsson) RAN4 LS in Rel-15 LTE_sTTIandPT To:RAN1 Cc:RAN2
=> Noted

R2-1713928 Reply LS on short processing time and short TTI (R1-1719223; contact: Ericsson) RAN1 LS in Rel-15 LTE_sTTIandPT To:RAN2
=> Noted

R2-1713929 LS on RRC parameters for WI on shortened TTI and processing time for LTE (R1-1719231; contact: Ericsson) RAN1 LS in Rel-15 LTE_sTTIandPT To:RAN2
=> Noted

R2-1713930 LS on maximum TA and processing time for LTE shortened processing time and short TTI (R1-1719238; contact: Nokia) RAN1 LS in Rel-15 LTE_sTTIandPT To:RAN2, RAN4
=> Noted



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R2-1713931 LS reply on SPS for short TTI (R1-1719248; contact: Huawei) RAN1 LS in Rel-15 LTE_sTTIandPT To:RAN2
=> Noted

R2-1712449 Running CR for introduction of shortened TTI and processing time for LTE Ericsson draftCR Rel-15 36.300 14.4.0 B LTE_sTTIandPT
=> The CR is endorsed

R2-1712450 Running CR for introduction of shortened TTI and processing time for LTE Ericsson draftCR Rel-15 36.302 14.3.0 B LTE_sTTIandPT
=> The CR is endorsed

R2-1712451 Running CR for introduction of shortened TTI and processing time for LTE Ericsson draftCR Rel-15 36.306 14.4.0 B LTE_sTTIandPT
=> The CR is endorsed

R2-1712452 Running CR for introduction of shortened TTI and processing time for LTE Ericsson draftCR Rel-15 36.321 14.4.0 B LTE_sTTIandPT
=> The CR is endorsed

R2-1712453 Running CR for introduction of shortened TTI and processing time for LTE Ericsson draftCR Rel-15 36.331 14.4.0 B LTE_sTTIandPT
- Nokia asks if the short processing should be per MAC entity or per cell. Ericsson explains it is per cell as per RAN1 agreement

=> The CR is endorsed

R2-1712445 Summary of e-mail discussion on remaining open issues for sTTI Ericsson discussion Rel-15 LTE_sTTIandPT
- Nokia thinks that the restrictions is for the new transmission. Retransmission is up to eNB.
- LG asks what happens if the TTI length is not enough to perform the retransmission. Lenovo explains that the UE should just follow the grant.

=> Noted

=> TTI restrictions for the logical channel apply to only the first transmission. It is up the eNB how it schedules the retransmissions.

R2-1712444 Outstanding issues for sTTI Ericsson discussion Rel-15 LTE_sTTIandPT
=> Noted

R2-1712446 Remaining issues of sTTI and SPS Ericsson discussion Rel-15 LTE_sTTIandPT
=> Noted

*Proposal 2 SPS and sSPS are not active at the same time.*
- LG doesn't think that it is complicated to support simultaneous activation
- Ericsson doesn't see the use case
- Nokia supports proposal 2
- Qualcomm thinks that if we agree to 2 we should allow proposal 3. We have a use where you can have SPS for voice on low band and we want to support another low latency service in another carrier.

*Proposal 3 sSPS is not supported on SCells.*
- Qualcomm understands that in NR this is supported
- LG thinks that we shouldn't support in SCell.

=> Noted

Agreeements
=> Truncated BSR includes the LCG with the highest priority logical channel with data available for transmission
=> No new BSR triggers will be added



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=> The current LTE prioritizaton between MAC CE and logical channel is maintained
=> The following SPS interval values are supported in DL and UL: sTTI1, sTTI2, sTTI4, sTTI6, sTTI8, sTTI12, sTTI20, sTTI40, sTTI60, sTTI80, sTTI120, sTTI240
=> SPS and sSPS are not active at the same time
=> sSPS is not supported on SCells

R2-1713322 Remaining Issues for sSPS Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
=> Noted

R2-1713245 SPS in sTTI LG Electronics Mobile Research discussion LTE_sTTIandPT-Core
=> Noted

R2-1712447 Remaining SR and BSR issues Ericsson discussion Rel-15 LTE_sTTIandPT
*oposal 1 The restrictions on scheduling request resources allowed for a logical channel shall be logicalChannelSrRestriction instead of sr-Config.*
- LG proposes *logicalChannelSrAllowed.* Ericsson thinks that allowed implies that we have to include always

*Proposal 2 After dssr-TransMax SPUCCH SR transmissions without the SR(s) being cancelled, release all SPUCCH resources on all serving cells on the next SPUCCH occasion when ssr-ProhibitTimer is not running.*
- Huawei thinks that we should adopt the NR
- LG thinks that we should make it simple and release all PUCCH resources. Ericsson thinks that going to RACH increases the latency. Qualcomm agrees. Nokia and Intel agree with the proposal.
- LG asks what is the difference with NR. Nokia explains that in NR we have a one to one mapping and in LTE we allow to map to more than one SR

*Proposal 3 If a UE has no SR resources configured that match the logical channel logicalChannelSrRestriction, the UE shall send SR on any resource configured for SR.*
- Qualcomm is concerned that all logical channels can use sPUCCH. Intel doesn't think there will be a case in which we have a sSR resource and no SR.
- LG thinks that we should have the same behaviour for release and not configured.
- Qualcomm think that for the case that there is no PUCCH configured the UE should trigger RACH.
- Samsung thinks that this defeats the purpose of the restriction.
- Intel thinks that it may complicate UE implementation if we RACH while we have sPUCCH.
- Huawei agrees with the proposal.

*Proposal 4 Base the SR resource selection on logicalChannelSrRestriction for the highest priority logical channel, belonging to a LCG, with data available for transmission.*
- Nokia asks if this is only for first transmission case
- Nokia thinks that for retrasnsmission all the SRs can be used. Intel agrees. Ericsson thinks its better to align.
- LG thinks that for retx the UE should use the SRs for logical channels that have available data. Ericsson asks what does the UE do when you have two logical channel. Nokia explains that the UE would send it on the earliest occasion, similar to the case where the same logical channel is mapped to both SRs.

*Proposal 5 Adopt the text proposal above.*
*Proposal 6 dssr-Transmax have the same values as dsr-TransMax: dssr-TransMax ENUMERATED {n4, n8, n16, n32, n64, spare3, spare2, spare1}*

**Agreements**
=> The restrictions on scheduling request resources allowed for a logical channel shall be logicalChannelSrRestriction instead of sr-Config.
=> After dssr-TransMax SPUCCH SR transmissions without the SR(s) being cancelled, release all SPUCCH resources on all serving cells on the next SPUCCH occasion when ssr-ProhibitTimer is not running



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=> If a UE releases the SR resources that match the logical channel logicalChannelSrRestriction, the UE shall send SR on any resource configured for SR
=> If the UE is configured with only one SR resource, any logical channel can use this resource.
=> For retransmission BSR, base the SR resource selection on logicalChannelSrRestriction for logical channels with data available for transmission. The UE transmits on the earliest available SR occassion, similar to the case where a logical channel can be mapped to both SRs.
=> dssr-Transmax have the same values as dsr-TransMax: dssr-TransMax ENUMERATED {n4, n8, n16, n32, n64, spare3, spare2, spare1}

R2-1712972 Remaining issues on SR for sTTI Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_sTTIandPT
=> remove the “else” in the SR on PUCCH for this TTI condition
=> Noted

R2-1713247 SR triggered by retransmission BSR LG Electronics Mobile Research discussion LTE_sTTIandPT-Core
=> not treated

R2-1713250 SR on PUCCH and sPUCCH LG Electronics Mobile Research discussion LTE_sTTIandPT-Core
=> not treated

R2-1712448 Scheduling Requests with short TTI Ericsson draftCR Rel-15 36.321 14.4.0 B LTE_sTTIandPT
=> not treated

R2-1713316 SR failure handling for sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
=> not treated

R2-1713318 Handling of SR configurations for CA case in sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
=> The intention of the proposals are agreeable but need to check if there is any specification impacts
=> noted

R2-1713317 Handling of SR triggered by retxBSR-Timer in sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
=> not treated

R2-1712454 sPUCCH Utilization Strategy Ericsson discussion Rel-15 LTE_sTTIandPT
R2-1712455 Further MAC impacts of sTTI Ericsson discussion Rel-15 LTE_sTTIandPT
=> Include a general statement in 36.321 saying that the actions to be executed “for each TTI” shall be executed for all TTIs also in the case of overlapping TTIs.
*Proposal 3: Add clarification regarding ability to decode a TB in 36.321.*
- Nokia asks if this is an error case
- Qualcomm and Nokia thinks that if you don’t decode the UE behaviour is according to legacy, it will send an NACK.
=> No note needed
=> Noted

R2-1712456 Further MAC impacts of sTTI Ericsson draftCR Rel-15 36.321 14.4.0 B LTE_sTTIandPT
=> Noted

R2-1713315 MAC impact of HARQ process sharing between TTI and sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
- Intel thinks that a note can be added to just say the eNB should ensure this doesn’t happen
=> Noted

R2-1713319 Handling of MAC CE Priority in sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
=> Not treated
R2-1713320 Impacts of sTTI on L2 Timers Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core R2-1710401
=> Not treated
R2-1713321 HARQ Process ID Calculation to support SPS for sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
=> Not treated

R2-1713323 Running CR for SPS in sTTI TS 36.321 Huawei, HiSilicon, Ericsson CR Rel-15 36.321 14.4.0 1185 1 B LTE_sTTIandPT-Core R2-1710404
=> Not treated

R2-1713328 Consideration on PHR for sTTI Huawei, HiSilicon discussion Rel-15 LTE_sTTIandPT-Core
*Proposal 1: no need to enhance the PHR triggering condition for sTTI.*
*Proposal 2: PHR MAC CE should be extended to include the factor of sPUCCH/sPUSCH.*
- Ericsson and Nokia think that we need to wait for RAN1.

Option1: New MAC CE for sTTI
Option 2: One PHR and a mechanism indicate whether it is sPHR or PHR
Option 3: No changes to current PHR reporting. The eNB implicitly determines
=> FFS how to report PHR for sTTI
=> noted

R2-1713813 Remaining Issues on SR for short TTI Qualcomm Incorporated discussion
=> Not treated

R2-1713882 TTI restriction for retransmission LG Electronics UK discussion LTE_sTTIandPT
=> Not treated

R2-1714144 LS on additional agreements for shortened TTI and processing time for LTE (R1-1721216; contact: Ericsson) RAN1 LS in Rel-15 LTE_sTTIandPT ToRAN2
=> Noted

# 9.3 Void

# 9.4 Study on Enhanced Support for Aerial Vehicles

*(FS_LTE_Aerial; leading WG: RAN2; REL-15; started: Mar. 17; target: Dec. 17: SID: RP-171050)*
*Time budget: 1.5 TU*
*Documents in this agenda item will be handled in a break out session*

## 9.4.1 General

*(work plan and TR skeleton)*
*Including output of email discussion [99bis#08][LTE/UAV] Running TR36.777 (DCM)*

LSs:
R2-1712123 LS on RAN1 observation on RSRP statistics for aerial vehicles (R1-1719052; contact: NTT DOCOMO) RAN1 LS in Rel-15 FS_LTE_Aerial To:RAN2
=> Noted
R2-1712152 Reply LS on Certification/License and Identification of Aerial Vehicles (S2-178175; contact: Ericsson) SA2 LS in Rel-15 FS_LTE_Aerial To:RAN2 Cc:RAN3, SA3, SA1
=> Noted
R2-1714113 Reply LS on Certification/License and Identification of Aerial Vehicles (S1-174512; contact: Qualcomm)
=> Noted
R2-1713927 Liaison Statement on defining a common value for SPID for Unmanned Aircraft GSM Association LSin To:SA2, RAN2, RAN3
- Qualcomm think defining SPID is out of the scope of RAN2.



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- Nokia think we should reply the request.
- DCM think the key point is to identify the UE and control them.
- Ericsson prefer to reply the LS in WI phase.

=> Noted

Running TR:

R2-1713543 TR 36.777 v040 NTT DOCOMO INC. draft TR Rel-15 36.777 0.4.0 FS_LTE_Aerial

## 9.4.2 Requirements and parameter identification

*(Identify the heights, speeds, latency, reliability, data rate, positioning accuracy, etc , taking into account the regulation viewpoints)*
*No contribution is expected since the requirements studied are finalized.*

## 9.4.3 Potential enhancements for UAV interference problem

*(Solutions to detect whether UL signal from an air-borne UE increases interference in multiple neighbour cells and whether an air-borne UE incurs interference from multiple cells)*
*Including output of email discussion [99bis#30][LTE/UAV] Capture potential solutions for DL and UL Interference detection [DCM]*

R2-1713544 Summary of email discussion [99bis#30][LTE/UAV] Capture potential solutions for DL and UL Interference detection NTT DOCOMO INC. discussion Rel-15

=> TP is endorsed.

R2-1713408 Interference detection in UAV scenarios Nokia, Nokia Shanghai Bell discussion Rel-15 FS_LTE_Aerial

=> Noted

R2-1713410 TP on mechanism for interference detection and UAV identification Nokia, Nokia Shanghai Bell discussion Rel-15 FS_LTE_Aerial

- Qualcomm think we don't need to capture such details. Huawei and Ericsson have the same view.

=> Noted

R2-1713536 Potential enhancements for UAV interference problem Ericsson discussion Rel-15 FS_LTE_Aerial

- Qualcomm support the TP and detailed wording can be improved.
- Huawei think "on the type of backhaul" is not right.
- DCM thin P3 is already captured in the TR.

=> The TP is endorsed.

R2-1712901 Discussion for signaling exchange issues for UL interference detection Lenovo, Motorola Mobility discussion Rel-15 FS_LTE_Aerial

## 9.4.4 Potential enhancements for handover

*(Identify if enhancements in terms of cell selection and handover efficiency as well as robustness in handover signalling can be achieved)*

### 9.4.4.1 Handover simulation results

*Capturing the UAV simulation result into the TR 36.777*
*Including output from email discussion [99bis#31][LTE/UAV] Capture handover simulation results with observations [Huawei]*

R2-1713329 Summary of email discussion [99bis#31][LTE/UAV] Capture handover simulation results with observations Huawei discussion Rel-15 FS_LTE_Aerial

=> Noted

R2-1713330 TP outcome of email discussion 99bis#31Capture handover simulation results with observations Huawei discussion Rel-15 FS_LTE_Aerial

**CBF to find a way to capture the simulation results. (Offline #111, Huawei). TP can be provided in R2-1714088.**



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R2-1713324 Discussion on New Measurement Events for Drones Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial
R2-1713325 Discussion on Network Coordination solution Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial
R2-1713332 Measurement Report Mechanism for Drones Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial
R2-1713452 Mobility Simulations of Aerial UEs - full buffer case Ericsson discussion Rel-15 FS_LTE_Aerial R2-1711938
R2-1713537 Mobility Simulations of Aerial UEs - full buffer RMa case Ericsson discussion Rel-15 FS_LTE_Aerial
=> The simulation results should be captured in the TP R2-1714088 without changing any observations.
R2-1713897 Simulation Results and Analysis of Mobility Issues for Drones Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial

### 9.4.4.2 Mobility related field trial result

*Capturing the mobility field trial result into the TR36.777*
*Including output from email discussion [99bis#60][LTE/UAV] Capture field trial results (Qualcomm)*
R2-1712586 Email discussion report [99bis#60] Field trial results for aerial vehicles Qualcomm Incorporated report Rel-15 FS_LTE_Aerial
=> Remove "*Editor's note: It is FFS whether to capture some or all of these observations in the main text of TR (in Section 6 and/or in Conclusion).*"
=> Remove "The number of strongest cell changes per second does decrease when the UE gets airborne."
=> With this change, the TP should be captured in Annex in TR 36.777.
R2-1713449 TP with corrections to field trials description Nokia, Nokia Shanghai Bell discussion Rel-15 FS_LTE_Aerial
R2-1713326 Mobility related field trial result for drones Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial
R2-1713538 Mobility performance for aerial vehicles in field trials Ericsson discussion Rel-15 FS_LTE_Aerial
=> The simulation results which not overlapped with RAN1 can be merged into the TP and it should be addressed through email discussion of the running TR.

### 9.4.4.3 Potential enhancements solutions

*Identify potential solutions for enhancements of UAV handover.*
*Including output from email discussion [99bis#61][LTE/UAV] Identify potential solutions on mobility enhancement (Ericsson)*

R2-1713451 Summary on [99b#61][LTE/UAV] Identify potential solutions on mobility enhancement Ericsson discussion FS_LTE_Aerial
=> Noted

Show hands on how to capture the handover procedure:
Capture the handover procedure (10)
Not Capture the handover procedure (3)

Show hands on how to capture flying path information:
Capture flying path information (9)
Not Capture flying path information (2)

Capture the following content into TR:

7.X Potential enhancements for mobility performance

In this section, potential enhancements for mobility performance are presented.
Existing mobility enhancement mechanisms (e.g., mobility history reporting, mobility state estimation and UE assistance information, etc.) can be assessed first if they work for drones and if they need enhancements.



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Handover procedure and related parameters for aerial UEs may be adjusted, based on UE's airborne status and location information.
Existing measurement reporting mechanisms may be enhanced, e.g., by defining new events, enhancing triggering condition, controlling the amount of measurement reporting, etc.
Flying path plan information might be used for mobility enhancement.

R2-1713953 TP on potential enhancements for mobility performance Ericsson discussion Rel-15 FS_LTE_Aerial
- Nokia think the TP is not aligned with the email discussion report. Ericsson clarify that that is the reason why providing a company TP. Qualcomm share the view of Nokia.

R2-1713264 Mobility enhancements for UAVs – planned route Nokia, Nokia Shanghai Bell discussion Rel-15 FS_LTE_Aerial R2-1711445

R2-1713265 Mobility enhancements for UAVs – reference altitude Nokia, Nokia Shanghai Bell discussion Rel-15 FS_LTE_Aerial

R2-1713507 Considerations for cell selection and reselection with UAVs Kyocera, KT Corp, KDDI discussion

R2-1713539 Potential enhancements for mobility performance Ericsson discussion Rel-15 FS_LTE_Aerial

R2-1712306 RRC Reestablishment problem for UAV KDDI Corporation discussion
- DCM think solving interference issue can fix the problem. Nokia don't think so.
- Ericsson think if no X2 interface, S1 handover is assumed and there will be no problem.

=> Noted

R2-1713790 Handover Failure Handling of Aerial UE LG Electronics Inc. discussion Rel-15 FS_LTE_Aerial R2-1711376

R2-1712469 Handover Enhancements for UAVs Fraunhofer HHI discussion

R2-1713313 Consideration for potential mobility enhancement for aerial UE Lenovo, Motorola Mobility discussion Rel-15 FS_LTE_Aerial

R2-1713314 State manamgement for aerial UEs Lenovo, Motorola Mobility discussion Rel-15 FS_LTE_Aerial

R2-1713526 UE-based mobility solution with Uplink Interference coordination Kyocera discussion

R2-1713788 Handover Support using Positioning Identification LG Electronics Inc. discussion Rel-15 FS_LTE_Aerial R2-1711375

R2-1713789 Handover Support using TTT for Aerial UE LG Electronics Inc. discussion Rel-15 FS_LTE_Aerial R2-1711378

R2-1712992 Discussion on measurement for Aerial Vehicles handover Sony discussion Rel-15 FS_LTE_Aerial R2-1711027

## 9.4.5 Identify certification

*(Identification of an air-borne UE that does not have proper certification for connecting to the cellular network while air-borne)*

R2-1714153 Text Proposal for UE Identification DoCOMo

**CB on Friday=> T**ry to endorse the revised TP (offline#168, DCM) in R2-171XXXX

R2-1713331 Potential enhancements for drones in idle state Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial R2-1710409
- DCM think we need to first identify the mechanism before capturing the observations. LG and Qualcomm share the same view.

=> Noted

R2-1713409 Discussion on SA2 LS on UAV certification Nokia, Nokia Shanghai Bell discussion Rel-15 FS_LTE_Aerial

=> Reply to SA2 LS to provide the endorsed TP, which is the revision of R2-1714153.
=> Draft LS in R2-171xxxx (Offline #168, Nokia)

R2-1712944 Discussion on certification issues for response LS from SA2 Lenovo, Motorola Mobility discussion Rel-15 FS_LTE_Aerial



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R2-1712945 Consideration for identification issues for drone UE Lenovo, Motorola Mobility discussion Rel-15 FS_LTE_Aerial R2-1711380
R2-1712991 Discussion on identification and certification of Aerial Vehicles Sony discussion Rel-15 FS_LTE_Aerial R2-1711026
R2-1713327 Identification of Air-borne UE Huawei, HiSilicon discussion Rel-15 FS_LTE_Aerial
R2-1713447 Identify certification for drones Ericsson discussion Rel-15 FS_LTE_Aerial
R2-1713488 Discussion on LS exchange with SA2 regarding "Certificate/Licence/Authorization" Qualcomm Incorporated discussion FS_LTE_Aerial
R2-1713546 UAV UE Certification and License Identification NTT DOCOMO INC. discussion Rel-15 FS_LTE_Aerial

### 9.4.6 Others

Conclusion of the SI:

R2-1714152 Text Proposal for Conclusion section of TR36.777
**CB on Friday:**=> Revised in R2-171xxxx (offline#169, DCM)
- The observations from field trial part should be considered.
- RAN1 related conclusion should be endorsed by RAN1 first

**[100#xx][LTE/UAV]TR 36.777(DCM)**
- All endorsed TPs from RAN2 and RAN1 should be merged into the TR
  Intended outcome: Agreed TR
  Deadline: one week

## 9.5 Further video enhancements for LTE

*(LTE_ViLTE_enh2-Core; leading WG: RAN2; REL-15; started: Mar. 17; target: Dec. 17: WID: RP-171392)*
*Time budget: 0.5 TU*

### 9.5.1 General

*(work plan)*

### 9.5.2 Local caching for UE assistance video request

*Including output from email discussions [99#33][LTE/eViLTE] UE assistance information (CMCC)*
R2-1713234 [99#33][LTE/eViLTE] UE assistance information CMCC discussion Rel-15 LTE_ViLTE_enh2-Core

**Agreements:**
1 the assistance bit is carried in PDCP layer, i.e. an indication inserted into the reserved bits of the PDCP header.
2 Activation / de-activation procedure of the assistance information transmission is performed via RRC signalling.
3 Activation / de-activation procedure is performed per UE.
4 UE reports its capability of assistance information for local cache through dedicated RRC signalling.

R2-1713236 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.306 14.4.0 1535 - B LTE_ViLTE_enh2-Core

R2-1713237 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.323 14.4.0 0211 - B LTE_ViLTE_enh2-Core
R2-1714159 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.323 14.4.0 0211 1 B LTE_ViLTE_enh2-Core
=> change "PDCP data SDU" to "PDCP SDU"
=> The name should be further polished during email discussion.



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✉ **[100#xx][LTE/ViLTE] Introduction of assistance information for local cache in 36.331, 36.323 and 36.306**
Use R2-1714159, R2-1714160, R2-1714158 as baseline
Intended outcome: Agreed CRs
Deadline: one week

R2-1713238 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.331 14.4.0 3178 - B LTE_ViLTE_enh2-Core
R2-1714160 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.331 14.4.0 3178 1 B LTE_ViLTE_enh2-Core

R2-1713235 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.300 14.4.0 1076 - B LTE_ViLTE_enh2-Core
- Huawei concerns on capturing the note in stage-2 CR.
- Nokia think the CR is too detailed. Nokia think some of the content in the CR is not discussed.
- CMCC just tries to provide the whole picture.

=> Revised to R2-1714083.

**CB on Thursday: Revised stage-2 CR [offline 124, CMCC]**

R2-1714083 Introduction of assistance information for local cache CMCC, Intel Corporation CR Rel-15 36.300 14.4.0 1076 1 B LTE_ViLTE_enh2-Core
=> Change to “UE assisted local cache is a solution to address long backhaul latency issue. The UE is allowed to transmit assistance information bit to eNB to enable the eNB to identify whether an uplink data needs to be transferred to the local cache entity, which may be co-sited with eNB or has direct connection with eNB, by operator implementation.
UE can report to the network its capability of supporting UE assistance information for local cache. If supported, the UE assisted local cache function can be activated by the eNB. After that, the UE may indicate the assistance information in the uplink PDCP PDU. Whether the UE includes this assistance information is based on for instance the service from the application layer the UE requests that support local cache handling.”
=> With this change, the CR is agreed in R2-1714179.
R2-1712724 Discussion on UE assistance information Huawei, HiSilicon discussion Rel-15 LTE_ViLTE_enh2-Core

R2-1713770 Solutions on UE assisted information for local cache Qualcomm Incorporated discussion Rel-15 LTE_ViLTE_enh2-Core
R2-1713771 Introduction of assistance information for local cache (PDCP) Qualcomm Incorporated draftCR Rel-15 36.323 14.4.0 B LTE_ViLTE_enh2-Core
R2-1713779 Introduction of assistance information for local cache (RRC) Qualcomm Incorporated draftCR Rel-15 36.331 14.4.0 B LTE_ViLTE_enh2-Core
R2-1713780 Introduction of assistance information for local cache (capabilities) Qualcomm Incorporated draftCR Rel-15 36.306 14.4.0 B LTE_ViLTE_enh2-Core

## 9.5.3 Enhancement to solve the problem of critical data discard

R2-1712617 Solution details on awareness of critical data Intel Corporation discussion Rel-15 LTE_ViLTE_enh2-Core
- LG think the awareness of critical data for eNB cannot help.
- Intel think this solution can work together with discard timer solution.
- Intel think how to use the indication depending on eNB implementation.
- Qualcomm wonders how to set the reserved bit.
- Ericsson think introducing this indication will impact the existing framework of QoS. Ericsson think the indication is not useful.
- Nokia concerns how UE identifies the critical data.
- Nokia think it is hard and complicated for eNB implementation.
- Intel trust network vendor to sue the indication properly.
- Huawei think the indication benefits.
- LG think the existing QoS can handle the critical data. Ericsson share the same view.



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- Intel think the indication can provide useful information for the existing QoS framework.

=> Noted.

R2-1712618 Introduction of reporting of critical data stored in the UL buffer (R bit) Intel Corporation CR Rel-15 36.321 14.4.0 1191 - B LTE_ViLTE_enh2-Core

R2-1712619 Introduction of reporting of critical data stored in the UL buffer (BSR content) Intel Corporation CR Rel-15 36.321 14.4.0 1192 - B LTE_ViLTE_enh2-Core

R2-1712620 Introduction of reporting of critical data stored in the UL buffer Intel Corporation CR Rel-15 36.331 14.4.0 3136 - B LTE_ViLTE_enh2-Core

R2-1712621 Introduction of reporting of critical data stored in the UL buffer Intel Corporation CR Rel-15 36.306 14.4.0 1517 - B LTE_ViLTE_enh2-Core

R2-1712725 Discussion on L2 differentiated handling for upper layer critical data Huawei, HiSilicon discussion Rel-15 LTE_ViLTE_enh2-Core R2-1707940

- Ericsson think adjusting the discard timer benefits.
- Huawei wonders whether Ericsson would like to introduce a new timer. Ericsson clarifies that using the same timer with different values.
- Qualcomm wonders the difference between one timer with two values and two timers.
- Ericsson think timer value can be dynamically adjusted according the data type in the buffer.
- OPPO wonder how to reconfigure the value of the timer accordingly.
- OPPO think the adjusting is complicated and prefer to use one value.
- LG think adjusting value should introduce new PDCP procedure.
- CMCC think adjusting value is complicated. CMCC prefer to introduce a new timer. Ericsson request CMCC to see the CR provided by Ericsson.
- OPPO prefer to use one timer with one value.

=> Noted

R2-1713421 L2 differentiated handling for critical data Ericsson discussion Rel-15 LTE_ViLTE_enh2-Core

R2-1713685 Discussion on different handling for critical data LG Electronics France discussion Rel-15 LTE_ViLTE_enh2-Core

R2-1713420 eNB awareness of critical data in UE buffer Ericsson discussion Rel-15 LTE_ViLTE_enh2-Core

**CB on Thursday: WF on enhancement to solve the problem of critical data discard [offline 123, Ericsson]**

=> Because there is no consensus on the benefit of the solutions among different companies, RAN2 have to conclude that no solution for solving the problem of critical data discard will be specified in this WI due to limited time.

=> Companies in RAN2 are fine to complete the WI without the solution for solving the problem of critical data discard.

R2-1712726 Introduction of new PDCP discard timer Huawei, HiSilicon CR Rel-15 36.300 14.4.0 1074 - B LTE_ViLTE_enh2-Core

R2-1712727 Introduction of new PDCP discard timer Huawei, HiSilicon CR Rel-15 36.323 14.4.0 0207 - B LTE_ViLTE_enh2-Core

R2-1712728 Introduction of new PDCP discard timer Huawei, HiSilicon CR Rel-15 36.306 14.4.0 1520 - B LTE_ViLTE_enh2-Core

R2-1712729 Introduction of new PDCP discard timer Huawei, HiSilicon CR Rel-15 36.331 14.4.0 3146 - B LTE_ViLTE_enh2-Core

R2-1713422 L2 differentiated handling of critical data Ericsson CR Rel-15 36.331 14.4.0 3185 - B LTE_ViLTE_enh2-Core

R2-1713423 L2 differentiated handling for critical data Ericsson CR Rel-15 36.323 14.4.0 0213 - B LTE_ViLTE_enh2-Core

R2-1713424 L2 differentiated handling for critical data Ericsson CR Rel-15 36.306 14.4.0 1539 - B LTE_ViLTE_enh2-Core

R2-1713686 Differant handling for critical data LG Electronics France CR Rel-15 36.323 14.4.0 0214 - B LTE_ViLTE_enh2-Core



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R2-1713689 Differant handling for critical data LG Electronics France CR Rel-15 36.331 14.4.0 3196 - B LTE_ViLTE_enh2-Core

### 9.5.4 Others

## 9.6 QoE Measurement Collection for streaming services in E-UTRAN

*(LTE_QMC_Streaming; leading WG: RAN2; REL-15; started: Mar. 17; target: Dec. 17: WID: RP-170956)*
*Time budget: 0 TU*
*Documents in this agenda item will be handled in a break out session*
*The WI has no time budget allocated for this meeting. CRs to conclude the WI were agreed in principle in RAN2#99bis, and hence this AI is only for handling of those CRs and any necessary modifications/corrections to those CRs.*

R2-1712159 LS on adding new service type in QMC reporting (S4-170952; contact: Ericsson) SA4 LS in Rel-15 LTE_QMC_Streaming, EQoE_MTSI, QOED To:RAN2, RAN3, SA5
- Ericsson point that the attached CR was already agreed.
- Huawei think SA4 did some work which should be done in RAN2.
- Huawei think adding new service type is out of the scope of current WI.
- Nokia prefer to discuss this in TEI15.

=> Adding new service type should discussed in TEI15.

### 9.6.0 In principle agreed CRs

R2-1712705 Introduction of QoE Measurement Collection for LTE Huawei, HiSilicon CR Rel-15 36.300 14.4.0 1073 - B LTE_QMC_Streaming-Core
=> CR is agreed

R2-1712706 Introduction of QoE Measurement Collection for LTE Huawei, HiSilicon CR Rel-15 36.306 14.4.0 1519 - B LTE_QMC_Streaming-Core
=> CR is agreed

R2-1712707 Introduction of QoE Measurement Collection for LTE Huawei, HiSilicon CR Rel-15 36.331 14.4.0 3144 - B LTE_QMC_Streaming-Core
=> CR is agreed

### 9.6.1 Others

R2-1712464 Handling of incoming LS on new service type in QMC reporting Ericsson discussion Rel-15 LTE_QMC_Streaming

R2-1712465 Introduction of QoE Measurement Collection for MTSI services Ericsson CR Rel-15 36.300 14.4.0 1072 - B LTE_QMC_Streaming

R2-1712466 Introduction of QoE Measurement Collection for MTSI services Ericsson CR Rel-15 36.306 14.4.0 1516 - B LTE_QMC_Streaming

R2-1712467 Introduction of QoE Measurement Collection for MTSI services Ericsson CR Rel-15 36.331 14.4.0 3134 - B LTE_QMC_Streaming

R2-1712461 Outstanding problem with QoE configuration Ericsson discussion Rel-15 LTE_QMC_Streaming
- Nokia think it is optimisation. Nokia think the solution is complicated.
- Huawei think we need to identify the whole the picture of the solution and expect that other working groups will be involved.
- Ericsson indicate that RAN3 CR is already provided by Ericsson.

=> Noted.

R2-1712462 Improved handling of QoE configuration Ericsson CR Rel-15 36.300 14.4.0 1071 - C LTE_QMC_Streaming

R2-1712463 Improved handling of QoE configuration Ericsson CR Rel-15 36.331 14.4.0 3133 - C LTE_QMC_Streaming



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# 9.7 LTE connectivity to 5G-CN

*(LTE_5GCN_connect-Core; leading WG: RAN2; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-171432)*
*Time budget: 1.5 TU*
*At this meeting, due to the commonality with NR, this WI will be handled in the main session.*

## 9.7.1 Organisational

*Including incoming LSs, rapporteur inputs, running CRs*
*Principles on what to specify in which specs, terminology, etc*

*LSs*

R2-1712103 Reply LS on CN node selection for LTE features when E-UTRA is connected to 5G CN (C1-174593; contact: Qualcomm) CT1 LS in Rel-15 5GS_Ph1-CT To:RAN2 Cc:SA2
- Ericsson think the answers are ambiguous. There was not clear answer if the lower layers can be involved in selecting the core in the case that the certain functionality is not supported by the 5GC is not supported. in SA2 is says that 5GC should be selected in the PLMN supports it.
- Huawei also think there is no answer for this case but is being discussed by CT1 that in some cases the 5GC mode can be disabled.
- Samsung think in the end it is up operator preferences and it might not follow the SA2 requirement.
- Intel think we agreed the selection is in NAS and CT1 have confirmed this. But it might make sense if some AS information is provided for NAS to make the decision, e.g. if a service is not support in 5GC.

=> Noted
=> RAN2 confirm that understanding that if cell (re)selection takes the UE to a cell that only support EPC then this information is provided to NAS which will cause NAS to select EPC.

R2-1712161 Reply LS to LS on supported features by 5GC for E-UTRA connected to 5G CN (S5-175495; contact: Nokia) SA5 LS in Rel-15 FS_5GS_Ph1_CH, QOED To:RAN2 Cc:SA1, SA2, CT1, RAN3
- Ericsson think that we cannot respond on MDT but we can respond on the QMC streaming part. Intel think QMC just reuses MDT and hence if we don't have MDT then we can't have QMC.
- Huawei think we have already responded on MDT and the reason they ask if that we said it could be supported, and they want confirmation.
- DT think we can response it can be supported from AS point of view and it is up to other groups to decide.
- Nokia point out there is a trace id that does not distinguish between CN types.

=> Respond that the RAN2 point of view the E-UTRA radio interface functionality for MDT and QMC streaming is the same for EPC and 5GC and hence can be supported. It is up to other groups to indicate if it can be supported from their perspective.
=> Draft LS in R2-1714157 (Offline discussion #35, Nokia)

R2-1714157 [DRAFT] Reply LS on supported features by 5GC for E-UTRA connected to 5G CN Nokia LS out Rel-15 LTE_5GCN_connect-Core To:SA5
=> Approved in R2-1714203

*Rapporteur inputs*

R2-1712661 The impact on TS36.331 due to E-UTRA connected to 5GC Intel Corporation discussion Rel-15 LTE_5GCN_connect-Core
P1
- Nokia has some concern about a generic note. We would be very careful how we do this.

P2
- OPPO is not clear that we should not distinguish between the 2 cores. Intel think we can continue to refer to upper layers without being specific.
- Samsung think we can agree with this in general and we generally only refer to upper layers. But in 304 we might need to be more specific.
- LG think P1 and P2 are a good target.

P5
=> Offline discussion to progress the on the principles to be used when trying to capture the E-UTRA connected to 5GC in 36.331. (Offline discussion #36, Intel)

R2-1714181 Offline discussion #36-the principles on capturing eLTE into RRC Intel discussion Rel-15 LTE_5GCN_connect-Core

**Agreements**
1: Do not change the terms E-UTRAN, EPC, MME, eNB which are used in relation to E-UTRA connected to EPC unless necessary.
2: 'When UE connects to EPC...' and 'When UE connects to 5G-CN...' is used in procedure part when we need to define UE behaviour specific for a UE using E-UTRA with EPC and a UE using E-UTRA with 5G-CN. Other text may be needed for the case when 'When UE connects to EPC...' and 'When UE connects to 5G-CN...' is not suitable.
3: Do not change the term NAS/upper layer used in TS36.331 unless it is really needed.
4: RAN2 aim to reuse the fields/IEs/structures introduced for EN-DC if they are also applicable for E-UTRA connected to 5GC, e.g. NR PDCP configuration

R2-1712662 Running 36.331 CR for E-UTRA connected to 5GC Intel Corporation CR Rel-15 36.331 14.4.0 3142 - B LTE_5GCN_connect-Core

✉ **[100#xx][LTE/5GC] 36.331 running CR (Intel)**
Intended outcome: Endorsed running CR
Deadline: Thursday 2017-12-14

✉ **[100#xx][LTE/5GC] 36.300 running CR ()**
Intended outcome: Endorsed running CR
Deadline: Thursday 2017-12-14

## 9.7.2 Stage 2 aspects independent from NR/5GC

*Including AS support for EPC/5GC selection, inter-RAT mobility (e.g. between E-UTRA/5GC and E-UTRA/EPC but not mobility in inactive which is addressed by AI 10.4.1.7.4), etc.*
*PDCP version change*

R2-1713134 NR PDCP configuration for SRB for UE accessing 5GC via ng-eNBHuawei, HiSilicon discussion Rel-15 LTE_5GCN_connect-Core
P1
- Qualcomm think that we can reuse the legacy security elements here.

P2
- Nokia is not sure of the status in SA3 of security for this case. Will they reuse existing security or new 5G security.
- ZTE think the message should support the new algorithms but which to use should be discussed in SA3.
- Qualcomm think we could use the LTE algorithms only so there would be no change to the message. Think we could continue to use them until 5G adds new algorithms in the future.
- Ericsson assume this is NR PDCP and support the proposal

P3
- ZTE support the explicit reconfiguration. This is anyway needed if the network wants to change the default configuration.
- Lenovo think this rules out changing PDCP type after SMC. But think an implicit method might be safer. But if we go with explicit then we need to consult SA3 about an unprotected reconfiguration. ZTE think his just changes a configuration that was first done without security protection.
- LG prefer to use an explicit configuration.
- Ericsson think an explicit reconfiguration before the SMC.
- Qualcomm think that it should be explicit but before or after the SMC.
- Intel think the implicit method could be used.



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**Agreements**

1: The legacy LTE SMC procedure (possibly with extensions to SMC message) is reused to activate initial AS security for the UE accessing 5GC via E-UTRA connected to 5GC.

FFS: Whether the SMC message indicates security algorithm ID using existing LTE code points or new 5G code points(i.e. neaX and niaX algorithms).

2 UE reconfigures to NR PDCP before the SMC is received

FFS Whether the reconfiguration to NR PDCP is performed via an explicit or implicit reconfiguration for SRB1 before SMC.

3 The UE is configured with NR PDCP for SRB2 when SRB2 is established.

=> Offline discussion to try to progress the second FFS on the method to reconfigure to NR PDCP (Offline discussion #37, Huawei)

R2-1714174 Report from offline discussion #037 Huawei report Rel-15 LTE_5GCN_connect-Core
=> Discussion to be continued to the next meeting

R2-1712263 SRB1 PDCP version change for UEs connecting to 5GCN through E-UTRAN Qualcomm Inc discussion Rel-15 LTE_5GCN_connect-Core
R2-1712610 PDCP type change for eLTE ZTE Corporation, Sane Chips discussion Rel-15
R2-1712658 Usage of NR PDCP for SRBs Intel Corporation discussion Rel-15 LTE_5GCN_connect-Core
R2-1712779 Consideration on SRB configuration in eLTE vivo discussion Rel-15 LTE_5GCN_connect-Core R2-1710951
R2-1713610 Consideration on PDCP version change in eLTE LG Electronics France discussion LTE_5GCN_connect-Core

*CN selection/CN type availability*

R2-1713270 Barring legacy UEs from 5GC only cells Ericsson discussion Rel-15 LTE_5GCN_connect-Core

Proposal 1 The cellReservedForOperatorUse flag in SIB1 is used to bar legacy UEs from camping on a 5GC cell in the case when some PLMNs hosted by the eNB are connected to 5GC only.

R2-1712659 Further consideration on CN type indication and CN type selection Intel Corporation discussion Rel-15 LTE_5GCN_connect-Core

- Discussed jointly with previous paper
- Qualcomm think the reserved for operator use flag is meant for a different use case and our design should be more backward compatible for legacy UEs.
- Ericsson is concerned about the size by adding the new list in SIB1. The AC11/15 case is a corner case.
- Vodafone is concern about the action of the UE when it sees the cell reserved.
- Samsung think using the reserved flag is an ugly solution and also this approach does not prevent UEs from attempting emergency calls. Think it is straight forward to add a new list.
- ZTE think we can't ensure that there are no AC11/15 UEs in the network that don't support 5GC.
- CATT prefer to avoid impacts to legacy UEs hence prefer to add a new PLMN. OPPO also prefer this.

P1

- Ericsson thinks there would be need to bar new UEs capable for 5GC for test purposes so a new flag is needed.
- Vodafone think the cellReservedForOperatorUse is mainly used for cell testing purposes and hence one bit per PLMN per cell is ok.
-

**Agreements**



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| | |
|---|---|
| 1 | Introduce a new 5GC PLMN list containing PLMNs that can connect to 5GC (coding details to be worked offline to avoid any need for repeating a PLMN ID if already present in the legacy PLMN list) |
| 2 | "cellReservedForOperatorUse" is introduced for PLMNs which can connect to 5GC only. |
| 3 | 5GC specific "cellReservedForOperatorUse" is introduced for PLMNs which can connect both EPC and 5GC. |
| 4 | UE AS indicates available CN types to upper layers for CN type selection. |

R2-1712171 Further considerations on the CN selection for E-UTRAN connected to 5G CN Samsung discussion Rel-15 LTE_5GCN_connect-Core
R2-1712172 CN type indication for E-UTRAN connected to 5G CN Samsung discussion Rel-15 LTE_5GCN_connect-Core
R2-1712217 Clarification on NAS and AS Function Division for CN Type Selection OPPO discussion Rel-15
R2-1712222 Discussion on EPC and 5GC Selection During for Intra-LTE Handover with CN Type Change OPPO discussion Rel-15 LTE_5GCN_connect-Core
R2-1712264 Preventing Legacy LTE UEs from camping on eLTE Cells & PLMNs connected to New 5G Core Network only Qualcomm Inc discussion Rel-15 LTE_5GCN_connect-Core R2-1710157
R2-1712285 How to Handle the Case Only Some PLMNs Have Access to 5GC? OPPO discussion LTE_5GCN_connect-Core
R2-1712588 Multi-PLMN aspects of E-UTRA cell connected to 5GC ZTE Corporation, Sane Chips discussion Rel-15 R2-1710420
R2-1712778 CN selection for LTE connected to 5GC vivo discussion Rel-15 LTE_5GCN_connect-Core R2-1710950
R2-1712864 Further Consideration on CN Type Selection CATT discussion R2-1710305
R2-1713130 Discussion on CN selection Huawei, HiSilicon discussion Rel-15 LTE_5GCN_connect-Core
R2-1713131 Draft LS to CT1 on CN selection Huawei LS out Rel-15 LTE_5GCN_connect-Core To:CT1
R2-1713132 Handling on E-UTRA cell where some PLMNs only have access to 5GC Huawei, HiSilicon discussion Rel-15 LTE_5GCN_connect-Core R2-1711109
R2-1713745 Discussion on CN type selection in RRC connection re-establishment HTC Corporation discussion LTE_5GCN_connect-Core

*Inter-RAT mobilty*
R2-1713271 Inter-system and inter-RAT mobility for LTE connected to 5GC Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1712780 Mobility issue in LTE connected to NextGen Core vivo discussion Rel-15 LTE_5GCN_connect-Core R2-1710949
R2-1712989 Handover involving EPC and 5GC Sony discussion Rel-15 LTE_5GCN_connect-Core R2-1711024
R2-1713135 Stage 3 design on intra-E-UTRA inter-system HO Huawei, HiSilicon discussion Rel-15 LTE_5GCN_connect-Core

*Security*
R2-1713266 Security aspects of supporting LTE connected to 5GC Ericsson discussion Rel-15 LTE_5GCN_connect-Core

=> LS to SA3 to ask about (detail wording to questions to be worked offline):
- key derivation mechanisms at mobility events
- AS security algorithms (and labels for the algorithms)
- provision of UE AS security capabilities (CT1 cced)
- addition of future NR algorithms (including 256 bit algorithms)

=> Draft LS in R2-1714163 (Offline discussion #38, Ericsson)

=> Check offline what requirements SA3 have provided to us for UP IP when LTE connected to 5GC. If not clear requirement has been provided then we can ask them in the LS



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R2-1714163 [DRAFT] LS on Security aspects of supporting LTE connected to 5GC Ericsson LS out Rel-15 LTE_5GCN_connect-Core To:SA3 Cc:CT1
=> Remove " based on the SA3 answer in R2-1714167"
=> Approved in R2-1714244

R2-1712261 Draft LS on AS Security Aspects of LTE connectivity to 5G-CN Qualcomm Inc LS out Rel-15 LTE_5GCN_connect-Core To:CT1, SA3
R2-1712262 Access Stratum Security aspects of E-UTRAN connected to 5GCN Qualcomm Inc discussion Rel-15 LTE_5GCN_connect-Core R2-1710159
R2-1712660 Support of security for eLTE Intel Corporation discussion Rel-15 LTE_5GCN_connect-Core
R2-1713136 Support of 5GS security in E-UTRA connected to 5GC Huawei, HiSilicon discussion Rel-15 LTE_5GCN_connect-Core
R2-1713233 Discussion on execution time of SMC CMCC discussion Rel-15 LTE_5GCN_connect-Core
R2-1713267 Draft LS on Security aspects of supporting LTE connected to 5GC Ericsson LS out Rel-15 LTE_5GCN_connect-Core To:SA3
R2-1713742 Discussion on Intra-Cell Handover with CN Type Change OPPO discussion Rel-15 LTE_5GCN_connect-Core

*Other*

R2-1712663 Support of positioning for E-UTRA connected to 5GC Intel Corporation discussion Rel-15 LTE_5GCN_connect-Core
R2-1712223 Discussion on Radio Bearer and Lower Layers Configuration in eLTE OPPO discussion Rel-15 LTE_5GCN_connect-Core
R2-1712286 Discussion on ANR Functionality for eLTE OPPO discussion NR_newRAT-Core R2-1710201
R2-1713133 Handling the features not supported in 5GC but supported in EPC Huawei, HiSilicon discussion Rel-15 LTE_5GCN_connect-Core
R2-1713268 QoS for LTE connected to 5GC Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1713269 Inactive state in LTE Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1713272 Handling of Collision netweem UE Identifier in LTE connected to 5GC Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1713273 Message 3.5 in LTE connected to 5GC Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1713611 RRC procedures for LTE connectivity to 5G-CN LG Electronics France discussion Rel-15 LTE_5GCN_connect-Core R2-1711122

*Withdrawn*
R2-1712218 Preventing Legacy UE and 5GC UE from Camping on 5GC-only and EPC-only eLTE Cells OPPO discussion Rel-15 LTE_5GCN_connect-Core R2-1710176 Withdrawn

## 9.7.3 Stage 2 aspects dependent on NR/5GC

*Including impact to E-UTRA DC due to flow based QoS, operation of flow based QoS at intra system handover and inter system handover, access control, inactive state, and slicing. These will be discussed when NR has made more progress on these items, and hence will not be discussed at this meeting.*

R2-1712220 Discussion on Access Control for eLTE OPPO discussion Rel-15 LTE_5GCN_connect-Core
R2-1712265 RRC INACTIVE State aspects for E-UTRAN connected to 5GCN Qualcomm Inc discussion Rel-15 LTE_5GCN_connect-Core
R2-1712865 Inactive State Modelling in LTE Connectivity to 5G-CN CATT discussion R2-1708244
R2-1712918 Number of DRBs in E-UTRA connected to 5GC Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1713632 Support for PLMN selection while in INACTIVE state in eLTE LG Electronics Inc. discussion Rel-15 LTE_5GCN_connect-Core R2-1711127



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R2-1713634 INACTIVE state in eLTE Core LG Electronics Inc. discussion Rel-15 LTE_5GCN_connect-R2-1711145
R2-1713757 Assistance information delivery for E-UTRA connected 5GC LG Electronics Inc. discussion Rel-15 R2-1711157

# 9.8 Positioning Accuracy Enhancements for LTE

*(LCS_LTE_acc_enh-Core; leading WG: RAN2; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-171508)*
*Time budget: 0 TU*
*This AI is a placeholder only - no documents to be submitted to this AI. The WI has no time budget allocated for this meeting and will be discussed again at RAN2#101.*

## 9.8.1 Organisational

*Including incoming LSs, rapporteur inputs, running CRs*

## 9.8.2 GNSS positioning enhancements

*RTK payload transmission, transparent or not? Supported RTK techniques, SSR, VRS, PPP, etc? The details on the support of UE based and UE assisted; The details about unicast and broadcast of RTK assistance data;*

## 9.8.3 Support for IMU positioning

*The details of IMU raw data; the scenario and benefits on how to use IMU raw data;*

## 9.8.4 UE-based OTDOA positioning

*What additional assistance information is required? Note, as second priority*

## 9.8.5 Broadcasting of assistance data

*SIB design for the transmission of A-GNSS, RTK and, as second priority, UE-based OTDOA assistance information. Encryption of assistance data broadcasting (SA3 input is needed);*

# 9.9 Enhancing CA Utilization

*(LTE_euCA-Core; leading WG: RAN2; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-170805)*
*Time budget: 1 TU*
*Documents in this agenda item will be handled in a break out session*

## 9.9.1 General

*Including incoming LSs, work plan, rapporteur inputs, running CRs*

R2-1713158 Discussion on running CRs for euCA Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
=> Noted

R2-1713159 Stage-2 running CR for euCA Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
=> used as the starting point for email discussion.
✉ **[100#xx][LTE/euCA]Running stage-2 CR for euCA (Nokia)**
Capture related the agreements from this meeting and the previous meetings.
Intended outcome: Endorsed running CR
Deadline: until next meeting

R2-1713160 RRC running CR for euCA Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
=> used as the starting point for email discussion.
✉ **[100#xx][LTE/euCA]Running stage-3 CR for euCA (Nokia)**
Capture related the agreements from this meeting and the previous meetings.
Intended outcome: Endorsed running CR
Deadline: until next meeting

1714148 Reply LS on RAN2 agreements for enhanced CA utilization WID
=> Noted

1714149 LS response on reduced SCell activation time for enhanced CA utilization WID
- Ericsson think there is misunderstanding in RAN4 for the state change.
- Huawei think the delay mostly coming from obtaining resource for CQI report according to the LS.
- Nokia think according the LS, introducing new state has no gain in latency.

=> Noted

## 9.9.2 Delay reduction for SCell set-up

*Including output of email discussion [99bis#32][LTE/euCA] Faster activation for Scells (Nokia)*

R2-1713170 Report of email discussion [99bis#32][LTE/euCA] Faster activation for Scells Nokia (rapporteur) report Rel-15 LTE_euCA-Core
- Huawei think the existing mechanism of activation should not be ruled out. Nokia indicate that nothing from the existing mechanism is ruled out.
- vivo indicate that there is CQI ambiguous issue for further study.

**Agreements:**
**1** Support configuring SCell directly in activated/deactivated state in Rel-15. FFS how to solve the CQI ambiguous and PDCCH monitoring timing issues.

*New state:*

R2-1712255 Fast SCell activation for enhanced CA utilization Qualcomm , AT&T, Verizon discussion Rel-15 LTE_euCA, LTE_euCA-Core R2-1710138
- Nokia prefer to not introduce L1 signalling.
- LG concern the power consumption.
- Huawei think the latency gain is limited.
- ATT and Sprint support to introduce the new state.
- Ericsson think the power consumption should be compared with DRX.
- Qualcomm indicate the DRX is not configured in their assessment.

Show hands on “Introduce a New SCell fast activation state”
1) Not introduce L1 signalling
2) Only period CQI report
3) without PDCCH monitoring

- Support to introduce this new state (6+Verizon)
- Not support (3)

**Agreements:**
Introduce a New SCell fast activation state as follows:
1) Not introduce L1 signalling
2) Only period CQI report based on CRS
3) without PDCCH monitoring

=> Send LS to RAN1 & RAN4 about L1 signalling usage for SCell state transition and timeline requirements

**CB on Friday:**=> Draft LS in R2-171xxxx to inform RAN1 and RAN4 our agreements of introducing new SCell fasct activation state. (Offline 144, Qualcomm)

**Agreements:**



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1 Transition between legacy SCell deactivated state and fast activation state is via MAC-CE (i.e., similar to legacy).
2 Legacy state transition mechanisms are applicable for transition between legacy SCell activated and SCell deactivated states.

*Direct activation:*

R2-1713164 Direct activation of configured Scells Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
R2-1712256 Fast SCell Configuration through Quick SCell Measurement Reporting Qualcomm Inc discussion Rel-15 LTE_euCA, LTE_euCA-Core
R2-1712258 Draft LS on usage of L1 Signaling and timeline for SCell State transition Qualcomm Inc LS out Rel-15 LTE_euCA-Core R2-1710770 To:RAN1 , RAN4
R2-1713226 Initial status of SCell for enhancing CA utilization LG Electronics Mobile Research discussion LTE_euCA-Core
R2-1713622 Direct activation at configuration Ericsson discussion Rel-15 LTE_euCA-Core

*Enhance the existing SCell activation:*

R2-1713336 Delay reduction for SCell Activation Huawei, HiSilicon discussion Rel-15 LTE_euCA-Core
- Qualcomm don't think there is real gain.

**Agreements:**
1 The short period of the CQI reporting resource could be only available upon receiving the SCell activation command. FFS when the UE fall back to longer periodicity.

Show hands on the proposal "The short period of the CQI reporting resource could be only available upon receiving the SCell activation command and be disabled after the eNB scheduling the UE on the activated SCell"
- Support (4)
- Not (2)

*Idle measurement:*

R2-1712831 UE selection for measurement of faster Scells activation vivo discussion
- Nokia wonder how to use the indication.
- LG and Nokia think it should be controlled by eNB.

=> Noted
=> Postpone the proposal 2 until when we have detailed solution of idle measurement.

R2-1713162 Security aspects of IDLE mode measurements Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
R2-1712832 Analysis on the Security and Configuration Issues of IDLE State Measurement vivo discussion
R2-1713161 Faster IDLE mode measurements Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
R2-1713163 Draft LS to SA3/RAN3 on RAN2 agreements for SCell delay reduction Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core
R2-1713334 Message selection for IDLE Mode Measurement Report Huawei, HiSilicon discussion Rel-15 LTE_euCA-Core
R2-1713620 CA establishment from Idle Ericsson discussion Rel-15 LTE_euCA-Core
R2-1713724 Reporting condition of IDLE measurements LG Electronics Inc. discussion Rel-15 LTE_euCA-Core

*Suspend state*:

R2-1713621 RRC Suspended and CA establishment Ericsson discussion Rel-15 LTE_euCA-Core

*Others*:

R2-1713623 Measurement improvements for euCA Ericsson discussion Rel-15 LTE_euCA-Core

*CRs*:

### 9.9.3 Signalling overhead reduction for configuration activation

R2-1712257 Signalling Optimization for SCell Configuration and Handover Qualcomm Inc discussion Rel-15 LTE_euCA, LTE_euCA-Core R2-1710154
R2-1713491 Common SCell configuration Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core R2-1710999

R2-1713165 Common SCell configuration Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_euCA-Core Withdrawn
R2-1713333 Signalling overhead reduction for SCell Configuration Huawei, HiSilicon discussion Rel-15 LTE_euCA-Core
R2-1713335 Signalling overhead reduction for SCell (de)Activation Huawei, HiSilicon discussion Rel-15 LTE_euCA-Core R2-1710411

✉ **[100#xx][LTE/euCA] Solutions on signalling overhead reduction (Nokia)**
Try to have a unified solution based on the contributions so far.
Intended outcome: Report to the next meeting
Deadline: until next meeting

### 9.9.4 Others

## 9.10 Enhancements on LTE-based V2X Services

*(LTE_eV2X-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-171740)*
*Time budget: 1 TU*
*Documents in this agenda item will be handled in a break out session*

### 9.10.1 General

*Including incoming LSs, work plan and rapporteur inputs.*
R2-1712115 LS to RAN2 on carrier selection rules for Rel-15 V2X (R1-1719151; contact: Huawei) RAN1 LS in Rel-15 LTE_eV2X-Core To:RAN2
Noted

R2-1712750 Reconsideration on sidelink HARQ entity and sidelink process in PC5 CA Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
Huawei: No SL HARQ entity per SL carrier
Ericsson, Samsung: No problem with keeping the agreement, it is same as UL case.
=> Noted

R2-1712117 LS to RAN4 on resource selection for Mode-4 sidelink CA (R1-1719159; contact: Intel) RAN1 LS in Rel-15 LTE_eV2X To:RAN4 Cc:RAN2
Samsung: What should be RAN2 impact?
Intel: No much RAN2 impact foreseen
=> Noted

R2-1712155 LS on the support of Unicast and Groupcast transmission over PC5 for eV2X (S2-178181; contact: LGE) SA2 LS in Rel-15 LTE_eV2X, FS_eV2XARC To:RAN, RAN2 Cc:SA, SA1, SA3
ZTE: In Rel-14, destination id is linked with service type. How to realize unicast?
OPPO: Shares similar question as ZTE and wonders the ID space will be exclusive or overlapped?
Qualcomm: Nothing is specified for group management. They may configure ID for any group.
OPPO: Different MAC HD for destination ID between Rel-12 and Rel-14.
Ericsson: V2X is based on SL and in that sense, it's not new.
LG: Even though the destination ID is mapped to service id, the application layer can distinguish the receiver/transmitter.
=> Noted



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## 9.10.2 Carrier aggregation (up to 8 PC5 carriers)

*Focus should be on RAN2 aspects.*
*1) Handling of the UE with limited Rx chains*
*- Do we need to introduce a mechanism to sync the selected carrier between Tx and Rx?*

R2-1712745 Need of Rx carrier selection for UEs with limited Rx capability Huawei, Qualcomm Incorporated, OPPO, CATT, HiSilicon discussion Rel-15 LTE_eV2X-Core
Huawei: In multiple services, the problem becomes severe.

R2-1713515 Sidelink Carrier Selection Criteria for RX Ericsson discussion Rel-15 LTE_eV2X-Core
Intel: Mismatch between TX and RX is possible issue and how to guarantee the sync between TX and RX (e.g. due to PPPP-CBR, etc.)?
Huawei: We can consider PPPP-CBR and carrier priority in joint manner.
Nokia: Why not select RX carrier based on the existing CBR?
CATT: It may bring the carrier congestion issue.
ZTE: RX carrier selection is the optimization issue
LG: RX should be able to monitor all carriers associated with service type.
OPPO: Rel-14 PPPP-CBR can be simply reused to sync TX and RX.
ZTE: If we consider both PPPP-CBR and carrier priority, how RX knows what TX selects?
Huawei: Let's first discuss and decide if needed to consider limited RX in carrier selection.
Ericsson: Don't want to mandate to monitor certain carrier and it can be left to UE.
LG: For important service (e.g. ITS safety service), that should not happen to miss the packet.
Huawei: For non ITS safety service, it's better to have it.
OPPO: Whether we will have additional optimization beyond Rel-14 PPPP-CBR mechanism?
Supporting companies (Yes, we need enhancement): 5
Supporting companies (No, we don't need it): 7
=> Working Assumption: No enhancement for the limited RX UE in RX&TX carrier selection beyond Rel-14 mechanism.

*2) Protocol architecture and details for packet duplication*
*2.1) Packet duplication at PDCP or MAC?*
*2.2) Specification impacts to be considered?*

R2-1713513 Packet duplication for PC5 Ericsson discussion Rel-15 LTE_eV2X-Core
Proposal 1 Sidelink packet duplication in LTE is anchored at PDCP.
=> Agreed

Proposal 2 As for the Uu packet duplication, duplicated sidelink PDCP PDUs are submitted to two different RLC entities and associated to two different logical channels.
ZTE: How many RLC entities should be assigned to duplicated packet?
Ericsson: Only two
LG: Do we have any restriction on the number of duplicated packets? We may not need it.
OPPO: In Rel-15, no strong reason to have too many.
CATT: Agrees with OPPO.
Ericsson: For Uu, only two are supported and it will make UE easier in implementation.
Samsung: Agrees with Ericsson
=> Agreed

Proposal 3 As for the Uu packet duplication, sidelink packet duplication on a single carrier is not supported, i.e. the MAC layer cannot multiplex the two logical channels associated to a duplicate packet into the same HARQ entity.
Lenovo: No restriction
Huawei: Packet duplication is for F-diversity
Samsung, LG: Shares the view with Huawei
=> Agreed

Proposal 4 The LCID(s) that can be used for transmission of one replica of a duplicate packet are reserved, i.e. they cannot be used by non-duplicated packet transmission. RAN2



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to discuss whether this LCID(s) for the duplicated packet should be (pre)configured or hard-coded or up to the UE implementation.
CATT: It should be (pre)configured
OPPO: How “up to the UE implementation” works?
Ericsson: Prefer (pre)configuation option
OPPO: Two options, i.e. i) fixed or ii) (pre)configured. What’s Ericssion view?
OPPO: Prefer fixed one (simplest one)
LG: No need of reservation. In Rel-14, already somewhat duplciation is allowed and the application layer handles duplicated packets.
ITL: Agrees with LG
Samsung: RX UE also needs to know the LCID for the duplicated packet
LG: From TX, it is duplicated in PDCP but from RX, it will detect duplication in application
=> Agreed with FFS (pre)configuration or hard-coded or up to the UE implementation. Option should be worked for both mode3 and mode4.

Proposal 5 (Pre)configuration may indicate the needed reliability for which a packet can be duplicated over the sidelink by the UE.
ZTE: Agrees with Ericsson
Intel: Can we derive the reliability requirement from the service (type)?
Samsung: Agrees with Ericsson
OPPO: Shouldn’t we need both reliability information and the associated threshold?
Huawei: Will reliability impact on TX carrier selection. Want to associate reliability to PPPP and it’s reluctant to introduce new dimension.
ITL: Agrees with Huawei
Samsung: How to combine them since PPPP is for PDB now?
OPPO: Agrees with Samsung and it should be also backward compatible with Rel-14 V2X
Huawei: No relationship between PPPP and service type
=> Will ask SA2 the possibility to derive reliability inforamtion. Will include some background information for packet duplication and the benifits of reliability indication. Includes background information of Rel-14 PPPP.

Proposal 6 In order to properly enable sidelink packet duplication, the AS layer needs to be provided with the reliability value of a packet to be transmitted over the PC5. The LS to SA2 is available in [5].

Proposal 7 (Pre)configuration determines channel conditions (e.g. CBR values) under which sidelink packet duplication can be used by the UE.

**Agreements**
1 Sidelink packet duplication in LTE is anchored at PDCP.
2 As for the Uu packet duplication, duplicated sidelink PDCP PDUs are submitted to two different RLC entities and associated to two different logical channels.
3 As for the Uu packet duplication, sidelink packet duplication on a single carrier is not supported, i.e. the MAC layer cannot multiplex the two logical channels associated to a duplicate packet into the same HARQ entity.
4 The LCID(s) that can be used for transmission of one replica of a duplicate packet are reserved, i.e. they cannot be used by non-duplicated packet transmission. RAN2 to discuss whether this LCID(s) for the duplicated packet should be (pre)configured or hard-coded or up to the UE implementation. (FFS (pre)configuration or hard-coded or up to the UE implementation. Option should be worked for both mode3 and mode4.)
5 Will ask SA2 the possibility to derive reliability inforamtion. Will include some background information for packet duplication and the benifits of reliability indication. Includes background information of Rel-14 PPPP.

[CB600]: LS on Reliability for eV2X (Ericsson, R2-1714131)

R2-1712942 Discussion on activation of Duplication Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_eV2X-Core



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Proposal 1: RAN2 is kindly requested to agree that eNB controls and configures the activation of duplication transmission on multiple carriers for PC5.
LG: How to handle OOC V2X UEs?
Nokia: Via preconfiguration option (like Rel-14)
CATT: For mode3, it's eNB control and for mode4, it's eNB configure.
ITL: How eNB can be aware whether packet duplication is needed or not? Some information from the UE would be required.

Proposal 2: UE should be allowed to autonomously activate duplication transmission on multiple carriers according to eNB configured CBR threshold and among the carriers allowed by the upper layer indication.
=> For mode4 (connected and idle), UE autonomous activation of duplication transmission on multiple carriers is allowed based on (pre)configuration. FFS on UE request to NW for duplication transmission.

Proposal 3: UE may request duplication transmission from eNB if UE cannot activate it autonomously based on eNB configuration, and eNB may respond to UE's request by providing either dedicated mode 4 configurations with different CBR threshold or dedicated mode 3 resource allocation in case eNB determines to accept the request.

**Agreements:**
1. For mode4 (connected and idle), UE autonomous activation of duplication transmission on multiple carriers is allowed based on (pre)configuration. FFS on UE request to NW for duplication transmission.

*3) Details of carrier selection*
*- How to implement PPPP and CBR in carrier selection?*
*1st step: carriers by upper layer, eNB configuration and UE capability then?*
*Option1: Narrow down to carriers to allow Tx based on Rel-14 CBR-PPPP table + further narrow down for load-balance*
*Option2: Narrow down to carriers to meet new CBR-PPPP threshold for each carrier*
*Option3: Narrow down to carriers to meet lowest CBR measurement for each carrier (PPPP is handled as part of LCP)*

R2-1712178 Carrier selection in CA-based eV2x OPPO discussion Rel-15 LTE_eV2X-Core
Huawei: How to reuse PPPP-CBR table?
OPPO: One TX resource pool for a given carrier is selected and PPPP-CBR will be applied.
Huawei: L1 parameters will be there anyway since CBR ranges for PPPP-CBR covers almost all ranges, which means all carriers will stay as candidate carriers.

R2-1712751 Discussion on the Tx carrier selection for PC5 CA Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
Huawei: Carrier selection should be done before resource selection/L1 parameters determination.
LG: CR_Limt can be used for TX carrier selection, so we can reuse the Rel-14 PPPP-CBR

R2-1712869 Layer design aspect for Tx carrier selection LG Electronics Inc. discussion Rel-15 LTE_eV2X-Core

✉ **[LTE – eV2X] TX carrier selection – LG**
- Identify the list of solutions by using PPPP and CBR in the TX carrier selection (based on the contributions this meeting)
- Analyze pros and cons
- Select the best option / the most preferred option

R2-1712626 Remaining aspects of TX Carrier Selection for CA over PC5 Intel Corporation discussion Rel-15 LTE_eV2X-Core
R2-1712947 Discussion on carrier selection details and handling Rx limited V2X UE Lenovo, Motorola Mobility discussion Rel-15 LTE_eV2X-Core
R2-1713070 Discussion on carrier selection in PC5 CA ZTE Corporation discussion



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R2-1713405 Carrier and resource selection in carrier aggregation for V2X Phase 2 Qualcomm Incorporated discussion Rel-15 LTE_eV2X-Core
R2-1713516 Sidelink Carrier Selection Criteria for TX Ericsson discussion Rel-15 LTE_eV2X-Core

R2-1712179 Packet duplication in CA-based eV2x OPPO discussion Rel-15 LTE_eV2X-Core
R2-1712183 Discussion on Carrier Set Configuration for PC5 CA OPPO discussion Rel-15 LTE_eV2X-Core
R2-1712625 Limited RX chain UE considerations for CA over PC5 Intel Corporation discussion Rel-15 LTE_eV2X-Core
R2-1712627 Discussion on carrier reselection aspects for CA over sidelink Intel Corporation discussion Rel-15 LTE_eV2X-Core
R2-1712628 Discussion on packet duplication for V2X CA Intel Corporation discussion Rel-15 LTE_eV2X-Core R2-1710650
R2-1712629 Further considerations on packet duplication for CA based eV2X Intel Corporation discussion Rel-15 LTE_eV2X-Core
R2-1712744 Discussion on how to deal with Destination L2 ID during Tx carrier selection Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1712745 Need of Rx carrier selection for UEs with limited Rx capability Huawei, Qualcomm Incorporated, OPPO, CATT, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1712746 Packet duplication for PC5 CA Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1712749 On UEs with limited Rx capability in PC5 CA Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1712752 Analysis on resource allocation for PC5 CA Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1712852 _Issues for carrier selection in CA-based eV2X CATT discussion
R2-1712854 some consideration of Rx limitatoin CATT discussion
R2-1712873 Tx/Rx Carrier selection LG Electronics Inc. discussion Rel-15 LTE_eV2X-Core
R2-1712948 Discussion on packet duplication on PC5 Lenovo, Motorola Mobility discussion Rel-15 LTE_eV2X-Core
R2-1712970 Packet Duplication for eV2X Sidelink CA Potevio discussion Rel-15
R2-1713071 Consideration on data duplication design for PC5 CA ZTE Corporation discussion
R2-1713072 Discussion on sidelink resource request mechanism for PC5 CA ZTE Corporation discussion
R2-1713512 LS on Reliability Values for eV2X Ericsson LS out Rel-15 LTE_eV2X-Core To:SA2
R2-1713513 Packet duplication for PC5 Ericsson discussion Rel-15 LTE_eV2X-Core
R2-1713515 Sidelink Carrier Selection Criteria for RX Ericsson discussion Rel-15 LTE_eV2X-Core
R2-1713707 De-prioritization of duplicated transmission for V2X sidelink communication LG Electronics Inc. discussion Rel-15 LTE_eV2X-Core
R2-1713823 Consideration on packet duplication LG Electronics Inc. discussion Rel-15 LTE_eV2X-Core
R2-1713828 Considerations on sidelink packet duplication ITL discussion Rel-15 LTE_eV2X
R2-1713834 Considerations on operating mode configuration for sidelink CA ITL discussion Rel-15 LTE_eV2X
R2-1713839 Discussion on SPS support with enhanced Carrier Aggregation Samsung discussion R2-1711775
R2-1713841 Packet Duplication for the Sidelink Carrier Aggregation Samsung discussion R2-1711812
R2-1713874 Consideration on Required Reliability for Tx Carrier Selection Samsung discussion

## 9.10.3 Radio resource pool sharing between UEs using mode 3 and mode 4

*Focus should be on RAN2 aspects.*

*1) Scenarios and pool configuration?*
R2-1712180 Resource pool sharing in eV2x OPPO discussion Rel-15 LTE_eV2X-Core

R2-1712630 Resource pool sharing between mode 3 and mode 4 Intel Corporation discussion Rel-15 LTE_eV2X-Core R2-1710652

✉ **[LTE – eV2X] Radio resource pool sharing – OPPO**
- Identify possible scenarios
- Clarify which scenario we'll take into account for the solution
- Pool configurations with pool sharing
- Possible solutions (RAN2 based one)

*2) Enhancements options?*

R2-1712747 Discussion on resource pool sharing between mode3 and mode4 UEs Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1713387 Resource pool sharing between Mode 3 and Mode 4 Qualcomm Incorporated discussion Rel-15 LTE_eV2X-Core R2-1710682

R2-1712748 On resource pool sharing between R15 UEs and R14 UEs Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1712846 Discussion about exceptional pool for resource pool sharing between UEs using mode 3 and UEs using mode 4 Samsung R&D Institute UK discussion Rel-15 LTE_eV2X-Core R2-1711733
R2-1712853 Discussion on mode 3 and mode 4 shared resource pool CATT discussion
R2-1712941 Resource pool sharing between mode 3 and mode 4 Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_eV2X-Core
R2-1712967 Discussion on radio resource pool sharing in eV2X Potevio discussion Rel-15
R2-1713078 Consideration on resource pool sharing between UEs using mode 3 and mode 4 ZTE Corporation discussion LTE_eV2X-Core R2-1711014
R2-1713514 Pool Sharing Between Mode-3 and Mode-4 Ericsson discussion Rel-15 LTE_eV2X-Core
R2-1713748 Mode3/Mode 4 resource pool sharing on V2X phase 2 Samsung R&D Institute UK discussion R2-1711754 Withdrawn
R2-1713749 Mode 3 behaviour in shared resource pools for V2X phase 2 Samsung R&D Institute UK discussion R2-1711754
R2-1713750 Mode 4 behaviour in shared resource pools for V2X phase 2 Samsung R&D Institute UK discussion
R2-1713751 Shared resource pool configuration on V2X phase 2 Samsung R&D Institute UK discussion
R2-1713822 Radio resource pool sharing between UEs using mode 3 and UEs using mode 4 LG Electronics Inc. discussion Rel-15 LTE_eV2X-Core R2-1709133

## 9.10.4 Others

*Including RAN2 aspects, if any, on the WI objectives 1b (64 QAM), 1c (delay reduction at layer 1), 2 (transmit diversity), and 3 (short TTI).*

R2-1712181 Resource selection for sTTI in eV2x OPPO discussion Rel-15 LTE_eV2X-Core R2-1710149
R2-1712182 Latency reduction in eV2x OPPO discussion Rel-15 LTE_eV2X-Core
R2-1712743 Consideration on latency related aspects in LTE eV2X Huawei, HiSilicon discussion Rel-15 LTE_eV2X-Core
R2-1713079 Consideration on latency reduction ZTE Corporation discussion LTE_eV2X-Core R2-1711015
R2-1713080 Discussion on support of 64QAM over sidelink ZTE Corporation discussion LTE_eV2X-Core R2-1711016
R2-1713404 Latency reduction for packet transmission in eV2X Qualcomm Incorporated discussion Rel-15 LTE_eV2X-Core
R2-1713407 Coexistence between Rel-14 and Rel-15 V2X UEs Qualcomm Incorporated discussion LTE_eV2X-Core
R2-1713511 Latency reduction for eV2V Ericsson discussion Rel-15 LTE_eV2X-Core
R2-1713670 Latency reduction on V2X phase 2 for UEs using Mode 4 Samsung R&D Institute UK discussion R2-1711744



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R2-1713759 Latency reduction on V2X phase 2 for sidelink SPS UEs Samsung R&D Institute UK
discussion
R2-1713766 Sidelink SPS confirmation for multiple SPS configurations Samsung R&D Institute UK
discussion
R2-1713824 RAN2 aspects regarding support of 64QAM and TX diversity LG Electronics Inc.
discussion Rel-15 LTE_eV2X-Core R2-1711686

# 9.11 High capacity stationary wireless and 1024 QAM

*(LTE_1024QAM_DL-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Mar. 18: WID: RP-171738)*
*Time budget: 0.5 TU*
*Documents in this agenda item will be handled in a break out session*

## 9.11.1 General

*Including incoming LSs, work plan, rapporteur inputs, running CRs*

R2-1712127 LS on HCS (R1-1719217; contact: Huawei) RAN1 LS in Rel-15 LTE_1024QAM_DL
To:RAN2, RAN4
- Qualcomm would like to know the meaning of “band/band combination”

=> Noted

## 9.11.2 UE capability and potential new categories

R2-1712899 Support of 1024QAM in TS 36.306 Huawei, HiSilicon CR Rel-15 36.306
14.4.0 1521 - B LTE_1024QAM_DL-Core Revised to R2-1714081
R2-1714081 Support of 1024QAM in TS 36.306 Huawei, HiSilicon CR Rel-15 36.306
14.4.0 1521 - B LTE_1024QAM_DL-Core

=> Postponed until we received further information on the capability per CC.

## 9.11.3 Corresponding higher-layer procedures and signalling

R2-1712898 Support of 1024QAM in TS 36.331 Huawei, HiSilicon CR Rel-15 36.331
14.4.0 3149 - B LTE_1024QAM_DL-Core Revised to R2-1714082
R2-1714082 Support of 1024QAM in TS 36.331 Huawei, HiSilicon CR Rel-15 36.331
14.4.0 3149 - B LTE_1024QAM_DL-Core

=> Postponed until we received further information on the capability per CC.

# 9.12 Enhancements to LTE operation in unlicensed spectrum

*(LTE_unlic-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-170848)*
*Time budget: 1 TU*
*Documents in this agenda item will be handled in a break out session*

## 9.12.1 General

*Including incoming LSs, work plan, rapporteur inputs, running CRs*

R2-1714086 Resource allocation for AUL discussion Rel-15 LTE_unlic-Core

RLC reordering handling:
- Huawei think it is very rare case.

HARQ related topics:

**Agreements**
**1** Add new separate RRC configurable timer X as follow:
- When Timer X starts is FFS
- Timer X is stopped if it received SUL grant or HARQ feedback with SUL grant for the retransmission
- UE shall not retransmit before the timer X stops/expires.



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**2** UE can select the HARQ process for new AUL transmission when the following conditions are fulfilled:

- the HARQ process for the corresponding HARQ process ID is not already being used for AUL (re)transmission in which HARQ ACK feedback has not been received for the HARQ process corresponding to the HARQ process ID
- The HARQ process ID is not used by a SUL grant unless it has been ACK as agreed in RAN1.

LBT and Logical channel limitation:

**Agreements:**
**1** Channel access priority for each UL LAA allowed logical channel can be configured via RRC Connection Reconfiguration as part of the Logical Channel Configuration per DRB or all DRBs.
2 For AUL transmission, UE selects the lowest access priority class of the logical channel with MAC SDU multiplexed into the MAC PDU
3 MAC CEs have highest priority access class

## 9.12.2 Autonomous uplink access on Frame structure type 3

HARQ operation:
R2-1712623 HARQ aspects of AUL Intel Corporation discussion Rel-15 LTE_unlic-Core
R2-1712979 Autonomous Uplink HARQ Aspects Motorola Mobility Germany GmbH discussion Rel-15 LTE_unlic-Core
R2-1713519 Coexistence Between AUL and Dynamically Scheduled UL Grants Ericsson discussion Rel-15 LTE_unlic-Core
=> The issue is confirmed and the solution should be discussed.
R2-1713520 HARQ Retransmissions for Autonomous UL Access Ericsson discussion Rel-15 LTE_unlic-Core
R2-1713883 HARQ process ID calculation for SPS with SkipULTx LG Electronics UK discussion LTE_unlic-Core
=> Noted
R2-1713815 Further details of Autonomous Uplink Access for eLAA Qualcomm Incorporated discussion

Other MAC:
R2-1712624 Other MAC aspects of AUL Intel Corporation discussion Rel-15 LTE_unlic-Core
R2-1712896 Other MAC aspects of AUL Huawei, HiSilicon discussion Rel-15 LTE_unlic-Core R2-1710365

AUL confirmation:
R2-1713521 On AUL Confirmation Ericsson discussion Rel-15 LTE_unlic-Core
R2-1712893 Confirmation on AUL activation and deactivation Huawei, HiSilicon discussion Rel-15 LTE_unlic-Core R2-1710363
R2-1713646 Necessity of multi bit confirmation MAC CE LG Electronics Inc. discussion LTE_unlic-Core
R2-1713198 Autonomous Uplink Access details Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_unlic-Core
R2-1712895 Issues on RLC reordering with AUL Huawei, HiSilicon discussion Rel-15 LTE_unlic-Core

BS and PH
R2-1712894 Issues on BS and PH calculation for AUL Huawei, HiSilicon discussion Rel-15 LTE_unlic-Core R2-1710366
R2-1713493 Miscellaneous MAC Issues for feLAA Ericsson discussion Rel-15 LTE_unlic-Core

AUL configuration:

R2-1713517 AUL configuration for feLAA Ericsson discussion Rel-15 LTE_unlic-Core

Channel Access Priority:
R2-1713518 Channel Access Priority Classes for feLAA Ericsson discussion Rel-15 LTE_unlic-Core

### 9.12.3 Other operation on Frame structure type 3

R2-1713522 RAN2 Impact on Multiple Starting and Ending Positions in a Subframe Ericsson discussion Rel-15 LTE_unlic-Core

### 9.12.4 Others

## 9.13 Further NB-IoT enhancements

*(NB_IOTenh2-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-172063)*
*Time budget: 2 TU*
*Documents in this agenda item will be handled in a break out session*
*Some sub-items in 9.13 and 9.14 may be treated jointly.*

*For WI objectives A-1 to A-5, the following approach has been concluded by RAN WG chairs for providing the "complete running CRs/draft CRs to RAN#78":*

*a/ Draft/running CRs for the prioritised features are endorsed by the RAN WGs as being complete*
*b/ The CRs are attached for information in an LS to RAN*
*c/ The CRs are referenced in the status report to demonstrate the objectives have been met*
*d/ RAN WGs do not provided the CRs to RAN as agreed or technically endorsed*

### 9.13.1 Organisational

*Including incoming LSs, rapporteur inputs, running CRs*

**LS in**

R2-1712122 LS on wake-up signal configuration and procedures for NB-IoT and BL/CE UEs in Rel-15 (R1-1719207; contact: HiSilicon) RAN1 LS in Rel-15 LTE_eMTC4, NB_IOTenh2 To:RAN2
- We should reply

⇒ **Noted**

R2-1712142 Reply LS on measurement accuracy improvement (R4-1711893; contact: Huawei) RAN4 LS in Rel-15 NB_IOTenh2-Core To:RAN1 Cc:RAN2

⇒ **Noted**

R2-1714168 LS on Wake-up signal features for Rel-15 LTE-MTC (R1-1721282; contact: Ericsson)
- QC think it is strange that the WA are identical. Ericsson cannot explain.

⇒ **Noted**

R2-1714151 LS on wake-up signal (R1-1721241; contact: HiSilicon)
- ZTE wonders if this means that we have one WUS per PO. Hisilicon clarifies that the exact mapping has not been agreed.

⇒ **Noted**

**Draft CRs**

R2-1713197 Running 36.304 CR for Further NB-IoT enhancements Nokia, Nokia Shanghai Bell draftCR Rel-15 36.304 14.4.0 B NB_IOTenh2-Core
R2-1713690 Introduction of further NB-IoT enhancements in 36.306 Ericsson CR Rel-15 36.306 14.4.0 1513 1 B NB_IOTenh2-Core R2-1710742
*Above 2 tdocs not treated*

R2-1713691 Introduction of further NB-IoT enhancements in 36.322 Ericsson CR Rel-15 36.322 14.1.0 0131 1 B NB_IOTenh2-Core R2-1710743



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- Should be a DraftCR

⇒ **Contents agreed, revise to DraftCR, provide with LS to RP**

⇒ **DraftCR in R2-1714005**

R2-1714005 Introduction of further NB-IoT enhancements in 36.322 Ericsson draftCR Rel-15 36.322 14.1.0 B NB_IOTenh2-Core R2-1710743

⇒ **Endorsed unseen**

General:

⇒ **We will prepare an LS for RP, with attached DraftCRs (one per TS).**

✉ **[NB-IoT R15] Email discussion one week, running Rel-15 36.331 CR for NB-IoT and LS to RP (Huawei)**

✉ **[NB-IoT R15] Email discussion one week, running Rel-15 36.321 CR for NB-IoT (Ericsson)**

R2-1713993 Draft LS on Rel-15 NB-IoT work progress Huawei

- Nokia wonders what to state on the other features. Huawei think that we report as usual on thise on the WI SR.

⇒ **Change "RAN2 has captured the following enhancements" to "RAN2 has captured progress on the following WI objectives". Otherwise the contents seems agreeable**

⇒ **For email approval, Add to email discussion for the Rel-15 RRC Running CRs.**

## 9.13.2 Early Data Transmission

*Early Data transmission for NB-IoT is treated jointly with MTC under AI 9.14.2. Do not use this AI for any item that can be discussed jointly.*

## 9.13.3 System Acquisition Enhancements

*System acquisition Enhancements for NB-IoT is treated jointly with MTC under AI 9.14.3. Do not use this AI for any item that can be discussed jointly.*

*Moved from 9.14.3*

R2-1713192 Introduction of additional SIB1-NB transmissions in 36.331 Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B NB_IOTenh2-Core

- R1 may have draftCR for this, and we need this to be reflected in R2 CR as well.

⇒ **Merged into the 36.331 Running CR**

## 9.13.4 Relaxed Monitoring for cell reselection

*Relaxed monitoring for cell reselection for MTC and NB-IoT is treated jointly under this AI.*
*Including output of email discussion [99bis#35][NB-IoT/MTC] Relaxed Monitoring (Ericsson)*

R2-1713010 Email report 99bis_35 Relaxed Monitoring Ericsson report Rel-15 NB_IOTenh-Core, LTE_eMTC4-Core

DISCUSSION

P1:

- Nokia think we don't need this standardized periodic measurements. This can be left to UE implementation. Huawei agrees and don't understand how the network can configure certain values. Mediatek think is it ok to not specify this. Nokia think the purpose of relaxed monitoring is to not measure. Ericsson think this cannot be left to UE implementation.
- LG are ok with proposal 1. QC also think proposal 1 is ok as it will anyway be difficult to agree on a value. Huawei wonders why this would need to be configurable. LG think the configuration could be changed. ZTE think that a hardcoded value is sufficient. Huawei want to know how to configure.



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- Ericsson think we have already agreed to do this, and there are two different aspects a) whether it is standardized, b) whether the period is configurable. Ericsson think we should only discuss b) Sierra Wireless agrees.
- SW think 24h would be acceptable.

P2
- Nokia think something is missing
- Understanding of the proposed mechanism:
  Detection of a drop serving cell signal strength.
  - RSRP (serving cell) is stored in *REFrxlev,* FFS exactly when this happens (Alt1: at cell reselection/NB cell measurement trigger, Alt2: periodically but only store the value if stronger than previous).
  - *REFrxlev* is compared to measured RSRP (serving cell), if the difference is > RSRP delta then: perform NB cell measurements and cell reselection evaluation (or does the UE exit "relaxed monitoring")
- Huawei think that we can have a mechanism that is significantly simpler than for GSM.
- Nokia think that we can have an absolute threshold. Chair think we have already discarded such mechanism. Nokia wonders if mobility can be detected by change in RSRP. Nokia think that a time scale is needed.
- Nokia think we have three different states: Normal monitoring, relaxed monitoring, and no monitoring (as today triggered by S threshold).
- Gemalto point out that the RSRP change is not very linear. We need to think about the delta.
- ZTE think we could follow the GSM approach and define a range rather than a value and the selection of the value is up to the UE.
- Sierra Wless think that setting this value is not easy, especially since Srxlev relates very differently to physical movement in different geometry.
- LG think it can be hardcoded to 6dB.
- Gemalto think it is not clear what the 6dB means, in light of UE measurement accuracy. QC think that the accuracy limitations is somewhat systematic so for comparing measurements it is not so bad.

P3:
- Huawei wonders where the value 10 comes from.
- Gemalto think that we need to avoid slow lowering of REFrxlev.

P5:
- Gemalto think that stationary devices could benefit from specific configuration. Ericsson agrees and think that a signalled solution is needed as backup. Nokia think that the mechanism already proposed is sufficient. Sierra Wireless think that it will work for truly stationary devices the way it currently is. Huawei agrees.
- Chair: not that much support for additional mechanism for truly stationary devices.

*Chair's suggests to discuss the following proposals (replacing P3 above):*

For a UE that uses Relaxed Monitoring:

Proposal 3.1: Relaxed Monitoring Requirements for neighbour cell detection and measurements are applied when the following conditions both apply:
  a) Srxlev.Ref - Srxlev < Srxlev.Delta
  b) *FFS criterion* since Srxlev.Ref - Srxlev < Srxlev.Delta last became false

(where b is a condition to stay in mobile state for a while when stationary/relaxed state has been left)

Proposal 3.2: The *FFS criterion* in condition b) is
  i) X Cell Reselection Evaluations (X=10?) has been performed

Proposal 3.3: The Srxlev.Ref is a stored Srxlev value. The UE sets Srxlev.Ref = Srxlev when any of the following conditions apply (R2 to choose):
  1) When a new serving cell has been selected or reselected to
  2) When cell reselection evaluation is triggered.
  3) When Condition b becomes applicable, i.e. when UE goes back to stationary/relaxed state.
  4) Whenever Srxlev > Srxlev.Ref

FURTHER DISCUSSION
- Huawei think that 3.1.a and 3.3.1 is the bare minimum that is needed.
- Gemalto wonders how often this is evaluated and whether this need to be applicable to a certain time. Chair think that consolidation of measurements can indeed be discussed but would like to first focus on the basic mechanism.
- Nokia wonders whether the UE would perform normal measurements when condition 3.1.a is not met. Chair think this is the proposal from all the CRs.
- QC think we might need to consider more exactly when measurements are being done. Maybe UE need to detect and measure then entering a new cell. Mediatek think that it just allows the UE to relax the measurements and the UE can measure in any case.
- Gemalto think that more conditions need.
- LG think that 3.3.4 is needed and think that 3.3.1 need to be updated to work. ZTE agrees. Sierra Wless agrees that 3.3.4 is needed and think that reset should also be done at 3.3.2. Nokia agrees with Sierra Wireless.
- Chair think that only 3.1.a and 3.3.1 is not sufficient, e.g. a UE that initializes Srxlev in good coverage, moves to worse coverage and becomes stationary there would not enter the relaxed monitoring. Gemalto agrees.
- QC think that only 3.3.4 doesn't work as this only increases the Reference to a higher value.
- MTK think that the update need to be able to decrease and increase the reference value.
- Ericsson and Huawei now think that the feature should only target cases where the UE is truly stationary. Sierra wireless think that a UE that goes stationary next to a cell border will anyway do cell reselection based on the timer.
- LG think that there may be changes in the environment that causes fluctuations in the signal strength measurements.
- SW anyway think that some additional criterion for updating Srxlev.Ref is needed.
- Veolia disagrees with the hard-coded 24h value abut can accept if this means there can be Rel-14 CRs.

⇒ **Relaxed Monitoring Requirements for neighbour cell detection and measurements are applied when the following condition apply Srxlev.Ref - Srxlev < Srxlev.Delta. Otherwise the UE perform neighbour cell detection and measurements according to current requirements.**

⇒ **The UE sets Srxlev.Ref = Srxlev when a new serving cell has been selected or reselected to.**

⇒ **When the UE applies relaxed monitoring, there will be periodic triggering of neighbor cell detection and measurements, and the period is hardcoded to 24h**

⇒ **The RSRP delta value range is {dB6, dB9, dB12, dB15} dB with default 6 dB**

⇒ **All UEs capable of relaxed monitoring can apply it in cells where it is configured by broadcast signalling.**

R2-1713765 Relaxed monitoring in NB-IoT and MTC LG Electronics Inc. discussion Rel-15
- A main point is that RSRP can change quite a lot also for stationary UEs, e.g. due to moving obstacles.
- P1: Huawei think that this is not needed. The UE can already filter measurements, based on freedom / flexibility in the standard. LG think that the P3 from the email discussion wasn't sufficient.
- P2: Nokia think this anyway need to be clear. Ericsson think that it is not nessecary but think that inter-frequency is most important. QC agrees.

⇒ **Relaxed monitoring applies to both intra-frequency and inter-frequency.**

R2-1713011 Relaxed Monitoring in MTC Ericsson discussion Rel-15 LTE_eMTC4-Core
- Nokia think that in general we should follow the WI and have this in Rel-15. Huawei agrees that we should have this in Rel-15. LG also agrees.
- Ericsson wonders whether this could be a Rel-15 early implementable feature. Huawei are OK with that.

⇒ **Introduce relaxed monitoring for UE that are Cat M1 M2 or are capable of CE.**

R2-1713012 Relaxed Monitoring in NB-IoT Ericsson discussion Rel-15 NB_IOTenh-Core

⇒ **Noted**



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R2-1713082 Introduction of relaxed monitoring for NB-IoT in 36.304 Huawei, HiSilicon CR Rel-14 36.304 14.4.0 0384 2 C NB_IOTenh-Core, TEI14 R2-1711321

⇒ **Merged with R2-1713013**

R2-1713083 Introduction of relaxed monitoring for NB-IoT in 36.306 Huawei, HiSilicon CR Rel-14 36.306 14.4.0 1492 2 C NB_IOTenh-Core, TEI14 R2-1711322

⇒ **Merged with R2-1713014**

R2-1713084 Introduction of relaxed monitoring for NB-IoT in 36.331 Huawei, HiSilicon CR Rel-14 36.331 14.4.0 2987 2 C NB_IOTenh-Core, TEI14 R2-1711323

⇒ **Merged with R2-1713015**

R2-1713812 Relaxed monitoring in NB-IoT in 36.304 LG Electronics CR Rel-15 36.304 14.4.0 0400 - B NB_IOTenh2-Core

⇒ **Merged with R2-1713013**

R2-1713814 Relaxed monitoring in NB-IoT in 36.331 LG Electronics CR Rel-15 36.331 14.4.0 3198 - B NB_IOTenh2-Core

⇒ **Merged with R2-1713015**

R2-1713013 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.304 14.4.0 0392 - B NB_IOTenh-Core

⇒ **revised**

R2-1713014 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.306 14.4.0 1523 - B NB_IOTenh-Core

⇒ **revised**

R2-1713015 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.331 14.4.0 3154 - B NB_IOTenh-Core

⇒ **revised**

R2-1713085 Introduction of relaxed monitoring for efeMTC in 36.304 Huawei, HiSilicon draftCR Rel-15 36.304 14.4.0 C LTE_eMTC4-Core

R2-1713086 Introduction of relaxed monitoring for efeMTC in 36.306 Huawei, HiSilicon draftCR Rel-15 36.306 14.4.0 C LTE_eMTC4-Core

R2-1713087 Introduction of relaxed monitoring for efeMTC in 36.331 Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 C LTE_eMTC4-Core

R2-1713016 Introduction of relaxed monitoring in MTC Ericsson CR Rel-14 36.304 14.4.0 0393 - B LTE_eMTC4-Core

R2-1713017 Introduction of relaxed monitoring in MTC Ericsson CR Rel-14 36.306 14.4.0 1524 - B LTE_eMTC4-Core

R2-1713023 Introduction of relaxed monitoring in MTC Ericsson CR Rel-14 36.331 14.4.0 3155 - B LTE_eMTC4-Core

*Above 6 tdocs not treated*

⇒ **We expect MTC solution to be identical to the NB-IoT solution, so no specific MTC CRs are needed at this meeting.**

Offline (308), revisions of NB-IoT Rel-14 CRs in R2-1713987,88,89. (NOTE that the solution is intended to be common for NB-IoT and MTC). (Ericsson)

- Nokia are ok with the CRs
- Ericsson and Huawei think that by relaxed monitoring also the cell detection requirements are not applied so we don't need to mention that anywhere
- QC think we should say on the cover sheets that the impact is measurements for cell reselection
- LG think we don't need cover sheet change.
- "draft" need to be removed from the tdoc numbers
- LG think this works for stationary UEs, but other cases not clear.

⇒ **On the coversheets, remove "draft", add "for cell reselection" or "Idle mode" etc.**

R2-1713987 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.304 14.4.0 0392 1 B NB_IOTenh-Core

- Kyocera point out that the unit for rxlev is dBm and not dB. Huawei think dB is correct as this is a difference between measured value and min value.

⇒ **revised**



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R2-1713988 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.306 14.4.0 1523 1 B NB_IOTenh-Core

⇒ **revised**

R2-1713989 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.331 14.4.0 3154 1 B NB_IOTenh-Core

- QC think that Optionality and presence in ASN.1 should be modified. Ericsson agrees.

⇒ **Revised, Update ASN.1**

Revisions in R2-1714002, 03, 04 (Ericsson)

R2-1714002 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.304 14.4.0 0392 2 B NB_IOTenh-Core

⇒ **agreed**

R2-1714003 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.306 14.4.0 1523 2 B NB_IOTenh-Core

⇒ **agreed**

R2-1714004 Introduction of relaxed monitoring in NB-IoT Ericsson CR Rel-14 36.331 14.4.0 3154 1 B NB_IOTenh-Core

- Ericsson explains that there is a missing "-NB" that need to be added in ASN.1

⇒ **Revised in R2-1714210, which is agreed unseen**

## 9.13.5 Semi-Persistent Scheduling

R2-1712330 Consideration on SPS for SC-PTM in FeNB-IoT ZTE Corporation, Sanechips discussion Rel-15 NB_IOTenh2-Core

R2-1713416 NB-IoT and SPS Ericsson discussion Rel-15 NB_IOTenh2-Core

R2-1713504 NB-IoT Idle mode SPS for M2M regular reporting MediaTek Beijing Inc. discussion Rel-15

R2-1713653 Further consideration on SPS for NB-IoT LG Electronics Inc. discussion Rel-15 NB_IOTenh2-Core R2-1711572

## 9.13.6 RRC Connection Release Enhancements

*Including output of email discussion [99bis#36][NB-IoT] RRC release enhancements (QC)*

R2-1712295 Email discussion report: [99bis#36][NB-IoT] RRC release enhancements Qualcomm Incorporated discussion Rel-15 NB_IOTenh2-Core

P1

- Ericsson think that proposal 1 is already supported. LG disagrees. R13 UE has to wait 10s time. Huawei think that in RRC it is clear that there is a 10s waiting time.
- LG think that proposal 1 involves additional wait as the UE doesn't know if the HARQ feedback is successful.
- Nokia wonders if the intention is to have one mechanism or multiple mechanisms. Nokia prefers to have only one mechanism. MTK think that timer based release is complementary and can still be considered a fallback.
- Intel think that P1 is already agreed (kind of), but would like to change immediate to be up to UE implementation.
- LG think that UE can go to idle immediately if DRX is configured.
- Nokia would like to know if the eNB need to know whether the UE waits or not.

P1.1/1.2

- QC think yes. LG agrees with these proposals.
- Nokia think this is not in the WID for eMTC so it should be only for NB-IoT. Huawei agrees.
- Gemalto are ok with Rel-14. Veolia support Rel-14. Nokia are ok as well for NB-IoT.
- Ericsson think we should have a magic sentence. Nokia think

P2

- LG think there is significant specification impact. QC think that specification changes is not so costly if you consider that there will be gains for very long time.
- Show of hands
  - Yes: 3

- No: 6

Veolia proposes to anyway keep this open for Rel-15.
Chair think that in any case, thre will be no further discussion time allocated to clarify technical details. If proponents manages to convince a majority we could possibly have this.

P3

- QC wonders how the UE can differentiate between different cases.
- Nokia supports this.
- QC think that this is a new timer.
- Ericsson think that whether NAS recovery is triggered or not need to be configured by RRC, but think this could either be the existing timer or a new timer.
- Docomo think we should define a new mechanism, i.e. a new timer.
- Intel think that the new timer would not work with the existing timer and that there is a lot of specification work. Ericsson explains that the two timers are not intended to be configured together.
- MTK think that the timer could be the existing timer and think that it is good to have this as fallback.
- QC clarifies that the timer has different start and expiry conditions.
- Show of hands in two steps:
  - Step 1
    - Existing timer (same start/stop/expiry cond with other cause value): 5
      (Where the other cause value will not trigger NAS recovery)
    - New timer (modified start/stop/expiry cond): 2
  - Step 2
    - Timer 5
    - No Timer 5

⇒ **Confirm that the UE is required to send the HARQ Ack at reception of the RRC Connection Release Message before going to Idle.**

⇒ **Thus the main modification for reception of RRC connection release without RLC AM poll is to clarify that the UE can go to Idle immediately after sending HARQ ack without any waiting time.**

⇒ **Introduce the clarification above for NB-IoT Rel-14.**

⇒ **We don't support the DCI based RRC connection release for Dec 2017.**

⇒ **We don't support timer based release without NAS recovery.**

Comeback. Nokia want to check whether magic sentence is ok for the Rel-14 CR.

- After checking Nokia confirms it is ok.

R2-1712296 Further input on RRC Connection Release via PDCCH DCI Qualcomm Incorporated
discussion Rel-15 NB_IOTenh2-Core

R2-1712329 Remaining issues for quick release of RRC connection in FeNB-IoT ZTE Corporation, Sanechips discussion Rel-15 NB_IOTenh2-Core

R2-1713024 Quick RRC connection release Ericsson discussion Rel-15 NB_IOTenh2-Core

R2-1713025 Introduction of timer based release Ericsson CR Rel-15 36.306 14.4.0 1525 - B NB_IOTenh2-Core

R2-1713026 Introduction of timer based release Ericsson CR Rel-15 36.321 14.4.0 1197 - B NB_IOTenh2-Core

R2-1713027 Introduction of timer based release Ericsson CR Rel-15 36.331 14.4.0 3156 - B NB_IOTenh2-Core

*Above 6 tdocs not treated*

R2-1713028 Successful acknowledgement of RRCConnectionRelease Ericsson CR Rel-14 36.331 14.4.0 3157 - F NB_IOTenh-Core

- Huawei think this should not be a NOTE.

⇒ **revised**

R2-1713994 Successful acknowledgement of RRCConnectionRelease Ericsson CR Rel-14 36.331 14.4.0 3157 - F NB_IOTenh-Core

⇒ **agreed**



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R2-1713193 Introduction of RRC Connection Release enhancements Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B NB_IOTenh2-Core
- Chair wonders why we don't say clearly that we mean RLC poll.

⇒ **Merged w above**

## 9.13.7 UE differentiation

R2-1713029 Way forward UE differentiation Ericsson, Vodafone discussion Rel-15 NB_IOTenh2-Core
- Chair wonders to what extent we should discuss the detailed mechanism.
- Vodafone think that the main points of this is a) the eNB can learn parameters b) there is additional useful info remaining UE battery life.
- Huawei think we shall wait for SA2. Huawei think we didn't agree on the remaining battery life information in R2.
- LG think we can consider remaining battery life and think that P2 is R3 scope. LG think we can wait for SA2.
- Nokia wonders what this info shall be used for. Vodafone think it can be considered in the scheduler, etc.
- QC would like to understand how the remaining battery life can be calculated. Vodafone think that for IoT devices it is easy and can be based on history. It would be up to operator to decide how to interpret this.
- Ericsson think that the list we provided was also preliminary and didn't have sufficient details. More work is needed but think we anyway can add this information.
- LG think we need input from SA2.
- Veolia think this is interesting, but do not think this should be interpreted as a proposal opposing previous information. Veolia would be ok with this.
- Huawei, LG and Nokia opposes this.

⇒ **Noted**

Comback Friday
- Ericsson explains that this has been discussed in SA2 and based on LS there will be opportunity to further discuss this at later meeting.

R2-1713030 DRAFT LS on UE differentiation in NB-IoT Ericsson LS out Rel-15 NB_IOTenh2-Core To:RAN3 SA2 Cc:CT1

## 9.13.8 TDD

*Including output of email discussion [99bis#34][NB-IoT] Timer impact of TDD (Ericsson)*

R2-1713358 Email discussion report on Timer impact of TDD Ericsson report Rel-15
R2-1713195 System information scheduling in TDD mode Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core
R2-1713196 Paging and random access for TDD mode Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core
R2-1713360 MIB, SIBs and Paging for NB-IoT TDD Ericsson discussion Rel-15

## 9.13.9 Wake Up Signal

*Wake Up Signal etc for MTC and NB-IoT is treated jointly under this Agenda Item.*
*Including output of email discussion [99bis#37][NB-IoT/MTC] WakeUp Signal (Huawei)*

R2-1713186 Report of email discussion [99bis#35][NB-IoT MTC] on wake-up signal Huawei report Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
BREIF DISCUSSION
- On UE grouping: Chair think feasibility is not the problem. Ericsson think benefit is also part of the question. QC think we can respond on the feasibility and indicate something on usefulness. Intel think grouping is useful. Nokia think paging UE grouping is sufficient. LG think UE grouping is feasible if we follow e.g. PI grouping in WCDMA.

- Concerns on grouping: Ericsson think that WUS need to contain more information of grouping is supported and there is then a risk that WUS is longer. ZTE agrees. QC think the length is a R1 problem.
- QC think we need to explain feasibility and can leave the decision to R1. Hisilicon and Intel agrees.
- Ericsson point out that we have not agreed on a solution and there are many details to decide on before the whole thing can be agreed. Ericsson think that the grouping must be configurable. QC wonders what is configurable but think that UE groups per WUS indeed need to be configurable.
- Chair think that indeed configurablibility need to be discussed if further grouping is agreed and think there are several possibilities
  - 1 WUS per PO
  - Multiple WUS per cell-level-PO (subgrouping of UEs)
  - Multiple PO per WUS

P5

- Intel wonders how to disable quickly
- Nokia and QC think this is just SI update. LG think this may increase power consumption.
- Ericsson think that the MME should not need to know about the WUS. Sony support the concern of Ericsson.
- Intel think that MME might need to know something.

⇒ **It is FFS if the use of wake-up signal for paging is enabled/disabled via system information in NB-IoT. Also in MTC if enabling/disabling is agreed in RAN1.**

R2-1713187 Draft reply LS to RAN1 on wake-up signal Huawei LS out Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core To:RAN1

- Ericsson think we need to discuss properly. Nokia think it wouldn't even work to have one WUS per PTW, as the consequence of WUS detection failure would be severe.
- Chair wonders why R2 would make performance evaluations.
- This seems to be a time consuming discussion. We will do this later.
- ZTE think the second bullet easier to meet than the first ..

⇒ **RAN2 could not agree on the feasibility to apply one wake-up signal to multiple POs in a PTW. It would need further discussions to reach an agreement in R2.**

⇒ **In the LS remove the second bullet.**

⇒ **Revised in R2-1714006**

R2-1714006 Draft reply LS to RAN1 on wake-up signal Huawei LS out Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core To:RAN1

⇒ **Approved, final version in R2-1714008**

R2-1712297 Wakup signal considerations Qualcomm Incorporated discussion Rel-15 LTE_eMTC4-Core, NB_IOTenh2-Core

R2-1713033 Wake-up signal for NB-IoT & eMTC Ericsson discussion Rel-15 NB_IOTenh2-Core

R2-1712334 Further consideration on wake-up signal ZTE Corporation, Sanechips discussion Rel-15 LTE_eMTC4-Core, NB_IOTenh2-Core

R2-1712993 WUS aspects on grouping and mobility for efeMTC and feNB-IoT Sony discussion Rel-15 NB_IOTenh2-Core

R2-1713034 Introduction of Wake Up Signal in NB-IoT - B Ericsson CR Rel-15 36.302 14.3.0 0118 NB_IOTenh2-Core

R2-1713035 Introduction of Wake Up Signal in NB-IoT - B Ericsson CR Rel-15 36.304 14.4.0 0394 NB_IOTenh2-Core

R2-1713036 Introduction of Wake Up Signal in NB-IoT - B Ericsson CR Rel-15 36.306 14.4.0 1526 NB_IOTenh2-Core

R2-1713037 Introduction of Wake Up Signal in NB-IoT - B Ericsson CR Rel-15 36.331 14.4.0 3158 NB_IOTenh2-Core

*Above 8 tdocs not treated*

R2-1713784 Issues on Wake-Up Signal for NB-IoT LG Electronics Inc. discussion Rel-15 NB_IOTenh2-Core Withdrawn

## 9.13.10 Other

*E.g. Support for RLC-UM, Support for physical layer SR, Measurement Accuracy Enhancements, NPRACH reliability, NPRACH range, small cell support, other*

**RLC UM**

R2-1713956 Introduction of RLC UM in 36.331 Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 NB_IOTenh2-Core B

- RLC need to be updated, as it states that for NB-ioT RLC-UM is just for SC-PTM
- Huawei think we need to discuss the SN length, 5bits, 10bits? LG think that if we just applied the two lengths of LTE we don't need to discuss. Huawei think 10bits is enough. QC think that we can have the same SN length as AM, which is 10 bits. LG think that if we use 5bits we can reduce the header size by 1 byte.
- QC wonders if all IEs are mandatory. Huawei think they are extensions.
- QC wonders is not just bidirectional is sufficient. Huawei just imported from LTE.
- LG wonders if this is just for DRB. Huawei confirms this is only for DRB.
- FFS if we use 5bit/10bit SN or just 10bit SN
- FFS if we support unidirectional

⇒ **With FFSes above (in editor notes), the CR content is agreed.**

⇒ **To be merged into 36.331 NB-IoT running CR, which is for email approval**

**High Quality Criterion**

R2-1713031 High quality criterion in NB-IoT Ericsson discussion Rel-15 NB_IOTenh2-Core

R2-1713032 DRAFT LS on high quality signal threshold in NB-IoT and EC-GSM Ericsson LS out Rel-15 NB_IOTenh2-Core To:RAN4 RAN6 Cc:CT1

**SR enhancements**

R2-1712331 Consideration on SR and PHR transmission enhancement in FeNB-IoT ZTE Corporation, Sanechips discussion Rel-15 NB_IOTenh2-Core

R2-1713417 NB-IoT PHY Scheduling Request Ericsson discussion Rel-15 NB_IOTenh2-Core

R2-1713418 DRAFT LS on dedicated PHY SR signal for Rel-15 NB-IoT Ericsson LS out Rel-15 NB_IOTenh2-Core To:RAN1

**Power saving other**

R2-1712199 Stopping contention resolution timer based on retransmission scheduling LG Electronics Inc. discussion Rel-15 36.321 NB_IOTenh2-Core R2-1711343

R2-1712205 Stopping contention resolution timer based on retransmission scheduling LG Electronics Inc. CR Rel-15 36.321 14.4.0 1158 2 F LTE_eMTC4-Core, NB_IOTenh2-Core R2-1711344

R2-1712332 Consideration on further UE power consumption reduction in FeNB-IoT ZTE Corporation, Sanechips discussion Rel-15 NB_IOTenh2-Core

R2-1713018 Dynamical adjustment for NPDCCH period in RRC_CONNECTED for UE power saving ZTE Corporation, Sanechips draftCR Rel-15 36.331 14.4.0 B NB_IOTenh2-Core

R2-1713019 Dynamical adjustment for NPDCCH period in RRC_CONNECTED for UE power saving ZTE Corporation, Sanechips draftCR Rel-15 36.306 14.4.0 B NB_IOTenh2-Core

R2-1713022 Cell measurement optimization during PRACH procedure for UE power saving ZTE Corporation, Sanechips draftCR Rel-15 36.331 14.4.0 B NB_IOTenh2-Core

R2-1713045 Cell measurement optimization during PRACH procedure for UE power saving ZTE Corporation, Sanechips draftCR Rel-15 36.321 14.4.0 B NB_IOTenh2-Core

**RACH reliability and range**

R2-1713419 NPRACH reliability and range enhancement for NB-IoT Ericsson discussion Rel-15 NB_IOTenh2-Core

**Small Cell**

R2-1713194 Small cell support in NB-IoT Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core
R2-1712961 2-Step RACH support for Small Cells Gemalto N.V. discussion
R2-1712283 Further Consideration of NB-IoT Small Cell Support Telekom R&D Sdn Bhd discussion Rel-15

**Access Barring CE level**

R2-1713756 Access barring for CE level in feNB-IOT LG Electronics Inc. discussion Rel-15 R2-1711638

*Withdrawn*
R2-1712234 Further Consideration of NB-IoT Small Cell Support Telekom R&D Sdn Bhd discussion Rel-15

# 9.14 Even further enhanced MTC for LTE

*(LTE_eMTC4-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-171427)*
*Time budget: 1 TU*
*Documents in this agenda item will be handled in a break out session*

## 9.14.1 Organisational

*Including incoming LSs, rapporteur inputs, running CRs*
R2-1712104 Reply LS on Early Data Transmission (C1-174595; contact: Qualcomm) CT1 LS in Rel-15 LTE_eMTC4-Core, NB_IOTenh2-Core To:RAN2, SA2 Cc:RAN3, SA3, CT4
=> Noted

R2-1712114 LS on agreements on early data transmission during random access procedure for NB-IoT and BL/CE UEs in Rel-15 (R1-1719103; contact: HiSilicon) RAN1 LS in Rel-15 LTE_eMTC4, NB_IOTenh2 To:RAN2
=> Noted

R2-1712121 LS on agreements on UL HARQ-ACK feedback in Rel-15 LTE efeMTC (R1-1719206; contact: ZTE) RAN1 LS in Rel-15 LTE_eMTC4 To:RAN2
=> Noted

R2-1712154 Reply LS on Early Data Transmission (S2-178180; contact: Qualcomm) SA2 LS in Rel-15 LTE_eMTC4-Core, NB_IOTenh2-Core To:RAN2, CT1 Cc:RAN3, SA3
=> Noted

R2-1712636 Running CR for Early Data Transmission Intel Corporation CR Rel-15 36.321 14.4.0 1193 - B LTE_eMTC4-Core
=> Companies are welcome to provide comments. The document is considered to be provided for information.

R2-1713710 Introduction of Early Data Transmission (eMTC) Qualcomm Incorporated draftCR Rel-15 36.331 14.4.0 B LTE_eMTC4-Core
=> Companies are welcome to provide comments. The document is considered to be provided for information.

R2-1714156 Reply LS on early data transmission (R1-1719305; contact: Huawei) RAN1 LS in Rel-15 LTE_eMTC4, NB_IOTenh2 To:RAN2
=> Noted.

## 9.14.2 Early data transmission

*Early Data transmission for NB-IoT and MTC is treated jointly under this AI.*
*Including output of email discussion [99bis#53][MTC/NB-IoT] EDT indication via PRACH – Ericsson*
*Including output of email discussion [99bis#55][MTC/NB-IoT] EDT RRC messages – Huawei*



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R2-1713057 [99bis#53][MTC/NB-IoT] EDT indication via PRACH Ericsson report LTE_eMTC4-Core, NB_IOTenh2-Core

**Proposal 1** **EDT is indicated when the Msg3 size the UE intends to transmit is equal or smaller than the maximum possible grant size for Msg3 broadcast per CE.**
- QC is concerned about the wording. Instead of “indicated”, “initiated” can be used. Nokia agrees. MediaTek thinks “indicated” also seems to be fine.

**Proposal 2** **Discuss if segmentation is allowed in Msg3 for the UP solution.**
- MediaTek thinks that segmentation is already supported, so it would be natural that it is supported in this case. LG agrees. Huawei thinks this does not seem to be beneficial assuming that the eNB always allocates the maximum possible TBS broadcast per CE for transmitting. It will also add complexity.
- Ericsson explains that the benefit would be not to waste the grant if it is smaller than user data.
- Nokia would like to keep the solution simple and therefore there is no need to support segmenation in this case. Veolia agrees.
- LG thinks it is possible that the eNB provides a grant with a TBS size smaller than the maximum broadcast. Segmenatation would be beneficial.
- MediaTek thinks that the eNB either provides a grant with the legacy size or the maximum possible size. QC also agrees.
- Show of hands:
Segmentation is supported for this case: 5
Segmentation is not supported for this case: 8

- QC thinks that this may impact UEs using the CP solution. SW think we can come back to it in the future.
=> Support for segmentation for this case is not prioritized for now. We will come back to it in the future.

**Proposal 3** **EDT indication is configured per enhanced coverage level.**

**Proposal 4** **Data size intended for early UL transmission is not explicitly indicated with preamble partitioning.**
- Kyocera agrees even though it may beneficial. MediaTek thinks this would have an big impact on the number of repetitions required to transmit and UE power consumption. Nokia shares MediaTek’s concerns.
- SW thinks that UE can be provided a flexible sized grant from which the UE can use.
- LG thinks segmentation helps in this case. Intel does not understand the concern.
- MediaTek thinks PRACH partitioning can be considered to address this issue. Nokia and ZTE agree.
- LG thinks one also needs to think about the resolution of such partitioning. It may require many fragments. Ericsson agrees. SW thinks these two approaches can be merged.
=> Working assumption: PRACH resource partitioning is not supported to indicate the intended data size other than legacy or maximum TBS broadcast per CE.

**Proposal 5** **UE category is not indicated using preambles, assuming that maximum TBS supported for EDT in the UL is 1000 bits or less.**
-

**Proposal 6** **Discuss if random access resource partitioning is configured with respect to physical layer resources, preambles or both, i.e. as in legacy eMTC or NB-IoT, for EDT indication.**
- Ericsson explains that this is not necessarily about shared vs. legacy way of partitioning.
- QC thinks that this may differently for eMTC and NB-IoT. LG agrees. Ericsson wonders what “dedicated resources” mean which was brought up durign the email discusision.



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- QC thinks PRACH resource pool should be separate from the legacy resource pool. Nokia agrees.
- Huawei wants to have a configuration similar to the legacy.

**Proposal 7 Discuss how uplink resources for transmitting Msg3 can be allocated efficiently, e.g. to minimize the number of padding bits etc.**
- This proposal has already been discussed within the context of the discussions above.

**Proposal 8.a Legacy UL grant format is used for early data transmission in Msg3.**

**Proposal 8.b Discuss alternative grant allocation mechanisms, e.g. how to allocate multiple grants or TB sizes for blind reception at eNB.**

**Agreements**
- The UE initiates EDT in Msg1 when the size of Msg3 including the user data, which UE intends to transmit, is equal or smaller than the maximum possible TBS size for Msg3 broadcast per CE.
- PRACH partitioning for EDT indication is configured per enhanced coverage level.
- Working assumption: Support for segmentation for this case is not prioritized.
- Working assumption: PRACH resource partitioning is not supported to indicate the intended data size other than legacy or maximum TBS broadcast per CE.
- FFS how to adress the padding issue in Msg3.
- UE category is not indicated in Msg1.
- For EDT indication, PRACH resources can be configured as in legacy eMTC or NB-IoT with respect to physical layer resources, preambles/subcarriers.
- PRACH resource pool, i.e. physical layer resources, preambles/subcarriers, for EDT indication is separate from PRACH resource pool for legacy RACH procedure.

✉ **Email discussion on how to adress the padding issue in Msg3 [Ericsson]**

- The intention is to progress the discussion until the next meeting.

R2-1713679 On NB-IoT EDT indication via PRACH MediaTek Beijing Inc. discussion Rel-15
R2-1713189 Trigger for EDT Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
R2-1713191 RACH procedure in early data transmission Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
R2-1713054 Remaining general aspects of early data transmission Ericsson discussion LTE_eMTC4-Core, NB_IOTenh2-Core

R2-1713182 Report of email discussion [99bis#55]NB-IoT MTC] on EDT RRC Messages Huawei report Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core

**<u>For the CP solution:</u>**

**Proposal A.1: Prerequisites to initiate early data transmission include 1) the eNB signals RACH preambles for EDT indication, 2) the resulting MAC PDU can fit in the TBS broadcast in system information, 3) NAS has requested the establishment for user data, i.e. excluding NAS signalling and SMS.**
- QC thinks these are already captured in previous agreements

**Proposal A.2: UE-Id (S-TMSI), the establishment cause and the NAS PDU are included in MSG3 for EDT.**
- This was discussed and agreed previously.

**Proposal A.3: An indication whether further UL/DL data are expected is included in MSG3 for EDT,**



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- Huawei explains that an indication similar to NAS RAI is needed. LG thinks this may not be needed since it can be indicated in BSR. Huawei clarifies that this does not necessarily mean that no further data is expected in the UL and DL as a response to the data in the UL.
- Nokia thinks EDT indication should be coupled with such indication. QC agrees.
- Huawei wants to couple EDT with NAS RAI, i.e. A UE that indicates EDT shall also indicate NAS RAI in NAS PDU. Veolia agrees.
- MediaTek wonders if this coupling is strictly needed. Ericsson thinks there is no need to couple. LG agrees.

**Proposal A.4: None of the parameters currently in MSG5 is included in MSG3 for EDT.**

**Proposal A.5: UE is in RRC_IDLE when sending MSG3 for EDT, same as legacy.**

**Proposal A.6: UE shall satisfy the prerequisites for EDT (proposal A1) and performs access barring check before initiating EDT.**

**Proposal A.7: RAN2 to discuss the RRC/MAC modelling for MSG3 transmission (TBS check, UL grant check, MSG3 padding…)**
=> This discussion is postponed for now.

**Proposal A.8: RAN2 to discuss whether changes to T300 and *mac-contentionResolutionTimer* are needed.**
- Huawei thinks it is less likely that the response data will be available in such a short time, so in most, if not all, cases, there will not be any data to transmit in the DL. Therefore, there is no need to extend the timer.
- Intel thinks there seems to be issues, so it would be good to address.
- LG would like to get opinion from RAN3.
- Sony wants to extend the timer assuming that there may be a response from the application server.
-

**Proposal A.9: RAN2 to discuss whether to use a critical extension of *RRCConnectionRequest* message or a new RRC message. This can be discussed together with Proposal A.18.**
- LG wants to use the existing message. Intel wonders what is meant by new. Ericsson supports LG and thinks that this is not self-contained. ZTE wants to introduce a new message. Huawei agrees. QC also supports to introduce a new RRC message.
- Kyocera supports the existing message. Veolia supports introducing a new message.

**Proposal A.18: When the final state indicated by MSG4 is RRC_IDLE, MSG4 is a new RRC message.**
- LG wants to use the existing RRC message.
- QC thinks if the network wants to release the UE, it should use a new release message.
- MediaTek thinks it is possible to use the existing messages both for Msg3 and Msg4. QC thinks that the names of the existing messages would not be semantically correct.

**Proposal A.10: DL EDT is supported by UEs supporting UL EDT and only by those.**

**Proposal A.11: For DL EDT following UL EDT, support is implicit.**
- This proposal is captured already.

**Proposal A.12: For DL EDT for the MT call, UE uses UL EDT to send the paging response in MSG3 and thus support is also implicit.**
- LG thinks that the network may know whether the UE support EDT.

**Proposal A.13: For the MT case, RAN2 to discuss how the eNB gets the information that no further data are expected, UE or MME.**



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=> We will focus on the MO case in this meeting and consider not specifying a solution for the MT case in Rel-15. Companies are welcome to provide contributions to the next meeting on whether MT case should be supported in Rel-15.

**Proposal A.14: a NAS PDU, *extendedWaitTime, redirectedCarrierInfo* and for eMTC *idlemodeMobilityInfo* can be optionally included in MSG4.**

- MediaTek suggest keeping the extendedWaitTime in Msg4. ZTE, Nokia, and Ericsson agree. LG wants to keep the existing parameters in the legacy release message. Huawei explains that the only parameter excluded here is *extendedWaitTime-CPdata.* LG wants to confirm if both are needed. Huawei explains that only one of them is needed in this case, i.e. when Msg4 is for releasing the UE, since the UE will be released. The intention with the legacy mechanism is to provide means to the MME to inform the eNB to release the UE with an extended wait timer.

=> We will reconsider the agreement if LG confirms that both, i.e. *extendedWaitTime* and *extendedWaitTime-CPdata*, are needed.

**Proposal A.15: RAN2 to discuss whether *releaseCause* is included, or cause 'other' is implicit.**

- Huawei thinks "other" is fine. QC wonders if *releaseCause* can be implicitly provided in the UE. MediaTek explains that it is needed internally in the UE for NAS-AS interaction.
- LG thinks this should be provided. MediaTek suggest having FFS for "load balancing".

**Proposal A.16: UE is in RRC_IDLE when receiving MSG4 and does not transit to RRC_CONNECTED if the final state indicated by MSG4 is RRC_IDLE.**

- MediaTek there is no need to mention connected mode as the UE is supposed to do anything particular. This may be different for the UP solution. Huawei agrees.
- LG prefers to keep the state transition mechanism same for both CP and UP solutions.
- MediaTek explains that in the NAS level the UE will be in connected mode and back shortly. But this is not needed for the AS level.

**Proposal A.17: When the final state indicated by MSG4 is RRC_IDLE, UE forwards the NAS PDU to upper layers, acts on other IEs included as per legacy, and indicates the completion of the procedure to the upper layers.**

**Proposal A.18: When the final state indicated by MSG4 is RRC_IDLE, MSG4 is a new RRC message.**

- This proposal has already been agreed.

**Proposal A.19: No change needed to *RRCConnectionSetup* when the final state is RRC_CONNECTED.**

- Ericsson wonders if it would be beneficial to have the possibility to deliver DL NAS PDU. Huawei does not think this would be beneficial considering that the UE will be in connected state.
- QC thinks the UE is not in connected mode yet, so no need to deliver the data. MediaTek thinks this does not seem to be beneficial.
- LG agrees with Ericsson. Veolia agrees with MediaTek and Huawei.
- QC wonders how it would be possible to know whether UL transmission is successful.
- MediaTek thinks the failure case would be followed by RRCConnectionReject message.
- LG does not want to use the reject message for the failure.
- ZTE thinks the UE should know whether the data is delivered regardless of UE going to idle or continuing to establish the connection.

**Proposal A.20: No optimisation to *RRCConnectionSetupComplete* is needed when the final state is RRC_CONNECTED.**

**Proposal A.21: RAN2 to discuss the mandatory NAS container.**

- Huawei suggests that the NAS container can be sent empty, i.e. length of the container is set to 0. Ericsson agrees. This needs to be checked from ASN.1 standpoint.
-



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**Proposals for the UP solution:**

**Proposal B.1: Same as Proposal A.1. In addition, the UE should have a NCC, pending on SA3 feedback.**

**Proposal B.2: RAN2 to discuss whether segmentation of the data is supported in MSG3.**
**- This proposal has already been discussed.**

**Proposal B.3: UE-Id (*resumeID*), *shortResumeMAC-I* and *resumeCause* are included in RRC MSG3 for EDT.**
- Ericsson suggests including a longer version of *shortResumeMAC-I* in Msg3. Huawei thinks there may be a need to couple NCC with this longer version to keep compatibility.
=> We will discuss introducing a longer version of *shortResumeMAC-I* if SA3 indicates that there may be issues with respect to security.
=> We can reconsider the related agreement on whether it should also be possible to use the trunked version of the resumeID if needed.

**Proposal B.4: RAN2 to discuss whether an indication that further UL/DL data are expected is included in MSG3 for EDT.**
- ZTE thinks it would be good to have the indication. Huawei suggests having this discussion later. LG agrees with ZTE. LG thinks it may be possible to send the actual data size. Ericsson supports to have the indication. QC thinks this discussion is related to segmentation. Intel wants the indication. Blackberry and Sony also support the indication.
- SW thinks the mechanism should be simple and the UE wants to send something more it may trigger another EDT.
- Sony would like to support to indicate the size of the data that the UE was not able to transmit due to grant size, but has concerns regarding UEs abusing the use of EDT.
- Gemalto is not in favour the indication since it is hard for the UE to know whether there is more data coming to be transmitted in the UL.
=> RAN2 understands that it is already possible for the UE to send the indication in AS if configured earlier, i.e., before suspended.

**Proposal B.5: None of the parameters currently in MSG5 is included in MSG3 for EDT.**

**Proposal B.6: UE is in RRC_IDLE when sending MSG3 for EDT, same as legacy.**

**Proposal B.7: Same as Proposal A.6 for the CP solution.**

**Proposal B.8: UE shall restore the UE context, reactivate security, deriving new keys based on the NCC provided at the suspension, and re-establish/ resume all SRBs/DRBs.**
- QC and Huawei think that this can be a working assumption until feedback is received from SA3.
- LG thinks that it would be good to indicate to the UE which DRB is for EDT, so that only that DRB can be activated.
- Ericsson thinks there is no need to allocate a DRB for EDT. ZTE wonders if this would be this DRB cannot be used for any other traffic. MediaTek wonders if there is a limitation in Suspend/Resume regarding using particular SRBs/DRBs.
- LG wonders how the UE knows whether EDT is triggered for a particular type of traffic. MediaTek wonders if these aspects will be captured in Stage 2.

**Proposal B.9: RAN2 to discuss whether to use a 'critical' extension of *RRCConnectionResumeRequest* message or a new RRC message. This can be discussed together with proposal B.16.**
- QC prefers new messages. Intel thinks the legacy message can be used considering that the data is muxed.
- Huawei thinks using the same message would be fine, but a new procedure may be needed.
- LG prefers to use the legacy message. ZTE prefers a new message.
- MediaTek thinks it is logically closer to resume, so maybe it is better to use the existing message.

**Proposal B.10: Proposals A,9, A.10, A.11, A.12 apply to the UP solution.**
- These proposals have already been captured.

**Proposal B.11: Same contents as RRCConnectionRelease plus NCC is included in MSG4 for EDT.**

**Proposal B.12: RAN2 to discuss whether a NAS PDU can also be included in MSG4 for EDT.**

**Proposal B.13: RAN2 to discuss UE state when receiving MSG4 and after receiving MSG4 for EDT when the final state is RRC_IDLE.**

**Proposal B.14: When the final state indicated by MSG4 is RRC_IDLE, UE forwards the data to upper layers, and performs the same actions as for legacy *RRCConnectionRelease.***

**Proposal B.15: RAN2 to wait for SA3 feedback for MSG4 security aspect when the final state is RRC_IDLE.**

**Proposal B.16: RAN2 to discuss which RRC message for MSG4 when the final state is RRC_IDLE.**
- Ericsson wants to use the RRC connection release message.

**Proposal B.17: No change is expected to *RRCConnectionResume* when the final state is RRC_CONNECTED.**

**Proposal B.18: RAN2 to wait for SA3 feedback for MSG4 security aspect in the case the final state is RRC_CONNECTED.**

**Proposal B.20: No optimisation to *RRCResumeSetupComplete* is needed when the final state is RRC_CONNECTED.**

**Agreements**

For CP solution

- None of the parameters currently provided in Msg5 are included in Msg3 for EDT.
- UE is in RRC_IDLE when transmitting Msg3 for EDT, same as legacy.
- UE shall perform access barring check before initiating EDT.
- FFS whether changes to T300 and *mac-contentionResolutionTimer* are needed.
- New RRC message is introduced for Msg3.
- New RRC message is introduced for Msg4 in case network sends the UE to idle mode.
- UE supporting EDT shall support both UL and DL EDT.
- Msg4, which is agreed to be introduced as the new RRC message, optionally includes a NAS PDU, *extendedWaitTime*, *redirectedCarrierInfo* and for eMTC *idleModeMobilityControlInfo*. No need to include *extendedWaitTime-CPdata* in this case.
- FFS whether releaseCause is included in the new Msg4.
- UE is in RRC_IDLE when receiving the new Msg4 and it does not transit to RRC_CONNECTED.
- When the UE receives the new Msg4, the UE forwards the DL NAS PDU, if any, to upper layers, follows the legacy behavior based on included IEs, and indicates the completion of the procedure to the upper layers.
- Legacy *RRCConnectionSetup* message is used when the network wants the UE to move to RRC_CONNECTED. The UE assumes that UL data transmission was succesful, i.e. up to MME.
- In EDT, it is possible for the UE to receive RRCConnectionReject message in response to the new Msg3.
- Legacy *RRCConnectionSetupComplete* is used when the network wants the UE to move to RRC_CONNECTED. NAS container in *RRCConnectionSetupComplete* message may be sent empty. FFS if this is possible from ASN.1 standpoint.

For UP solution



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- UE supporting EDT shall support both UL and DL EDT.
- The UE shall have NCC prior ro indicating EDT.
- *resumeID*, *shortResumeMAC-I*, and *resumeCause* are included in Msg3 for EDT.
- None of the parameters currently provided in MSG5 are included in Msg3 for EDT.
- UE is in RRC_IDLE when transmitting Msg3 for EDT, same as legacy.
- UE shall perform access barring check before initiating EDT.
- UE shall restore the UE context, reactivate security, and re-establish/resume all SRBs/DRBs. The UE shall derive new keys based on the NCC provided in the previous connection. It is FFS in which message NCC is provided in the previous connection. The FFS is pending SA3 feedback.
- Legacy *RRCConnectionResumeRequest* message is used in Msg3.
- Legacy *RRCConnectionRelease* message with suspend is extended to include NCC in Msg4 when the network wants the UE to move to RRC_IDLE.

- Veolia would like to have an email discusion to discuss the support for segmention for the UP solution.

Email discussion to progress the running 36.331 CR for eMTC to capture the Rel-15 agreements [Qualcomm]
- Intention: to progress the running 36.331 CR for eMTC to capture the Rel-15 agreements.
- The email discussion is until the next meeting.

Email discussion to progress the running 36.321 CR for eMTC to capture the Rel-15 agreements [Intel]
- Intention: to progress the running 36.321 CR for eMTC to capture the Rel-15 agreements.
- The email discussion is until the next meeting.

R2-1713056 Remaining Issues in Early Data Transmission over NAS Ericsson discussion LTE_eMTC4-Core, NB_IOTenh2-Core
R2-1713184 Remaining issues for EDT in the CP solution for eMTC and NB-IoT Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
R2-1713185 Remaining issues for EDT in the UP solution for eMTC and NB-IoT Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
R2-1713055 Remaining issues on early data transmission over UP Ericsson discussion LTE_eMTC4-Core, NB_IOTenh2-Core
R2-1712639 Early data transmission discussion for eFeMTC and FeNB-IoT Intel Corporation discussion Rel-15 LTE_eMTC4-Core
R2-1713190 Early DL data transmission Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
R2-1713506 Transmission Reliability with Early Data Transmission MediaTek Beijing Inc. discussion Rel-15
R2-1713188 PRACH partitioning for early data transmission Huawei, HiSilicon, Neul discussion Rel-15 NB_IOTenh2-Core, LTE_eMTC4-Core
R2-1713503 Remaining issues for basic functionality of EDT in eFeMTC/FeNB-IoT Kyocera discussion
R2-1713713 Discussion on some FFSes on EDT Qualcomm Incorporated discussion Rel-15 LTE_eMTC4-Core
R2-1713644 (N)PRACH resource partitioning for EDT indication LG Electronics Polska discussion LTE_eMTC4-Core
R2-1713649 Clarification on MAX grant size for Msg3 and UP solution LG Electronics Polska discussion LTE_eMTC4-Core
R2-1713785 Early Data Transmission Failrue Handling in NB-IoT LG Electronics Inc. discussion Rel-15 R2-1711402
R2-1712982 Remaining issues for EDT ZTE Corporation, Sanechips discussion Rel-15 LTE_eMTC4-Core, NB_IOTenh2-Core
R2-1712940 Network initiated early UL data transmission Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_eMTC4-Core
R2-1712315 Fall-back mode from early data transmission III discussion Rel-15 NB_IOTenh2
R2-1713754 Issues on early data transmission (related to email discussion) LG Electronics Inc. discussion Rel-15 R2-1711158

R2-1713758 Indication of support for EDT LG Electronics Inc. discussion Rel-15
R2-1713787 Early Data Transmission Failure Handling in MTC LG Electronics Inc. discussion Rel-15 LTE_eMTC4-Core R2-1711403
R2-1713862 PRACH for EDT requests Sierra Wireless, S.A. discussion Rel-15
R2-1713058 Evaluation for early data transmissions Ericsson discussion LTE_eMTC4-Core, NB_IOTenh2-Core
R2-1713183 Introduction of Early data transmission in 36.331 Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B NB_IOTenh2-Core

## 9.14.3 System acquisition time enhancements

*System acquisition Enhancements for NB-IoT and MTC is treated jointly under this AI.*

R2-1713050 Reduced System Acquisition Time Ericsson discussion LTE_eMTC4-Core, NB_IOTenh2-Core
R2-1713106 Accumulation across SIB1-BR/SI modification period Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core R2-1711215

**Agreements**
- RAN2 confirms that SIB1-BR accumulation across SIB1-BR modification period is possible since it has been introduced in Rel-13, and it is left to UE implementation.
- RAN2 confirms that SI message accumulation across SI windows and modification period is possible since it has been introduced in Rel-13, and it is left to UE implementation.

R2-1713053 DRAFT LS reply on system acquisition time reduction for Rel-15 LTE-MTC Ericsson LS out LTE_eMTC4-Core To:WG1
R2-1713107 [DRAFT] Reply LS on System acquisition time reduction for Rel-15 LTE MTC Huawei, HiSilicon LS out Rel-15 LTE_eMTC4-Core R2-1711216 To:RAN1, RAN4

Draft LS reply to RAN1 on system acquisition time reduction for Rel-15 LTE-MTC [offline# 401] [Huawei] in R2-1714014

- Address the questions asked in the LS from RAN1
- Include the agreements from the last meeting.
- Capture the agreements from this meeting.

R2-1714014 [DRAFT] Reply LS on System acquisition time reduction for Rel-15 LTE MTC Huawei Rel-15 LTE_eMTC4-Core R2-1713107 To:RAN1, RAN4

=> The LS is approved in R2-1714015.

R2-1712337 Remaining issues for system acquisition time reduction in eFeMTC ZTE Corporation, Sanechips discussion Rel-15 LTE_eMTC4-Core
R2-1713108 Skip system information reading for MTC based on neighbour cell indication Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713110 Introduction of system information acquisition optimisation in MIB and SIB4 Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B LTE_eMTC4-Core
R2-1713051 Skipping SIB1-BR acquisition Ericsson discussion LTE_eMTC4-Core
R2-1713052 Skipping SIB1-BR acquisition Ericsson CR Rel-15 36.331 14.4.0 3162 - B LTE_eMTC4-Core
R2-1713678 System Information Storage and Validity across NB-IoT Cells MediaTek Beijing Inc. discussion NB_IOTenh2-Core
R2-1713764 MIB-NB skipping in NB-IoT LG Electronics Inc. discussion Rel-15
R2-1713816 New parameters on NPDCCH for skipping MIB-NB LG Electronics CR Rel-15 36.331 14.4.0 3199 - C LTE_eMTC4-Core
R2-1713763 Optimization of SI acquisition in MTC LG Electronics Inc. discussion Rel-15 R2-1711649
R2-1713109 Skip system information reading for MTC based on MIB indication Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core



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R2-1713111 Introduction of system information acquisition optimisation in MIB Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B LTE_eMTC4-Core
R2-1713105 System Information acquisition enhancements. Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713840 EAB indications in MIB Sierra Wireless, S.A. discussion Rel-15
R2-1713192 Introduction of additional SIB1-NB transmissions in 36.331 Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B NB_IOTenh2-Core

## 9.14.4 Relaxed monitoring for cell reselection

*Relaxed monitoring for cell reselection for MTC is treated jointly with NB-IoT under AI 9.13.4. Do not use this AI for any item that can be discussed jointly.*

## 9.14.5 Access/load control of idle mode UEs

R2-1712335 Further consideration on access control in eFeMTC ZTE Corporation, Sanechips discussion Rel-15 LTE_eMTC4-Core
R2-1713502 CE-based access barring and load balancing for idle mode UEs for eFeMTC Kyocera discussion
R2-1712640 CE level based access barring and load control for eFeMTC Intel Corporation discussion Rel-15 LTE_eMTC4-Core
R2-1713112 Existing solutions for access/load control of idle mode UEs Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713113 Improved access/load control of idle mode UEs Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713068 Improved Idle Mode Access Control for efeMTC UEs Ericsson discussion LTE_eMTC4-Core
R2-1713069 Improved Idle Mode Access Control for efeMTC UEs Ericsson CR Rel-15 36.331 14.4.0 3166 - B LTE_eMTC4-Core
R2-1713755 Access barring for CE level in efeMTC LG Electronics Inc. discussion Rel-15 R2-1711160
R2-1712812 Improved Access and Load Control for Idle Mode UEs Fujitsu discussion Rel-15 LTE_eMTC4-Core Withdrawn
R2-1712821 Improved Access and Load control for Idle Mode UEs Fujitsu discussion Rel-15 LTE_eMTC4-Core R2-1710354 Withdrawn
R2-1712976 Improved Access and Load control for Idle Mode UEs Fujitsu discussion Rel-15 LTE_eMTC4-Core R2-1710354

## 9.14.6 Uplink HARQ-ACK feedback

R2-1713114 Uplink HARQ-ACK feedback for early termination of MPDCCH monitoring Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713115 Uplink HARQ-ACK feedback for early termination of PUSCH transmission Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1712231 DRX enhancement using HARQ feedback LG Electronics Inc. discussion Rel-15 36.321 LTE_eMTC4-Core R2-1711300
R2-1712232 DRX enhancement using HARQ feedback LG Electronics Inc. draftCR Rel-15 36.321 14.4.0 C LTE_eMTC4-Core R2-1711310
R2-1712233 RA enhancement using HARQ feedback LG Electronics Inc. discussion Rel-15 36.321 LTE_eMTC4-Core R2-1711359
R2-1712336 Further consideration on Uplink HARQ-ACK feedback in eFeMTC ZTE Corporation, Sanechips discussion Rel-15 LTE_eMTC4-Core
R2-1713059 Uplink HARQ ACK feedback for MTC Ericsson discussion LTE_eMTC4-Core
R2-1713060 Uplink HARQ ACK feedback for BL UEs and UEs in CE Ericsson CR Rel-15 36.306 14.4.0 1530 - B LTE_eMTC4-Core
R2-1713061 Uplink HARQ ACK feedback for BL UEs and UEs in CE Ericsson CR Rel-15 36.321 14.4.0 1198 - B LTE_eMTC4-Core



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R2-1713062 Uplink HARQ ACK feedback for BL UEs and UEs in CE Ericsson CR Rel-15 36.331 14.4.0 3163 - B LTE_eMTC4-Core

## 9.14.7 Increased PDSCH spectral efficiency

R2-1713116 Increased PDSCH spectral efficiency for Rel-15 MTC Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core R2-1711220
R2-1713117 DRAFT LS on signalling support of 64QAM for Rel-15 MTC Huawei, HiSilicon LS out Rel-15 LTE_eMTC4-Core R2-1711221 To:RAN1
R2-1713118 Introduction of 64QAM for PDSCH in Rel-15 MTC Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B LTE_eMTC4-Core
R2-1713119 Introduction of 64QAM for PDSCH in Rel-15 MTC Huawei, HiSilicon draftCR Rel-15 36.306 14.4.0 B LTE_eMTC4-Core
R2-1713066 Introduction of DL 64QAM for BL/CE UEs Ericsson CR Rel-15 36.306 14.4.0 1532 - B LTE_eMTC4-Core
R2-1713067 Introduction of DL 64QAM for BL/CE UEs Ericsson CR Rel-15 36.331 14.4.0 3165 - B LTE_eMTC4-Core

## 9.14.8 Increased PUSCH spectral efficiency

R2-1713120 Increased PUSCH spectral efficiency for Rel-15 MTC Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713877 Message 3 support for Sub-PRB Uplink Sierra Wireless, S.A. discussion Rel-15
R2-1713064 Introduction of UE capability for PUSCH sub-PRB allocation Ericsson CR Rel-15 36.306 14.4.0 1531 - B LTE_eMTC4-Core
R2-1713065 Introduction of UE capability for PUSCH sub-PRB allocation Ericsson CR Rel-15 36.331 14.4.0 3164 - B LTE_eMTC4-Core

## 9.14.9 Wake Up Signal

*Wake Up Signal etc for MTC is treated jointly with NB-IoT under AI 9.13.9 Do not use this AI for any item that can be discussed jointly.*

R2-1713786 Issues on Wake-Up Signal for MTC LG Electronics Inc. discussion Rel-15 LTE_eMTC4-Core Withdrawn

## 9.14.10 Other

*Including higher UE velocity, lower UE power class, CRS muting etc.*

R2-1712333 Consideration on supporting lower UE power class in eFeMTC ZTE Corporation, Sanechips discussion Rel-15 LTE_eMTC4-Core
R2-1713046 Lower power class UE for LTE-MTC Ericsson discussion LTE_eMTC4-Core R2-1710515
R2-1713047 Introducing 14 dBm UE power class for BL UEs Ericsson CR Rel-15 36.304 14.4.0 0395 - B LTE_eMTC4-Core
R2-1713048 Introducing 14 dBm UE power class for BL UEs Ericsson CR Rel-15 36.306 14.4.0 1529 - B LTE_eMTC4-Core
R2-1713049 Introducing 14 dBm UE power class for BL UEs Ericsson CR Rel-15 36.331 14.4.0 3161 - B LTE_eMTC4-Core
R2-1713121 Lower UE power class for Rel-15 MTC Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core R2-1711222
R2-1713122 Draft Reply LS on new UE power class for Rel-15 MTC Huawei, HiSilicon LS out Rel-15 LTE_eMTC4-Core R2-1711223 To:RAN4 Cc:RAN1
R2-1713123 Introduction of Lower UE power class for Rel-15 MTC Huawei, HiSilicon draftCR Rel-15 36.331 14.4.0 B LTE_eMTC4-Core
R2-1713124 Introduction of Lower UE power class for Rel-15 MTC Huawei, HiSilicon draftCR Rel-15 36.304 14.4.0 B LTE_eMTC4-Core

R2-1713125 Introduction of Lower UE power class for Rel-15 MTC Huawei, HiSilicon draftCR Rel-15 36.306 14.4.0 B LTE_eMTC4-Core
R2-1713126 Discussion on higher UE velocity in Rel-15 MTC Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core
R2-1713063 CRS muting Ericsson discussion LTE_eMTC4-Core R2-1710527
R2-1713127 On CRS muting for BL UEs Huawei, HiSilicon discussion Rel-15 LTE_eMTC4-Core

# 9.15 Highly Reliable Low Latency Communication for LTE

*LTE_HRLLC-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-171489*
*Time budget: 0.5 TU*
*Documents in this agenda item will be handled in a break out session*

R2-1712124 LS on Ultra Reliable Low Latency Communication for LTE (R1-1719210; contact: Ericsson) RAN1 LS in Rel-15 LTE_HRLLC To:RAN2
=> Noted

*PDCP duplication:*
R2-1713791 Discussion on the L2 Impact from Packet Duplication Huawei, HiSilicon discussion Rel-15 LTE_HRLLC-Core
P1
- OPPO wonder the impact on the spec regarding P1.
- LG think it should depend on eNB implementation.

P2
- Ericsson support the proposal.
- LG think it is not in the scope of WI.
- Ericsson and Huawei think it benefits handover case.

P3
- Ericsson think the reliability is the concern

**Agreements:**

1 The activation/deactivation MAC CE contains a bitmap corresponding to DRBs configured with duplication. The mapping between DRB and the MAC bitmap is based on order of DRB ID(s) of the duplicate configured DRB(s).
2 the logical channel handling can take the NR's conclusion as baseline:
- Duplicated PDCP PDUs are submitted to two different RLC entities for two different LCH, and the LCH cannot be mapped on the same carrier.
- LCP takes into account all the restrictions configured for the logical channels (which include the PDCP data duplication restrictions).

R2-1712457 Packet duplication in LTE Ericsson discussion Rel-15 LTE_HRLLC-Core
P1
- LG think RLC AM is used for throughput enhancement.
- OPPO only support SRB case for RLC AM.
- Huawei think DRB and SRB should both be supported.

=> SRB duplication is in the scope of the WI.
P2
- OPPO think it should be deprioritised. LG share the same view.
- OPPO wonder the benefit of supporting RLC AM via CA case.

**Agreements:**

1 Support RLC AM for SRB for packet duplication via DC and CA. FFS the DRB case.
2 Support RLC UM for packet duplication via DC.
3 Apply LTE PDCP to support packet duplication. FFS the necessary changes.
4 Support PDCP reordering for duplication case



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R2-1713716 Issues on PDCP duplication LG Electronics France discussion Rel-15 LTE_HRLLC-Core
R2-1712188 Discussion on LTE PDCP receive operation OPPO discussion Rel-15 LTE_HRLLC-Core
R2-1712190 Discussion on UL duplication control OPPO discussion Rel-15
R2-1713337 Discussion on the RRC Impact from Packet Duplication Huawei, HiSilicon discussion Rel-15 LTE_HRLLC-Core
R2-1712191 Discussion on use case of UL duplication OPPO discussion Rel-15 LTE_HRLLC-Core

*TB repetition:*
R2-1712459 Transport block repetition for reliability Ericsson discussion Rel-15 LTE_HRLLC-Core
- LG wonder the relation with TTI bundling. Ericsson think TTI bundling is one of possible solution.

**Agreements:**
1 Transport block repetition is supported for ultra high-reliability within the latency bound.

R2-1713248 Autonomous TTI bundling for HRLLC LG Electronics Mobile Research discussion LTE_HRLLC-Core
- OPPO would like to know the exact meaning of “autonomously”.
- Huawei and Ericsson don’t know how this can work.
- Nokia think it can be workable but not sure the gain of this solution.

=> Noted

*SPS:*
R2-1712189 Discussion on SPS configuration OPPO discussion Rel-15 LTE_HRLLC-Core

**Agreements:**
1 SPS configuration can be active simultaneously for Pcell, PSCell and SCell.
2 Multiple active SPS configurations per serving cell are not supported.

R2-1712460 Reliable HARQ feedback for UL SPS Ericsson discussion Rel-15 LTE_HRLLC-Core
R2-1713338 Potential enhancements for HRLLC based on sTTI Huawei, HiSilicon discussion Rel-15 LTE_HRLLC-Core R2-1711116
R2-1712458 URLLC Techniques for Latency Ericsson discussion Rel-15 LTE_HRLLC-Core
R2-1713339 MAC Structure and Operation for HRLLC Huawei, HiSilicon discussion Rel-15 LTE_HRLLC-Core
R2-1712216 Discussion on HARQ configuration OPPO discussion Rel-15 LTE_HRLLC-Core

*New scenarios:*
R2-1713340 Discussion on new scenarios and requirements for URLLC service Huawei, HiSilicon discussion Rel-15 LTE_HRLLC-Core
- Ericsson think it should be discussed in RAN1.

*CRs:*
R2-1713708 Support of PDCP reordering function for DRB mapped on RLC UM LG Electronics France CR Rel-15 36.323 14.4.0 0215 - B LTE_HRLLC-Core
*Late:*
R2-1713166 Achievable reliability and latency for HRLLC Nokia, Nokia Shanghai Bell discussion Rel-15 LTE_HRLLC-Core

# 9.16 UL data compression in LTE

*(LTE_UDC-Core; leading WG: RAN2; Rel-15; started Sep 17; target: Mar 18; WID RP-172076)*
*Time budget: 1.0 TU*
*Including output of email discussion [99bis#29][LTE/UDC] Operator controlled dictionary issue [MTK]*



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*Documents in this agenda item will be handled in a break out session*

*Running CRs:*

R2-1714084 Introduction of DEFLATE based UDC Solution CATT draftCR Rel-15 36.323 14.4.0 B
=> Endorsed as the running CR.
=> Add clarification that UDC header packet just for uplink. The wording can be improved.

R2-1714085 Introduction of DEFLATE based UDC Solution CATT draftCR Rel-15 36.331 14.4.0 B
=> Endorsed as the running CR.

*Predefined dictionary:*

R2-1713907 Summary of email discussion [99bis#29][LTE/UDC] Operator controlled dictionary issue [MTK] MediaTek Inc. report Rel-15 LTE_UDC-Core
P1
- Huawei prefer to set pre-defined dictionary optional. LG share the same view.
- LG wonder the use case of operator-defined dictionary. CMCC think the operator-defined dictionary can provide better benefit for specific traffic or future traffic. SoftBank support to have operator-defined dictionary.

**Agreements:**
1 The pre-defined dictionary in RFC 3485 is configurable.
2 Specify in RAN2 spec the memory operation for pre-defined dictionary.
3 SIP dictionary for UDC is the first 3468 bytes in RFC 3485.
4 For the case pre-defined dictionary size is larger than the configured memory size, only the tail of pre-defined dictionary is put into the compression memory to fit the compression memory size.
5 The UE only applies 1 operator-defined dictionary in UDC for Release 15.
6 Introduce UE capabilities for operator-defined dictionary and SIP dictionary in UDC.
7 Operator-defined dictionary is pre-stored in UE by operators.
8 Dictionary selection is controlled by NW.

R2-1713352 Pre-Defined Dictionary for UDC Ericsson discussion Rel-15
- Nokia think operators can align the dictionary. CMCC think the dictionary is different for different operators.

=> Noted

R2-1712719 Discussion on SIP dictionary RFC 3485 for UDC Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core

R2-1712720 Discussion on configuration of UDC dictionary Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core

R2-1713309 Standard and Operator defined dictionary capability support for UDC Ericsson CR Rel-15 36.306 14.4.0 1538 - B LTE_UDC-Core

R2-1712245 Summary of email discussion [99bis#29][LTE/UDC] Operator controlled dictionary issue [MTK] MediaTek Inc. report Rel-15 LTE_UDC-Core Withdrawn

R2-1712881 Further Discussion on Pre-defined Dictionary for UDC CATT discussion Rel-15 LTE_UDC-Core

*Checksum operation:*

R2-1712878 Checksum Calculation for UDC CATT discussion Rel-15 LTE_UDC-Core

**Agreements:**
1 Checksum algorithm based on 4-bit binary accumulation can be used in UDC.
2 In order to get a 4-bit checksum value, right most 4-bit truncation from the sum.
3 Checksum value can be bit-reversed before put into UDC header.
4 The input of checksum is the first 4 bytes and the last 4 bytes in the buffer. When buffer content is empty, UE sets the content of the buffer to 0. The reset case is FFS.



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R2-1713353 Understanding the buffer content And Checksum calculation for UDC Ericsson discussion Rel-15
=> Noted
R2-1712713 Discussion on checksum options for UDC Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core
R2-1712714 CR on checksum option for UDC Huawei, HiSilicon CR Rel-15 36.323 14.4.0 0204 - B LTE_UDC-Core

*Checksum failure handling:*
R2-1713904 Discussion on UDC checksum error handling and message formats MediaTek Inc., CATT discussion Rel-15 LTE_UDC-Core
- Huawei prefer to use RRC message for informing checksum error.
- Ericsson support to use PDCP control PDU.

**Agreements:**
1 UDC checksum error is handled by PDCP layer.
2 Use PDCP Control PDU for UDC checksum error notification.
3 Receiving the notification, the sender resets its compression memory and re-initialize UDC operations.
4 Specify in RAN2 spec the FR bit in UDC header for compression memory reset indication.
5 Set the content of the buffer to 0 after memory clean-up.

R2-1712808 Discussion on UDC checksum error handling and message formats MediaTek Inc discussion Rel-15 LTE_UDC-Core Withdrawn
R2-1712715 Discussion on checksum failure handling for UDC Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core
R2-1712716 CR on checksum failure handling for UDC Huawei, HiSilicon CR Rel-15 36.323 14.4.0 0205 - B LTE_UDC-Core
R2-1712717 CR on checksum failure handling for UDC Huawei, HiSilicon CR Rel-15 36.331 14.4.0 3145 - B LTE_UDC-Core
R2-1713357 Release and Reset Behaviour for UDC Ericsson discussion Rel-15

*UDC procedure:*
R2-1712879 Buffer Handling for UDC CATT discussion Rel-15 LTE_UDC-Core
=> Capture buffer handling in 36.323. Details can be discussed further.
R2-1712721 Discussion on setup and release of UDC Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core
R2-1712722 Discussion on UDC functionality in PDCP layer Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core

**Agreement:**
1 PDCP header doesn't include the UDC header.

R2-1712723 CR on UDC functionality in PDCP layer Huawei, HiSilicon CR Rel-15 36.323 14.4.0 0206 - B LTE_UDC-Core

*Handover and re-establishment:*
R2-1712718 Discussion on handover and re-establishment cases for UDC Huawei, HiSilicon discussion Rel-15 LTE_UDC-Core
- Nokia support P1.
- CATT think we should follow the RoHC for handover case. Huawei think the case is different.

Agreements:
1 UDC context is reset and release during intra-node handover.
2 Memory size reconfiguration is supported at handover case.
3 Upon initiation of RRC connection re-establishment (i.e. transmission of uplink RRC message *RRCConnectionReestablishmentRequest*), the UE shall release the UDC configuration if configured.

R2-1712880 Consideration on Intra-eNB Handover for UDC Core CATT discussion Rel-15 LTE_UDC-

CRs:

R2-1712876 Introduction of DEFLATE based UDC Solution LTE_UDC-Core CATT draftCR Rel-15 36.300 14.4.0 B

R2-1712877 Introduction of DEFLATE based UDC Solution LTE_UDC-Core CATT draftCR Rel-15 36.306 14.4.0 B

R2-1713767 Introduction of Operator controlled dictionary for UDC 36.323 14.4.0 B LTE_UDC-Core MediaTek Inc draftCR Rel-15

R2-1713768 Introduction of Operator-defined dictionary for UDC 36.331 14.4.0 B LTE_UDC-Core MediaTek Inc draftCR Rel-15

R2-1713311 Selection of Pre-defined Dictionary for UDC 14.4.0 0212 - B LTE_UDC-Core Ericsson CR Rel-15 36.323

R2-1713312 Pre-Defined Dictionary Configuration for UDC 14.4.0 3183 - B LTE_UDC-Core Ericsson CR Rel-15 36.331

R2-1713769 Introduction of UDC checksum error handling 14.4.0 B LTE_UDC-Core MediaTek Inc draftCR Rel-15 36.323

R2-1712809 Introduction of Operator controlled dictionary for UDC 36.323 14.4.0 0208 - B LTE_UDC-Core MediaTek Inc CR Rel-15 Withdrawn

R2-1712810 Introduction of Operator-defined dictionary for UDC 36.331 14.4.0 3147 - B LTE_UDC-Core MediaTek Inc CR Rel-15 Withdrawn

R2-1712811 Introduction of UDC checksum error handling 14.4.0 0209 - B LTE_UDC-Core MediaTek Inc CR Rel-15 36.323 Withdrawn

✉ **[100#xx][LTE/UDC] Running 36.323 CR (CATT)**
- Update the running CR according to the agreements from this meeting
Intended outcome: endorsed running CR
Deadline: until next meeting

✉ **[100#xx][LTE/UDC] Running 36.331 CR (CATT)**
- Update the running CR according to the agreements from this meeting
Intended outcome: endorsed running CR
Deadline: until next meeting

## 9.17 Further enhancements to CoMP for LTE

*(feCOMP_LTE-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Mar. 18: WID: RP-171031)*
*Time budget: 0.5 TU*
*Documents in this agenda item will be handled in a break out session*

R2-1712641 Introduction of further enhancements to CoMP Intel Corporation discussion Rel-15 feCOMP_LTE-Core
- Huawei think we cannot reuse Class B FD-MIMO (beamformed) CSI Process
- Huawei think we should wait RAN1 feedback for capability issue.

**Agreement:**
1 Introduce the enhancement CoMP including QCL type C and CSI feedback enhancement in RRC specification.

R2-1712642 Introduction of further enhancements to CoMP 36.331 14.4.0 B feCOMP_LTE-Core Intel Corporation draftCR Rel-15
=> Postponed to next meeting

R2-1712643 Introduction of further enhancements to CoMP 36.306 14.4.0 B feCOMP_LTE-Core Intel Corporation draftCR Rel-15
=> Postponed to next meeting



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R2-1712897 Support of FeCoMP in TS 36.331 Huawei, HiSilicon CR Rel-15 36.331 14.4.0 3148 - B feCOMP_LTE-Core

# 9.18 Other LTE Rel-15 WIs

*This agenda item may be used for documents relating to Rel-15 WIs with no allocated RAN2 time but which might have minor RAN2 impact (e.g. CT/SA WIs for which we have received an LS requesting RAN2 action)*

R2-1713523 Control Plane latency reduction Ericsson CR Rel-15 36.306 14.4.0 1540 - B TEI15

R2-1713524 Control Plane latency reduction Ericsson CR Rel-15 36.331 14.4.0 3187 - B TEI15

R2-1713525 Control Plane latency reduction Ericsson discussion Rel-15 TEI15

# 9.19 LTE TEI15 enhancements

*Small Technical Enhancements affecting LTE Rel-15 that do not belong to any Rel-15 WI.*
*Note: A TEI enhancement proposal should be treated for only one meeting cycle and involve only one WG. Otherwise, a WI should be proposed at RAN plenary!*
*Time budget: 1 TU*

*CP latency reduction*:

R2-1713525 Control Plane latency reduction Ericsson discussion Rel-15 TEI15
- Huawei think the spec impact is small and proposals are acceptable.

=> Noted

R2-1713925 LTE Control Plane Latency Reduction Vodafone Group plc discussion

**CB on Friday:**=> Draft LS in R2-1714087 to RAN1 and RAN to ask the feasibility of CP latency reduction (offline 150, Vodafone)

R2-1713926 [DRAFT] LS on LTE Control Plane Latency Reduction Vodafone LS out Rel-15 TEI15 To:RAN1

R2-1713523 Control Plane latency reduction Ericsson CR Rel-15 36.306 14.4.0 1540 - B TEI15

R2-1713524 Control Plane latency reduction Ericsson CR Rel-15 36.331 14.4.0 3187 - B TEI15

*High speed dedicated network:*

R2-1713255 Solutions for UE camping in high speed railway scenario CMCC, MediaTek Inc discussion Rel-15 TEI15 R2-1709000

=> Noted
- OPPO would like to know how UE know whether it is on the train or not.
- Intel think MSE can be used to identify the UE state.
- Nokia wonder the HSDN is dedicated carrier.
- CMCC point that it is not dedicated carrier but is dedicated optimised for high speed trains.

R2-1712616 Cell reselection for the UE on high-speed-dedicated network Intel Corporation, CMCC discussion Rel-15 TEI15

=> Noted

**Agreements:**
1. Indication in SIB to indicate if the cell is a “high-speed-railway dedicated LTE network” (HSDN) is needed. Whether to introduce new indication or reuse the existing indication is FFS. FFS how to indicate HSDN neighbouring cell.
2. A cell can indicate the number of equivalent cells for speed state estimation in system information. The value range of number is FFS.
3. When the UE is in high speed state, higher priority to reselect HSDN cell than normal cell. How to handle the frequency priority and the speed priority is FFS. Other conditions for UE to choose higher priority is FFS
4. When the UE is not in high speed state, higher priority to reselect normal cell than HSDN cell. Other conditions for UE to choose higher priority is FFS. How to handle the frequency priority and the speed priority is FFS



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R2-1713256 Support of accurate UE speed-level estimation and speed-level-based cell (re)selection CMCC CR Rel-15 36.331 14.4.0 3181 - F TEI15
R2-1712875 Considerations on Cell Reselection in High Speed Railway Scenario CATT discussion

*Inbound mobility:*
R2-1713575 Inbound mobility to the shared non-CSG small cells SoftBank, Nokia, Nokia Shanghai Bell discussion Rel-15 TEI15 R2-1711006
=> Noted
=> It will be discussed with specific solution next meeting.

*New measurement for MDT:*
R2-1713257 Introduction of new measurement collection in MDT CMCC discussion Rel-15 TEI15
- Huawei support the enhancement.
- Nokia think there is security issue to report MAC address.
- CMCC indicate that the WLAN measurement for positioning purpose.

=> Introducing WLAN/BT measurements and corresponding collection procedure in MDT framework should be addressed by new WI.
=> Noted
R2-1713258 Introduction of new measurement collection in MDT CMCC CR Rel-15 36.306 14.4.0 1537 - B TEI15
R2-1713259 Introduction of new measurement collection in MDT CMCC CR Rel-15 36.331 14.4.0 3182 - B TEI15
Rel-15 TEI

*Bearer and LCID extension*:
R2-1712951 FGI20 limitation for DRBs Ericsson discussion Rel-15 TEI15
R2-1712952 Avoiding FGI20 limitation for DRBs Ericsson CR Rel-14 36.306 14.4.0 1522 - C TEI14
R2-1712953 Avoiding FGI20 limitation for DRBs Ericsson CR Rel-14 36.331 14.4.0 3151 - C TEI14

R2-1712198 Further considerations on extended number of dedicated radio bearers for E-UTRAN Samsung discussion Rel-15 TEI15
R2-1712957 Number of DRBs in E-UTRA Ericsson discussion Rel-15 TEI15

R2-1712955 LCID space extension Ericsson discussion Rel-15 TEI15
R2-1712956 LCID space extension Ericsson CR Rel-15 36.321 14.4.0 1195 - C TEI15
R2-1713709 Introduction of the extended number of bearers Samsung draftCR Rel-15 36.321 14.4.0 B TEI15
R2-1713711 Introduction of the extended number of bearers Samsung draftCR Rel-15 36.331 14.4.0 B TEI15

*New L2 measurement:*
R2-1712708 Overview on new LTE measurements Huawei, HiSilicon, China Telecom discussion Rel-15 TEI15 R2-1710912
=> Noted
R2-1713450 Considerations on new LTE eNB measurements requirements Nokia, Nokia Shanghai Bell discussion Rel-15 TEI15
- Ericsson think new measurement on number of active UEs is needed.

=> Noted
R2-1712709 Discussion on new measurement on PRB usage distribution Huawei, HiSilicon, China Telecom discussion Rel-15 TEI15 R2-1710913
=> Noted.
=> Introduce new measurements or finer granularity for the existing measurements to address SA5 requirement.

✉ **[100#xx][LTE/new L2 measurements](Huawei)**
Identify the solution to address SA5 requirement
Intended outcome: agreeable CR if needed



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Deadline: until next meeting

R2-1712710 Discussion on new measurement on IP throughput distribution Huawei, HiSilicon, China Telecom discussion Rel-15 TEI15 R2-1710914
R2-1712711 Introduction of new measurement on PRB usage distribution Huawei, HiSilicon, China Telecom CR Rel-15 36.314 14.0.0 0045 - B TEI15
R2-1712712 Introduction of new measurement on IP throughput distribution Huawei, HiSilicon, China Telecom CR Rel-15 36.314 14.0.0 0046 - B TEI15
R2-1713460 Introduction of PRB usage distribution measurement and IP Throughput usage distribution Ericsson CR Rel-15 36.314 14.0.0 0047 - B TEI15
R2-1713461 PRB Usage Distribution and IP Throughput Distribution Ericsson discussion Rel-15
R2-1713905 Discussion on new measurements on number of active UEs China Telecommunications discussion
R2-1713908 Introduction of new measurement on number of active UEs China Telecommunications CR Rel-15 36.314 14.0.0 0048 - B TEI15

*MBMS notification:*
R2-1713425 Enabling MBMS Bearer Event Notification Ericsson CR Rel-15 36.300 14.4.0 1082 - F MBMS_LTE_enh2-Core
*SRS antenna switching:*
R2-1713681 Enhancement of SRS antenna switching in TS 36.331 Huawei, HiSilicon CR Rel-15 36.331 14.4.0 3195 - B TEI15
R2-1713683 Enhancement of SRS antenna switching in TS 36.306 Huawei, HiSilicon CR Rel-15 36.306 14.4.0 1541 - B TEI15

# 10 WI: New Radio (NR) Access Technology

*(NR_newRAT-Core; leading WG: RAN1; REL-15; started: Mar. 17; target: Jun. 18: WID: RP-172115)*

## 10.1 Organisational

*Incoming LSs, work plan, status from other groups, etc.*

*Liaisons to RAN2*
R2-1712102 FURTHER INFORMATION RELATED TO DRAFT NEW REPORT FOR IMT-2020 EVALUATION ITU-R WP 5D LS in To:RAN2
=> Noted

R2-1712105 LS on requirements on unified access control for 5GS (C1-174626; contact: LGE) CT1 LS in Rel-15 5GS_Ph1-CT To:SA1, RAN2 Cc:SA2
- Ericsson have a draft response in R2-1712534
=> Noted

R2-1712108 Response LS to RAN2 on jumbo frames (S3-172515; contact: Ericsson) SA3 LS in Rel-15 NR_newRAT-Core To:RAN2
=> Noted

R2-1712109 Reply LS on Reply LS on 5GS Security aspects seeking resolution (S3-172517; contact: Ericsson) SA3 LS in Rel-15 5GS_Ph1 To:SA2, RAN2
=> Noted

R2-1712113 LS on Supportable RNTI Length on DCI (R1-1719094; contact: Ericsson) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
- Samsung understand there is no performance impact but to 17 but 21 there might be some impact.
- Ericsson understand they will conclude a single value. Ericsson have contribution in R2-1713487
=> C-RNTI length will be discussed in common session.

=> Noted

R2-1712118 LS on NR Paging Mechanisms (R1-1719164; contact: Huawei) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
=> Noted

R2-1712126 Reply LS on RACH agreements (R1-1719214; contact: CATT) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
=> Noted

R2-1712128 LS on system information broadcast for CU/DU split scenario (R3-174199; contact: CATT) RAN3 LS in Rel-15 NR_newRAT-Core To:RAN2 Cc:RAN1
- Vivo ask if the DU has an RRC layer. CATT understand that this is the assumption in RAN3 that it is encoded in DU but is transmitted from the CU.
- LG understand that this has not impact on our specifications.
- OPPO wonder if DU responds to on demand requests or whether it is CU.

=> Noted

R2-1712129 LS on Centralized Retransmission Solution (R3-174219; contact: Ericsson) RAN3 LS in Rel-15 NR_newRAT To:RAN2
- Ericsson confirm this is for NR-NR DC.
- AT+T have a contribution for how to address this for NR-NR DC.

=> Noted

R2-1712130 LS on length of NR Cell Identity (R3-174229; contact: Nokia) RAN3 LS in Rel-15 NR_newRAT-Core To:RAN2
- Vivo wonder if there is impact on the resume ID.
- OPPO ask if this is relevant to EN-DC. Nokia understand that it is only in SIB1 so only for SA.

=> Noted

R2-1712132 LS on MN-initiated SN change for delta signalling (R3-174233; contact: Nokia) RAN3 LS in Rel-15 NR_newRAT-Core To:RAN2
- Intel ask if this is just the SCG config or also for the radio bearer config. Nokia understand that it is just the SCG config.
- ZTE think this is already taken into account in the latest stage 2. RAN2 will need to check what we want to convey in the stage 3 details.

=> Noted

R2-1712136 LS on single Tx switched UL (R4-1711610; contact: Apple) RAN4 LS in Rel-15 NR_newRAT To:RAN2 Cc:RAN1, RAN3
- Vodafone ask if there will be a table of problem channel combinations. Apply understand a formula will be used for channel combination within a problem band combination. But for problem BCs that will be a table.

=> Noted

R2-1712137 LS on mmWave UE NC CA capability signalling (R4-1711623; contact: Qualcomm) RAN4 LS in Rel-15 NR_newRAT To:RAN2
=> Noted

R2-1712140 LS reply to subcarrier alignment (R4-1711859; contact: Huawei) RAN4 LS in Rel-15 NR_newRAT To:RAN1, RAN2
=> Noted

R2-1712141 LS reply on NR UE baseband capabilities signalling (R4-1711888; contact: Intel) RAN4 LS in Rel-15 NR_newRAT-Core To:RAN2 Cc:RAN1
=> Noted

R2-1712143 LS on gaps for SS block measurement in NR (R4-1711940; contact: Ericsson) RAN4 LS in Rel-15 NR_newRAT To:RAN2 Cc:RAN1

- AT+T ask if the SSB is outside the active BWP also covers the case that the SSB is on a different carrier. Ericsson doesn't know what was considered but assume it applies in all cases.
- Samsung ask if RAN4 is only working on per UE gaps.

=> Noted

R2-1712144 LS to RAN1 and RAN2 on Definition of synchronous and asynchronous Dual connectivity in Rel-15 LTE-NR combinations (R4-1711965; contact: Ericsson) RAN4 LS in Rel-15 NR_newRAT-Core To:RAN1, RAN2

- Huawei ask if RAN4 have taken into account 1tx. Ericsson think RAN4 assume that it can work in all sync cases.
- Vodafone wonder if async is only for non collocated case. Ericsson think that even in co-located case that async operation may be used.

=> Noted

R2-1712149 LS on default values for 5GS QoS averaging window for standardised 5QIs (S2-178049; contact: Qualcomm) SA2 LS in Rel-15 5GS_Ph1 To:SA4, RAN2, SA6 Cc:CT1

- Nokia think the default values do not make sense, they are way too long. They should be of the same length as a PDU.
- Ericsson have a similar concern in case the traffic is very bursty.
- Nokia think we can send a quick reply on this.

=> Offline discussion to draft a response to SA2 on the average window length. R2-1714012 (Offline discussion #04, Nokia)

R2-1714012 [DRAFT] [Response LS on R2-1712149 to SA2] Nokia LS out Rel-15 NR_newRAT-Core To:SA2

=> Replace " radio delay requirement " with "radio portion of the packet delay budget"

=> Approved in R2-1714245

R2-1712150 Reply LS on SDAP header design (S2-178056; contact: MediaTek) SA2 LS in Rel-15 5GS_Ph1 To:RAN2

- MediaTek think we need to discuss whether to send a single bit for both AS and NAS functions or send 2 bits. This LS says that 1 bit is not possible.
- Ericsson think we could send a quick LS now. Intel think LS may not be needed as we anyway need to address the SA2 requirements.
- CATT think there are approaches that make one bit work.

=> Needs to be considered in the UP session (most likely not this meeting but Jan ad hoc)

=> Noted

R2-1712158 Reply LS on unified Access Control for 5G NR (S2-178191; contact: LGE) SA2 LS in Rel-15 SMARTER, 5GS_Ph1, 5GS_Ph1-CT To:CT1, SA1, RAN2

=> Noted

R2-1712298 Reply LS on details of network identifiers (C4-175291; contact: Qualcomm) CT4 LS in Rel-15 5GS_Ph1-CT To:RAN2, SA2

=> Noted

R2-1713952 LS Reply to 3GPP SA2 on Status Icon related to 5G GSM Association LS in SA2, RAN2 SA, SA1, RAN, CT1, CT

- Vodafone think the LS states in what conditions the 5G bit must be able to be set.
- DT think that GSMA also talk about detection of NR cells as well as relying on the bit which is not in line with our previous discussions.

=> People can consider offline if there is anything from this LS that affects what we need to do in RAN2.

=> Noted

R2-1713940 LS on RRC parameters for NR RAN WG 1 LS in

- Ericsson point out that these are not yet captured in the output of the email discussion but they are working on an update. Ericsson think the changes are very significant (50% more parameters)

=> Noted

*Liaisons with RAN2 in CC*

R2-1712125 Response LS on simultaneous transmission and/or reception over EPC/E-UTRAN and 5GC/NR (R1-1719211; contact: Intel) RAN1 LS in Rel-15 5GS_Ph1, NR_newRATTo:SA2, RAN4 Cc:RAN2
=> Noted

R2-1712156 Reply LS on algorithm selection in E-UTRA-NR Dual Connectivity (S2-178182; contact: Qualcomm) SA2 LS in Rel-15 EDCE5 To:CT1, SA3 Cc:CT4, RAN2, RAN3
- Intel think we should look as solutions that do not change our previous agreements. Qualcomm think that CT1 have some alternatives to avoid MME impact so RAN2 don't need to take actions.
- Ericsson have a similar view to Intel. Some SA3 solutions to avoid MME impact have radio impact.

=> Noted

R2-1712300 Reply LS on algorithm selection in E-UTRA-NR Dual Connectivity (C4-175349; contact: Ericsson) CT4 LS in Rel-15 EDCE5 To:CT1, SA3 Cc:SA2, RAN2, RAN3
=> Noted

R2-1713933 Reply LS on default values for 5GS QoS averaging window for standardised 5QIs (S4-171363; contact: Qualcomm) LS in SA4
- Qualcomm think we need to consider this in our response.

=> Noted

R2-1712157 Reply LS on NR Edge Computing (S2-178185; contact: Nokia) SA2 LS in Rel-15 NR_newRAT To:RANCc:SA, RAN2, RAN3
=> Noted

R2-1712131 Reply LS on UE/RAN Radio Information and Compatibility Request (R3-174231; contact: Nokia) RAN3 LS in Rel-15 NR_newRAT-Core To:SA2 Cc:RAN2

R2-1712133 LS on handling concurrent running of security procedures (S3-172565; contact: Ericsson) SA3 LS in Rel-15 5GS_Ph1 To:RAN3 Cc:RAN2

R2-1712134 LS reply on Support for fake gNB detection mechanisms (R4-1711318; contact: Ericsson) RAN4 LS in Rel-15 NR_newRAT To:SA3 Cc:RAN1, RAN2

R2-1712139 LS to RAN5 cc RAN1 and RAN2 on UE beamlock function (R4-1711823; contact: Keysight) RAN4 LS in Rel-15 FS_NR_test_methods To:RAN5 Cc:RAN1, RAN2

R2-1712145 LS on PRB grid in the NR (R4-1711972; contact: Nokia) RAN4 LS in Rel-14 NR_newRAT-Core To:RAN1 Cc:RAN2, RAN3
=> LSs above are noted without presentation.

*New LS in (during RAN2#100)*

R2-1714112 LS on NR Idle Mode procedures (S1-174294; contact: Qualcomm) SA1 LS in Rel-15 5GS_Ph1-CT SA2, RAN2, CT1 RAN3
New Ls in
=> Noted

R2-1714114 Reply LS on QCIs for EPC based ULLC (S1-174513; contact: Vodafone) SA1 LS in Rel-15 NR_newRAT-Core, LTE_HRLLC, LTE_sTTIandPT, EDCE5 SA2, RAN, RAN1 RAN2, RAN3, SA4, CT4
New Ls in
=> Noted

R2-1714137 LS on EDCE5 Algorithm Indication between UE and SgNB (S3-173444; contact: Vodafone) SA3 LS in Rel-15 EDCE5 To:CT1, CT4, RAN2, RAN3 Cc:SA2
New Ls in
=> Noted

R2-1714140 "LS on NR TDD UL/DL configurations and support of HPUE (R1-1721560; contact: Softbank, Sprint)" RAN1 LS in Rel-15 NR_newRAT-Core To:RAN4 Cc:RAN1



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New Ls in
=> Noted

R2-1714145 LS on NR RMSI TTI (R1-1721557; contact: CATT) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
New Ls in
=> Noted

R2-1714155 LS on required information for NSA on X2 (R3-174964; contact: Nokia) RAN3 LS in Rel-15 NR_newRAT-Core To:RAN1, RAN2, RAN4
New Ls in
=> Noted

R2-1714167 Reply LS on maximum data rate of user plane integrity protected data SA3
- Ericsson wondered if this also applies to LTE connected to 5GC.
- Qualcomm think they don't care much about the difference between LTE and NR requirements.
- Sharp consider that 64 kbit/s is ok for voice. Qualcomm also think it is more than enough.

=> Noted

R2-1714161 Reply LS on SPS and Grant-free (R1-1721574; contact: NTT DOCOMO) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
- Nokia think the DL SPS we could have shorter values than LTE.

=> This has been considered in the UP session
=> Noted

R2-1714162 LS on RAN1 agreement on UL power sharing for LTE/NR NSA operation (R1-1721606; contact: Intel) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
=> Noted

R2-1714164 LS on RRC parameters for NR (R1-1721616; contact: Ericsson) RAN1 LS in Rel-15 NR_newRAT-Core To:RAN2
=> Noted

R2-1714189 LS on SRS PHR reporting (R1-1721680; contact: Huawei)
=> Treated in UP session

R2-1714201 LS reply on SSTD measurements for EN-DC (R4-1714289; contact: Ericsson)
=> Noted

R2-1714236 LS on MAC CE parameters for NR MIMO (R1-1721663; contact: NTT DOCOMO) RAN1 LS in
=> Noted

*RAN2 in Cc:*
R2-1714171 LS reply on support of Trace and MDT in NG-RAN in rel-15 (S5-176477; contact: Nokia) SA5 LS in Rel-15 NR_newRAT-Core To:RAN3, CT4 Cc:RAN2
=> Noted

*Rapporteur inputs*
R2-1712305 RAN WG's progress on NR WI in the October meeting 2017 NTT DOCOMO, INC. (Rapporteur) discussion Rel-15 NR_newRAT-Core
=> Noted

## 10.2 Stage 2 and common UP/CP aspects

*Proposals to the stage 2 should be submitted with a TP to show the impact to the stage 2 specifications.*



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## 10.2.1 Stage 2 TSs and running CR

*Latest TS 38.300, TS 37.340 and running CR to 36.300, other rapporteur inputs, anything related to specification methodology. Please submit any new text proposals to the appropriate agenda item.*

R2-1712266 Draft TS 38.300 v120 Rapporteur (Nokia) draft TSRel-15 38.300 1.2.0 NR_newRAT-Core
=> Noted

R2-1712356 NR Stage 2 Clean Up Rapporteur (Nokia) discussion Rel-15 NR_newRAT
=> Noted

R2-1712357 NR Stage 2 Open Issues Rapporteur (Nokia) discussion Rel-15 NR_newRAT
=> Noted

R2-1712355 Draft TS 38.300 v121 Rapporteur (Nokia) draft TSRel-15 38.300 1.2.1 NR_newRAT-Core
=> Revised in R2-1714079 to capture agreements from this meeting (Offline discussion #11)

R2-1714079 Draft TS 38.300 v122 Rapporteur (Nokia) draft TSRel-15 38.300 1.2.2 NR_newRAT-Core

✉ **[100#xx][NR] 36.800 (Nokia)**
Intended outcome: Agreed TS for submission to RAN for approval
Deadline: Thursday 2017-12-07

R2-1712301 TS 37.340v120 Rapporteur (ZTE Corporation) draft TSRel-15 37.340 1.2.0 NR_newRAT-Core
=> Noted

R2-1712303 List of FFSs for MR-DC with 5GC Rapporteur (ZTE Corporation) discussion Rel-15
=> Noted

R2-1712302 Draft TS 37.340v121 Rapporteur (ZTE Corporation) draft TSRel-15 37.340 1.2.1 NR_newRAT-Core
- Ericsson wonder if we should say anything about duplication in NR PDCP. ZTE explain NR PDCP is covered in 38.300.
- Ericsson wonder why the security key text is changed in section 9. ZTE think the change aligns to what we have agreed.

=> Revised in R2-1714080 to capture agreements from this meeting (Offline discussion #12)

R2-1714080 Draft TS 37.340v122 Rapporteur (ZTE Corporation) draft TSRel-15 37.340 1.2.2 NR_newRAT-Core

✉ **[100#xx][NR] 37.340 (ZTE)**
Intended outcome: Agreed TS for submission to RAN for approval
Deadline: Thursday 2017-12-07

R2-1712304 Draft 37.340CR to introduce NR-NR DC Rapporteur (ZTE Corporation) pCR Rel-15 37.340 1.2.0 NR_newRAT-Core
=> Noted

## 10.2.2 User Plane

*No documents should be submitted to 10.2.2. Please submit to 10.2.2.x.*

### 10.2.2.1 Bearer type harmonisation

*Any remaining stage 2 aspects relating to bearer type harmonisation*
*This agenda item is relevant to EN-DC completion and standalone operation.*

*Maximum 1 tdoc per company*

*2c/2x*

R2-1712890 Stage2 TP to update bearer type description ZTE Corporation, Sanechips discussion Rel-15

- Ericsson think this approach would result in a minor update to the specifications but it would be better to make a more fundamental update based on our harmonised bearer agreements.
- Intel have a similar view to Ericsson. SCG split bearer to denote 2x is not very clear as the SCG leg is optional.
- ZTE concern is that there will be a big impact in stage 3 in RAN3. They are currently not aligned to our flexible configuration approach. Also this would allow the 2c approach which we think is not needed at all, and we should not add things because they are possible. Finally want to avoid different meanings in LTE DC and MR-DC.
- DOCOMO have sympathy with Ericsson and Intel.
- Huawei think we don't need to change our current definitions nor introduce 2x. We left the 2x decision to RAN3.
- Vodafone think the stage 2 should reflect our agreements and think the terminology update from Ericsson would be useful. Qualcomm support the Ericsson approach to reflect the harmonised bearer in stage 2. CATT agree with Ericsson for terminology but for 2x we should wait for RAN3 conclusion.
- Samsung understands ZTE concern but their update is very confusing, hence support Ericsson. Nokia also have sympathy for Ericsson approach.
- ZTE think if we don't have 2x there is no need to make any update.
- Intel think the terminology should be fixed even if RAN3 don't conclude on 2x/2c.

=> Wait for RAN3 to make final decision.

=> Offline discussion to progress if and how we want to update the terminology to better align to our harmonised bearer agreements (Offline discussion #13, Intel)

=> Revised in R2-1714183 to capture the outcome of the discussion in the TP

R2-1714165 Offline discussion on Bearer type redefinitions Intel corporation (rapporteur) report Rel-15 NR_newRAT-Core

**Agreements**

1: it is proposed to agree on Option 1: From R2-1712669 and R3-1713906:

- MCG bearer: in MR-DC, a bearer with RLC bearer only in the MCG.
- SCG bearer: in MR-DC, a bearer with RLC bearer only in the SCG.
- Split bearer: in MR-DC, a bearer with RLC bearers in both SCG and MCG.
- MN terminated bearer: in MR-DC, a bearer for which PDCP is located in the MN.
- SN terminated bearer: in MR-DC, a bearer for which PDCP is located in the SN.

2: 2x/2c (i.e., MN terminated SCG bearer and SN terminated MCG bearer) are supported in stage 2.

R2-1714183 Stage 2 TP to update bearer type description ZTE

R2-1713560 On Reconfiguration to option 2c/2x for SCG addition/modification and SCG Failure NTT DOCOMO INC. discussion Rel-15 NR_newRAT-Core

*Other*

R2-1713906 TP for 37340 - Introducing bearer harmonization Ericsson, Samsung discussion Rel-15 NR_newRAT-Core

R2-1712669 Terminology for RBs in EN-DC Intel Corporation discussion Rel-15 NR_newRAT-Core

**Agreements**

1 Define a term to denote the lower layer (RLC+MAC logical channel) configuration.

2 Use the term "RLC bearer"

R2-1713151 Discussion on PDCP version change Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core



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**Agreements:**
1 The change from NR PDCP to LTE PDCP for MCG SRBs is only supported via release/addition at handover.
2 The change from NR PDCP to LTE PDCP for MCG DRBs is only supported via release/addition at handover.

R2-1713728 RLC UM support for split bearers in MR-DC NEC discussion Rel-15 NR_newRAT-Core
- LG think this is the assumption used for the stage 3 definition.

**Agreements**
1: RAN2 to confirm the split bearers (DRBs) support the RLC UM in MR-DC.

*Withdrawn*
R2-1713434 TP for 37340 - Introducing bearer harmonization Ericsson discussion Rel-15 NR_newRAT-Core Withdrawn
R2-1713901 TP for 37340 - Introducing bearer harmonization Ericsson, Samsung discussion Rel-15 NR_newRAT-Core Withdrawn

### 10.2.2.2 Bearer type change

*This agenda item is relevant to EN-DC completion and standalone operation.*
*Maximum 1 tdoc per company.*

*Late*
R2-1713836 L2 handling for bearer type change covering option 2x/2c NTT DOCOMO, INC. discussion Rel-15 NR_newRAT-Core

### 10.2.2.3 Other

*Any remaining stage 2 user plane aspects - detailed topics should be discussed in stage 3 user plane.*
*This agenda item is relevant to EN-DC completion and SA.*

R2-1712325 Discussion on the handling 2 for UM DRB and SRB Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
*moved from 10.2.2.2 to 10.2.2.3*
P1
- CATT think this is already captured in stage 2 spec for both UM DRBs and SRBs. Ericsson think it is covered in stage 3 also according to proposal1 .

P2
- LG think we can just rely on re-establishment but without a key change. DOCOMO agree with LG. Ericsson thinks it becomes confusing to re-establishment for some bearers but not for others. Also the re-establishment will reset the COUNT and so key must be changed.
- OPPO think the network configuration can solve this.
- Nokia think if we have to re-establish then we will not be able to support HO without key change.

**Agreements**
1 For handling 2 (i.e. no PDCP re-establishment) of SRBs, PDCP should discard all stored SDUs and PDUs.

R2-1713435 PDCP handling in case of PSCell change Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713378 Open issues on switched mode on split bearers Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
P2
- Lenovo think that it would be similar if RLC re-establishment and PDCP data recovery is always performed.
- MediaTek think a simple common behaviour should be performed.
- LG think we can reuse the existing indicators in the reconfiguration message.



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- Ericsson also think we can just reuse the indicators and then there is no impact to the UP.

**Agreements**
1: RRC Connection Reconfiguration that switches the uplink path can explicitly indicate (using existing indicators) whether the UE, for a given split bearer, shall perform re-establishment of an RLC and PDCP data recovery.
FFS How this is handled in the case of pre-processing for UM-RLC (to be discussed in UP session)

R2-1713838 Bearer type change with PDPC version change NTT DOCOMO INC. discussion Rel-15
- LG think we should not discuss this again.
- Nokia support the proposal and think the signalling in RRC could already support this so no need for a restriction in stage 2. Ericsson have the same view and think there is not restriction in stage 3.
- Qualcomm also support the proposal. ZTE also support.
- DOCOMO understand a single message would include a remove an add with a PDCP version change. Intel also think there is nothing in RRC that prevents this.

**Agreements**
1 Support 1-step (direct) bearer type change with PDCP version change (i.e. reverting the agreement in RAN2#99bis).

R2-1713876 Control of UL Split or Duplicate MCG SRB Samsung Electronics GmbH discussion R2-1711774
- LG support proposal 1.
- Intel support the proposal to avoid having the address the question of what to do at SCG failure.
- Huawei support the proposal. OPPO also support . Vivo also.
- Ericsson think we previously agreed to support all the cases. This case can be used to avoid power sharing issues. Nokia have similar view to Ericsson and think re-establishment should be triggered if there is SCG failure.
- ZTE also support the proposal.
- CATT share the Ericsson and Nokia view but the SCG failure case can be discussed further. IDC also share this view.
- Ericsson understand that for Dec 17 we should support SCG only or MCG only, and it is only duplication that is not supported.

P2
- ZTE support the proposal. LG think duplication is not useful for SRB.

=> Support of SRB duplication for CA can be discussed after December.

R2-1712917 Number of supported DRBs in NR (16/32) Ericsson discussion Rel-15 NR_newRAT-Core
- Samsung explain that the NR LCID field has 64 values and hence has enough flexibility that we don't need to conclude the number of DRBs now.
- Ericsson wonder what value should be included in the NR RRC spec. Samsung think that we could already have enough space in the RRC signalling for 32 DRBs.
- Samsung think the SA2 discussion is only related to EPC.

=> DRB ID space in NR RRC is 32 (same as LTE).

R2-1713731 NR data rates effects on the UE and networks Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
- Samsung think this is a valid issue but it is difficult to make any agreement.
- MediaTek wonder if flow control is that big an issue as there is a flow control at TCP
- Qualcomm agree in the past we have always agreed that flow control is not needed, but with 5G data rates we might need to reconsider. TCP reaction is very slow and cannot resolve the problem.
- Qualcomm can agree the observations but the TP is not suitable for the TS. Also wonders if 3GPP can resolve this is data is discarded by upper layers.



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=> Offline discussion to try to conclude whether this is an issue that we should aim to address in future meetings (Offline discussion #14, Qualcomm)
- Update from offline: No conclusion how to progress.

R2-1713148 Secondary RAT data volume report Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1711093
R2-1712908 Remaining issues for RoHC in NR and EN-DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712909 Consideration on PHR in EN-DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713464 Activation and Deactivation time of Secondary Cells Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713465 [DRAFT] LS on Activation and Deactivation time of Secondary Cells Ericsson LS out Rel-15 NR_newRAT-Core To:RAN4
R2-1713612 Support of ECN in NR Ericsson, Nokia, Nokia Shanghai Bell, Vodafone discussion Rel-15 NR_newRAT-Core

*Withdrawn*
R2-1713585 NR data rates effects on the UE and networks Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core Withdrawn
R2-1713837 Bearer type change with PDPC version change NTT DOCOMO INC. discussion Rel-15 Withdrawn

## 10.2.3 Impact of bandwidth parts

*Any remaining stage 2 aspects relating to bandwidth parts for EN-DC, noting that it was agreed last meeting to discuss BWP impact to standalone operation after Dec 17. Detailed topics should be addressed under the appropriate UP or CP stage 3 AI.*
*This agenda item is relevant to EN-DC completion.*
*Maximum 1 tdoc per company*
R2-1712322 BWP issues for EN-DC completion Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
P1
- ZTE wonder what initial BWP means for connected, and wonder if we need to define any initial BWP.
- MediaTek think we don't need to consider initial BWP at this stage.
- Qualcomm think the initial BWP still needs to be defined for EN-DC
- Samsung think these terms used by RAN1 may not be appropriate for our discussion. We can refer to BWP configured by RMSI instead of initial BWP.
- IDC share the view of ZTE.

P3
- CATT think that the UE should not have to switch BWP to perform RACH and the network will not be aware and hence there will be data loss. Hence RACH should be available on every BWP.
- LG share the view with CATT.
- Huawei think that if there are RACH resources on all BWPs it still doesn't work. The network doesn't know the DL BWP on which RAR should be sent.
- IDC think the network should be able to choose which BWPs have RACH resources.
- LG think we also need to consider he CSI-RS RACH resource.
- MediaTek think that RAN1 will conclude on the RACH resource relation to BWP.
- Ericsson think a single RACH config is ok for BWPs that are subset of each other. For other cases where the UE BW is less than carrier BW then the different BWPs will need common search space and hence could have RACH resources.

=> Offline discussion to conclude the relation between RACH resources and BWPs, and also what BWP types (e.g. initial, default, etc) are needed from RAN2 point of view. (Huawei, Offline discussion #15). Discuss should focus on what is required for EN-DC operation for Dec 17.

R2-1713885 Remaining control plane issues of BWP Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1713729 Clarifications on BWP set configuration NEC discussion Rel-15 NR_newRAT-Core

R2-1713733 BWP and RLM in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712250 Discussion on configuration and mobility about BWP operation OPPO discussion
R2-1712275 Delta signaling of BWP Spreadtrum Communications discussion Rel-15
R2-1712601 Discussion on the RAN2 impacts with the BWP terminologies introduced in RAN1 ZTE Corporation, Sane Chips discussion Rel-15
R2-1712646 Overall impact in RAN2 for BWP Intel Corporation discussion Rel-15 NR_newRAT-Core
R2-1712759 BWP impact on idle inactive mode vivo discussion Rel-15 NR_newRAT-Core
R2-1712795 Control Plan Impacts of BWP InterDigital discussion Rel-15 NR_newRAT-Core
R2-1712863 BWP selection in handover CATT discussion
R2-1712883 Text Proposal to support BWP Operation in 38.300 MediaTek Inc. discussion
R2-1712990 BWP impact on RRM Measurements for Wideband CC Sony discussion Rel-15 NR_newRAT-Core
R2-1713567 Discussion on the impact of bandwidth parts in MN/SN coordination ITRI discussion NR_newRAT-Core
R2-1713865 Remaining aspects to support bandwidth part Samsung discussion Rel-15
R2-1713568 Bandwidth part configuration during SN addition procedure ITRI discussion NR_newRAT-Core
*moved from 10.2.4 to 10.2.3*

## 10.2.4 MN/SN measurement coordination

*Any remaining stage 2 aspects relating to MN/SN measurement coordination.*
*Further detail discussion of the measurement object parameters that can be configured differently without affecting whether the 2 measurement objects will count as 1 or 2 measurement layers, please use stage 3 agenda item 10.4.1.4.1.*
*This agenda item is relevant to EN-DC completion.*
*Maximum 1 tdoc per company*
R2-1712439 Measurement coordination for EN-DC ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1713137 Measurement coordination for LTE-NR DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712242 Measurement Gap Coordination in EN-DC OPPO discussion

*Withdrawn*
R2-1712813 Coordination of Parameters for Measurements Report Trigger Fujitsu discussion Rel-15 NR_newRAT-Core Withdrawn

## 10.2.5 MN/SN procedures for EN-DC

*Any remaining stage 2 aspects relating to MN/SN procedures for EN-DC*
*Details of the content of inter node RRC messages should be progressed in stage 3 AI 10.4.1.9.*
*This agenda item is relevant to EN-DC completion.*
*Maximum 1 tdoc per company*

*Cell index*
R2-1712855 Cell Index in EN-DC CATT discussion
*moved from 10.2.9 to 10.2.5*
P1
- Vivo wonder if the cell index could be used for per CC measurement gaps.
- LG support the proposal. Qualcomm also support.

P2
- LG think that in future there could be multiple secondary nodes and it would be good to avoid coordination between the nodes for this purpose.
- ZTE think that coordination could be useful. Also think P3 hints about MN informing SN about remaining indexes. CATT think the hard split could be hard coded in the spec of informed by the MN and then the SN selects from its set without MN involvement.

P3
- Nokia would like to support renegotiation so that the SellIndex space can be kept small and use the smaller format. Ericsson think these agreements don't have direct impact to the choice of PHR format to be used.
- ZTE think the MN decision is per UE as it can depend on UE capability.



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**Agreements**
1 No change to previous agreements that the UE includes ARFCN and PCI of the NR serving cells are used to identify the NR serving cell measurements. SCellIndex is not used for this purpose.
2 SCellIndex is unique in the UE (i.e. across NR and LTE SCells)
3 Each node allocates SCellIndex for its own cells (from a set of SCellIndices available to that node) without involvement of the other node at the time of allocation of the SCell
4 MN decides the SCellIndex range available for MN and SN, and informs the SN range to the SN. This is a per UE configuration.

=> Offline discussion for stage 3 details to be captured in the inter-node RRC message. (Offline discussion #05, CATT).

R2-1714170 Offline discussion #05: stage3 details to be captured for SCellIndex coordination CATT

**Agreements**

1: The MN provides the SN the range of SCellIndex to be used by signalling a start value and a stop value if the range. 32 SCellIndex range is used between the MN and the SN. The UE uses “Dual Connectivity PHR MAC Control Element supporting 32 serving cells with configured uplink” for PH reporting.

R2-1712441 Consideration on the Coordination of SCell Index in EN-DC ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1713431 Serving Cell Index across Cell Groups Ericsson discussion Rel-15 NR_newRAT-Core
*moved from 10.2.9 to 10.2.5*
R2-1712998 Discussion on the SCell index vivo, Xiaomi, CATR, TCL discussion Rel-15 NR_newRAT-Core
*moved from 10.2.9 to 10.2.5*

*Other*
R2-1713149 Remaining issue on SRB3 establishment Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
- Intel think the SK counter should also be signalled to the UE at time of SCG setup. Huawei think that without this counter the SCG bearer cannot be setup.
- ZTE think the SK counter should always be provided and then the SN can make the decision to setup SRB3. So we don’t need to change the agreement.
- Ericsson think we already agreed the SN makes the decision to setup SRB3. We could also have the case that the SN requests the key from the MN when needed.
- LG think the previous agreement doesn’t need to be changed.
- Huawei clarify that the MN can always provide the SK counter and security capability to the SN, so we don't want to change the previous agreement. CATT also support the MN always provides this information. Nokia also have this understanding.
- Ericsson think this was also discussed in RAN3.
- LG suggest that SRB3 and SCG anchored DRN could be linked to resolve the problem

Agreement:
1 The MN should always provide SK counter to the UE and SKgNB and security capability to SN at SN addition (even if no SCG anchored bearers are setup) in order to enable SRB3 to be setup based on SN decision.

R2-1712251 Discussion on SCG RRC reconfiguration failure on SRB3 OPPO discussion
R2-1712310 SN change/addition during handover HTC Corporation discussion
R2-1713436 Race conditions in case of SCG change Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713782 NR UE Capability Size Reduction LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711420

*Withdrawn*



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R2-1712271 BWP Switch Impact on MN/SN procedures Spreadtrum Communications discussion Rel-15 Withdrawn

## 10.2.6 Security for EN-DC

*Any remaining stage 2 aspects relating to security for EN-DC.*
*This agenda item is relevant to EN-DC completion.*

R2-1712468 TP for Usage of user plane integrity protection Qualcomm Incorporated, Panasonic, Samsung, MediaTek Inc., Lenovo, Motorola Mobility discussion Rel-15

- ZTE think this is related to non EN-DC. Have a paper in R2-1712611 submitted to a different agenda item proposing that it would be a capability.
- LG think if we agree it can be captured in the stage 2 but don't think a capability is needed.
- Nokia would prefer no limit form network point of view but can accept it. But think 64kbps is too low. And also think that a capability is needed to enable UEs to do better.
- ZTE think the very low bit rate will preclude some applications.
- Huawei also think a capability is useful.
- Qualcomm would be ok to have a capability. May need to think about some averaging window for this.
- LG think the some CN signalling can be used instead of a radio capability.
- MediaTek think capability would be a simple way to achieve this. The averaging discussion can wait.
- Ericsson agree that this mainly for IoT use cases but it is difficult now to fix to certain bit rates. Need to know what was discussed in SA3.
- Qualcomm expect that the network will schedule the integrity protected data to meeting this requirement.
- Intel think the network need to know when the DRB is setup what the likely maximum data rate will be in order to decide whether IP can be setup.

**Agreements**
1 UE capability to be added for the maximum aggregate data rate per UE of user plane integrity protected data for DRBs.
2 Lowest possible value for the data rate is XX kbps

=> Offline discussion to conclude the XX value to be indicated in the LS
=> Inform SA3 cc SA2 of our decision and ask them if the lowest maximum data rate value is acceptable for the uses cases they were considering. Draft LS in R2-1714076 (Offline discussion #07, Qualcomm)

Following discussion of SA3 response LS:
=> XX = 64 kbit/s. UE capability signalling will also support values above 64 kbit/s up to the maximum supported bit rate of the UE.
=> Agreement to be captured in TS 38.306.

R2-1714076 [DRAFT] LS on maximum data rate of user plane integrity protected data Qualcomm LS out Rel-15 NR_newRAT-Core To:SA3 Cc:SA2
=> Change DRB to DRBs
=> Change question to SA3 for "Does SA3 see any problem with the RAN2 agreed lowest possible value for the user plane integrity protected data rate"
=> Approved in R2-1714125

R2-1714166 TP for the maximum data rate of user plane integrity protection Qualcomm IncorporatedpCR Rel-15 38.300 NR_newRAT-Core

R2-1712697 UE security algorithm capability signalling in EN-DC Intel Corporation discussion Rel-15 NR_newRAT-Core
P1

- DOCOMO think it the first proposal can be confirmed then it will simplify things. Wonder is from UE perspective whether all the NR algorithms can be supported.
- ZTE think we cannot decide that UE has to support the same algorithms. Qualcomm think that if in future we support an LTE only algorithm then it will cause problems.



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- Intel clarify that this proposal is just for the existing algorithms and not new ones, for which there would be an MME update anyway.
- Ericsson can agree with the proposals. Qualcomm think CT1 is discussing this as well.
- Intel explain the intent is not to prevent NAS from adding signalling but that if the NAS is not updated then the RAN can rely on just the LTE capabilities. Lenovo have the same understanding as Intel and think this was clarified by SA3.

**Agreements**
1 EN-DC UE shall support the NR algorithms (nea0/1/2/3 and nia0/1/2/3) corresponding to the LTE algorithms (eea0/1/2/3 and eia 0/1/2/3) signalled at NAS. This agreement does not apply to future algorithms that may be added to LTE or NR.
2 There is no need to signal the UE NR AS Security capability over LTE RRC.
3 Mapping from LTE security algorithms (provided over S1) to corresponding NR security algorithms (where necessary) is performed at eNB.

=> Draft LS to SA2, CT1 and SA3 with RAN2 decisions, for verification and consideration in their specifications. R2-1714077 (Offline discussion #08, Intel)

R2-1714077 [DRAFT] Reply LS on algorithm selection in E-UTRA-NR Dual Connectivity Intel LS out Rel-15 NR_newRAT-Core To:SA2, CT1, SA3
=> Approved in R2-1714124

R2-1713379 Possibility of NR PDCP COUNT wrapping around Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
- ZTE had the same understanding as Nokia when this was agreed that COUNT can wrap but not with the same key.
- LG think we agreed COUNT will not wrap and hence network needs to release and add the DRB to avoid he problem. Lenovo think there will be data loss with this.
- ZTE wonder what was the issue in the user plane. LG explain the issue is in the complexity of PDCP procedures to check for the wrap around. Also it is not exactly the same as LTE so we can't just reuse the LTE approach.
- OPPO think that this could be the same as LTE and can be addressed by reconfiguring the DRB ID without key change.
- Samsung think PDCP compares absolute values of count and this will not work if count wraps.
- LG also think COUNT wrap is very rare so changing the previous agreement would be an optimisation for a rare case.
- Nokia think this an artificial limitation. Nokia think that SN can only request release of DRB and MN doesn't know why.

=> RAN2 confirm previous agreement that COUNT does not wrap around.
=> Offline discussion on the MN/SN interaction to avoid a COUNT wrap in SN. (Offline discussion #09, Nokia)
- Update from offline discussion from Nokia. Majority of companies want to stay with current agreements

R2-1712430 Use of two security keys in the same network node Lenovo, Motorola Mobility discussion Rel-15 NR_newRAT-Core
R2-1712539 UE handling requirement for integrity on DRBs Huawei, HiSilicon discussion Rel-15
R2-1713138 UP integrity protection check failure handling in LTE-NR DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713396 Handling of UP integrity protection failure Ericsson discussion Rel-15 NR_newRAT-Core

## 10.2.7 Single Tx

*Any remaing aspects for single tx operation, including capability signalling and TDM pattern coordination (NOTE: Conclusion of dicussion with RAN3 chair is that TDM pattern coordination will be discussed first in RAN2)*
*Including output from email discussion [99bis#15][NR] Capability of signalling for 1 tx (Nokia)*
*UE capability*



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R2-1713168 Report of email discussion 99bis#15 Nokia (rapporteur) report Rel-15 NR_newRAT-Core

P1

- Nokia think this re-introduces per BC bits that we try to avoid. Also think it ties the RAN2 and RAN4 specifications more tightly than the other approach.
- Vodafone think there will no mechanism to indicate problem channel allocations.
- DOCOMO tend to agree with Nokia. We are trying to avoid putting bits into the BC signalling.
- Vivo think the bit should be included in the BC signalling and also this is consistent with the RAN4 LS.
- OPPO think based on LS from RAN and RAN4 the per BC indication is the simplest way.
- Apple think the proposal is aligned with the RAN4 agreements which says the capability is per BC. RAN4 will define a formula for channel combinations within a BC. Apple also think this is pure RF capability and hence not related to BPC.
- Qualcomm think there is a problem with the fallback combinations to avoid them being signalled. We need a solution for this. Ericsson is ok with this for sake of progress but think we need to address the fallback combination issue.
- T-Mobile think a per BC bit is the right way to go but think we need to allow fallback combinations and also some channel indications per BC.
- Intel also support per BC bit and for fallback mechanism we need to have a general discussion.
- Huawei share Intel's view and the fallback solution needs to be discussed.
- LG also support the per BC signalling.

**Agreements**

1: RAN2 to adopt per-BC capability bit for SUO. The bit applies to all fallback BCs that are defined in RAN4 as problematic BCs. The bit does not apply to fallback BCs that are defined in RAN4 as not problematic BCs. Hence the UE does not explicitly list the fallback BCs.

2: UE is only allowed to set the per-BC capability bit for those band combinations that are defined in RAN4 as problematic BCs

R2-1712282 Discussion on UE capability signaling for 1TX transmission ZTE Corporation,Sanechips discussion NR_newRAT-Core

R2-1712847 Capability design for single UL transmission Apple discussion Rel-15 NR_newRAT-Core

*TDM pattern*

R2-1713209 TP on LTE RRC for supporting single UL transmission Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

- Apple think only the reference UL/DL configuration is necessary. Huawei explain this is their intent and it can be clarified.
- Ericsson ask if the reference UL/DL config is the same as the TDD configuration. ZTE think it is a bit different as the special subframe is considered as DL.

**Agreements**

1 The reference UL/DL configuration (0 to 6) and HARQ_offset (0 to 9) should be configured to UE in case the UE is configured with EN-DC and simultaneous transmission on LTE UL and NR UL is not supported.

=> Stage 3 details to be added to the 36.331 CR can be progressed offline

R2-1712850 LTE impact of single UL transmission Apple discussion Rel-15 NR_newRAT-Core

- Huawei is not sure that a capability is needed. If UE indicates it needs 1tx then it could be mandatory that the UE supports case 1.
- Apple explain that case 2 does not need UE support and hence no capability is needed.
- ZTE think for case 2 the network still needs to indicate a pattern to the UE as the patterns need to be aligned. Nokia think case 2 is that nothing is signalled to the UE. Ericsson also think case 2 is up to network implementation how to avoid the simultaneous transmission on LTE and NR. Also think that case 1 could be an optional feature but maybe RAN1 should decide.
- Qualcomm also understand that case 2 relies on network scheduling but wonders how it works for UE initiated signalling such as RACH. Intel understand that case 2 relies fully in



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network and this includes the RACH configuration but if there is a collision it could be left to UE implementation.
- Samsung assume the capability may not be needed.

P3
- Apple think the definition of the HARQ RTT Timer needs to be updated.

**Agreements**
1 HARQ RTT Timer should be updated to reflect the case 1 which is based on the HARQ/scheduling timing according to dl-reference UL/DL configuration (i.e.tdd-Config-v15).

R2-1713684 TDM pattern coordination for 1Tx and Harmonic scenario vivo discussion Rel-15 NR_newRAT-Core
- ZTE think exactly the same procedure could be applied for the 2 cases.
- ZTE think we could define a container over X2 that carries the same IE as provided to the UE in the case 2 case.
- Nokia also agree the same approach should be used but don't think an inter-node message helps as what is exchanged between nodes is not what is sent over the radio to the UE.
- Ericsson think the harmonic issue has some additional FDM coordination and think RAN3 can discuss all the required cases.
- Apple suggest to focus on the 1TX case and then see if it can be used for the harmonic issue. Also think thinks this is a UE specific pattern so it is reasonable to use an inter-node message.
- Intel think the TDM pattern coordination can be treated separately. The only case bot are needed is that the BC has both harmonic and 1 tx issue.
- Huawei prefer that this is carried on Xn interface.
- Ericsson think the information is not sent to the UE, but only to inform the node how to schedule the UE. Also the information will need to be provided to the DU. Also the harmonic case requires time and freq coordination but 1tx is a subset of this

**Agreements**
- RAN2 assume that RAN3 will progress the topic of TDM pattern coordination for 1Tx.

=> Can discuss offline what addition guidance can be given to RAN3 about the TDM pattern for 1Tx case.
=> Draft LS to RAN3 to inform them of our decision. R2-1714078 (Offline discussion #10, Apple)

R2-1714078 [DRAFT] LS on TDM pattern coordination for single UL operation Apple LS out Rel-15 NR_newRAT-Core To:RAN3
=> Remove " and complete the work in this meeting " from the action.
=> Add statement to the first paragraph that "It is up to RAN3 to define the signalling and whether the same mechanism is used to address the harmonic issue"
=> Approved in R2-1714129

R2-1712370 LTE-NR coordination for RF coexistence Qualcomm Incorporated discussion Rel-15 NR_newRAT
R2-1713167 Finalization of SUO for EN-DC Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1712281 Discussion on single TX transmission and solution ZTE Corporation, Sanechips discussion NR_newRAT-Core
R2-1712696 TDM pattern for single UL Tx Intel Corporation discussion Rel-15 NR_newRAT-Core
R2-1712848 TDM pattern coordination for single UL transmission Apple discussion Rel-15 NR_newRAT-Core
R2-1713347 single Tx operation and HARQ timing Ericsson discussion Rel-15 NR_newRAT-Core

*Other*
R2-1712849 Stage-2 TP for single UL transmission Apple discussion Rel-15 NR_newRAT-Core
R2-1712985 Single and simultaneous UL on problematic channels Sony discussion Rel-15 NR_newRAT-Core



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R2-1714238 Stage-2 TP for single UL transmission Apple discussion Rel-15 NR_newRAT-Core
=> Noted.

## 10.2.8 Supplementary uplink

*Any remaing stage 2 aspects for SUL operation, including any joint CP/UP aspects. Contributions on stage 3 aspects should be submitted in the corresponding stage 3 AIs.*

R2-1713208 Discussion paper on procedures for supporting SUL Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

P3

- Intel think this approach is feasible but wonder what happens of the UE selected UL carrier is different from the network selected carrier.
- ZTE wonder for which cases the threshold based selection should be used. Think for HO, SCG change and PDCCH order the network should control the carrier. For SR case the UE would be configured which UL carrier to use. LG have the same understanding so the threshold is only needed for idle mode, and in connected the network can control the carrier.
- Vivo wonder if the UE can configure dedicated RACH on more than one UL.
- Qualcomm support the proposal and the UE should be ready to receive RA from either UL.
- IDC think the threshold should be used in cases that the network is not able to received SRS in advance of the random access.
- OPPO think that the threshold based should be used.
- ZTE think there may be cases in connected where the threshold is needed.
- Nokia think the RAN1 LS was that threshold should be used for contention based. Huawei agree this was the intention of RAN1. Intel think the RAN1 LS was focussed on initial access and doesn't comment on connected mode. Think both approaches can work and given that PUCCH and SRS are semi statically configured then RA could be configured in this way.
- Ericsson think we could just configure RA on a single SUL carrier. In the time available it would be easier if just one UL has RA resources. ZTE think the RA resource on both carriers is already agreed in RAN1.
- CATT think the resources will be needed for idle and hence they will also be there for connected.
- CMCC think the threshold approach also gives some information to the network which carrier is good for the network to use.
- Qualcomm think it should be possible to use resources on the higher frequency carrier when possible to reduce load on the lower frequency SUL.

P6

- OPPO think the network should be able to configure 2 sets of RA resources and the UE chooses even for CFRA. CATT have the same view.

P9

- Intel do not see the need for per UL PHR as only UL one is used at a time and also the DL pathloss is the same for both carriers. DOCOMO share the same view.
- Huawei think even without simultaneous transmission we still have dynamic scheduling.
- Vivo think we still have PUCCH and PUSCH on different carriers at the same time.
- Qualcomm think the per carrier PHR is needed. This is needed for DCI based uplink switching.
- LG think even with DCI based switching the per carrier is not needed as the network know which carrier is used.
- CATT think the network has all the information to derive what it needs for the other carrier.

**Agreements for connected mode operation:**

1 Random access resources (including PRACH and common PUSCH configuration just for the RA procedure) can be configured on both the UL and the SUL carrier.

FFS: Whether common PUCCH configuration is also needed for the connected mode case.

2 For contention based RA, if the network does not explicitly tell the UE which carrier to use, the UE shall perform UL selection based on the RSRP threshold as initial access.

3 For contention free RA, the network explicitly indicates to the UE which UL carrier to used (e.g. in PDCCH order or via dedicated RRC RACH configuration) (For PDCCH order case RAN1 needs to make final decision if the carrier can be indicated in the DCI)

4 SUL specific configuration should also be carried in the inter node messages for EN-DC and handover cases.



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5 RRC configuration can include PUSCH, SRS and power control info per UL carrier, and dedicated PUCCH for a single UL carrier.
FFS: What combination of configuration per carrier are allowed.
6 Per UL PHR reporting is not supported in this release.

Offline discussion to try to progress the FFS points. (Offline discussion #16, Huawei)

R2-1714173 offline discussion report for SUL remaining issues Huawei

**Agreements:**
1: Common PUCCH configuration can be included in the common configuration in the RRC dedicated signalling.
2: The UL differentiation (i.e. indication of SUL and UL) in DCI is predefined
3 In RRC signalling separate UL configuration and SUL configuration structures as they both only represent up to one UL configuration. The setupRelease structure can be used to indicate addition/modification/removal for each UL.
4: Confirm the RRC configuration as in the table in the paper (the BWP parts should follow the agreements from the BWP discussion)

R2-1712675 Random Access in SUL Intel Corporation discussion Rel-15 NR_newRAT-Core

R2-1712805 Control Plane Impacts of SUL InterDigital discussion Rel-15 NR_newRAT-Core
=> MAC CE based switching of the UL carrier will not be supported

R2-1712277 Discussion on initial access for SUL ZTE Corporation,Sanechips discussion NR_newRAT-Core
R2-1712247 Discussion on RACH issue and UE capability for SUL operation OPPO discussion
=> revised to R2-1713946
R2-1713946 Discussion on RACH issue and UE capability for SUL operation OPPO discussion
R2-1712278 Discussion on configuration of uplink channels for SUL carrier ZTE Corporation,Sanechips discussion NR_newRAT-Core
R2-1712760 RACH resource selection for SUL vivo discussion Rel-15 NR_newRAT-Core
R2-1712836 On the procedures for SUL Samsung discussion NR_newRAT-Core
R2-1712999 Remaining stage-2 issues of SUL carrier for EN-DC vivo, CATR discussion Rel-15 NR_newRAT-Core
=> revised to R2-1713955
R2-1713955 Remaining stage-2 issues of SUL carrier for EN-DC vivo, CATR discussion Rel-15 NR_newRAT-Core

R2-1713706 Support of SUL in EN-DC and Standalone NR HO LG Electronics Inc. discussion Rel-15 NR_newRAT-Core
R2-1713810 On the impact of supplementary uplink on HARQ configurations Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1713847 The Impact of SUL on UL Transmission without Grant Samsung Electronics discussion

*Late*
R2-1713628 Discussion on remaining SUL issues for EN-DC Ericsson discussion Rel-15 NR_newRAT-Core

## 10.2.9 EN-DC - other aspects

*Any remaining stage 2 aspects. Contributions should include a TP to show how the stage 2 specification would be impacted (if no stage 2 spec impact then the contribution should be submitted to an appropriate stage 3 AI)*
*This agenda item is relevant to EN-DC completion.*
R2-1713150 Clarification on duplication SRB in EN-DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1711091
=> Covered by previous discussion.

R2-1713251 Consideration on the PSCell Change and SCG Change in EN-DC ZTE Corporation, Sanechips discussion Rel-15 NR_newRAT-Core



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- CATT think if PDCP recover needs to be performed for split bearers then the MN will need to be involved.
- Ericsson think in some cases MN is not involved
- ZTE understand that RAN3 would also have to use a different terminology instead of SCG change.

**Agreement**
1: The PSCell Change included in the SN Modification procedure should be specified clearly in TS 37.340, i.e. in EN-DC:
- The PSCell change without security key change can be performed via SN initiated SN Modification with or without MN involvement procedure (depending on the case);

FFS: For which cases it is possible to perform the PSCell change without MN involvement
- The PSCell change with security key change should be performed via SN initiated SN Modification with MN involvement procedure.

2: The concept of "SCG Change" should be removed in TS 37.340 (replacement term could be e.g. SN security refresh)

=> TP to be updated in R2-1714122 (Offline discussion #19)
=> Draft LS to RAN3 in R2-1714123 to inform them of our decisions (Offline discussion #19, ZTE)

R2-1714122 Consideration on the PSCell Change and SCG Change in EN-DC ZTE Corporation, Sanechips discussion Rel-15 NR_newRAT-Core
=> Revised in R2-1714176 to address comments received
=> Offline discussion to consider whether we need to add an SN to NM indication to enable the SN to request the MN to perform PDCP data recovery

R2-1714176 Consideration on the PSCell Change and SCG Change in EN-DC ZTE Corporation, Sanechips discussion Rel-15 NR_newRAT-Core
=> TP is agreed

R2-1714123 [DRAFT] LS on replacement of "SCG change" with "SN Security Refresh" indication ZTE LS out Rel-15 NR_newRAT-Core RAN3
- Intel think we need to inform RAN3 that there is an indication from SN to MN to trigger the PDCP data recovery.

=> Revised LS in R2-1714147

R2-1714147 [DRAFT] LS on replacement of "SCG change" with "SN Security Refresh" indication ZTE LS out Rel-15 NR_newRAT-Core To:RAN3
=> Approved in R2-1714169

R2-1712613 Handling of EN-DC with suspend/resume ZTE Corporation, Sane Chips discussion Rel-15
- Intel thinks the latest RRC CR addresses this. The SCG configuration is always released for re-establishment and resume. For the radio bearer configurations they need to be kept and the MN can keep them or reconfigure them at re-establishment. For suspend case there are more cases that need to be discussed.
- Ericsson think it is important to keep the PDCP configuration of the bearer.
- Samsung think that for release 13 suspend the S1 connection is released completely so why is this needed.
- Ericsson think in R13 the SCG config is released when the UE resumes, but now for R15 we can keep the bearer configuration but release the SCG configuration. Intel think this is sufficient from the UE point of view.
- Samsung think keeping the bearer configuration only makes sense if the S1 is kept.

=> Noted

R2-1712695 Support of measurements on legacy RATs for EN-DC Intel Corporation discussion Rel-15 NR_newRAT-Core
- Qualcomm understand that RAN4 have not got this agreement. If voice is ongoing then it would be needed to keep measurements for legacy RATs ongoing. Also think that it is not



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just for RAN4 to decide this. Intel agree that it is a surprising decision in RAN4 and the aim is to raise awareness.
- Ericsson think from RAN2 point of view we should support the measurements. Although RAN4 may not have performance requirements for these measurements.

=> Noted

R2-1712248 Discussion on the data available for BSR calculation due to DRB IP OPPO discussion
R2-1712249 Discussion on the data recovery due to DRB IP failure OPPO discussion
R2-1713398 Discussion and Stage 2 TP on Race conditions in case of SN release Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713490 Considerations on fast access inter-site small cells in NR Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core R2-1711004
R2-1713594 ANR framework in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713595 TP on ANR to 36.300 Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713773 Remaining issues on suspension to INACTIVE in MR dual connectivity Samsung Electronics discussion
R2-1713801 Power management by cross-RAT signaling in NSA configuration Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711701

*Withdrawn*
R2-1712272 Text Proposal for Stage 2 on SN initiated SN Modification in TS37.340 Spreadtrum Communications discussion Rel-15 Withdrawn
R2-1713169 Considerations on fast access inter-site small cells in NR Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core Withdrawn

## 10.2.10 Mobility mechanisms - basic handover

*Any remaining stage 2 aspects of basic handover (and not common to SCG change for EN-DC). Contributions should include a TP to show how the stage 2 specification would be impacted (if no stage 2 spec impact then the contribution should be submitted to an appropriate stage 3 AI)*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows*
R2-1712408 TP for on-demand SI acquisition during HO PANASONIC R&D Center Germany discussion Rel-15
R2-1712506 Further discussion on information for handover Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710262
R2-1712603 Discussion on the support of MBB and RACH-less in NR ZTE Corporation, Sane Chips discussion Rel-15 R2-1710430
R2-1712822 Further issues on basic handover procedure Fujitsu discussion Rel-15 NR_newRAT-Core
R2-1712885 TP on Basic HO Considering the FFS Issues MediaTek Inc. discussion R2-1710869
R2-1712761 Remaining issues and TP for baseline handover procedure vivo discussion Rel-15 NR_newRAT-Core R2-1710932
*moved from 10.2.9 to 10.2.10*

## 10.2.11 Mobility mechanisms - other

*Note decisions at RAN2#97bis to progress the basic HO mechanism and only when stable to discuss conditional handover and potential optimisations to target close to 0ms or 0ms interruption.*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*
R2-1712175 Ping Pong Issues for Conditional Handover TCL discussion NR_newRAT-Core R2-1710169
R2-1712259 Mobility enhancements for NR NSA Samsung discussion Rel-15 NR_newRAT-Core
R2-1712260 Mobility enhancements for NR SA Samsung discussion Rel-15 NR_newRAT-Core
R2-1712503 Support for intra-frequency dual connectivity in NR AT&T discussion
R2-1712508 3 Types of HO in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710264
R2-1712509 Further discussion on Conditional HO Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710265
R2-1712510 DC based NR scheme for 0ms interruption handover Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710266



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R2-1712511 Security key change without L2 reset Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710267
R2-1712512 DC for intra-frequency mobility in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710268
R2-1712513 Mobility enhancements for PCell change Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710270
R2-1712514 Potential Advantages of multi-connectivity with multiple MAC entities within an NR cell Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710271
R2-1712515 Inter MN handover without SN change Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710272
R2-1712516 Allocation of appropriate RACH resources for handover Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710273
R2-1712548 Automatic Neighbour Relation in NR Huawei, HiSilicon discussion Rel-15 R2-1710543
R2-1712604 Targeting a Lossless handover with 0ms interruption ZTE Corporation, Sane Chips discussion Rel-15 R2-1710434
R2-1712605 Discussion on single connected handover ZTE Corporation, Sane Chips discussion Rel-15 R2-1710435
R2-1712651 Handover optimization in NR for Rel 15 Intel Corporation discussion Rel-15 NR_newRAT-Core
R2-1712794 Conditional Reconfiguration for NR InterDigital discussion Rel-15 NR_newRAT-Core R2-1710669
R2-1712872 Mobility Enhancement for ‘0ms Interruption’ HO MediaTek Inc. discussion NR_newRAT-Core R2-1710871
R2-1712874 One or Multiple NR-Cells per MAC Entity MediaTek Inc. discussion NR_newRAT-Core R2-1710872
R2-1712946 Discussion on Inter DU mobility KT Corp. discussion
R2-1712950 Conditional handover in NR system Lenovo, Motorola Mobility discussion Rel-15 NR_newRAT-Core
R2-1712958 Discussion on conditional handover in NR KT Corp. discussion R2-1710892
R2-1713402 0 ms interruption support during handover procedure in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713403 RACHless HO in NR when UE is in CA or DC Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713605 Enhancing Handover Failure Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713606 Conditional Handover Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713607 Conditional Handover Simulation Results Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713608 On Reliability, overhead and controllability aspects of Conditional Handover Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713701 Handling of SRBs in connection re-establishment LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711396
R2-1713747 Discussion on Conditional Handover in NR ASTRI, TCL Communication Ltd. discussion
R2-1713783 DRB Handling while RRC Connection Re-establishment in NR LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711419
R2-1713820 Conditional handover procedure LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1707134
R2-1713843 Conditional Handover: Event Design Aspects Samsung Electronics discussion R2-1711600
R2-1713848 The Necessity of Fast RLF Recovery based on T312 in NR Samsung Electronics discussion R2-1711599
R2-1713850 Discussion on intra-frequency DC as an aggregating solution and mobility solution Samsung R&D Institute UK discussion
R2-1713853 Problem of DC enhancement for 0 ms interruption time Samsung R&D Institute UK discussion R2-1711412 Withdrawn
R2-1713854 Problem of DC enhancement for 0 ms interruption time Samsung R&D Institute UK discussion R2-1711412
R2-1713855 Introduction of Conditional handover Samsung R&D Institute UK discussion R2-1711413 Withdrawn



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R2-1713856 Introduction of Conditional handover Samsung R&D Institute UK discussion R2-1711413
R2-1713857 Operational aspects of conditional handover mechanism Samsung R&D Institute UK discussion R2-1711416

## 10.2.12 Mobility - RLM,RLF

*Any remaining stage 2 aspects of radio link monitoring procedure and criteria for declaring radio link failure, including impact of beam failure/recovery based on responses from RAN1 to questions sent from last meeting.*
*Stage 2 for RLM/RLF for EN-DC is considered complete, and hence this agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*
*Maximum 1 tdoc per company*

R2-1712238 Discussion on Detailed Issues for RLM OPPO discussion
R2-1712276 Discussions on the IS and OOS counting procedure Spreadtrum Communications discussion Rel-15
R2-1712559 RLF for NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712753 RLM/RLF in NR vivo discussion Rel-15 NR_newRAT-Core R2-1710919
R2-1713588 Remaining open issues of RLM and RLF in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713898 RLM RS type and L3 parameter differentiation Samsung R&D Institute UK discussion

## 10.2.13 Mobility without RRC involvement

*AI is a placeholder for when RAN1 has made progress on beam management. Any RAN2 contributions should focus on the RAN2 implications as a consequence of RAN1 agreements - do not submit duplicates of RAN1 documents here.*
*This agenda item is relevant to EN-DC completion*

R2-1712561 Need for new MAC CEs for UL and DL beam management Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
- DOCOMO think RAN1 is still discussing and think they may send an LS. They may send it on Thursday.
- Samsung have the same view as DOCOMO. Think they will not conclude MAC CE for all of these. LG think that RAN1 might decide on DCI based signalling.
- Ericsson think in some cases it is clear that some MAC CEs will be needed.

=> Offline discussion to try get a common understanding of what RAN have agreed (and any information from ongoing discussion of RAN1) and what MAC CEs will need to be defined. Then draft LS to ask RAN1 to confirm the understanding. (Offline discussion #17, Ericsson) Initial list and final LS when ready will be seen and approved by UP session.

- Update from offline:

R2-1714243 DRAFT LS on MAC CEs for beam management and CSI Ericsson
=> Approved in R2-1714246

R2-1713738 RRC configuration of CSI-MeasConfig Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713406 Discussion on the beam failure recovery impact on RAN2 ZTE Corporation discussion
=> Revised to R2-1713954
R2-1713954 Discussion on the beam failure recovery impact on RAN2 ZTE Corporation discussion

P2
- MediaTek think that it is not exactly CFRA but just uses a part of it. Nokia have the same view. We can agree to capture it in MAC but think it could be a separate section instead of into the same procedure.

P3
- MediaTek think this is agreed in RAN1 but it is good to have a clear RAN2 understanding
- LG think it needs to be addressed to RA-RNTI, cannot use C-RNTI and contention resolution is required. ZTE think this aspect was discussed in RAN1 and it can be done as these are contention free resources. Panasonic agree with ZTE.
- MediaTek explain it is a separate resource for beam recovery compared to other RA.
- ZTE explain this is only reserved on beams that the UE could potentially recover on.

- Ericsson wonder if in the SSB case why can't the UE recover on any beam. MediaTek think even in the case that the beam uses SSB then there is a dedicated resource for recovery.

P4

- Ericsson think that the UE should recover if it finds itself in a beam that is not indicated by the network. And it would be good for the UE to use CBRA for this purpose to avoid allocating dedicated resources.

P5

- Samsung support to have fallback to contention based resources.
- ZTE think the beam recovery mechanism is not used with CBRA. If CBRA was used there would be more signalling needed in order to recovery the beam.
- Ericsson think the most important case is to use the CBRA. Nokia also agree but this will be a bit different from what RAN1 have so far agreed. Ericsson think it could just be a CBRA with C-RNTI in msg3 and it might lead of a reconfiguration from the network.
- Panasonic think that RAN1 still have FFS on use of CBRA.
- LG would prefer to align with handover and hence fallback to CBRA.

=> UP session can discuss whether the RA for beam recovery is in a new section of included in the existing RA text.

**Agreements**

1 The reception of the gNB response to beam recovery request sent on RACH is based on the monitoring of a PDCCH addressed to C-RNTI within a time duration configured by RRC.

2 Beam recovery can take place on a candidate beam (e.g. beams above threshold) with dedicated PRACH resources either associated with an SSB or CSI-RS resource.

FFS In which spec the criteria for a candidate beam for beam recovery is specified

3: When more than one beam is a valid candidate, it is up to UE implementation to select the beam.

FFS Whether we need to configure candidate beams for recovery with a mixture of SSB based and CSI-RS resource based beams. Any RAN1 agreement on this can be checked

FFS Behaviour in case the beam recovery attempt is not successful

FFS Whether beam recovery is supported using CBRA.

=> Offline to try to progress the FFS points. (Offline discussion #18, ZTE)

=> Stage 3 TP to capture the agreements to be discussed in UP session.

R2-1714178 offline discussion#18 (on the beam failure recovery impact on RAN2) ZTE

**Agreements**

1: For beam recovery purposes RRC signalling allows the case of configuring both SSB + CSI-RS (i.e. simultaneously) for new candidate beam identification. The case where only one of SSB or CSI-RS resource is configured is also covered – i.e. this is network configuration.

2: When more than one beam is a valid candidate, it is up to UE implementation to select either the SSB based resource or the CSI-RS based resource.

R2-1713793 Beamformed NR C-DRX operation Samsung Electronics discussion

R2-1712213 Discussion on beam recovery request in NR ASUSTeK discussion Rel-15 NR_newRAT-Core R2-1711081

R2-1712407 UL resource configuration for the beam failure recovery PANASONIC R&D Center Germany discussion Rel-15

R2-1712562 Consideration on DRX with beam management Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1712563 Handling of resources for beam failure recovery Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1712754 RACH configuration for beam recovery vivo discussion Rel-15 NR_newRAT-Core R2-1710920

R2-1712871 Beam Management and Beam Recovery in MAC MediaTek Inc. discussion NR_newRAT-Core R2-1710870

R2-1712959 Dedicated resource configuration for beam failure recovery Lenovo, Motorola Mobility discussion Rel-15 NR_newRAT-Core R2-1711370



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R2-1713412 Beam Recovery in NR Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1713414 Impact of beam management on RAN2 Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1713688 Prioritized random access for beam failure recovery Lenovo, Motorola Mobility discussion Rel-15 NR_newRAT-Core R2-1711382
R2-1713734 Beam link monitoring in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713792 Aperiodic indications due to Beam Recovery Samsung Electronics discussion R2-1711713
R2-1713796 NR signals for downlink beam management Samsung Electronics discussion R2-1711721
R2-1713797 RAN1 agreements based beam recovery procedure Samsung Electronics discussion
R2-1713888 Beam recovery request Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711361
R2-1713890 Beam reporting and refinement during handover Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711360
R2-1713892 Beam management in C-DRX Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711348
R2-1713894 Beam refinement after beam recovery or scheduling request Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711363
R2-1713910 UL resource allocation and usage for beam failure recovery OPPO discussion
R2-1712870 MAC Functions to support Beam Management and Beam Recovery MediaTek Inc. discussion
*moved from 10.3.1.2 to 10.2.13*
R2-1713533 MAC CEs for activating an RS resource and handling corresponding TCI states Ericsson discussion Rel-15 NR_newRAT-Core
*moved from 10.3.1.13 to 10.2.13*
R2-1713818 Potential new MAC CE NTT DOCOMO INC. discussion Rel-15 NR_newRAT-Core
*moved from 10.3.1.13 to 10.2.13*

## 10.2.14 Mobility - Inter-RAT

*Connected mode mobility between NR and E-UTRA*
*Inter-RAT NR measurements to be added to E-UTRA for purpose of EN-DC should be discussed under stage 3 AI 10.4.2.*
*Inter-RAT E-UTRA measurements to be added to NR for the purpose of inter-RAT handover from NR to -E-UTRA should be discussed under stage 3 AI 10.4.1.3.7*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*
R2-1712517 Inter-RAT handover between LTE and NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710566
R2-1712518 Message content in inter-RAT handover Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710567
R2-1713761 NR inter-RAT mobility to CSG cell LG Electronics Inc. discussion Rel-15 R2-1711647
R2-1713920 Supporting Lossless Inter-RAT Handover Samsung discussion

## 10.2.15 Security (non EN-DC)

*Stage 2 aspects of security for cases other than EN-DC*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows.*
R2-1712438 DRB integrity check failure handling ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1712538 Procedures for enabling security per bearer Huawei, HiSilicon discussion Rel-15
R2-1712545 Re-establishment upon integrity check failure Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710346
R2-1712546 [DRAFT] LS to SA3 on re-establishment upon integrity check failure Huawei LS out Rel-15 NR_newRAT-Core R2-1710347 To:SA3
R2-1712547 "Integrity protection and Counter Check Procedure for NR UP" Huawei, HiSilicon discussion Rel-15
R2-1712611 Data rate restrictions for user plane integrity protection ZTE Corporation, Sane Chips discussion Rel-15



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R2-1712755 Behavior on DRB IP check failure vivo discussion Rel-15 NR_newRAT-Core R2-1710921
R2-1713278 Key refresh at handover in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713301 NR RRC States overview and remaining open issues Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713302 Need for MSG5 at RRC resume Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713305 Way forward with Security in RRC Inactive Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713306 Security for RRCConnectionResumeRequest message Ericsson discussion Rel-15 NR_newRAT-Core

## 10.2.16 Slicing

*Including signalling of slice info to RAN, impact to access control, confirmation (or otherwise) of working assumption from RAN2#99 on use of dedicated prioritises to control idle mode mobility for slicing, etc*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows.*
R2-1712226 Working Assumption Confirmation and Propose TP to TS 38.300 on Network Slicing OPPO, Coolpaddiscussion Rel-15 NR_newRAT-Core R2-1710172
R2-1712350 Slice assistance information over RRC Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1712386 Further Discussion on Slice Selection Information over RRC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712387 Slice-based Unified Access Control Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712388 Slice Availability for Cell Reselection Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712389 What is RAN part of a network slice ? Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712405 Demerits of using Slice information for Cell selection Lenovo Mobile Com. Technology discussion NR_newRAT-Core R2-1710163
R2-1712410 Cell reselection based on slice availability CATT discussion
R2-1712589 Leftover issues for NW slicing ZTE Corporation, Sane Chips discussion Rel-15 R2-1710422
R2-1712756 UE registered slices information at gNB vivo discussion Rel-15 NR_newRAT-Core R2-1710925
R2-1712757 Cell selection/reselection with network slicing vivo discussion Rel-15 NR_newRAT-Core R2-1711080
R2-1712987 NSSAI in MSG5 Sony discussion Rel-15 NR_newRAT-Core R2-1711020
R2-1713232 Requested NSSAI in RRC CMCC discussion Rel-15 NR_newRAT-Core
R2-1713276 Signalling aspects of network slicing Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713277 Slice availability Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713569 Cell reselection for network slicing ITRI discussion NR_newRAT-Core R2-1711762
R2-1713615 Slicing support and cell reselection Qualcomm Incorporated discussion R2-1710785
R2-1713752 AMF selection based on assistance information LG Electronics Inc. discussion Rel-15 R2-1711155
R2-1713866 Connected mobility aspects to support network slicing Samsung discussion Rel-15
R2-1713886 Initial Access considering Network Slices Samsung Electronics GmbH discussion R2-1711779
R2-1713889 Slice Information in RRC Samsung Electronics GmbH discussion R2-1711791

## 10.2.17 QoS

*Any remaining stage 2 aspects, including QoS operation with DC.*
*Detailed topics should be discussed in stage 3 user plane*
*Note agreement at RAN2#97bis that QoS flow remapping at handover will be discussed when flow remapping not at handover has been progressed within user plane session.*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows.*
R2-1712162 On default DRB, default QoS flow and profile Samsung discussion Rel-15 NR_newRAT-Core



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R2-1712163 Further considerations on the number of DRBs and PDU sessions for NR Samsung discussion Rel-15 NR_newRAT-Core
R2-1712358 Notification Control for GBR QoS Flows Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
R2-1712390 DRB Level Offloading in NR DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712391 Notification Control Huawei, HiSilicon, CATT discussion Rel-15 NR_newRAT-Core
R2-1712608 Discussion on QoS flow-DRB remapping ZTE Corporation, Sane Chips discussion Rel-15
R2-1712609 QoS remaining aspects for NR-NR DC ZTE Corporation, Sane Chips discussion Rel-15 R2-1710440
R2-1712612 QoS flow to DRB mapping during HO for bearers using reflective QoS ZTE Corporation, Sane Chips discussion Rel-15 R2-1710441
R2-1712758 Lossless HO for Qos flow and DRB offloading vivo discussion Rel-15 NR_newRAT-Core R2-1710926
R2-1712919 Analysis of the QoS framework (Stage 2) Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712921 QoS Flow Relocation in NR-DC between MN and SN Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713852 Re-configuration scenarios for the NR QoS framework Samsung discussion Rel-15 NR_newRAT-Core

## 10.2.18 Positioning

*This agenda item is not relevant to EN-DC completion but will be treated if time allows.*
R2-1712382 Support of measurement gaps for location related inter-RAT measurements Ericsson discussion Rel-15
R2-1712406 Text proposal for 38.305 skeleton Ericsson discussion Rel-15 38.305
R2-1712471 Text Proposal for Clause 1 to 3 of TS 38.305 Qualcomm Incorporated discussion Rel-15 NR_newRAT R2-1711045
R2-1712473 Text Proposal for Clause 4 of TS 38.305 Qualcomm Incorporated discussion Rel-15 R2-1711047
R2-1712474 Text Proposal for Clause 5 of TS 38.305 Qualcomm Incorporated discussion R2-1711048
R2-1712475 Text Proposal for Clause 6 of TS 38.305 Qualcomm Incorporated discussion R2-1711049
R2-1712476 Text Proposal for Clause 7 of TS 38.305 Qualcomm Incorporated discussion R2-1711051
R2-1712477 Text Proposal for Clause 8 of TS 38.305 Qualcomm Incorporated discussion R2-1711052
R2-1712540 Protocol impacts of positioning in NR Huawei, HiSilicon discussion Rel-15
R2-1713253 Support NR positioning under dual connectivity LG Electronics Inc. discussion Rel-15 NR_newRAT-Core

## 10.2.19 Stage 2 corrections

*This agenda item is for corrections to the draft stage 2 TSs. 'Corrections' means improvements to the way that existing agreements are captured in the TS, or addition of existing agreements that have been omitted (new agreements should not be proposed). In addition, such corrections should first to communicated to the specification rapporteur for possible inclusion in a rapporteur's update, and only submitted here if you conclude a separate contribution should be useful.*
*This agenda item is relevant to EN-DC completion and non EN-DC.*

R2-1712359 QoS Update Rapporteur (Nokia) discussion Rel-15 NR_newRAT
=> Remove " In the downlink "
=> Remove "only" in 2 places
=> Revised in R2-1714230

R2-1712687 Updates to stage 2 QoS flow Intel Corporation, Rapporteur (Nokia) discussion Rel-15 NR_newRAT-Core
=> Remove NAS from A.3 bullet 1
=> TP is agreed with change above

R2-1712168 Clarification for the MR-DC QoS framework Samsung pCR Rel-15 37.340 1.1.1 NR_newRAT-Core

=> Revised in R2-1714237

R2-1714237 Clarification for the MR-DC QoS framework Samsung pCR Rel-15 37.340 1.1.1 NR_newRAT-Core
=> Agreed

R2-1712324 Stage-2 TP for cell definition Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1712360 BWP Description Rapporteur (Nokia), Huawei discussion Rel-15 NR_newRAT
=> TP is agreed

R2-1712838 SUL Description Rapporteur (Nokia), CMCC discussion Rel-15 NR_newRAT
=> Remove " To improve UL coverage for high frequency scenarios, a Supplementary Uplink (SUL) can be configured (see 3GPP TS 38.101 [18]). "
=> Move figure to the Annex.
=> Do not remove PUSCH transmissions
=> TP is agreed with the changes above

R2-1713597 TP to stage-2 on measurements Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713676 TP on capability coordination HTC Corporation discussion
=> Noted

R2-1713900 TP on UE triggered transition from RRC_INACTIVE to RRC_CONNECTED vivo discussion Rel-15 NR_newRAT-Core
=> Revised to R2-1713937

R2-1713937 TP on UE triggered transition from RRC_INACTIVE to RRC_CONNECTED vivo discussion Rel-15 NR_newRAT-Core
=> Removed " cannot retrieve the UE Context "
=> TP is agreed with changes above

R2-1713141 TP on TS 37.340 Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
*moved from 10.2.1 to 10.2.19*
=> First is change is not needed
=> Other changes are agreed

## 10.2.20 Other (non EN-DC)

*Other stage 2 aspects for non EN-DC*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*
*Dual registration*

R2-1712385 Supporting Dual Registration in Access Stratum Lenovo, Motorola Mobility LS out Rel-15 NR_newRAT-Core R2-1710156 To:SA2 Cc:RAN1, RAN4
R2-1713878 RAN2 aspects to support dual registration Samsung Electronics GmbH discussion
R2-1712398 [DRAFT] Reply to LS on simultaneous transmission and/or reception over EPC/E-UTRAN and 5GC/NR Lenovo, Motorola Mobility LS out Rel-15 NR_newRAT-Core R2-1711828 To:SA2 Cc:RAN1, RAN4
R2-1712688 Dual registration solution for 5GS / EPS interworking Intel Corporation discussion Rel-15 NR_newRAT-Core
R2-1712995 Analysis on the feasibility and technical restrictions of dual registration vivo discussion Rel-15 NR_newRAT-Core R2-1710927
R2-1712996 Draft reply LS on dual registration vivo discussion Rel-15 NR_newRAT-Core
R2-1713348 Dual registration and RAN impacts Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713884 [Draft] Reply LS on simultaneous transmission and/or reception over EPC/E-UTRAN and 5GC/NR Samsung Electronics GmbH LS out R2-1711776 To:SA2



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*Other*

R2-1712170 Further considerations on radio network identities for NR Samsung discussion Rel-15 NR_newRAT-Core
R2-1712323 BWP issues for non EN-DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712504 Regarding LS from RAN3 on Centralized Retransmission Solution AT&T discussion
R2-1712521 TP on 38.300 for RNA Configuration Ericsson discussion NR_newRAT-Core
R2-1712522 RAN Sharing and identifier aspects in NR Ericsson discussion NR_newRAT-Core
R2-1712523 VoLTE enhancements in NR Ericsson discussion NR_newRAT-Core
R2-1712524 Support for IMS Emergency calls in NR Ericsson discussion NR_newRAT-Core
R2-1712585 Discussion on the support of SCG SRB for intra-NR DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712943 Bearer handling in NR-E-UTRA Dual Connectivity Samsung R&D Institute India discussion Rel-15 R2-1711088
R2-1713000 UE behavior upon SCell-failure of PDCP duplication vivo discussion Rel-15 NR_newRAT-Core R2-1710930
R2-1713213 Support of Rel-14 voice enhancements in SA NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713350 CP latency in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713351 UP latency in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713401 Support of SRB3 for NR-NR DC Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713692 AS context in RRC_IDLE LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711383
R2-1713696 Impacts of BWP for UE in IDLE and INACTIVE LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711387
R2-1713721 Mobility history reporting in NR LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1710810
R2-1713753 Support for IMS emergency services in NR LG Electronics Inc. discussion Rel-15 R2-1711156
R2-1713772 RAN2 aspect on fast carrier switch Samsung Electronics discussion R2-1711803
R2-1713893 RAN2 consideration on control plane latency enhancement Samsung Electronics GmbH discussion R2-1711793

# 10.3 Stage 3 user plane

*Documents in this agenda item will be handled in the NR user plane break out session*

## 10.3.1 MAC

### 10.3.1.1 TS

*Latest TS 38.321, rapporteur inputs, etc*
*Including output from email discussion [99bis#12][NR UP/MAC] – Running TS 386.321 – Samsung*
*Please provide input to the rapporteur for corrections. Single rapporteur TP is encouraged.*

R2-1712698 Draft TS 38.321 v1.1.0 Samsung (Rapporteur) draft TS Rel-15 38.321 1.1.0 NR_newRAT-Core
=> The TS is endorsed
R2-1713943 List of open issues on NR MAC Samsung (Rapporteur) discussion Agreement TS available Rel-15 38.321 NR_newRAT-Core
Late
=> Not treated

R2-1712980 EN-DC impacts to LTE MAC Huawei, HiSilicon CR Rel-15 36.321 14.4.0 1196 - B NR_newRAT-Core
=> the CR is revised in R2-1714063
R2-1714063 EN-DC impacts to LTE MAC Huawei, HiSilicon, Apple CR Approval R2-1712980 Rel-15 36.321 14.4.0 NR_newRAT-Core 1196
=> Remove the change from 6.1.3.10
=> The CR is agreed in R2-1714072

R2-1713944 Small issues on NR MAC Samsung



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=> Noted

**Agreements:**
1: As in LTE, PDCCH order is used for network to trigger RA to UE
2: As in LTE, UE monitors PDCCH for RAR and Msg4 during random access procedure regardless the occurrence of a measurement gap.
3: The LTE principle is applied to NR on the maximum UL timing differences between TAGs
4: The LTE principle is applied to NR on the UL transmission while TAT is not running.

### 10.3.1.2 MAC general aspects

*Including output of email discussion [99bis#42][NR UP/MAC] – NR Unit replacement – Ericsson*
*Including output of email discussion [99bis#43][NR UP/MAC] Impact of BWP – LG*
*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion will not be treated and are highly discouraged even if you disagree with the proposal made by rapporteur.*

R2-1713462 [99bis#42][NR UP/MAC] - NR Unit replacement Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713463 Text proposal for [99bis#42][NR UP/MAC] - NR Unit replacement Ericsson discussion Rel-15 NR_newRAT-Core
- Xiaomi is concered with the use of the word “immediate”
- Nokia suggests to use TTI
- Convida suggests to use “transmission at this time”
- Nokia thinks that we need to rediscuss the PDCCH occasion in the UL HARQ as it doesn’t cover SPS/GF

=> The principles in this TP are agreeable except the occurance of “immediate”
=> Discuss PDCCH occasion in UL HARQ with SPS
=> Discuss offline for appropriate replacement
=> The TP is revised in R2-1714191

R2-1714191 Text proposal for [99bis#42][NR UP/MAC] - NR Unit replacement Ericsson discussion Rel-15 NR_newRAT-Core
=> for triggering an SR when there is already a grant, use as a baseline what is in the current TS “for immediate transmission” however companies can study until next meeting if there are additional changes needed.
- Xiaomi doesn’t agree to the TP

=> Changes in 6.1.3.1 “Buffer Size: The Buffer Size field identifies the total amount of data available according to the data volume calculation procedure in TSs 38.322 and 38.323 [3] [4] across all logical channels of a logical channel group after <u>the MAC PDU has</u> been built
=> The TP is agreeable. The TP plus the change above in section 6.1.3.1 will be merged from rapporteur in main TS

R2-1713879 Summary of e-mail discussion [99bis43] Impact of BWP LG Electronics UK discussion NR_newRAT-Core
Proposal 2
- Oppo thinks that we need to discuss
- Qualcomm indicates that RAN1 is now discussing the concept of 0 BWP.
- Intel asks what is the UE behaviour before the RRC configuration. It is better to use DCI as there is an ambiguitiy period. Huawei thinks that there may be a problem when the RRC reconfigures the SCell. Nokia thinks that a reasonable network would problem deactivate the SCell and then reconfigure. Vivo agrees.

Proposal 4
- Samsung thinks this depends on RAN1 agreeemnt and whether it is confined within the BWP.

Proposal 6 During CFRA, the network doesn’t perform BWP switching.
- CATT thinks that we may end up switching BWP due to timer and has a proposal that the timer is restarted when a PDCCH order is received. LG thinks that we can also say that the timer doesn’t apply. Nokia asks what happens if the timer expires during the RACH procedure.



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- Vivo thinks that we should have a common solution for both CFRA and CB.
- Nokia thinks that we now also have to consider the beam failure case.

=> Noted

*What UL BWP is used for CBRA*

1. Always Initial UL BWP
2. Active/Additional BWP

- Ericsson thinks that if we always uses initial BWP then all UEs will use the same resources and we should have an option to configure dedicated resources.
- CATT asks if we mandate the UE to switch the DL BWP.
- Samsung thinks that the UE should also store the initial BWP

=> The option of always using UL initial BWP is excluded

*RACH configuration options*

1. Each BWP is configured with PRACH resources (The UE always perform RACH on the active BWP)
2. Some UL BWP are configured with PRACH resources. (The UE performs RACH on the active BWP if configured with RACH resources). FFS what happens when there is not RACH configured with the active BWP
3. Only one BWP are configured with PRACH (e.g. one common BWP)

- Intel thinks that the simplest option is 1 and we don't need to define UE behaviour is different cases. CATT agrees but option 2 can work as well.
- Ericsson has a preference for option 2 as option 1 would mandate network NW to provide UL resources. Vivo agrees
- LG prefers option 1.
- ZTE asks how the NW knows where to transmit in the DL. LG thinks for the overlapping cases the NW can transmit in all DL.
- Panasonic supports option 3.
- Qualcomm supports option 2 and we can simply configure a simple common search space.
- Nokia thinks option 1 is too much for the network.
- InterDigital supports option 2. Mediatek thinks option 1 should be adopted and the NW should always commit RACH resources.
- Ericsson has sympathy for Qualcomm's proposal on using a common search space
- Huawie asks how the association is done with option 1 and option 2. Qualcomm doesn't think that we really need an association.
- Intel asks what happens if the UE switches to initial UL/DL and the network doesn't know. CATT thinks that there may be some loses while the UE does RA. Qualcomm explains that is why the network should properly configure the search space. Lenovo and Ericsson accept the fact that there may some loses, but it's ok. Vivo explains that the UE will send the C-RNTI in msg3 and the network will know where the UE is.

*What happens when a BWP switch command is received by the network while the UE is doing CBRA*

- Mediatek thinks that the simplest thing is to just stop the RA and then restart it in the new BWP. CATT thinks we should restart unless the BWP overlap.
- Convida thinks that we should stop and restart
- LG, Docomo thinks that continuing is the simplest one. For msg4 the network already knows the UE.
- Intel thinks that the UE will continue doing RACH and the network won't know where the UE is.
- Nokia thinks that the UE should continue the RACH procedure in the BWP it started with.
- LG thinks that if we let the UE continue with the existing procedure the UE will switch, select a new preamble and continue.
- Ericsson doesn't think ignoring is very problematic.
- Nokia indicates that in option 1 the UE may end up switching a BWP without a RACH config and has to switch again to the initial UL/DL and it sucks.

**Options**
1. The UE switches UL BWP, stops RA and restarts
2. The UE ignores the UL BWP switch commands and continues the RA procedures
3. UE implementations – UE is free to do whatever it wants (either option 1 or option 2)

Proposal 10
- CATT is concerned with the case that there is a numerology change.

*BWP timer – where to specify*
1. MAC
2. PHY

**Agreements:**
1. The UE behavior on the active BWP includes the followings:
    1. PDCCH monitoring on the BWP
    2. PUCCH transmission on the BWP, if configured.
    3. PUSCH transmission on the BWP
    4. PRACH transmission on the BWP, if configured.
    5. PDSCH reception on the BWP
2. For PCell/SCell, no additional activation step is required to activate a BWP when PCell is newly added (i.e. PCell/Scell is always configured with an active BWP)
3. There is no case that a cell is active with no active BWP.
4. BWP switching cannot occur during RA procedure for RRC Connection establishment
5. During CFRA the network doesn't perform BWP switching. FFS on the impact of beam recovery.
6. The UE stops the BWP timer when it initiates random access procedure
7. For contention based, some UL BWP are configured with PRACH resources. The UE performs RACH on the active BWP if configured with RACH resources. If not configured the UE uses initial UL/DL BWP. It is recommended for the network to configure RACH resources on active BWP. If the UE switches to initial BWP it stays there until told by the network to switch with a DCI.
8. When a BWP switch command is received while the UE is doing CBRA, it is up to UE implementation whether it switches BWP, stops the RA and start in new BWP or whether it ignores the BWP switch command and continues the RA in the BWP where it started.
9. There is no additional text required to specify the UE behaviour for the BWP switching during SR procedure. Only the PUCCH resources on the activated BWP can be considered valid.
10. BWP switching either by DCI or BWP timer does not impact any running *drx-InactivityTimer* or *drx-onDurationTimer*
11. No new PHR trigger condition is required for BWP switching
12. There is one HARQ entity per serving cell even with there are multiple BWPs configured for a serving cell.
13. The BWP timer is specified in the MAC

R2-1714045 LS to RAN1 on BWP related agreements LG LS out
=> The LS is approved in R2-1714049

R2-1713880 TP for outcome of 99bis-43 Impact of BWP NR_newRAT-Core LG Electronics UK discussion
=> The TP is revised in R2-1714046

R2-1714046 TP for outcome of 99bis-43 Impact of BWP discussion
- Samsung ask if the UE doesn't get configured with a default does it use initial
=> Update the TP to cover the case where the UE is not configured with Default BWP the UE uses Initial BWP
=> TP is agreed with the update of fallback to initial BWP (to be covered in the running TS by Rapporteur)



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R2-1713806 BWPs for random access in connected mode Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
=> Not treated

R2-1712433 Consideration on the UE autonomous BWP switch ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
=> Not treated

R2-1712870 MAC Functions to support Beam Management and Beam Recovery MediaTek Inc. discussion
=> Not treated

**Not treated**

R2-1713172 Revisit of Stage 3 MAC spec in consideration of SUL Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1713851 Common C-RNTI for common PDCCH CMCC discussion Rel-15 NR_newRAT-Core R2-1713228

R2-1712326 Remaining issues for BWP Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1713228 Common C-RNTI for common PDCCH CMCC discussion Rel-15 NR_newRAT-Core

R2-1713310 Unresolved NR-UNIT in Bj calculation MediaTek (Wuhan) Inc. discussion Rel-15 NR_newRAT-Core

### 10.3.1.3 MAC PDU format

*Contributions should focus only on critical issues/corrections related to agreed MAC PDU formats – Max 1 contributions per company*

R2-1712781 Remaining issues for MAC PDU format in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

Proposal 1: The UE only discards the first unknown MAC subPDU and subsequent MAC subPDUs; or, it is up to UE implementation how to deal with the unknown MAC subPDU.

- Huawei thinks that with an interleaved structure the UE would have to wait to parse through all headers to check.
- Intel agrees that this restricts UE implementation as some UEs will deliver packets to upper layers upon successful.

=> Noted

R2-1713534 MAC PDU discard at split bearer / SCG bearer reconfiguration Ericsson discussion Rel-15 NR_newRAT-Core
=> the CR is revised in R2-1714192

R2-1714192 MAC PDU discard at split bearer / SCG bearer reconfiguration Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

**Agreements:**
When a MAC entity receives a MAC PDU for the MAC entity's C-RNTI or SPS C-RNTI, or by the configured downlink assignment, containing a Reserved LCID value, or an LCID value the MAC Entity does not support, the MAC entity shall at least:
1> discard the received subPDU and any remaining subPDUs in the MAC PDU.
When a MAC entity receives a MAC PDU for the MAC entity's C-RNTI or SPS C-RNTI, or by the configured downlink assignment, containing an LCID value which is not configured, the MAC entity shall at least:
1> discard the received subPDU.

R2-1713473 RAR Contents Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1712823 Unknown MAC PDU discard Fujitsu discussion Rel-15 NR_newRAT-Core
=> Not treated
R2-1713535 Padding for NR Samsung discussion Rel-15 NR_newRAT-Core R2-1711581
=> This can be specified by just adding a line to state “padding size can be zero”.
=> Add that the L field should not to be present in the MAC sub-header
R2-1712830 BI value and UE Contention Resolution Identity vivo discussion
*Proposal 1: The Backoff Indicator subheader in LTE is reused and reserved Backoff Parameter values can be defined as 1200ms, 1600ms and 2000ms to meet various services (e.g. eMBB, URLLC) in NR.*
- Ericsson and Samsung think that the 0ms value is not useful. Nokia thinks that we have zero in LTE and NBIoT and we shouldn’t remove it.
- Qualcomm thinks the zero values is still important. Ericsson thinks that you can set it to zero by not including the BI.
- Samsung thinks that we should still keep two reserved values.

=> Noted

**Agreements:**
1: In NR, the length of BI is 4 bit
2: As in LTE, the time unit of Backoff parameter value in NR is millisecond.
*3: FFS - The size of UL grant field in RAR message depends on further input from RAN1.*
4: For NR, length of TA field is 12 bits in MAC RAR. FFS if *there are reserved bits depending on the UL grant field size*
5: Temporary C-RNTI is 16 bits in RAR message. C-RNTI is 16 bits. [CB for Friday]
6: BI table design: remove the zero value from the NR BI table. 5 ms and 1920 ms are added in addition to LTE value
*7: If* C-RNTI MAC CE was not included in Msg3, the contention resolution is successful if the UE Contention Resolution Identity received in Msg4 matches the first ‘48’ bits of CCCH SDU transmitted in Msg3. FFS how contention resolution is done for the msg3 based SI request [CB for Friday to flag]

R2-1714071 summary of discussion on BI value vivo
=> Noted
R2-1712835 Handling of unknown, unforeseen and erroneous protocol data vivo discussion
=> moved from 10.3.1.3

### 10.3.1.4 Random access

#### 10.3.1.4.1 Differentiation of RA parameters

*This AI will not be treated. Discussion on this topic will resume where we left off after Dec. 2017*

Not treated
R2-1712381 Categorized Events for Differentiation of backoff and power ramping parameter Beijing Xiaomi Mobile Software discussion Rel-15 R2-1711040
R2-1712837 Differentiation of Backoff parameter and/or power ramping Samsung discussion NR_newRAT-Core
R2-1712911 Differentiation for SR-triggered Random Access Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713472 Differentiation on RACH parameters in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713800 Details of prioritized random access AsusTek, CATT, Convida, Ericsson, Huawei, Intel, Interdigital, ITRI, OPPO, Qualcomm, Vivo discussion Rel-15 NR_newRAT-Core R2-1711695

#### 10.3.1.4.2 Random access in presence of multi-beam operation

*Max 1 contribution per company only on issues related to multi-beam operation*
R2-1712904 Remaining issues on the power ramping Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
Proposal 1: Preamble selection procedure between Group A and B in contention-based random access should be applied for the set of preamble associated with each SS block.



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Proposal 2: For the selection of preamble between group A and B for contention-based RA, the test condition that whether or not msg3 is being retransmitted should be deleted.
- Ericsson thinks that if we change SSB we should re-evaluate the condition but otherwise we don't need.
- Samsung thinks that even in LTE during retransmission the PL can change but we don't re-select. Nokia agrees. Interdigital agrees and there is no need to delete text.

*Proposal 3a: For CFRA, when the network sends a PDCCH order to the UE with the dedicated PRACH resources and the common PRACH resources, the UE chooses the PRACH resource first in the dedicated PRACH resources and then in the common PRACH resources.*
- Samsung indicates that RAN1 is still discussing whether PRACH resources will be provided in case of CFRA

Proposal 4: Remove the above Editor's note and incorporate in RAN 1's agreement: the threshold is configured by the network. Take the following NOTE in the section 5.1.2 of MAC specification. NOTE: It is up to UE implementation how to select the SS block when multiple SS blocks are above the ssb-Threshold.
- Interdigital thinks that it was agreed in common session and there is no need to capture anything
- Intel and Huawei think that we should capture in the note the two RAN1 cases.

=> Noted

**Agreements:**
1. Preamble selection procedure between Group A and B in contention-based random access should be applied for the set of preamble associated with each SS block
2. The UE doesn't reselect between group A or B even if PL changes (i.e. we keep the existing text)
3. Move the location of "increment PREAMBLE_POWER_RAMPING_COUNTER" to section 5.1.3 of MAC specification

R2-1712434 Further consideration on the power ramping ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
- LG thinks that the ping-poing issue can be fixed by proper setting of the threshold.
- Intel asks if it is possible to fix this issue by filtering

=> Noted

R2-1712782 Location of the Power Ramping Counter in the RA Procedure InterDigital discussion Rel-15 NR_newRAT-Core

=> not treated

R2-1712379 Multiple preamble transmission for contention free RACH Beijing Xiaomi Mobile Software discussion Rel-15 R2-1711050

=> not treated

R2-1713362 Beamformed Random Access: Remaining Issues Samsung R&D Institute India discussion

=> not treated

R2-1713380 Beam recovery using RA procedure Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT

*Proposal 1: Beam failure recovery request using a dedicated PRACH preamble is initiated and performed by MAC through Random Access procedure.*
- Mediatek supports to do it in the MAC but we can discuss in which section
- Convida asks why each beam failure has to be told to the MAC. Nokia thinks that the MAC needs to be aware of the failure.
- Intel asks if the beam failure procedure will be specified
- LG thinks that there are two ways to handle this – one is the PHY tells the RRC and then the RRC notifies the MAC or the PHY tells the MAC directly.
- Intel thinks that RAN1 is still discussing this and if it is the same as in-synch and out-synch we can follow a similar approach as LTE.
- Lenovo doesn't see the benefit of notifying the RRC as the beam failure/recovery is done at the PHY. Mediatek agrees and thinks that the PHY should indicate and the MAC can specify the procedure.



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- Panasonic thinks that we also need to select the best beam. Where is this selection done? Samsungs says it's the MAC.
- Sharp says that the PHY also has to select the candidate beam in L1

*Whether we support fallback to contention based*
- Convida thinks that beam recovery doesn't happen very frequently and when it happens do we really need to optimize. We can rely on RLF. Nokia thinks that we should avoid RLFs as much as possible.
- Mediatek doesn't think this is necessary as the recovery procedure should be a fast recovery procedure and if we do CB then it is no longer a fast recovery. Docomo agrees
- Panasonic thinks it is important to support CB as there are cases in which the best beam is not associated to a dedicated preambles. Nokia thinks that it would mandate the network to allocate a dedicate preamble per SSB.
- Samsung supports CB, otherwise it would take a lot longer to do cell reseletin and re-establishment.
- Lenovo and LG support fallback. LG explains that even for handover case the UE has the option to perform handover use CB if it fails.
- Intel asks if

**Agreements**
1. Beam failure recovery using a dedicated PRACH preamble is specified in the MAC and triggered upon indication from Physical layer. RAN2 assumes that the PHY layer does the detection of beam failure.
2. Beam selection is specified in the MAC similar to the HO case
3. The UE uses contention free when there is a beam associated to a dedicated "preamble/resource" and the beam is above a threshold. Otherwise use contention based.

=> LS to RAN1 informing them of our agreements

R2-1714048 LS to RAN1 on beam recovery failure Nokia LS out
=> The LS is approved in R2-1714050

R2-1714047 TP on beam recovery Nokia
=> Review the two TPs from R2-1713380 and R2-1712870 to determine what is the best way to capture
=> Assumption is that it will be a separate section
=> The TP is agreed

R2-1712870 MAC Functions to support Beam Management and Beam Recovery MediaTek Inc. discussion
=> Moved from 10.3.1.1
=> Noted

R2-1713479 Parameters for Random Access preamble groups when SSBs are configured Ericsson discussion Rel-15 NR_newRAT-Core
Proposal 4 The preambles in Random Access Preamble Group B are the preambles whose indices are from startIndex-PreambleGroupA + sizeOfRA-PreamblesGroupA to startIndex-PreambleGroupA + numberOfRA-Preambles – 1.
- Qualcomm and Samsung don't see why these parameters have to be configured on a per SSB
- Samsung thinks that groupB should be supported per cell and not per SSB. So if it is supported in a cell it should be configured per SSB.

=> Noted

**Agreements for the case where SSBs are mapped to preambles in the non-overlapping case:**
1 The parameters sizeOfRA-PreamblesGroupA and numberOfRA-Preambles are defined for each SSB. The parameter messageSizeGroupA is defined per cell.

| | |
|---|---|
| 2 | A new parameter startIndex-PreambleGroupA is defined for each SSB. 3 The preambles in Random Access Preamble Group A are the preambles whose indices are from startIndex-PreambleGroupA to startIndex-PreambleGroupA + sizeOfRA-PreamblesGroupA – 1. |
| 4 | The preambles in Random Access Preamble Group B (if supported by the cell) are the preambles whose indices are from startIndex-PreambleGroupA + sizeOfRA-PreamblesGroupA to startIndex-PreambleGroupA + numberOfRA-Preambles – 1. If group B is supported by the cell random access preambles group B is included in each SSB. |

R2-1713808 Backoff indication in mmW systems Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
=> Not treated
R2-1712653 On choosing SSB for RACH resource selection Intel Corporation discussion Rel-15 NR_newRAT-Core
=> Not treated

### 10.3.1.4.3 Random access procedures

*Final issues to be resolved on further details of random access procedures, preamble selection, power ramping for msg1 transmission (with no beam forming) RA-RNTI calculation and contention resolution. – Maximum 1 contribution per company*
*Stage 3 details of On-demand SI request. Details for msg3 based-SI request depend on CP discussions will not not be progressed given the prioritization of SI design in CP.*

R2-1712203 The first x bits of CCCH SDU transmitted in Msg3 OPPO discussion Rel-15
=> Noted
R2-1712652 Random Access Procedural Aspects Intel Corporation discussion Rel-15 NR_newRAT-Core
=> *Noted*
R2-1713076 RA-RNTI formula MediaTek Inc. discussion
=> *Noted*

R2-1713809 On RA-RNTI calculation Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
=> *Noted*

*Whether to use subframe or symbol level*
- LG thinks that we should simplify and use subframe as different numerologies have different symbol lengths. Intel explains that we need to go to symbol level to be able to uniquely identify each symbol. LG explains that in LTE we use contention to resolve the collision.
- Samsung thinks that we should have symbol level granularity.
- Ericsson thinks that we can achieve this using Qualcomm's proposal, with an index per PRACH occasion. Samsungs explains that this depends on the number of PRACH occasions. ZTE thinks that we should deal with the worst case scenario. ZTE's proposal is PRACH occasion index within slot
- Oppo asks how big the RA-RNTI would be. Intel says 840 for worst case scenario.

*If SUL carrier is configured for RACH transmission, the UL carrier used for Msg1 transmission can be incorporated in RA-RNTI computation.*
- CATT doesn't see the need to increase complexity and the network can avoid collisions. ZTE thinks it would be complex for the network. ZTE thinks we can differente with the RAR rather RA-RNTI. Huawei thinks RA-RNTI is a more straight forward way.
- Oppo shares the same view as CATT. InterDigital sees a need to include an index and it can be either done by including index in the formula or extending the fid. QC thinks we should include in Rel-15.
- ZTE is concerned that this will increase the RA-RNTI space and the decoding in the UE.
- Ericsson thinks that the network can just configure different RACH configuration for each carrier. Qualcomm thinks it can be challenging as they have to be non-overlaping
- Oppo thinks that we can also differentiante by usind different preamble index.
- Futjistu think we can separate by fid.



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RAR window size
- Samsung things that it should be up to 10ms. Intel asks if the window should be defined in terms of slots. ZTE thinks the periodicy of the CORESET can be more than 10ms and then it can be problematic to limit to 10ms.

**Agreements:**
1 RA-RNTI calculation does not need to include SS block index.
2 Regarding multiple PRACH instances within a slot, the RA-RNTI equation in LTE should be modified for NR to provide OFDM symbol level granularity.
3 For SUL, some form of differentiation will be specified. FFS how.
4 RAR window size is up to 10ms

R2-1714069 summary of discussion on RA-RNTI Intel Corporation discussion

**Agreements**
=> Capture OFDM symbol ID explicitly.
=> Option 1 as a baseline: By including explicitly in the RA-RNTI computation (as a multiplicative factor).
=> Use formula suggested by Intel R2-1714069. Range of parameters are FFS

=> Noted

Not treated
R2-1712856 Further considerations on the RA procedure CATT discussion
R2-1712443 Remaining details of RACH procedure ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1713474 Open issues for the Random access procedure Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713366 Msg1 based SI Request: DL TX Beam Identification Samsung R&D Institute India discussion Rel-15 NR_newRAT-Core
R2-1713367 Msg1 based SI Request: PRACH Preamble Selection Samsung R&D Institute India discussion
R2-1712785 RACH Configuration in Handover InterDigital discussion Rel-15 NR_newRAT-Core R2-1710657
R2-1712815 RA-RNTI calculation Fujitsu discussion Rel-15 NR_newRAT-Core Withdrawn
R2-1712903 Remaining issues on RA procedure Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712906 Complete text proposal for NR random access procedure Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712910 Discussion on the procedure of MSG1-based SI request Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712977 RA-RNTI calculation Fujitsu discussion Rel-15 NR_newRAT-Core R2-1710357
R2-1713229 RA-RNTI calculation in NR CMCC discussion Rel-15 NR_newRAT-Core
R2-1713371 Random Access in NR: RA-RNTI Calculation Samsung R&D Institute India discussion
R2-1713381 Clarification on the Preamble group B selection Nokia, Nokia Shanghai Bell, NTT DOCOMO discussion Rel-15 NR_newRAT
R2-1713633 Considerations for RA-RNTI calculation LG Electronics Inc. discussion NR_newRAT-Core R2-1711609

### 10.3.1.4.4 Other aspects related to RA

*Other remaining aspects including impacts of SUL on initial access*

Not treated
R2-1713477 Criteria for selection of Preamble group B Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712432 Consideration on the remaining issues for multi-Msg.1 transmission ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1713368 Multiple Msg1 Transmissions Samsung R&D Institute India discussion Rel-15

R2-1713372 Random Access in RRC Connected: Bandwidth Part Aspects Samsung R&D Institute India discussion
R2-1713475 Preamble transmission power Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713478 Backoff Parameter values for Random Access Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713529 DRAFT LS on Preamble transmission power Ericsson LS out Rel-15 NR_newRAT-Core To:RAN1

SUL
R2-1712905 Discussion on RA procedure related to SUL Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
*Proposal 1: MAC layer should select the SUL carrier when the RSRP measured on the downlink is lower than RSRP threshold.*
- ZTE thinks it needs to be done in the MAC. Interdigital thinks that the selection can be done in RRC as it is aware of RSRP measurements.

*Proposal 2: when indicate by the PDCCH order or RRC signalling, the MAC entity should perform the rest of the RA procedure on the indicated UL carrier.*
=> Noted

R2-1712762 Random access with SUL and corresponding Text Proposal vivo discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1712280 Discussion on UP issues for SUL ZTE Corporation,Sanechips discussion NR_newRAT-Core
Proposal11: for cell with SUL, SPS/GF configuration in the uplink should be configured (activated) only on one uplink carrier.
- Vivo thinks we shouldn't support SPS/GF with SUL
- Huawei thinks the network can configure on both carriers
- Nokia thinks we should use the same agreement as BWP (one active at a time per cell).

=> Noted

**Agreements**
1. For CB RA, when needed (as per CP agreement) MAC layer selects the SUL carrier according to the RSRP threshold criteria
2. The UE shall not perform SUL switch while having an ongoing RA procedure
3. As a baseline the same restrictions on number of UL SPS/GF configurations apply for SUL.

Not treated
R2-1713476 Random Access and SUL Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712783 RA Procedure on the SUL InterDigital discussion Rel-15 NR_newRAT-Core
R2-1712279 Discussion on RACH procedure for SUL ZTE Corporation,Sanechips discussion NR_newRAT-Core
R2-1712373 SUL impact on random access Beijing Xiaomi Mobile Software discussion Rel-15

### 10.3.1.5 SR

*Including output of email discussion [99bis#38][NR UP/MAC] – SR open issues - Nokia*
*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion will not be treated and are highly discouraged even if you disagree with the proposal made by rapporteur.*

R2-1712973 Email discussion summary on [99bis#38][NR UP/MAC] – SR open issues - Nokia Nokia discussion Rel-15 NR_newRAT
**Proposal 6**: discuss which option to adopt if there are SR configurations but the mapping is not configured for a LCH assigned to a LCG.
Option 1: trigger RACH (11)



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Option 3: remain pending until cancelled **if there are other pending SR** (10)
Option x: Trigger RACH if there is no other pending SR with a valid SR configuration otherwise SR remains pending until cancelled. If an SR with SR configuration is triggered while RACH is ongoing, the UE can send the SR.

- Ericsson asks what happens with option 3. CATT explains that nothing happens, the UE just keeps the SR.
- CATT asks what happens if we have two SRs and one triggers the RACH. Nokia thinks that option 1 may be more complicated because of the scenario from CATT.
- Lenovo understands that if the network doesn't configure then it is for non latency critical services and RACH is a natural concequence.
- LG thinks we shouldn't have parallel RACH and SR and option 1 is not good if there is any pending SR. Lenovo doesn't see what is complex.
- Interdigital asks what happens if a SR is triggered while a RACH is ongoing. Ericsson thinks that the network should properly configure.

discuss which option to adopt for SR triggered by retxBSR-Timer expiry.
Option 1: SR configuration of the highest priority LCH that has data available for transmission (12);
Option 2: SR configurations of all the LCHs that have data available for transmission (8).
- Interdigital thinks that we may have LCP restriction so it is important to know the highest priority logical channel. Ericsson and Samsung see benefit with option 1. HTC supports option 1.

**Proposal 14** As in LTE, all pending SR(s) shall be cancelled and sr-ProhibitTimer shall be stopped when a MAC PDU is assembled and this PDU includes a BSR which contains buffer status up to (and including) the last event that triggered a BSR, or when the UL grant(s) can accommodate all pending data available for transmission. (already captured in the running TS.)
- Huawei is concerned with the case that a BSR is sent over eMBB grant for URLCC. The SR for URLLC should be triggered and be sent otherwise the service latency won't be met. Samsung asks why is the network giving an eMBB grant instead of URLLC. Huawei thinks that the network may have already given the grant before receiving the SR of URLLC.
- Qualcomm thinks Huawei's concern is quite valid and it is best to leave it to UE implementation to decide whether it should cancel it or trigger it. ZTE asks if this means that PUCCH and PUSCH would be transmitted at the same time. CATT thinks that in Rel-15 we can't do simultaneous PUCCH/PUSCH. Ericsson thinks that we can handle this cases with pre-scheduling as well.
- Interdigital thinks that there is a concern with latency. Huawei thinks that a loss of a packet is a big issue for ultra reliable services. Lenovo thinks that if this is very important it can use grant-free.

**Agreements:**
1. Single SR configuration with single SR ID covers PUCCH configurations for one or more BWPs and PUCCH SCell
2. maximum of 8 SR configurations should be supported per MAC entity
3. SR configuration ID is configured in LCH configuration for the mapping between SR configuration and LCH.
4. If there are SR configurations but a mapping is not configured for a LCH assigned to a LCG a RACH is triggered.
5. Use absolute time as unit for *sr-ProhibitTimer*
6. *logicalChannelSR-ProhibitTimer* is per MAC entity and *logicalChannelSR-Prohibit* is set per LCH as in LTE, no other special handling for the timer is introduced.
7. rename *logicalChannelSR-ProhibitTimer* to *logicalChannelSR-DelayTimer* to distinguish from *sr-ProhibitTimer*
8. there can be multiple pending SRs per MAC entity.
9. for each pending SR, the SR configuration of the LCH that triggers the BSR is used for SR transmission.
10. For SR triggered by retxBSR-Timer expiry, the UE uses the SR configuration of the highest priority LCH that has data available for transmission



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11. As in LTE, all pending SR(s) shall be cancelled and sr-ProhibitTimer shall be stopped when a MAC PDU is assembled and this PDU includes a BSR which contains buffer status up to (and including) the last event that triggered a BSR, or when the UL grant(s) can accommodate all pending data available for transmission. (already captured in the running TS.)
12. SR is sent when there is no overlapping PUSCH and PUCCH collision for the case of retransmission
13. As in LTE, SR is sent only if it does not collide with measurement gap
14. the SR configuration on PUCCH SCell is kept when the SCell is deactivated as in LTE
15. the SR configuration on a BWP is kept when the BWP is deactivated/switched.

R2-1712974 TP outcome of Email discussion [99bis#38][NR UP/MAC] – SR open issues - Nokia Nokia discussion Rel-15 NR_newRAT
=> The TP is revised in R2-1714052

R2-1714052 TP outcome of Email discussion [99bis#38][NR UP/MAC] – SR open issues - Nokia discussion Discussion R2-1712974 Rel-15 NR_newRAT
- Panasonic thinks that you should cancel them them all. Interdigital thinks we should cancel other pending SR as they may belong to other high priority channel.

=> confirm the agreement on triggering RACH when there is no SR configured for the LCHc cancel only the concerned SR that does not have SR configuration mapping.
=> The TP is agreed

R2-1712436 Consideration on SR Transmission in NR ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
=> Noted

Not treated

R2-1713480 Open issues for scheduling request Ericsson discussion Rel-15 NR_newRAT-Core

R2-1712267 SR configuration reuse under LCH release Spreadtrum Communications discussion Rel-15

R2-1712284 Outstanding issues with SR design for NR and TP for TS 38.321 Samsung R&D Institute UK discussion

R2-1712784 Remaining Details of the SR Procedure InterDigital discussion Rel-15 NR_newRAT-Core
=> Withdrawn

R2-1712816 SR procedure with multiple SR configurations Fujitsu discussion Rel-15 NR_newRAT-Core Withdrawn

R2-1713938 Additional Issues of the SR Procedure Xiaomi
Late

### 10.3.1.6 BSR

*Including output of email discussion [99bis#39][NR UP/MAC] – BSR open issues – Vivo*
*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion will not be treated and are highly discouraged even if you disagree with the proposal made by rapporteur.*

R2-1712827 [99bis#39][NR UP/MAC] – BSR open issues vivo discussion
=> Noted
*LTE BSR cancellation part in TS 36.321 is reused for NR BSR cancellation.*
- Qualcomm is concerned about the case of multiple parallel grants. Lenovo, Vivo agrees.
- Ericsson asks if we relax the requirement we may add overhead. Qualcomm thinks that if have large grant the overhead is small and this shouldn't happen

*For NR, the MAC entity can include a padding BSR in any of the MAC PDUs, which do not contain a Regular/Periodic BSR*
- Intel thinks we should not mandate the UE to include a padding BSR



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*For NR, all BSRs transmitted in a TTI always reflect the buffer status after all MAC PDUs have been built for this TTI. However there is no more description in NR BSR procedure part in addition to the description in Buffer Size description part*

***For NR, shall each LCG report at the most one buffer status value per TTI in case of multiple BSR MAC CEs in one TTI***

- CATT thinks that BS reflects the buffer status at the end of the assignment.
- Huawei thinks that if the BS reflects the buffer status at the end we can have different BS values in two MAC PDU. HTC agrees.
- LG thinks it is good to remove the restrictions. Ericsson is concerned that the gNB doesn't know how to estimate which BS to take into account. Qualcomm agrees with LG and thinks that the gNB can figure it out from the start time of the transmission.

*Formula*

$$B_k = \lceil B_{min} \cdot (1+p)^k \rceil \text{ where } p = (B_{max} / B_{min})^{1/(N-1)} - 1. \quad \text{(Formula A)}$$

$$B_{max} = \text{Maximum Transport Block Size} \times 2 \times \text{RTT} \times N_{mimo} \times N_{carrier} \quad \text{(Formula B)}$$

- Huawei asks if companies have considered 1 RTT.

Proposal 12: Online discussion is needed for below three issues:

*Open issue 11: Shall the MAC subheader of the variable-size BSR MAC CE be optimized without an L field?*

- Nokia thinks we need to distinguish between the truncated BSR and long BSR. For long BSR we need L field and truncated BSR may not be need as the size can be determined. Ericsson agrees. Oppo thinks that for long BSR we can omit the L field as the bitmap can indicate the length. LG wants to keep the same format and we can omit the L field for both cases. CATT thinks we can remove L field for both cases.
- Mediatek thinks its important that we have the same formats. Qualcomm thinks that the L field is important to include for truncated.
- CATT thinks that if we add the L field we are adding two more bytes.
- Ericsson and Nokia want to have quick processing of the header fields and therefore to have the L field for long BSR.
- HTC thinks we should keep the L field and bitmap indicate the LCG being reported
- LG doesn't see why it is more complex.

*Option 1- L field for Long BS and no L field for truncated BSR*
*Option 2 - No L field for both*
*Option 3 – L field for both*

*Option A or Option B*

After offline

1. L field for both and bitmap indicate LCG reported (9)
2. L field for both and bitmap indicates what data is available (11)

**Agreement**
=> L field for both. Bitmap indicates which LCG has data is available for tructated BSR and for long BSR the bitmap includes all LCG being reported.
=> The BS order is in order of LCG index for both cases

R2-1714190 TP on long/truncated BSR on Ericsson
=> The TP is agreed

- CATT still has the same concern.
- Nokia thinks that it can be acceptable if we handle the 3 byte padding case.

*Open issue 12: For truncated BSR, shall the bitmap indicate which LCG have buffered data (A) or which LCG are being reported (B).*

- Nokia thinks that to make the truncated BSR useful we should report the LCG that have buffered data



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- Vivo supports option B. LG as well. What is important is the value of high priority data buffered in the UE. Oppo would like to align the formats. Ericsson supports option A as it provides similar information to long BSR. Qualcomm agrees with Ericsson and Nokia, it provides useful info. CATT as well.
- Samsung supports option B. LG thinks that there is complexity with option A as the network has to figure out which LCG the UE is reporting.
- HTC thinks that option B is simpler.

*Open issue 13: How are LCG to be reported selected when of equal priority.*

**Agreements**

1. The short BSR is used for padding BSR in case of no any data in all LCGs
2. The long BSR format is used when only a single LCG has data available in case that the number of padding bits is equal to or larger than the size of the long BSR plus its subheader
3. The truncated BSR will not start or restart the periodicBSR-Timer
4. LTE BSR cancellation part is re-used for NR BSR cancellation TS 36.321 with the change from “shall” to “may”
5. No restriction is needed to be specified that the MAC entity shall transmit at most one Regular/Periodic BSR
6. For NR, the MAC entity shall not include a padding BSR in any of the MAC PDUs which contain a Regular/Periodic BSR
7. One MAC PDU contains at most one BSR. No restriction on the UE reporting the same BS value in case of multiple overlapping MAC PDUs is specified.
8. Confirm that no new BSR trigger is needed for NR
9. *[Assumption waiting for RAN1 input]* The above formula A and formula B are used as baseline for 8 bits BS calculation; the detailed parameters can be revised after receiving RAN1 LS, e.g “2xRTT”, Nmimo and Ncarrier. FFS if we there is a need to have more than one table
10. The max value of RTT is used if RAN1 provides a range for RTT value in their LS
11. The Bmin value is equal to10 bytes for both 5 bits BS table and 8 bits BS table. The different Bmax values are applied for 5 bits BS table and 8 bits BS table. The final Bmax values for 5 bits BS table and 8 bits BS table can be discussed after receiving RAN1 LS.

R2-1712828 TP for output of email discussion #39 BSR open issues vivo discussion
=> The TP is revised in R2-1714056

R2-1714056 TP for output of email discussion #39 BSR open issues discussion R2-1712828
=> Change last sentence in 5.4.5: “The MAC entity shall transmit at most one BSR in one MAC PDU. Padding BSR shall not be included when the MAC PDU contain a Regular or Periodic BSR”
=> The two paragraphs of section 5.4.5 will be merged in the main TS and include the change above by rapporteur.

Not treated

R2-1712472 BSR design to support pre-processing MediaTek Inc. discussion Rel-15 NR_newRAT-Core R2-1710695

R2-1713354 Padding BSR for multiple UL grants Intel Corporation, Qualcomm Incorporated discussion Rel-15

R2-1713805 On BSR cancellation conditions Qualcomm, Intel, MediaTek discussion Rel-15 NR_newRAT-Core R2-1711708

R2-1712316 Uses of different BSR formats Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1712814 MAC TP for BSR Fujitsu discussion Rel-15 NR_newRAT-Core Withdrawn

R2-1712824 Necessity of R values in Long BSR Fujitsu discussion Rel-15 NR_newRAT-Core

R2-1713230 More considerations on BSR CMCC discussion Rel-15 NR_newRAT-Core

R2-1713483 Open issues on BSR Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713687 Discussion on a potential issue for BSR HTC discussion Rel-15 NR_newRAT-Core

### 10.3.1.7 LCP

*Including output of email discussion [99bis#40][NR UP/ MAC] – LCP – Interdigital*



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*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion will not be treated and are highly discouraged even if you disagree with the proposal made by rapporteur.*

R2-1712786 Summary of email discussion [99b#40][NR UP/MAC] LCP InterDigital discussion Rel-15 NR_newRAT-Core

*Decide at RAN2#100 if LCH selection includes a restriction on minimum PUSCH duration.*
*Options 1: Tmin, Tmax (allow Tmin may be zero)*
*Option 2: Tmax*

- Samsung would like to know the motivation the about Tmin. Mediatek also thinks we should keep it simple and there other ways to prevent eMBB from using URLLC.
- Nokia thinks that the most important is to not use grant free resources by eMBB and Tmin is a simple way of achieving it.
- MEdiatek thinks that using Tmin to prevent eMBB from using GF is not a good way to do it and putting a direct restriction is better.
- Nokia thinks that for the collision base it is very important that eMBB doesn't use GF resources as it will cause a lot of collision. LG, QC agrees and thinks that Tmin can be used. Interdigital explains that we cannot use numerology to prevent this case as we are only allowed on BWP active a time. Convida thinks that we should restrict but if use Tmin we would also restrict dynamic grant.
- Qualcomm thinks that by setting Tmin to zero the network can control whether a restriction is applied for dynamic grants.
- CATT thinks that the two options are independent and should both be sepcied.

=> Means to restrict eMBB from using grant free
Option 1: scheduling type direct restriction (e.g. grant free or dynamic)
Option 2: Tmin with value zero allowed

*In case of slot aggregation, the duration of a single repetition of a TB (i.e. single PUSCH transmission) should be considered for LCH selection*

- CATT thinks that the total time including repetition should be taken into account as it impacts the overall latency. Interdigital thinks that a repetition can be schedule for additional reliability but the network can decode the packets earlier.

BSR

- Mediatek thinks we shouldnot send padding BSR especially for the case of grant free. We shouldn't use the grant free to transmit BSR for eMBB. Samsung thinks we can keep it simple and just skip if there is no data that can be transmitted with that grant.

Options

1. UE skips
2. UE sends periodic BSR
3. UE sends BSR only for dynamic grant. FFS for grant-free

On Bj

- Qualcomm thinks that it is better to be event driven
- Samsung thinks that it should be done at a regular rate.
- Convida thinks that the important part is that it is accurately update at the time of LCP.

**Agreements:**

1. Subcarrier spacing and PUSCH duration restrictions are applied independently. Only Tmax PUSCH duration is used
2. Means to restrict eMBB from using certain graints (e.g. grant free) will be specified. A scheduling type restriction is defined (e.g. a restriction per type of grant)
3. No additional restriction based on the granularity of PUSCH transmission duration is introduced
4. In case of slot aggregation, the duration of a single repetition of a TB (i.e. single PUSCH transmission) should be considered for LCH selection

5. The minimum grant size for not transmitting padding or padding BSR while having data available for transmission is 8 bytes



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6. The UE shall not perform UL skipping if a periodic BSR is triggered and there are data in any LCG

FFS if there is no data available allowed to be transmitted on given UL grant the UE can perform UL skipping or if it can send padding BSR

7. A priority order is specified between different types of MAC CE and logical channels and the order is the same as in LTE
8. No change to the draft specification to address the “skipping segmentation” behavior. Revisit after December in case there are concerns
9. No mechanism is introduced to minimize the reordering workload at the PDCP receiver
10. No mapping rule is specified for MAC CE in case of multiple grants
11. No additional prioritization mechanism based on time is specified before December
12. No change to existing text to clarify that only logical channels with data are allocated resources in step 1
13. No enhancements to LCP procedure to allow eMBB data to be allocated resources only in Step 3 for short PUSCH duration
14. The increase of the variable Bj is independent of whether LCHj can utilize the grant or not
15. The Bj should be up to date at the time the grant is processed by LCP. The rate and how it is updated it is up to UE implementation. T needs to be specified.
16. Upon reception of an UL grant, PHY provides “uplink transmission information” to the MAC same as HARQ information. Uplink transmission information consists of Subcarrier Spacing index, PUSCH transmission duration, type of grant and cell information for the corresponding scheduled uplink transmission. The Uplink transmission information associated with an UL grant is used within LCP/logical channel selection procedure.

R2-1712787 TP output of email discussion [99b#40][NR UP/MAC] LCP InterDigital discussion Rel-15 NR_newRAT-Core
=> The TP is revised in R2-1714057

R2-1714057 TP output of email discussion [99b#40][NR UP/MAC] LCP discussion Approval R2-1712787 Rel-15 NR_newRAT-Core
*What is type of grant for restrict*
- LCP restriction for configured grant (type 1 and type 2)
- LCP restriction for configured grant type 1

=> LCP restriction is performed for configured grant type 1
=> Baseline for now: If there is no data available allowed to be transmitted on given UL grant the UE can perform UL skipping (do not send padding BSR). FFS for next meeting if we do allow padding BSR in some cases.
=> The TP is agreed

R2-1712912 LCP procedure for NR Motorola Mobility España SA discussion Rel-15 NR_newRAT-Core
=> Not treated

R2-1712215 Discussion on the relative priority order of NR LCP ASUSTeK discussion Rel-15 NR_newRAT-Core
=> Not treated

R2-1712365 LCP design for NR – focus on calculation and updating of Bj values in NR – and TP for TS 38.321 Samsung R&D Institute UK discussion
=> Not treated

R2-1712374 SUL impact on LCP Beijing Xiaomi Mobile Software discussion Rel-15
=> No restriction necessary for SUL
=> Noted

R2-1712900 Text Proposal on LCP in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core Withdrawn
=> Not treated

R2-1713467 Open issues on LCP Ericsson discussion Rel-15 NR_newRAT-Core
=> Not treated

## 10.3.1.8 SPS/Grant-free

*Including output of email discussion [99bis#41][NR UP/MAC] – Open issues on SPS and GF – Huawei*
*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion will not be treated and are highly discouraged even if you disagree with the proposal made by rapporteur.*

R2-1713173 Summary of [99bis#41][NR/UP] Open issues on SPS and GF discussion Huawei, HiSilicon Rel-15 NR_newRAT-Core

Proposal 1: RAN2 confirms that no addition issues need to be addressed regarding activation/deactivation for Type 2 (SPS) and an RNTI can be used at least for one resource configuration in a serving cell for Type 2 (SPS).

- LG asks how retransmissions work for type 1

*Retransmissions of GF Type 1 and Type 2 (SPS) can continue with dynamic grant as long as RRC configured RNTI(s) of GF Type 1 and Type 2 (SPS) is valid.*

- Nokia and LG think that we can use dynamic grant and don't need to capture anything.
- LG asks how to distinguish between UEs in the case of shared resource.
- CATT thinks that we should keep the RNTI alive. Qualcomm explains that the HARQ processes are shared so the gNB can use dynamic grant.

Whether we have GF (type 1) and SPS (type 2) configured for the same cell

- CATT sees now issue if they use different HARQ processes. LG thinks that we should allow both. Nokia thinks that we shouldn't allow this and the HARQ processes should be shared. Qualcomm and interdigital thinks we should share HARQ process for the same cell. Nokia doesn't see the use case to allow this for the cell.

Whether we support the multiple type 1 configuration(s) per cell

- Huawei considers the fact that we may have multiple BWP.

*RAN2 to discuss whether to suspend or release the configured resources of GF Type 1 of one SCell when the SCell is deactivated.*

- Docomo thinks we should not release
- Ericsson thinks from MAC point of view we should release and re-activate them when SCell is activated.
- Qualcomm is concerned that when an SCell is re-activated the gNB may need to re-configure the resources anyway. Oppo thinks that the resources should be released. LG thinks that if that is the case the network can release the resources before deactivating. Ericsson thinks that the network doesn't necessarily know in advance.
- Vivo thinks that upon re-activation we should start using the configuration.

*For Type 2 (SPS), when a BWP is deactivated, how to handle the configured resources within the BWP?*

- *Option 1: To suspend, i.e., to not transmit PUCCH and PUSCH within the BWP (if any).*
- *Option 2: To clear configured resources within the BWP (if any).*

- Nokia thinks that there is an overlapping case, if the resources are in overlapping area we should keep the configuration.
- Samsung thinks that we should follow the same behaviour as SCell deactivation
- Interdigital thinks we should store the configuration. Qualcomm agrees and BWP switching can happen very frequently. Samsung doesn't think it should happen very often. Oppo thinks the SPS should be reactivated when you switch back.
- LG thinks that it may be simpler.
- ZTE thinks that clearing is a more straightforward and when re-activating BWP a DCI can be sent to reactivate

SPS – is the RRC configuration per cell or BWP

- Nokia thinks that for type 2 it is per cell. Qualcomm thinks that for type 2 there could still be benefit to configure the SPS.
- MEdiatek thinks for Type 1 it is per BWP and for type 2 it is per cell.

Whether different RNTI or separate RNTIs are used

- Ericsson, Nokia, Samsung, QC, OPPO prefer to have the same RNTI

*RAN2 to discuss how to capture GF Type 1 and Type 2 (SPS) in MAC with the options including,*



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- Ericsson thinks that based on the functionality from the MAC perspective we can have a unified naming and we can use SPS and configured grant and distinguish whether it is activated by physical layer and RRC. Qualcomm shares the view.
- Interdigital thinks we should be careful as even today we don't have unified named. In 5.3 and 5.7 we can keep using configured grant and assignment. In 5.10 we can change the name to something more generic and describe separately the type 1 and SPS. LG also prefers to have a separate name and use the differentiation in the LCP as well.
- Huawei doesn't think that we should use SPS as the umbrella terminology as the scheme are different.
- Vodafone and Intel also thinks that for the umbrella terminology we should use a different name.

**Agreements**

1. GF Type 1 resource shall be activated upon RRC configuration according to resource allocation in terms of periodicity and offset provided within the configuration
2. When GF Type 1 or SPS is released by RRC, the all corresponding configuration shall be released.
3. For SPS, the MAC entity shall clear the configured resource assignments immediately after transmitting confirmation MAC CE for the SPS release, as in LTE.
4. For GF Type 1, the MAC entity shall clear the configured uplink resource assignments immediately when receiving RRC reconfiguration message of GF Type 1 release.
5. Retransmissions (except for repetition) of GF Type 1 and SPS use dynamic grant
6. As in LTE, the pool of HARQ processes are shared between dynamic and configured grants.
7. From RAN2 perspective, type 1 and SPS cannot be configured for the same cell but can be configured for different cells at the same time.
8. From RAN2 perspective, at most one type 1 configuration is active at a time (e.g. one type 1 configuration per active BWP) per cell at least for Dec. freeze.
9. Upon SCell deactivation the GF type 1 the RRC configuration is kept. From the MAC point of view the resources are suspended (the UE is considered to not have a valid configured grant). Upon SCell activation the UE starts using the configured grant free resources.
10. The MAC entity shall clear the configured resources of one SCell for SPS when the SCell is deactivated.
11. Type 1 resource configuration can be configured per BWP and RRC configuration for SPS can be configure per BWP. A common RNTI for SPS and type 1 is configured per MAC entity.
12. For SPS when a BWP is deactivated, the from the MAC perspective the UE clears the configured resources within the BWP
13. The MAC entity shall clear all configured resources for Type1/ (SPS) when the TA timer associated with pTAG expires. Type 1 and SPS resources can be reactivated by RRC configuration and DCI respectively.
14. The MAC entity shall clear all configured resources for Type1/ (SPS) for all Serving Cells belonging to this TAG when TA timer associated with sTAG expires. Type 1 and SPS resources can be reactivated by RRC configuration and DCI respectively
15. The dynamic grant addressed to C-RNTI shall override the configured grant for this transmission in case of overlap in time domain, for type 1 and SPS.

FFS if/how we handle the URLLC case (e.g. we only allow to override the configured grant iff the dynamic grant can be used for the higher priority data or if the URLLC can preempt eMBB transmission.

16. For SPS and type 1, if the received uplink grant or DL assignment addressed to SPS C-RNTI. If the NDI in the received HARQ information is 1, consider the NDI for the HARQ process not to been toggled, as in LTE.
17. For SPS if the NDI in the received HARQ information is 0, it is for SPS activation/deactivation
18. From RAN2 perspective, a timer T is introduced. While the timer is running the UE does not use the SPS or Type 1 resource for new trasnmisson for this HARQ process (e.g. UE assumes ACK if the timer is not running).
19. T is configured by RRC and it can be stopped when a dynamic grant is received for this HARQ process.
20. It is started/restarted after the initial transmission/retransmission regardless of whether repetition is configured or not

21. It is up to RAN1 to decide the definition of period which is related to HARQ ID determination
22. “Configured grant” / “configured assignment” is kept in MAC
23. Main umbrella name title “Transmission/reception without dynamic scheduling” and below is the description of Type 1 and Type 2
24. Use Configured Grant Type 1 and Configured Grant Type 2 and DL SPS

R2-1713174 TP outcome of [99bis#41][NR/UP] Open issues on SPS and GF Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
=> The TP is revised in R2-1714058
R2-1714058 TP outcome of [99bis#41][NR/UP] Open issues on SPS and GF discussion Decision R2-1713174 Rel-15 NR_newRAT-Core
- Nokia thinks that we may need some further updates
=> We will use Configured Scheduling (CS – RNTI)
=> We should introduce the LTE text on PDCCH grant overriding the SPS grant

✉ **[NR UP/MAC] – TP on SPS/GF**
- agreeable TP to be merged in main
- Deadline: Dec. 6th

R2-1714059 LS to RAN1 on GF/SPS agreements LS out Huawei
=> Update action to “RAN2 respectfully asks RAN1 to take the above information into account in their work and to update their terminology according to RAN2 agreements”
=> The LS is approved in R2-1714062 with change above

Not treated
R2-1713917 DL SPS Operation in NR Samsung discussion
R2-1713650 BWP timer restart for DL SPS LG Electronics Inc. discussion NR_newRAT-Core
R2-1713847 The Impact of SUL on UL Transmission without Grant Samsung Electronics discussion
R2-1712857 Leftover issues of configured grants CATT discussion
R2-1712937 Remaining issues for SPS in NR Ericsson discussion Rel-15 NR_newRAT-Core

### 10.3.1.9 HARQ

R2-1712699 CBG-based HARQ operations in MAC Samsung discussion Rel-15 NR_newRAT-Core
=> Noted

**Agreements:**
1: The CBG-specific parameters (i.e. CBGTI and CBGFI) in DCI for NR are not specified in the MAC specification.
2: No changes are required for UL HARQ operations in the MAC specification.
3: For DL HARQ operations, the MAC specification describes that MAC instructs PHY to perform soft combining and HARQ feedback operations.

R2-1713077 Handle ongoing HARQ process when BWP switching occurs MediaTek Inc. discussion
=> Noted

**Agreements:**
1: HARQ process can continue when BWP/SUL switching occurs.
2: No impact to the spec to capture this understanding
3: For same cell, one common HARQ entity is used for both UL and SUL

R2-1713175 Discussion on HARQ in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
*UE would not flush HARQ buffers upon BWP/SUL switch*
- LG thinks that we never
- Qualcomm thinks that we should have separate HARQ entities.

- ZTE thinks that we should not allow retransmission across carriers. We can still have the same HARQ entity.
- Lenovo thinks we can prevent the retrasnsmission by gNB scheduling.
- ZTE notes that this can imply retrasnmsission across TDD and FDD

=> Noted

R2-1714060 LS to RAN1 on HARQ agreements LS out Samsung
=> Add RAN2 has removed the ACK generation procedure in the current running MAC specification and expects PHY to account for it in their procedure
=> Delete agreement 5
=> Updated agreement 6 “For same cell, one common HARQ entity is used for both UL and SUL”
=> The LS is approved in R2-1714061 with the changes above

Not treated
R2-1713807 Granularity of HARQ timing parameters with BWP Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1713881 RAN2 aspect for HARQ in NR LG Electronics UK discussion NR_newRAT-Core
R2-1713810 On the impact of supplementary uplink on HARQ configurations Qualcomm

### 10.3.1.10 DRX

*Contributions should focus on final critical issues/corrections for DRX*
R2-1712318 Remaining issues for DRX Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
-
The unit of drx-RetransmissionTimerDL and drx-RetransmissionTimerUL is OFDM symbol corresponding to the numerology of the active BWP.
- LG, Mediatek, lenovo thinks it shoud be absolute time. Ericsson, Nokia, Interdigital thinks slot. Huawei is fine with slot. ZTE thinks absolute time. Nokia thinks that defining the codes it may be difficult as we have to account for all possible numerologies.
- Interdigital points that for HARQ RTT the K values are in terms of slot.

=> Noted

**Agreements**
1: As in LTE, when receiving a DCI indicating a DL transmission or configuring DL assignments for a HARQ process, drx-RetransmissionTimerDL of the corresponding HARQ process is stopped.
2: As in LTE, when receiving a DCI indicating a UL transmission or configuring UL grants for a HARQ process, drx-RetransmissionTimerUL of the corresponding HARQ process is stopped.
3: The unit of drx-RetransmissionTimerDL and drx-RetransmissionTimerUL is slot
4: UL HARQ RTT timer is started after the first PUSCH transmission of a bundle
5: The equation for DRX from R2-1713471 is used as a baseline (i.e. LTE formula with *drx-SlotOffset* added)

R2-1712858 Open Issues on DRX CATT discussion
- Ericsson thinks that if we multiple by 32 it may be more complex

=> Noted
R2-1712975 Remaining issues on DRX Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
=> Noted
R2-1713471 Remaining issues on DRX timers Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

BWP
R2-1713867 Issues on timer-based BWP switching Samsung discussion Rel-15
=> Noted
R2-1713469 BWP Inactivity Timer and DRX Ericsson discussion Rel-15 NR_newRAT-Core
=> Revised in R2-1713941
R2-1713941 BWP Inactivity Timer and DRX Ericsson discussion Rel-15 NR_newRAT-Core

Not treated



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R2-1712212 Details of BWP inactivity timer ASUSTeK discussion Rel-15 NR_newRAT-Core
=> Moved from 10.3.1.13
R2-1712861 BWP Inactivity Timer for active UL BWP CATT discussion
=> Moved from 10.3.1.13

SPS

Not treated
R2-1713470 SPS and SR in DRX Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712700 DRX timer for SPS Samsung discussion Rel-15 NR_newRAT-Core R2-1709012
R2-1713466 Modelling of PDCCH Monitoring Considering Duplex Modes Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713802 Wakeup signaling for C-DRX mode Qualcomm Incorporated, Apple, OPPO discussion Rel-15 NR_newRAT-Core R2-1711702
R2-1712442 Remaining issues on DRXZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1712201 DRX operation for cross slot PDCCH monitoring OPPO discussion Rel-15
=> Noted
R2-1712204 The start condition of the UL HARQ RTT timer OPPO discussion Rel-15
R2-1712319 Enhancement of DRX Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710209
R2-1712829 DRX inactivity timer for SPS UL skip vivo discussion R2-1708492
R2-1712834 Discussion on the remaining problems on DRX vivo discussion
R2-1712969 BWP switch on C-DRX Potevio discussion Rel-15
R2-1713244 Consideration on HARQ RTT Timer LG Electronics Mobile Research discussion NR_newRAT-Core
R2-1713468 DRX with short on-duration and Wake-up signaling Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713803 Wakeup signaling for multi-beam systems Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711703

## 10.3.1.11 Impact of PDCP duplication on MAC

*MAC CE for activation/deactivation of PDCU duplication*
*Aspects related to fallback to split bearer and handling of RLC/PDCP entities during activation/deactivation should be submitted in AI 10.3.3.5*
*This AI will not be treated*

Not treated
R2-1712210 PDCP duplication and SCell (de-)activation ASUSTeK discussion Rel-15 NR_newRAT-Core
R2-1712730 BSR procedure for data duplication Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710757
R2-1712731 Cell deactivation impacts on PDCP duplication Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710758
R2-1712732 PBR configuration for duplication DRB Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710759
R2-1712833 Duplication deactivation due to Scell or BWP deactivation vivo discussion R2-1710958
R2-1712859 Duplication activation/deactivation MAC CE CATT discussion R2-1710304
R2-1712933 PDCP duplication control related to SCell control Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712966 PDCP duplication consideration Potevio discussion Rel-15

## 10.3.1.12 PHR

*Contributions should focus on final critical issues/corrections for PHR and finalizing PHR in the presence of beamforming*
R2-1712916 PHR MAC CE format Lenovo, Motorola Mobility, Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
=> Noted

Agreements:



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1. UE determines the PHR MAC CE - whether PH value for an activated Serving Cell is based on real transmission or a reference format - based on the downlink control information which has been received until and including the PDCCH occasion in which the first UL grant is received since a PHR has been triggered

R2-1712431 Consideration on the mapping between PHR reported value and the measured quantity ZTE CORPORATION discussion Rel-15 NR_newRAT-Core

=> For the EN-DC/MR-DC, the PHR measured values for LTE cell should be referred to 36.133 and the PHR measured values for NR cell should be referred to 38.133

=> send an LS to RAN4
- Whether two separate PHR table will be defined for FR1 and FR2, or 1 common PHR table will be used for both FR1 and FR2?

R2-1714067 LS to RAN4 on PHR ZTE LS out
=> The LS is approved in R2-1714074

R2-1712860 RAN1 impact on RAN2 PHR design CATT discussion
- Huawei has a different understanding about RAN2 and further we should report type 3
=> the assumption is that the rapporteur will include the PHR types agreed by RAN1 at the end of the week in his running TS.
=> Noted

R2-1714189 LS on SRS PHR reporting
=> Type 3 will be supported and be included in the MAC TS
=> Noted

R2-1713484 Power Headroom Reporting in NR Ericsson discussion Rel-15 NR_newRAT-Core
*NR reuses LTE PHR MAC CE for single serving cell scenario.*
=> Noted
- Lenovo indicates that RAN1 agreeed that we report PCmax for single cell scenario.

*Proposal 3: NR supports separate PHR triggering settings (e.g. dlPathLossChange) for SUL carrier and NR UL carrier in one cell.*
- Vivo agrees with the proposal since SUL and UL can have different power backoff.
- Qualcomm thinks that periodic periods should be different but thresholds should be the same.
- LG and Docomo think that we can apply the same principle as CA

Proposal 4 PHR is triggered at carrier switch between SUL carrier and NR UL carrier
- Lenovo understand that you can trigger very often the switch with DCI. Interdigital doesn't think that the switch should haveppen very often. ZTE thinks that we can switch every 10ms.
- LG and ZTE doesn't thinks this is needed.
- Xiaomi and Huawei, QC consider there are other cases where a switch happens, and it can be helpful.
- Convida thinks that we have enough triggers to ensure that we get the PHR.
- Samsung and CATT don't think this is an essential feature.

*Proposal 6: It is unnecessary to update PHR format and trigger with respect to the change of serving beams.*
- Interdigital thinks that we should include PHR for the beam and sees this as carrier aggregation. Huawei agrees and RAN1 agreed to beam level power control. We can include it in the format and discuss further with the triggers.
- CATT thinks that we have the pathloss change trigger. When we switch beams the pathloss may change and the PHR will be report. Interdigital thinks the benefit is that the network should know the PHR of the beam if it were to switch.
- Convida agrees that we should include it in the report.
- CATT thinks that RAN1 will not define beam management procedure based on PHR. Interdigital explains that this is for the case where the beams are alredy created. This is similar to CA where we have two independent power control loops.



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- Mediatek asks if this is the same discussion as SUL. Interdigital doesn't thinks it is the same as pathloss reference for SUL is the same.
- Nokia

**Agreements:**
1. NR defines a MAC CE for single serving cell scenario (similar to LTE but with PCmax added if RAN1 has agreed that it has to be report). The UE determines which format to use similar to LTE.
2. NR does not supports separate PHR triggering settings (e.g. dlPathLossChange) for SUL carrier and NR UL carrier in one cell.
3. No new PHR triggers or formats for beams are defined for now.

R2-1712788 Power Headroom Reporting for NR InterDigital discussion Rel-15 NR_newRAT-Core
=> Noted
R2-1712915 PHR for NR CA Lenovo, Motorola Mobility discussion Rel-15 NR_newRAT-Core
=> Noted
R2-1713486 Open issues for PHR in LTE-NR DC Ericsson discussion Rel-15 NR_newRAT-Core
=> As in LTE-LTE DC, after transmission of a PHR comprising PHs for both MCG and SCG by any UE MAC entity upon reception of a grant, the UE only cancels all triggered PHRs and reset timers (prohibit and periodic timer) in the corresponding CG.
=> Noted

Not treated
R2-1713177 PHR with multi-beam operation Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713485 Power Control Aspects Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713774 Guaranteed power for Power Headroom in EN-DC Samsung Electronics discussion R2-1711798
R2-1712246 The power headroom report MAC CE OPPO discussion
R2-1712788 Power Headroom Reporting for NR InterDigital discussion Rel-15 NR_newRAT-Core
R2-1713007 PHR impacts for beamforming vivo discussion
R2-1713176 Remaining issues of PHR procedure and power management Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713574 PHR Text proposal Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713642 PHR in PDCP duplication with CA ITL discussion Rel-15
R2-1713645 PHR for multi-beam operation LG Electronics Inc. discussion NR_newRAT-Core R2-1711612
R2-1713775 PHR triggering event for beam change Samsung Electronics discussion R2-1711800
R2-1713776 Extended PHR considering beam and TRxP change Samsung Electronics discussion R2-1711801
R2-1713804 Power allocation and PHR for UL split bearer Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711706

SUL and PHR
R2-1712375 SUL impact on PHR Beijing Xiaomi Mobile Software discussion Rel-15
R2-1712701 PHR and SUL in NR Samsung discussion Rel-15 NR_newRAT-Core
R2-1713002 Clarification on the SUL PHR reporting vivo discussion
R2-1713178 Impacts of SUL on PHR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

### 10.3.1.13 Other

*Other aspects not included in the detailed agenda items.*

SUL
R2-1712376 SUL impact on TA Beijing Xiaomi Mobile Software discussion Rel-15
=> The UL and SUL of the same cell belong to the same TAG
=> Noted

R2-1712868 Timing Advance to support SUL Samsung Electronics discussion
=> Noted

Other
R2-1712703 Variables and constants for NR MAC specification Samsung discussion Rel-15 NR_newRAT-Core
=> Noted

**Agreements:**
1: The following RNTIs are defined for NR: RA-RNTI, Temporary C-RNTI, C-RNTI, SPS [align this with termology in SPS/GF TP) C-RNTI, P-RNTI and SI-RNTI.
2: Whether to use TPC-PUCCH-RNTI and TPC-PUSCH-RNTI would be determined by RAN1, and RAN2 put Editor's Note.
3: As in LTE, a single P-RNTI (i.e. 0xFFFE) and a single SI-RNTI (i.e. 0xFFFF) are defined for NR.
4: 14 values for the common search space are reserved for future use assuming the above RNTIs
5: The procedures of MAC reset in LTE are baseline for NR MAC reset
6: Partial MAC reset is not support in Rel-15 NR

R2-1712702 MAC reset for NR Samsung discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1712704 Text propsoal for a new clause for the handling of measurement gap Samsung discussion Rel-15 NR_newRAT-Core R2-1709018
- Ericsson is concerned that there are other sections handling measurement gaps.
=> The MAC entity does not transmit HARQ feedbacks, CSI feedbacks, and SRS during measurement gap.
=> To have a normative clause for the handling of measurement gap. State in that section that there are other sections talking about measurement gap handling
=> Noted

R2-1713179 Uplink TA maintenance with multi-beam operation Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
=> The document is revised in R2-1713924
R2-1713924 Uplink TA maintenance with multi-beam operation Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1713179
**Proposal 1: Per beam/TRP TA maintenance should be supported in NR.**
- Asustek thinks that this is needed
- Interdigital doesn't think it is always needed as there are times they are collocated
=> Wait for RAN1 to discuss this first
=> Noted

R2-1713508 L2 Header size and voice packet sizes for NR Ericsson discussion Rel-15 NR_newRAT-Core
Proposal 1 RAN2 is kindly requested to send LS to SA4 about voice protocol overhead and special frames which are send frequently within the voice data.
- Qualcomm thinks that SA4 has already defined the codec and it is the ones already supported today.
=> Send an LS to RAN1 to provide input about RAN2 UP protocol
=> Noted

R2-1713527 DRAFT LS on VoIP packet sizes and transport blocks Ericsson LS out Rel-15 NR_newRAT-Core To:RAN1, SA4
=> Delete SA4, the paragraph on SA4, and the action
=> With these changes the LS is approved in R2-1714070

R2-1713531 Aspects of Timing Advance Ericsson discussion NR_newRAT-Core

Proposal 1 NR TA Command MAC CE uses LTE TA Command MAC CE format. If RAN1 requires larger adjustment range for higher numerologies RAN2 will add second TA Command MAC CE with extended TA Command field based on range indicated by RAN1.
=> Restore clarification in subclause 5.2 that "A MAC entity stores or maintains NTA value upon expiry of associated timeAlignmentTimer
=> Confirm that the values of TA fields are 0 to 63.
=> Noted

R2-1713818 Potential new MAC CE NTT DOCOMO INC. discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713945 Details on SCell activation/ deactivation Samsung
=> Noted

**Agreements:**
1: sCellDeactivationTimer is not applied to the SCell configured with PUCCH.
2: UE performs the same actions (except PTI report) as in LTE upon SCell activation.
3: UE performs the same actions (except PTI report) as in LTE upon SCell deactivation.

Not treated
R2-1712202 MAC SDU discard procedure OPPO discussion Rel-15
R2-1712211 Discussion on Timing Advance in NR ASUSTeK discussion Rel-15 NR_newRAT-Core R2-1711082
R2-1713481 Further enhancement to the SR failure handling for multiple pending SRs Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713533 MAC CEs for activating an RS resource and handling corresponding TCI states Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713654 SPS with implicit SCell deactivation LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711569
R2-1713655 Restart condition of sCellDeactivationTimer with skipping operation LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711570
R2-1713656 Impact of RAN1's Discontinuous Transmission Indication ETSI discussion
R2-1713658 Impact of RAN1's Discontinuous Transmission Indication CATT discussion
R2-1713895 RAN2 consideration on user plane latency enhancement Samsung Electronics GmbH discussion R2-1711795

## 10.3.2 RLC

### 10.3.2.1 TS

*Latest TS 38.323, rapporteur inputs, etc*
*Including output from email discussion [99bis#13][NR UP/RLCMAC] – Running TS 386.322 – Mediatek*
*Please provide input to the rapporteur for corrections. Single/combined rapporteur TP is encouraged.*
R2-1712478 Draft TS 38.322 v110 MediaTek Inc. draft TS Rel-15 38.322 1.1.0 NR_newRAT-Core
=> The TS is endorsed

R2-1712981 EN-DC impacts to LTE RLC Huawei, HiSilicon CR Rel-15 36.322 14.1.0 0132 - B NR_newRAT-Core
=> We will only keep the reference in the reference sections
=> the CR is agreed in R2-1714066

### 10.3.2.2 RLC header format

*Contributions should focus only on critical issues/corrections related to agreed RLC PDU format (e.g. not enhancements)*

### 10.3.2.3 RLC UM operation

*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*



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### 10.3.2.4 Impact of PDCP duplication to RLC

*This AI will not be treated*

Not treated

R2-1712733 RLC optimization for packet duplication Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710760

R2-1712734 Further consideration on RLF indication Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710761

R2-1712735 RLC behaviours upon duplicate deactivation Huawei, ASUSTek, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710762

R2-1713832 Interaction between RLC Entities for PDCP Duplication Samsung discussion Rel-15 NR_newRAT-Core R2-1711786

R2-1713833 RLC Max Retransmissions in CA Duplication Samsung discussion Rel-15 NR_newRAT-Core R2-1711788

### 10.3.2.5 RLC AM operation

*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion are highly discouraged.*

R2-1713581 Addressing potentially excessive RETX_COUNT increment in RLC AM Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core

*RETX_COUNT is incremented at most once per status PDU.*

- LG supports the proposal
- Mediatek doesn't think we should change it. Maybe we can solve it by network setting proper values. Qualcomm thinks that to set the values the network would need to know in advance how many segments would be created.

=> RETX_COUNT is incremented at most once per status PDU
=> Noted

R2-1712320 Clarification on RLC STATUS PDU construction Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710211
=> No need to change anything
=> Noted

Not treated

R2-1712936 RLC STATUS report format Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713682 Transmitter friendly RLC Status Report Intel Corporation discussion Rel-15 NR_newRAT-Core

### 10.3.2.6 Other

*Including output from email discussion [99bis#59][NR UP/RLC] Open issues related to RLC – Ericsson*
*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*
*Contributions related to open issues discussed in email discussion are highly discouraged.*

R2-1712934 Email discussion on RLC open issues Ericsson discussion Rel-15 NR_newRAT-Core

=> Noted

*For polling, PDU_WITHOUT_POLL and BYTE_WITHOUT_POLL are updated (and reset) upon transmission opportunity is notified from lower layer*

- LG would like it to be upon assembly. Intel doesn't want to restrict UE implementation. Nokia raises a number of issues that can't be solved. Intel thinks that the UE can count while generating headers. Ericsson explains that we can have segmentation and we don't know the count.
- CATT thinks that because of the second agreement, count per PDU, upon transmission is a direct consequence

*It is specified that submission to lower layers is done when a transmission opportunity from lower layers is indicated*

- Intel, OPPO, Mediatek doesn't want to restrict the UE implementation. Ericsson doesn't see this restriction. The MAC header pre-construction can be done. There is no buffer in the

MAC. LG thinks that this is related to segmentation, there can be cases where the grant is smaller than submitted PDU and then it needs to be segmented. Nokia agrees with LG and Ericsson. Huawei raises another issue that BSR is calculated at the RLC and do we now have to consider packets buffered in the MAC.

*Capture in normative text RLC SN gap is not allowed in the transmitter side. In NR, the RLC entity discards a RLC SDU only if no segments of the RLC SDU has been submitted to the lower layer*

- Mediatek thinks that RLC UM doesn't need to be added. We don't put many SN in the RLC UM only for segments and we don't need to restrict for UM.

*Whether "transmitter delivers to lower layer" or "transmitter submits to lower layer";*

- *LG and Ericsson would like to align the terminology*

*Whether current wording in all RLC sections reflect correctly P13, i.e. does not mandate that RLC PDU(s) are constructed "when" an RLC SDU is received from upper layer;*

- Nokia raised this issue. Lenovo, LG explains that we don't specify the timing and we leave it up to UE implementation.
- Huawei agrees with Nokia and maybe we can add a Note. LG explains that in PDCP we use "for each PDU" to achieve the point that when to generate the PDU is up to UE implementation.

**Agreeements:**

1. RLC entity release procedure is specified in RLC specification (triggering discarding of all RLC SDUs and PDUs).
2. Restructure RLC sections, i.e. common section "RLC entity handling" with subsections "RLC establishment", "RLC re-establishment", "RLC release".
3. The TS 38.322 description on Status report format is sufficient to capture the behaviour of Status PDU construction, when a grant is not large enough to accommodate the status information of all missing PDUs
4. From a procedure specification perspective, retransmissions and acknowledgements are defined to be associated with RLC SDU (segments).
5. For polling, PDU_WITHOUT_POLL and BYTE_WITHOUT_POLL are updated (and reset) upon transmission opportunity is notified from lower layer
6. Segments of SDUs that have not yet been included in a data PDU should be considered as RLC data volume
7. It is specified that submission to lower layers is done when a transmission opportunity from lower layers is indicated. This does not preclude the UE doing preprocessing at the RLC layer and pre-creating MAC sub-headers. No additional note is added to the specification.
8. Capture for RLC AM in normative text RLC SN gap is not allowed in the transmitter side. In NR, the RLC entity discards a RLC SDU only if no segments of the RLC SDU has been submitted to the lower layer (i.e. *The transmitting side of an AM RLC entity shall not introduce an RLC SN gap when discarding an RLC SDU*)
9. No need is seen to align the transmit procedures for AM and UM
10. No changes/optimizations for the ACK_SN setting in a STATUS PDU.
11. No changes to Figure 4.2.1.2.1-1 and Figure 4.2.1.3.1-1 wrt header pre-preation/pre-processing
12. When receiving an RLC SDU from upper layers, it is up to the UE implementation when to construct an RLC AMD PDU
13. Align definition of the state variable TX_Next for RLC AM with description in procedural text by modifying the definition of TX_Next as follows: "This state variable holds the value of the SN to be assigned for the next newly generated AMD PDU. It is initially set to 0, and is updated whenever the AM RLC entity constructs an AMD PDU with SN = TX_Next and contains a RLC SDU or the last segment of a RLC SDU".
14. Specify a unified behaviour across all specs UE submits to lower layer and delivers to upper layers



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R2-1712935 TP on RLC open issue email discussion Ericsson discussion Rel-15 NR_newRAT-Core
=> The TP is revised in R2-1714068
R2-1714068 TP on RLC open issue email discussion Ericsson discussion Discussion R2-1712935 Rel-15 NR_newRAT-Core
=> change in section 5.3.1 (if needed and split the procedure in three steps)
=> The TP is agreed in R2-1714073 with the changes above

R2-1713657 Simplification of RLC entity re-establishment LG Electronics Polska discussion NR_newRAT-Core
=> the discard procedure needs to be added to the PDCP spec (LG will do it)
=> The TP is agreed

Not treated
R2-1712321 Impacts of RLC Pre-processing to BSR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712328 Updated RLC SDU discard procedure due to MAC layer discard procedure OPPO discussion
R2-1712690 Submission of RLC PDUs to MAC Intel Corporation discussion Rel-15 NR_newRAT-Core
R2-1712817 RLC TP for BSR Fujitsu discussion Rel-15 NR_newRAT-Core Withdrawn

## 10.3.3 PDCP

### 10.3.3.1 TS

*Latest TS 38.323, rapporteur inputs, etc*
*Including output from email discussion [99bis#14][NR UP/PDCPMAC] – Running TS 386.323 – LG*
*Please provide input to the rapporteur for corrections. Single/combined rapporteur TP is encouraged.*
R2-1713660 Draft TS 38.323 v101 LG Electronics Inc. (PDCP rapporteur) draft TR Rel-15 38.323 1.0.1 NR_newRAT-Core
=> The TS is endorsed

R2-1712807 Text Proposal on PDCP Data Recovery procedure for EN-DC Samsung R&D Institute India discussion Rel-15 R2-1710905
=> The TP is agreed

### 10.3.3.2 PDCP PDU formats

*Contributions should focus only on critical issues/corrections related to agreed PDCP PDU format (e.g. not enhancements)*

### 10.3.3.3 PDCP receive operation

*Contributions should focus only on critical remaining issues/corrections*

### 10.3.3.4 UL data split

*Including output of email discussion [99bis#44][NR UP/PDCP] – TP for PDCP pre-processing – LG*
*Max 1 contribution per company focusing on critical issues NOT identified/addressed by email discussion – supporting TP included in the contribution*

R2-1713661 Summary of E-mail [99bis#44] PDCP pre-processing report Rel-15 NR_newRAT-Core LG Electronics Inc. (E-mail rapporteur)
=> Noted

Agree on the NOTE, “The transmitting PDCP entity is allowed to submit PDCP PDUs to lower layers before receiving request from lower layers. It is up to UE implementation how many PDCP PDUs are submitted to lower layers before receiving request from lower layers.”
- Nokia asks what is the purpose of the note. LG thinks majority company would like a note. Nokia doesn’t see how this resolve a UE behaving badly. CATT, Sequans has sympathy with Nokia. Sequans explains that the normative text we already allow pre-processing.

=> This note is not needed

*Add the guideline text to the NOTE of Proposal 1, "If the transmitting PDCP entity is associated with two RLC entities, the UE should minimize the amount of PDCP PDUs submitted to lower layers before receiving request from lower layers in order to minimize the transmission gap between PDCP SNs of PDCP PDUs submitted to two associated RLC entities."*

- Nokia asks what is meant by minimization and we should have a concequence.

**Agreements:**
Add the guideline text to the NOTE of Proposal 1, "If the transmitting PDCP entity is associated with two RLC entities, the UE should minimize the amount of PDCP PDUs submitted to lower layers before receiving request from lower layers and minimize the PDCP SN gap between PDCP PDUs submitted to two associated RLC entities to minimize re-ordering delays in receiving side"

R2-1713662 TP of E-mail [99bis#44] PDCP pre-processing LG Electronics Inc. (E-mail rapporteur) discussion Rel-15 NR_newRAT-Core
=> Not treated

R2-1713663 PDCP data volume indication to MAC LG Electronics Inc. discussion Rel-15 NR_newRAT-Core

**Agreements [CBF]**
1. For split bearers, instead of *ul-DataSplitDRB-ViaSCG,* use generic name *primaryPath* to indicate the preferred RLC entity. The RLC entities can be in the same cell group or different cell groups. A RLC type IE is not needed. The presence of the IE *primaryPath* is sufficient.
2. For split bearers, call the MAC entity as "MAC entity associated with primary/secondary RLC".
3. For split bearers, use infinity value of ul-DataSplitThreshold to realize UL path restriction

R2-1713382 RLC buffer handling for pre-processed data Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
- LG, QC, Mediatek, Intel and Lenovo, thinks that pre-processed data are reported as RLC data volume and we agreed that we will minimize amount of data.
- Nokia thinks that this has the concequence of forcing the network to schedule the UE and the threshold is not very useful. CATT understands the concequence but if the UE is not being scheduled it can still re-process the data so the network doesn't have to schedule the UE.
- Sequans doesn't want to mandate the UE to re-process. Nokia thinks that we need to re-process anyways for other use cases

=> Noted

R2-1713580 BSR reporting for UL split bearer Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
=> Noted

**Agreements**
1. No change in BSR reporting, PDCP data volume calculation, RLC data volume calculation are required due to preprocessing for UL split

R2-1713665 UL split with LTE link Sequans Communications discussion NR_newRAT-Core
*Proposal 1 for split bearers, PDCP may submit PDCP PDU to LTE lower layers only when requested by LTE lower layers*
*Proposal 2: when comparing with the PDCP split threshold the UE should take into account the PDCP data volume and the RLC data volume pending for initial transmission in NR link(s)*
- LG thinks that we don't need to change anything in the current text.
- Mediatek thinks that we need to update the PDCP spec to refer to LTE – data available for transmission. In LTE we do not use the RLC data volume so in NR PDCP the LTE data volume shoud be zero.
- Oppo thinks this is a reasonable proposal for split bearer.
- Sequans indicates that if we have proposal 2 a concequence is that we shouldn't submit pre-processed data. TCL agrees with both proposals.
- Nokia and ericsson thinks we shouldn't change anything.

=> No restriction is specified for the EN-DC case.
=> Noted

Not treated

| | | | | | |
|---|---|---|---|---|---|
| R2-1712931 | PDCP BSR reporting at UL split | Ericsson | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712479 | PDCP data recovery for UL split bearer | MediaTek Inc. | discussion | Rel-15 | NR_newRAT-Core R2-1711547 |
| R2-1712186 | Left issue for split bearer | OPPO | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712480 | NR PDCP enhancements to support LTE RLC | MediaTek Inc. | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712818 | Pre-processing restriction | Fujitsu | discussion | Rel-15 | NR_newRAT-Core Withdrawn |
| R2-1712907 | Remaining issues with UL split bearer | Huawei, HiSilicon | discussion | Rel-15 | NR_newRAT-Core |
| R2-1713008 | UE behavior at UL path switch | vivo | discussion | | |

## 10.3.3.5 PDCP duplication

*This AI will not be treated*

Not treated

| | | | | | |
|---|---|---|---|---|---|
| R2-1712308 | Interaction between PDCP and RLC Entities for duplication in NR-NR DC | TCL | discussion | | NR_newRAT-Core |
| R2-1712435 | Consideration on PDCP Duplication in NR | ZTE CORPORATION | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712736 | PDCP operation for packet duplication | Huawei, ASUSTek, HiSilicon | discussion | Rel-15 | NR_newRAT-Core R2-1710763 |
| R2-1712737 | PDCP data volume calculation for packet duplication | Huawei, HiSilicon | discussion | Rel-15 | NR_newRAT-Core R2-1710764 |
| R2-1712738 | Clarification on bearer type for packet duplication | Huawei, HiSilicon | discussion | Rel-15 | NR_newRAT-Core R2-1710765 |
| R2-1712739 | Enhancements for DL Packet Duplication | Huawei, HiSilicon | discussion | Rel-15 | NR_newRAT-Core R2-1710766 |
| R2-1712914 | PDCP packet duplication | Lenovo, Motorola Mobility | discussion | Rel-15 | NR_newRAT-Core R2-1711041 |
| R2-1712926 | PDCP duplication and discard | Ericsson | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712928 | PDCP duplication for AM operation | Ericsson | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712929 | PDCP duplication transmit operation | Ericsson | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712932 | PDCP data volume reporting in duplication | Ericsson | discussion | Rel-15 | NR_newRAT-Core |
| R2-1712964 | Discussion on PDCP data volume calculation during PDCP Duplication | Samsung R&D Institute India | discussion | | R2-1711123 |
| R2-1712965 | Discussion on Uplink Packet Duplication III | | discussion | Rel-15 | |
| R2-1713004 | Layer-2 behaviors of PDCP duplication deactivation | vivo | discussion | | R2-1710970 |
| R2-1713005 | PDCP duplication impacts on LCP | vivo | discussion | | R2-1710968 |
| R2-1713006 | Discussion on the PDCP data volume | vivo | discussion | | R2-1710966 |
| R2-1713009 | UE layer-2 behaviors at SCell-failure | vivo | discussion | | |
| R2-1713584 | PDCP duplication | Qualcomm Incorporated | discussion | Rel-15 | NR_newRAT-Core R2-1711544 |
| R2-1713641 | Configuration of PDCP duplication on default DRB | ITL | discussion | Rel-15 | |
| R2-1713829 | Activation and Deactivation of PDCP Duplication | Samsung | discussion | Rel-15 | NR_newRAT-Core R2-1711782 |
| R2-1713830 | Discussion on CA Duplication | Samsung | discussion | Rel-15 | NR_newRAT-Core R2-1711783 |
| R2-1713831 | Initial State of Uplink Packet Duplication | Samsung | discussion | Rel-15 | NR_newRAT-Core R2-1711785 |



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### 10.3.3.6 Support for RoHC

### 10.3.3.7 Other

*Contributions should focus only on critical remaining issues/corrections*

R2-1712187 PDCP handling for UL path switch OPPO discussion Rel-15 NR_newRAT-Core

*Proposal 1 During UL path switch, re-transmit all the PDCP PDUs previously submitted to the old path for which the successful delivery has not been confirmed by lower layers*

*Proposal 2 No need to do PDCP status report during UL path switch.*

*Proposal 3 RLC re-establishment is not needed for UL path switch.*

*Proposal 4 RLC data discard for the old path is triggered before UL path switch.*

- Intel thinks that we don't need to discuss as we concluded in main session to have an explicit indication whether to perform data recovery. Nokia doesn't see the need to discuss this again. LG and QC don't support. Qualcomm thinks that there are many corner cases to discuss.
- Lenovo and Sequans support this.

*How to deal with pre-processing*

- Mediatek is concerned that we may flush the data that we pre-processed. Oppo agrees.

=> No additional things need to be specified

=> Noted

R2-1713727 SDAP header excluded from PDCP ciphering Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1710906

- Intel shares the concerns
- Samsung thinks that there are different implementations and some may have a problem with this proposal. Huawei, LG doesn't agree with the proposal and is violating the cross layers. Qualcomm thinks that there should have been one layer. Nokia confirms and the split is an aritificial split.
- Intel thinks this is aligned with ROHC agreement.
- Mediatek thinks that it is more important that we finalize the header size.
- Nokia supports the proposal and there is some benefits with the CU/DU
- Qualcomm thinks that having to de-cipher before knowing where to route data is forcing steps in the implementations.
- Mediatek asks if there are any concern with not ciphering the SDAP header.
- Intel explains that it is easier to do ROHC, encrypt and the put the header, other than doing ROHC, putting header, and then ciphering

**Agreement**

=> The PDCP ciphering function shall not be applied to SDAP header

Not treated

R2-1712691 UL path switching Intel Corporation discussion Rel-15 NR_newRAT-Core

R2-1712925 PDCP SN reconfiguration at handover Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713563 L2 actions upon UL path switch Sequans Communications discussion NR_newRAT-Core

R2-1713714 PDCP data recovery for SRB LG Electronics France discussion Rel-15 NR_newRAT-Core

R2-1713715 UE behaviour upon UL path switch LG Electronics France discussion Rel-15 NR_newRAT-Core

R2-1712930 PDCP UL switch procedure Ericsson discussion Rel-15 NR_newRAT-Core

R2-1712902 Behavior of t-Reordering timer during PDCP re-establishment for SRB and AM DRB Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1712927 UP timers in PDCP Ericsson discussion Rel-15 NR_newRAT-Core

R2-1713383 Clarification of agreement on header-only PDCP Data PDU Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT

R2-1713827 PDCP parameter applicability for SRB NTT DOCOMO INC. discussion Rel-15 NR_newRAT-Core



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## 10.3.4 SDAP

*This AI is down-prioritized and will be treated if issues that require RAN2 attention for other WGs to progress are identified*

### 10.3.4.1 TS

*Latest TS 37.324, rapporteur inputs, etc*

R2-1713458 Draft TS 37.324 v111 Rapporteur (Huawei) draft TSRel-15 37.324 1.1.1 NR_newRAT-Core
=> The TS is endorsed

Not treated

R2-1712164 Text proposal for the SDAP entity establishment and release Samsung pCR Rel-15 37.324 1.0.1 NR_newRAT-Core
R2-1712165 Text proposal on the number of SDAP entities Samsung pCR Rel-15 37.324 1.0.1 NR_newRAT-Core
R2-1712392 Number of SDAP Entities for NR DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713459 List of Editor's Notes from TS 37.324 v1.1.0 Rapporteur (Huawei) discussion Rel-15 37.324 NR_newRAT-Core
R2-1713863 Alignment with QoS section in TS 23.501 SHARP Corporation discussion Rel-15 NR_newRAT-Core

### 10.3.4.2 Header Format

*Details of header format only (e.g. size of QFI and use of one bit QFI). Progress on some aspects may require SA2 response.*

R2-1712481 SDAP header design based on NAS 5G QoS requirements MediaTek Inc. discussion Rel-15 NR_newRAT-Core
- Samsung thinks that we should respect SA2 7 bit QFI. Xioami and Vivo. Samsung thinks that the 1 bit RQI can work.
- Nokia understands that SA2 would have liked to but doesn't mean 6 didn't work.
- CATT thinks that SA2 had very clear reason why. Mediatek thinks not all UEs have to support all these flows.
- Ericsson thinks that SA2 is open to doing some remapping.
- Huawei shares MEdiatek view and 6 bits can work.
- Huawei thinks that RAN2 has a work around even if SA2/CT1 decides 7 or 8 bits QFI.

=> Noted

**Agreements**
=> SDAP header remains fixed to 8 bits. The details are FFS.

Not treated

R2-1712166 Further considerations on the QoS header format Samsung discussion Rel-15 NR_newRAT-Core
R2-1712177 Clarification on RQI bits TCL discussion NR_newRAT-Core
R2-1712200 SDAP PDU format OPPO discussion Rel-15
R2-1712377 Consideration on reflective QoS of SDAP Beijing Xiaomi Mobile Software discussion Rel-15
R2-1712393 Further Discussion on SDAP Header Format Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712437 Discussion on SDAP DATA PDU for reflective QoS ZTE CORPORATION discussion Rel-15 NR_newRAT-Core R2-1710439
R2-1712862 SDAP header format CATT discussion
R2-1712923 SDAP Header Format Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713231 Considerations on one bit RQI CMCC discussion Rel-15 NR_newRAT-Core R2-1710394
R2-1713583 Considerations on Reflective QoS Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1713586 Location of QoS Flow ID in UL and DL packet LG Electronics France discussion Rel-15 NR_newRAT-Core R2-1703023



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R2-1713669 SDAP header format LG Electronics discussion NR_newRAT-Core R2-1711755

### 10.3.4.3 Other

*QoS flow remapping and handover within the same cell (max 1 contribution per company for this topic)*
*Other SDAP issues*
Not treated
R2-1712167 Further considerations on a common AS/NAS reflective QoS indicator Samsung discussion Rel-15 NR_newRAT-Core
R2-1712173 Issues with RQI setting for AS updating TCL, vivo, CATT discussion NR_newRAT-Core R2-1710166
R2-1712174 QFI Presence for AS Level Reflective QoS TCL, CATT discussion NR_newRAT-Core R2-1710167
R2-1712206 Presence of UL SDAP header on default DRB ASUSTeK discussion Rel-15 NR_newRAT-Core R2-1711077
R2-1712207 Discussion on changing presence of SDAP header ASUSTeK discussion Rel-15 NR_newRAT-Core R2-1711078
R2-1712317 BSR enhancement for SDAP Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710205
R2-1712361 New QoS flow on the Default Bearer Nokia, Mediatek, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
R2-1712362 Reflective QoS Control Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT Withdrawn
R2-1712363 QoS Flow Remapping Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
R2-1712364 Default QoS Profile Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT
R2-1712378 QoS Flow Remapping Beijing Xiaomi Mobile Software discussion Rel-15 R2-1711068
R2-1712394 SDAP (re)configuration Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712395 QoS Flow to DRB Re-Mapping Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712396 Lossless Handover of QoS Flow Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712397 QoS Flow Level Offloading in NR-DC Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712482 In-order delivery during QoS flow relocation MediaTek Inc. discussion Rel-15 NR_newRAT-Core R2-1710699
R2-1712920 Issues with the exisiting QoS framewok (Stage 3) Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712922 SDAP entity establishment Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712924 SDAP configurations aspects Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712963 QoS Flow Remapping in Handover and Within the Same Cell Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713003 Consideration on BSR for SDAP vivo discussion R2-1710969
R2-1713505 Number of SDAP entities in UE for NR DC Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713582 SDAP remaining issues Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711543
R2-1713609 QoS flow to DRB remapping LG Electronics France discussion Rel-15 NR_newRAT-Core R2-1711558
R2-1713647 Reflective QoS acknowledgement ITL discussion Rel-15 R2-1711668
R2-1713648 QoS Flow Remapping ITL discussion Rel-15
R2-1713659 Configurability for the presence of SDAP header LG Electronics discussion NR_newRAT-Core R2-1709068
R2-1713666 Considerations on release of a mapping of QoS flow to DRB LG Electronics discussion NR_newRAT-Core R2-1711748
R2-1713667 Discussion on SDAP entity establishment in DC LG Electronics discussion NR_newRAT-Core R2-1709074
R2-1713668 Further discussion on SDAP Configuration LG Electronics discussion NR_newRAT-Core R2-1709071



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# 10.4 Stage 3 control plane

## 10.4.1 NR RRC

### 10.4.1.1 TS

*Latest TS 38.331, other rapporteur inputs, etc. Please submit any new text proposals to the appropriate agenda item. Note specification methodology has been given a separate AI for RRC.*
*Including output from email discussion [99bis#16][NR] TS 38.331 (Ericsson)*
*This agenda item is relevant to EN-DC completion.*

R2-1713629 Draft TS 38.331 v0.2.0 Ericsson (Rapporteur) draft TSRel-15 38.331 0.2.0 NR_newRAT-Core
- Samsung think we did not agree the failure causes in the SCG failure that are included in the draft TS. Ericsson think it came from the previous agreed TP on SCG failure.

=> Comments to the rapporteur invited
=> New version including latest RAN1 parameter list in R2-1714126

R2-1714126 Draft TS 38.331 v0.3.0 Ericsson (Rapporteur) draft TSRel-15 38.331 0.3.0 NR_newRAT-Core

✉ **[100#xx][NR] 38.306 (Intel)**
Intended outcome: Agreed TS for submission to RAN for (one step) approval
Deadline: Thursday 2017-12-07

R2-1713630 TS38.331 Open Issues Ericsson (Rapporteur) discussion Rel-15 NR_newRAT-Core
=> Noted

### 10.4.1.2 Specification methodology

*This agenda item is relevant to EN-DC completion.*

R2-1713500 NR RRC specification, protocol extension aspects & introduction of SA Samsung Telecommunications discussion Rel-15 NR_newRAT-Core
- Ericsson think there is little point to try to have a running CR until after March. Samsung thinks it depends on the changes as some parts will be independent of the EN-DC parts of the spec.

**Agreements**
1 Develop the running CR introducing the SA related changes using the regular non-critical extension approach as baseline. Critical extensions should however be considered in specific cases e.g. when a change of information structure is highly desirable
2 In Q1 the running CR can start to develop text for those sections that do not contains anything related to EN-DC. Sections that contain text on EN-DC can be updated to add SA aspects after March.

=> Other methodology aspects can be discussed in offline session (Ericsson)

R2-1714172 TS38.331 Methodology session Ericsson report
=> ASN.1 review plan is agreed

R2-1712541 ASN.1 handling of SA specific fields in NSA Huawei, HiSilicon discussion Rel-15
R2-1712542 Extensibility in NR ASN.1 Huawei, HiSilicon discussion Rel-15
R2-1713922 Generic error handling in NR RRC Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core

### 10.4.1.3 Connection control procedures

*No documents should be submitted to 10.4.1.3. Please submit to 10.4.1.3.x.*

### 10.4.1.3.1 Connection reconfiguration message and bearer handling

*Structure and general content of RRCConnectionReconfiguration message. Including the related additions to the LTE RRCConnectionReconfiguration for EN-DC operation.*
*Including output from email discussion [99bis#17][NR] Reconfiguration and bearer handling (Ericsson)*
*Any contributions should focus on critical issues NOT resolved by the email discussion and a supporting TP should be included in the contribution.*
*This agenda item is relevant to EN-DC completion.*

R2-1713341 Email disc 17: TP for NR RRC Reconfiguration Ericsson discussion Rel-15 NR_newRAT-Core
- Samsung think that both direction of NR/LTE PDCP version change should be captured in the LTE RRC spec, to keep NR RRC clean. Ericsson think it is triggered from NR RRC and hence should captured there.
- Samsung also had a comment on the RLC re-establishment indicator whether this is used in all cases that re-establishment is required. Ericsson prefer that the triggering for synchronous reconfiguration would be implicit.
- Intel wonder if the order of execution should be radio bearer first and then lower layer configuration. Ericsson think that RLC re-establishment should be first and then PDCP re-establishment. Think the DRB to LCH linking can be done with any order.
- Samsung wonder if T312 is needed in the NR spec and thought it would be discussed after December.

=> Noted (already captured in the latest version of the TS)
=> Check offline how to update the text so that RLC re-establishment indicator is always set in the case of a synchronous reconfiguration, instead of being implicitly triggered.

R2-1713342 Email disc 17: TP for LTE RRCConnectionReconfiguration Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted (already captured in the latest version of the running CR)

R2-1712666 Delta/Full configuration for bearer type change and SN change Intel Corporation discussion Rel-15 NR_newRAT-Core
P2
- Intel explain that the question is whether we want to avoid doing release and add which is a lossy procedure.
- HTC think in LTE we do not support lossless full configuration. Intel think it will be more frequency than in LTE as it is for bearer type change.
- LG think the procedure will be more complex than just keeping the PDCP SNs.
- Ericsson think if that if the target SN does not understand the source SN bearer configuration then we can rely on the LTE full configuration. CATT agree with Ericsson as the bearer type change is not so frequency.

**Agreements**
1 To support delta configuration for bearer type change between MCG (split) DRB and SCG (split) DRB and SN change, the 'SCGConfigInfo' and 'SCGConfig' INMs should include both radioBearerConfig containers and nr-secondaryCellGroupConfig container.

=> Handover case also needs to be checked and aligned with the previous agreement.

R2-1713390 Full configuration in EN-DC Ericsson discussion Rel-15 NR_newRAT-Core
*moved from 10.4.1.3.4 to 10.4.1.3.1*
- HTC think that a full config flag is simpler than using the release flag. Qualcomm agree.
- Intel support proposal 2 as it is a simple way to achieve the full configuration.

=> Offline discussion to try to progress how the full configuration works (Offline discussion #21, Ericsson)
- Update from offline:

R2-1714207 OFFLINE#21 Full configuration in EN-DC (Ericsson) Ericsson
=> Revised in R2-1714422 8 to update proposal 1

**Agreements**



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1 In case the target eNB doesn't understand the MCG part of the configuration but the target SgNB does understand the SCG part
- MN sets the LTE fullconfig flag in the LTE RRCConnectionReconfiguration message, and this will release both MCG and SCG configuration.
- MN doesn't include the scg-configInfo in the sgNB addition request (if an SN is added)

R2-1714228 OFFLINE#21 Full configuration in EN-DC (Ericsson) Ericsson

**Agreements**
1: In case the target eNB understands the MCG part of the configuration but the target SgNB doesn't understand the SCG part
- SN indicates to the MN that it has applied full SCG configuration
- Impacted bearers in indicated in the drb-toReleaseList
- MN sets the en-DC-release flag to TRUE in the LTE RRCConnectionReconfiguration message sent to the UE

=> Inter node signalling can be discussed as part of the email discussion on inter node messages.

R2-1712667 RRC signaling for PDCP data recovery Intel Corporation discussion Rel-15 NR_newRAT-Core
=> Already covered by the TP from the email discussion.

R2-1712689 Addition and Release of SCG configuration over LTE RRC Intel Corporation discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713343 Some remaining terminology issues Ericsson discussion Rel-15 NR_newRAT-Core

**Agreements**
1 Do not use term HO nor SCG Change nor SCG refresh in Stage-3 RRC but instead
1) Reconfiguration with sync with key change
2) Reconfiguration with sync without key change

2 Within the NR RRC spec the term SpCell refers to the primary cell of the master and the secondary cell group. The term PSCell can be defined as SpCell of SN and PCell is defined as the SpCell of the MN

R2-1713388 LTE re-establishment when using NR PDCP (TP to 36.331 and 38.331) Ericsson discussion Rel-15 NR_newRAT-Core
- Lenovo think this reduces the chances to successfully re-establishment. Ericsson think in this case it would result in extra reconfiguration when the cell does support NR PDCP.
- IDC think the common case is reestablishment to a cell that does support NR PDCP.
- Intel wonder why reject is needed and full configuration is not used.
- HTC think that full configuration is not possible in the re-establishment , it can only be done in the first reconfiguration.
- OPPO think this proposal has some benefit when the cell supports EN-DC.

=> Offline discussion to progress the SRB1 issue to ensure that the mechanism works when the UE attempts to re-establish on an eNB that supports EN-DC, and when the UE attempts to re-establish on a legacy eNB that has the context but cannot understand the full context. (Offline discussion #22, Ericsson)

**Agreements**
1 For re-establishment in LTE, UE releases the lower layer SCG configuration (i.e. nr-secondaryCellGroupConfig) at RRC re-establishment while the DRB configuration (incl. the NR PDCP configuration received in radioBearerConfig) is kept.

R2-1714208 OFFLINE#22 LTE re-establishment and resume while using NR PDCP Ericsson

**Agreements**
1 On re-establishment,
- UE reverts to using LTE PDCP for SRB1
- If target eNB supports NR-PDCP, it can use RRCConnectionReconfiguration to revert the PDCP version of SRB1 or any other bearers to NR
- If target eNB doesn't support NR-PDCP, it can perform full configuration to revert the PDCP version of all bearers to LTE PDCP.

2 On resume,
- UE reverts to using LTE PDCP for SRB1

3 The RRCResume message extend to enable configuration of bearers with NR PDCP

R2-1713530 Capturing network restrictions and bearer type changes in Stage-3 Ericsson discussion Rel-15 NR_newRAT-Core

**Agreements**
1 Related to bearer type changes, capture the cases that are not supported as network restrictions in the conditions.
2 Capture in the conditions the network restrictions that when security key change is performed, PDCP re-establishment as well as synchronised reconfiguration need to be triggered.

R2-1712219 Corrections to TP in RRC(Connection)Reconfiguration OPPO discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713344 RRC Reconfiguration of NR-NR DC and NE-DC Ericsson discussion Rel-15 NR_newRAT-Core

**Agreement**
1 For EN-DC for Dec 17, the UE behaviour will only be specified for the case that the embedded NR RRC PDU in the LTE RRRCConnectionReconfiguration includes secondaryCellGroupToAddModList and/or measConfig and nothing else.

### 10.4.1.3.2 Connection reconfiguration message - L2 parameters

*L2 parameter content of RRCConnectionReconfiguration message.*
*Including output from email discussion [99bis#18][NR] L2 parameters in RRC (Huawei)*
*Any contributions should focus on critical issues NOT resolved by the email discussion and a supporting TP should be included in the contribution..*
*This agenda item is relevant to EN-DC completion.*

R2-1712578 L2 parameter content of RRCReconfiguration message Huawei (Rapporteur) discussion Rel-15 NR_newRAT-Core
Discussion on on-duration timer
- Ericsson, CATT, LG thinks that slot level is sufficient
-

**Agreements**
1. Information for PDCP duplication / UL split is provided in PDCP-Config (not in LCH-Config). In the ASN.1, "configuredRLC" is changed to "primaryRLC" but can be changed if another name seems more suitable for 38.323. "secondaryRLC" is used for the other.
2. Slot level granularity is sufficient for *drx-onDuration* and DRX-*inactivity timer and "slot offset".* Values will include 32.
3. Separate values can be specified for UL and DL HARQ RTT. The values are numerology dependents and in number of symbols. Maximum number is 4ms as in LTE.

=> Rapporteur will create a list of parameters that still need discussions



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[CBF 537]

R2-1713482 Values of counters and timers for SR and BSR Ericsson discussion Rel-15 NR_newRAT-Core
=> Not treated

R2-1713902 Separate configurations for UL and DL PDCP SN lengths HTC Corporation discussion R2-1711735
=> Not treated

### 10.4.1.3.3 Connection reconfiguration message - L1 parameters

*L1 parameter content of RRCConnectionReconfiguration message.*
*Including output from email discussion [99bis#19][NR] L1 parameters in RRC (Ericsson)*
*Any contributions should focus on critical issues NOT resolved by the email discussion and a supporting TP should be included in the contribution.*
*This agenda item is relevant to EN-DC completion.*

R2-1713430 [99bis#19] Summary of NR L1 parameters in RRC Ericsson discussion Rel-15 NR_newRAT-Core
P1
- Intel would prefer to have 2 separate MIBs and avoid optionality in the MIB.
- Samsung ask if the MIB size would be the same in both cases.
- OPPO also prefer to have separate MIBs but to align with RAN1 agreements

**Agreements**
1 Create two different MIB encodings, one for sub-6 and one for mmWave (sub-6 encoding will require fewer bits).
2 ssb-subcarrierOffset should be mandatory present and its value range should be from 0..11 (already captured in TP)
3 Consider pdcchConfigSIB1 (in MIB) as mandatory field and define one code-point (e.g. all-zeros) as “SIB1 not present”.
=> Inform RAN1 of MIB decisions (1 and 3). Can explain to RAN1 the reason to define this code point.
4 The NW may reconfigure BWPs in ServingCellConfigDedicated with or without synchronousReconfiguration (up to NW implementation).
7 For initial access, the UE uses the information derived from MSI until the NW configures (if at all) one or more BWPs via RRC in ServingCellConfigDedicated.
FFS Whether ServingCellConfigCommon should contain information (e.g. CORESET and/or (Common-)SearchSpace) similar that derived from MSI.
FFS Whether to keep the SPS-Config including Type1 and Type2 or whether to split it into SPS-Config (Type2) and UplinkGrant-Config (Type1).

Update from offline discussion of MIB: RAN1 have concluded that the SSB index is now not in the MIB so the MIB is less frequency range dependent. Proposal is to revert agreement 1 and have a single MIB encoding.
- Samsung think there is still the subcarrier spacing which will be 2 bits. Ericsson suggest that the subcarrier spacing can still be a single bit but having different meaning depending on the frequency range.
- Nokia wonder about extension in future that only apply for a single range

=> Offline discussion to conclude
=> Draft LS to RAN1 on code point meaning no RMSI in R2-1714184 (Offline discussion #41, Ericsson)

R2-1714184 Code point in MIB meaning no RMSI Ericsson LS out RAN1
=> Approved in R2-1714205

✉ **[100#xx][NR] L1 CSI meas config (Ericsson)**
Progress details of L1 parameters
Intended outcome: Report to next meeting
Deadline: Thursday 2018-01-04



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*BWP*

R2-1712889 Supporting BWP Operation in Stage-3 RRC MediaTek Inc. discussion

**Agreements**
1 Add a subclause for DL/UL BWP and BWP pair additional/modification is added in NR RRC spec.
2 Add a subclause for DL/UL BWP and BWP pair release is added in NR RRC spec.
3 For reconfiguration with synchronisation or for SCell addition, one DL/UL BWP indicated in the RRC message is the active BWP until it is changed by DCI.

R2-1712891 Supporting BWP Operation in Stage-3 RRC MediaTek Inc. discussion
=> Revised to R2-1713942

R2-1713942 Supporting BWP Operation in Stage-3 RRC MediaTek Inc. discussion

R2-1713437 Cell specific parameter handling in EN-DC Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713868 Remaining issues on bandwidth part configuration Samsung discussion Rel-15

**Agreement**
1: BWP configuration for the SUL carrier is to be added.

*SUL*

R2-1713207 Stage 3 Procedure and parameters for supporting SUL Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

**Agreements**
1: Common configuration and dedicated configuration for the UL and SUL can be independent. (Agreement is not meant to preclude any discussion in UP session)
2 Common configurations for both non-SUL and SUL can be provided to the UE
3 UE is configured with PUCCH and PUSCH dedicated configuration for either UL or SUL
4 UE can additionally be configured a PUSCH on the other carrier.
5 For reconfiguration with synchronisation, the UE can be provided with RACH dedicated configuration for either UL or SUL.

R2-1713356 TP on 38.331 for supporting SUL Huawei, HiSilicon pCR Rel-15 38.331 0.1.0 NR_newRAT-Core

R2-1713896 RRC configuration of SUL Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
=> Noted

*Other*

R2-1713858 RLM and RLF signalling structure for NR and TP for TS 38.331 Samsung R&D Institute UK discussion
P1
- MediaTek think this should be separate from RRM and hence in a separate location

P6
- Samsung explain the value range is based on periodicity of SSB and the number of samples that are needed.

**Agreements**
1 RLM configuration and RLF related timers and constants are located as part of the SpCell configuration information (therefore a separate configuration from RRM)
FFS Value range for T310/T313

R2-1712371 RB Alignment in NR Qualcomm Incorporated discussion Rel-15 NR_newRAT
*moved from 10.3.1.3.4 to 10.4.1.3.3*

R2-1712287 Correction on NR-PBCH Definition for TS 38.331 OPPO discussion NR_newRAT-Core
=> revised to R2-1713951
R2-1713951 Correction on NR-PBCH Definition for TS 38.331 OPPO discussion NR_newRAT-Core
*moved from 10.4.1.6.1 to 10.4.1.3.3*
=> Noted

R2-1713860 RLF signalling for BWP Samsung R&D Institute UK discussion
=> Noted

*Withdrawn*
R2-1713859 RLF signalling for BWP Samsung R&D Institute UK discussion Withdrawn

10.4.1.3.4 Other (for EN-DCs)

*Stage 3 details related to SCG SRB, split SRB, etc.*
*Including output from email discussion [99bis#21][NR] RRC reconfiguration processing time for EN-DC (Ericsson)*
*This agenda item is relevant to EN-DC completion.*
*RRC processing times*
R2-1713439 Summary of email discussion [99bis#21][NR] RRC reconfiguration processing time for EN-DC
Ericsson discussion Rel-15 NR_newRAT-Core

**Agreements**
1 A joint processing time requirement is defined to LTE reconfiguration message with embedded NR RRC part.
2 The processing time requirement for NR RRC received over SRB3 is defined in 38.331.
3 The processing time requirements only apply to the case where the UE receives one RRC message at a time.
4 The processing time definition and unit of LTE RRC is applied also for LTE RRC with embedded NR RRC.
5 Following aspects should be considered when deciding RRC processing times for LTE RRCConnectionReconfiguration with embedded NR RRC:
- LTE and NR ASN.1 decoding and encoding
- Configuration time including coordination between LTE and NR part of UE
- Encoding of LTE and NR complete message
- Increased complexity due to introduction of new features and RRC IEs in LTE-A and NR
- UE processing capability improvements since R8
6 The following two subcases are defined for RRCConnectionReconfiguration including NR RRC:
- RRC connection re-configuration (NR measurement configuration)
- RRC connection re-configuration (NR SCG establish/mod/release)

R2-1713440 TP for 36.331 on RRC reconfiguration processing time for EN-DC Ericsson discussion Rel-15 NR_newRAT-Core
=> Agreed

R2-1713441 TP for 38.331 on RRC reconfiguration processing time for EN-DC Ericsson discussion Rel-15 NR_newRAT-Core
=> Agreed

R2-1712668 Processing delay requirement for EN-DC UE Intel Corporation discussion Rel-15 NR_newRAT-Core

*Default configs*
R2-1712414 Capturing of default configuration of SRB CATT discussion
- Samsung think this approach gives us the chance to switch back to a default and wonder if it is needed. CATT agree there is not really any need to switch back to default.
- Ericsson think the choice structure is not need as there is no need to switch back and forth, and hence it will be possible to add a default configuration in future.
=> Offline discussion to conclude if and how to introduce default configurations for SRBs. (Offline discussion #34, CATT)
- Update from offline:



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R2-1714233 Offline discussion #34: Capturing of default configuration of SRB CATT discussion

**Agreements**
1: Default configuration for SRB is used in NR. However the applicability of default configuration for SRB setup is captured in the procedure description only.

R2-1713142 Default configuration of SRB1S, SRB2S and SRB3 Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
=> TP is agreed

R2-1713392 Default configurations for SRB3 and split SRBs Ericsson discussion Rel-15 NR_newRAT-Core

*Other*
R2-1712664 UE handling of combined configuration message Intel Corporation discussion Rel-15 NR_newRAT-Core

**Agreements**
1: LTE reconfiguration message with embedded NR reconfiguration message is valid if the resultant configuration after processing both the LTE and NR reconfigurations is valid (i.e. the max capability is not exceeded in terms of band combination support, measurement capability and DRB support)
2: RAN2 will not have a requirement that the NR and LTE parts of the reconfiguration need to be applied at exactly the same time, as long at each part is applied within the processing requirement.

R2-1713399 Discussion and TP on preserving NR PDCP version Ericsson discussion Rel-15 NR_newRAT-Core
- OPPO think this should be discussed together with re-establishment. Samsung have the same view.
- Ericsson think this case is different as an additional reconfiguration is not always needed but if we change to LTE PDCP then an extra reconfiguration step will be needed
- Intel think this case has the same issue with legacy eNBs as the re-establishment.
- LG think this requires that all cells in the resume area will have to support NE-DC and NR PDCP.

=> Can be discussed within the scope of offline discussion #22

R2-1713438 PDCP version change for SRBs Ericsson discussion Rel-15 NR_newRAT-Core
- Intel think the only case for change from NR to LTE PDCP is only performed in the case of handover to legacy eNB.

**Agreements**
1 UEs configured with NR PDCP for SRB1 reverts back to LTE PDCP for SRB1 when they receive a “full configuration” RRC connection reconfiguration message which does not include any embedded NR RRC information.

R2-1713442 TP for 38.331 on security algorithm configuration Ericsson discussion Rel-15 NR_newRAT-Core

**Agreements**
1 NR RRC should use the NR namespace (e.g. nia1, nea1) for configuring the security algorithms for all radio bearers configured with NR PDCP.
2 For EN-DC, the NR algorithm configured for bearers using NR PDCP and KeNB is restricted to algorithms which have an identical LTE algorithm and shall be the same as the algorithm configured for SRB1.

R2-1712763 Remaining issues on SRB3 vivo discussion Rel-15 NR_newRAT-Core

=> Noted

R2-1713487 Size of the C-RNTI Ericsson discussion Rel-15 NR_newRAT-Core
*moved from 10.4.1.4.5 to 10.4.1.3.4*

**Agreements**
The length of the C-RNTI field is 16 bits.

R2-1713497 DRAFT Reply LS on Supportable RNTI Length on DCI Ericsson LS out Rel-15 NR_newRAT-Core To:RAN1
*moved from 10.4.1.4.5 to 10.4.1.3.4*
=> Change RNTI to C-RNTI
=> Approved in R2-1714154

### 10.4.1.3.5 Connection control message harmonisation

*Harmonisation/merging of messages to be used for different procedures, UE identity and other message content to be used in different cases, etc.*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows.*
*Maximum 1 tdoc per company*

R2-1713205 Harmonization of the RRC procedures Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core R2-1711486
R2-1713295 Harmonizing RRC Connection control messages and procedures Ericsson discussion Rel-15 NR_newRAT-Core
R2-1712169 Further discussion on merging NR RRC messages Samsung discussion Rel-15 NR_newRAT-Core
R2-1712411 RRC connection re-establishment and resume procedures in NR CATT discussion R2-1710279
R2-1712579 Harmonization of RRC Connection Control management procedures Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712672 NR common RRC procedures Intel Corporation discussion Rel-15 NR_newRAT-Core
R2-1712796 Harmonization of Connection Control Procedures and Messages InterDigital discussion Rel-15 NR_newRAT-Core
R2-1712986 NR RRC connection request Sony discussion Rel-15 NR_newRAT-Core R2-1711458
R2-1713553 Harmonization of the RRC connection management procedures NTT DOCOMO INC. discussion Rel-15 NR_newRAT-Core
R2-1713643 Simplification of RRC messages for NR LG Electronics France discussion Rel-15 NR_newRAT-Core R2-1711150

### 10.4.1.3.6 Other (for non EN-DC)

*Other aspects of connection control procedures, state transitions, etc that are not relevant for EN-DC (other aspects relevant for EN-DC should be submitted to 10.4.1.3.2)*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*

R2-1712208 State transition from RRC_CONNECTED to RRC_INACTIVE ASUSTeK discussion Rel-15 NR_newRAT-Core R2-1711076
R2-1712237 Discussion on Left Issues for RRC State Transitions OPPO discussion R2-1710240
R2-1712412 Open Issues on Connection Control Procedure CATT discussion R2-1710280
R2-1712413 Consideration on the relation between access categories and establishment causes CATT discussion R2-1710313
R2-1712566 Remaining issues on State transition between RRC CONNECTED and INACTIVE Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712567 Timer based state transmission from CONNECTED to inactive Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712580 UE behaviour upon leaving RRC_CONNECTED state Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712582 RRC Establishment Cause Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core



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R2-1712583 Consideration on RRC connection establishment procedure Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712584 Draft LS to RAN1 on MSG3 size Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712764 Remaining FFS Issues on MSG3/4/5 Content for NR RRC Connection Control vivo discussion Rel-15 NR_newRAT-Core R2-1710934
R2-1712791 Open Issues on Connection Control Procedures InterDigital discussion Rel-15 NR_newRAT-Core
R2-1712797 Timer-based Inactivation for NR InterDigital discussion Rel-15 NR_newRAT-Core R2-1710671
R2-1713206 RRC connection release and inactivation procedures Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core R2-1711483
R2-1713275 Multiplexing NAS messages with MSG 3 Ericsson discussion Rel-15 LTE_5GCN_connect-Core
R2-1713279 Size of MSG3 in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713280 Draft LS on MSG3 size Ericsson LS out Rel-15 NR_newRAT-Core To:RAN1
R2-1713300 Context fetch and paging relay via 5GC Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713303 Text proposal to 38.331 on RRC states Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713304 Text proposal to RRC connection control Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713389 NR re-establishment procedure Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713397 NR RRC procedure for inter-RAT handover Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713635 Enhance RRC configuration procedure in NR Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1713693 Configurable cause for NR LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1711384
R2-1713778 L2 parameter update for RRC Activation and Inactivation Samsung Electronics discussion R2-1711797

### 10.4.1.4 RRM measurements

*No documents should be submitted to 10.4.1.4. Please submit to 10.4.1.4.x.*

#### 10.4.1.4.1 RRM TP

*Including finalising details of measurement report content and measurement report configuration (separate AIs for these topics are not provided at this meeting).*
*This agenda item is relevant to EN-DC completion*
*Including output from email discussion [99bis#20][NR] RRM (Ericsson)*
*Any contributions should focus on critical issues NOT resolved by the email discussion and a supporting TP should be included in the contribution.*

R2-1713589 Summary of Email discussion #20: RRM TP Ericsson discussion Rel-15 NR_newRAT-Core
=> Revised in R2-1714128

R2-1714128 Summary of Email discussion #20: RRM TP Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713590 TP on RRM Ericsson discussion Rel-15 NR_newRAT-Core
=> Noted

R2-1713598 Remaining issues of email discussion # 20 on measurement reporting Ericsson discussion Rel-15 NR_newRAT-Core
P1,2
- LG think UE should only report if SINR if the there is an SINR measurement configured on that frequency. Huawei think we should align to the other quantities. Ericsson explain that for RSRQ and RSRQ then we always measure on serving cells.



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- Vivo think we have not agreed that RSRQ is always measured on the serving cell. Intel is also not clear about RSRQ.
- Samsung think there is agreement that RSRP and RSRQ are always reported.
- Huawei think it would be strange to only report only if it is configured for the serving frequency. Also think that the network can always force the UE to make the measurement if it wants it.

Show of hands:

Approach A [6]
Proposal 1 UE shall perform SINR measurements, is possible, for each configured serving cell if it has at least one measId whose trigger quantity and/or report quantity includes SINR.
Proposal 2 UE shall report SINR measurements for each configured serving cell if the measID that has triggered the report has the SINR as one of the report quantity.

Approach B [10]

**Agreements**
1 UE shall report SINR measurements for each configured serving cell if SINR measurements are available (ie if the SINR measurements on serving cell are required according to a configured meas ID.)

=> Double check previous agreements related to serving cell reporting to determine if all cases are covered and captured in the spec. Identify anything that still needs to be concluded (Offline discussion #39, Samsung)

=> Offline discussion to conclude on reporting of RSType(s) and measurement quantities and beam level measurements for best neighbour cell reporting. (Offline discussion #40, Ericsson)

R2-1714188 Summary of offline#40 (neighbour cells on serving frequencies)

**Agreements**
1 Report available measurements of best neighbours on serving frequencies as in reportConfig (that triggered the report):
- Include available beam measurement information if in reportConfig. If configured, same beam info is reported as in reportConfig (e.g. only indexes, same quantity(ies), same rsType, etc.)
- Include the quantities indicated in reportConfig.
- Include only available measurements associated to the same RS type indicated in reportConfig (e.g. if report config associated to the report has rsType set to SSB, report only SSB. If the report config associated to the report has rsType set to CSI-RS, report only CSI-RS).

R2-1714204 Offline discussion for serving cell measurement and reporting
=> Revised in R2-1714206

R2-1714206 Offline discussion for serving cell measurement and reporting

**Agreements**
1-1: The UE shall perform RSRP, RSRQ measurements for each serving cell.
1-2: The UE shall report RSRP and RSRQ measurements of each serving cell if a measurement report is triggered, as in LTE.
2-1: The UE shall perform SINR measurements for each serving cell if SINR is configured in at least one of the meas ID(s).
2-2: The UE shall report SINR measurements of each serving cell if available and if a measurement report is triggered.
3-1: The UE shall perform L3 filtering of beams for beam measurements for each serving cell(s) if beam measurement reporting is configured in at least one of the measID(s).
3-2: The UE shall report beam measurements of each serving cell if available and if a measurement report is triggered.

4-2: The UE shall report serving cell measurement of the single RS Type, if available, which is configured in the ReportConfig which triggered the measurement report.

*MO content*

R2-1712887 Further Clarification on MO Configuration with/without SSB MediaTek Inc. discussion P2

- Nokia think RAN4 have progressed on this discussion. The SSB can be located on or off the sync raster. AT+T clarify that if the SSB is for initial access then it will be on the sync raster but in other cases it may be off the raster.
- MediaTek think RAN4 has sync and channel raster and think the UE needs to know both rasters.

P5

- ATT think that RAN4 should decide the restriction whether this is just intra-band.
- Huawei think the MO already includes an SSB location and that can be used.

**Agreements:**

1 SSB subcarrier spacing is configured in the MO.

2 The SSB configuration used for timing reference is provided in the MO where only CSI-RS based RRM measurement is performed.

R2-1713199 What is serving frequency in NR? Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core

- Huawei thought the CD-SSB is just the one where the serving cell measurements are done. Nokia think this is not how RAN1 have defined. AT+T think it is mainly the one used for cell timing and serving cell measurements.
- Nokia assume that a cell can have multiple SSBs. Ericsson think that a single UE is configured with a single SSB that is using for timing, RLM, and measurements.
- Samsung agree with the Ericsson view.
- Ericsson explain there is a carrier frequency in the serving cell config common but it is not yet defined but assume it will have to point to the location of the CD-SSB.

**Agreements**

1 UE determines which MO corresponds to the serving cell frequency from the frequency location of the CD-SSB that is contained within the serving cell configuration.

2 More than one MO with CSI-RS resources for measurement can be associated to the same SSB location in frequency. The SSB is at least used for timing reference.

3 In case that more than one MO with CSI-RS resources for measurement is associated to the same SSB location in frequency the UE is indicated which MO corresponds to the serving carrier.

FFS whether the indication is in MO or serving cell configuration

R2-1712500 Remaining details of NR measurement report content and configuration AT&T discussion

R2-1713735 Remaining details for MO definition Ericsson discussion Rel-15 NR_newRAT-Core

R2-1712766 Remaing issues for measurement object vivo discussion Rel-15 NR_newRAT-Core

R2-1712372 Synchronization Raster and Frequency Location Signalling in NR Qualcomm Incorporated discussion Rel-15 NR_newRAT

*moved from 10.3.1.3.4 to 10.4.1.4.1*

*Other*

R2-1712415 Considerations on neighbor cell reporting on serving frequencies CATT discussion R2-1710281

R2-1712647 s-Measure for NR-SS and CSI-RS in NR Intel Corporation discussion Rel-15 NR_newRAT-Core

- Ericsson explain the assumption in the TP is that there is just one RS type provided for s-Measure at any point in time.
- Nokia think the current approach in the TP is sufficient. LG have the same view and the problems in the documents cannot happen if the network configures correctly. Sony also have the same view. IDC think that one is sufficient as the trigger to just start measuring.
- OPPO think that one is sufficient.
- ZTE support the proposal.

=> The approach in the current TP is confirmed (i.e. s-Measure controls all measurements, irrespective of whether s-Measure is configure as CSI-RS or SSB threshold)

**Agreements**

Proposal 3: The UE is not required to perform measurement configured by MN when s-Measure configured by MN satisfied, except for NR (i.e. NR measurements are not controlled by s-Measure). Similarly, the UE is not required to perform measurements configured by SN when s-Measure configured by SN is satisfied.

R2-1713427 Corrections on RRM TP Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713591 Parameters for cell quality derivation Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713592 Measurement object addition/ modification Ericsson discussion Rel-15 NR_newRAT-Core

*New*
R2-1714127 Measurement related actions upon handover and re-establishment Ericsson discussion Rel-15 NR_newRAT-Core
R2-1714139 s-Measure configuration and UE behavior Ericsson discussion Rel-15 NR_newRAT-Core
R2-1714150 Explicit indication for only beam ID reporting Ericsson discussion Rel-15 NR_newRAT-Core

### 10.4.1.4.2 L3 filter configuration

*Including output from email discussion [99bis#22][NR] Filter coefficients (MediaTek)*
*This agenda item is relevant to EN-DC completion*
*Maximum 1 tdoc per company*
R2-1713673 Report of Email Discussion 99bis#22 NR Filter Coefficients MediaTek Inc. report

**Agreements**

1 Different filter coefficients can be configured for different measurement quantities, for different RS types, and for cell and beam measurements.

*Different filter configurations*
R2-1712789 Remaining issues with RRM measurements InterDigital discussion Rel-15 NR_newRAT-Core

R2-1713674 NR Filter coefficients for different frequencies MediaTek Inc. discussion

R2-1713263 On the need of multiple filter coefficients in NR Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
- Discussed jointly with previous two papers

**Agreements**

1 Different MOs can operate with different filter coefficients
2 Up to 2 filter coefficient sets are configured within the measConfig
3 Add a reference in the MO to the filter coefficient configuration that is to be used

R2-1712550 ASN.1 structure for L3 filter configuration Huawei, HiSilicon discussion Rel-15
R2-1714034 L3 filtering configuration Ericsson discussion Rel-15 NR_newRAT-Core



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*Others*

R2-1712648 Remaining issues on measurement reporting for beam and cell Intel Corporation discussion Rel-15 NR_newRAT-Core

R2-1712649 Draft : LS on minimum requirement on total number of beam measure in NR Intel Corporation discussion Rel-15 NR_newRAT-Core

R2-1713675 NR Beam Measurements and UE Complexity MediaTek Inc. discussion
*moved from 10.4.1.4.5 to 10.4.1.4.2*

R2-1713677 Draft LS on NR Beam Measurements MediaTek Inc. LS out To:RAN4
*moved from 10.4.1.4.5 to 10.4.1.4.2*

R2-1713596 Triggering of L3 filtered beam measurements Ericsson discussion Rel-15 NR_newRAT-Core
*moved from 10.4.1.4.5 to 10.4.1.4.2*

### 10.4.1.4.3 Measurement events

*Any additional aspects of measurement events. Potential support for Cx events will be discussed when input has been received from RAN1 on beam management*
*This agenda item is relevant to EN-DC completion*

*Cx events*

R2-1713736 Layer 3 mobility based on CSI-RS events Ericsson discussion Rel-15 NR_newRAT-Core
=> Cx events will not be included in the Dec 17 spec.

R2-1713887 Discussion on C1/C2 events Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core R2-1711347

R2-1712416 Further considerations on events C1 and C2 CATT discussion R2-1710282

R2-1712519 On the need for Cx events Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core

R2-1712606 Discussion on the introduction of SS-block specific events ZTE Corporation, Sane Chips discussion Rel-15 R2-1710432

R2-1712790 Measurement configuration with Ax and Cx events InterDigital discussion Rel-15 NR_newRAT-Core R2-1710672

R2-1713415 Details of events A1-A6 and need for C1-C2 events in NR Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core

*Other*

R2-1713599 Triggering condition for A1-A6 events in NR Ericsson discussion Rel-15 NR_newRAT-Core

R2-1712798 Measurement Events to Support BWPs InterDigital discussion Rel-15 NR_newRAT-Core
*moved from 10.3.1.4.3 to 10.4.1.4.3*

### 10.4.1.4.4 Measurement gaps

*For initial discussion in RAN2 but may be difficult to progress without input from RAN4.*
*This agenda item is relevant to EN-DC completion*

R2-1712650 Measurement gap in NR Intel Corporation discussion Rel-15 NR_newRAT-Core

**Agreements:**
1 For case of a single gap pattern that applies to both LTE and NR radios of the UE ('per UE gaps'): LTE RRC provides a single measurement gap configuration.
2 For the independent gap case where UE is able to apply a different gap pattern for LTE/FR1 and FR2:
  a/ NR RRC configures a measurement gap configuration for FR2.
  b/ LTE RRC configures a measurement gap configuration for LTE and NR FR1 frequencies

R2-1713426 Measurement gap configuration in EN-DC Ericsson Inc. discussion Rel-15

**Agreements:**
1 In the case of per UE measurement gap configuration, MN decides the configuration and informs the SN about the configuration.



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2 For Dec 17, adopt a solution where:
a/ For case of a single gap case the network always configures per UE gaps if the UE is configured to measure any inter-freq or inter-RAT carrier or intra-freq cases where gaps are required.
b/ For the independent gap case the network always configures for the LTE/FR1 gaps if the UE is configured to measure any carrier within the FR1 range, and network always configures for the FR2 gaps if the UE is configured to measure any carrier within the FR2 range.

3 For the independent gap case once EN-DC is setup:
a/ the MN should inform the measurement gap pattern configuration on FR1 to the SN
b/ the MN should inform the SN that it wants to measure in FR2 frequency(ies). Some assistance information to the SN to configure the gaps is provided
c/ the SN should inform the MN that it wants to measure in NR carriers in FR1 range, if the SN has not already received a measurement gap pattern. Some assistance information to the MN to configure the gaps is provided
FFS What assistance information is required

4 For the per UE gap case once EN-DC is setup:
a/ the MN should inform the measurement gap pattern configuration to the SN
b/ the SN should inform the MN that it wants to measure any inter-freq carrier or intra-freq cases where gaps are required. Some assistance information to the MN to configure the gaps is provided

5 Capability is added to indicate support for independent gap configuration for FR1 and FR2

R2-1712366 Measurement capability and measurement gap handling in EN-DC Qualcomm Incorporated
discussion Rel-15 NR_newRAT
=> Noted

R2-1712693 Measurement Gap Capability Signaling aspects for EN-DC and NR SA Intel Corporation
discussion Rel-15 NR_newRAT-Core
R2-1713739 Discussion on AllowInterruption in NR and EN-DC Ericsson discussion Rel-15
NR_newRAT-Core
R2-1713740 Draft LS to RAN4 on need of allowInterruption Ericsson discussion Rel-15
NR_newRAT-Core
R2-1713200 Measurement configuration and measurement gaps Nokia, Nokia Shanghai Bell
discussion Rel-15 NR_newRAT-Core
R2-1712243 NR Measurement Gap Configurations OPPO discussion
R2-1712270 Considerations for measurement GAP for NR in EN DC Spreadtrum Communications
discussion Rel-15 R2-1710373
R2-1712274 Sliding measurement GAP Spreadtrum Communications discussion Rel-15 R2-1710375
R2-1712551 Measurement gap configuration in NR Huawei, HiSilicon discussion Rel-15
R2-1712569 Definition of GAP assisted measurement in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712602 Discussion on the configuration of measurement gap ZTE Corporation, Sane Chips
discussion Rel-15
R2-1712765 Issues on measurement gap in EN-DC and NR vivo discussion Rel-15 NR_newRAT-Core
R2-1712886 Measurement Gap Design for EN-DC MediaTek Inc. discussion Rel-15 NR_newRAT-Core
R2-1712888 Measurement Gap Design for NR SA MediaTek Inc. discussion Rel-15 NR_newRAT-Core
R2-1713555 Measurement Gap for MR-DC NTT DOCOMO INC. discussion Rel-15 NR_newRAT-Core
R2-1713737 Configuration of measurement gap in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713821 Measurement gap considering beam LG Electronics Inc. discussion Rel-15
NR_newRAT-Core R2-1709131



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R2-1713918 Measurement Gap Configuration for EN-DC Samsung discussion

#### 10.4.1.4.5 Other (for EN-DC)

*Other RRM related aspects that are relevant to EN-DC*
*This agenda item is relevant to EN-DC completion*

R2-1713869 RRM measurement to support bandwidth parts in NR Samsung discussion Rel-15
R2-1712560 BWP impact on RRM measurement Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712417 Handling of Measurement Configured by SN upon SN/PSCell change CATT discussion
R2-1712240 Discussion on Remaining Issues for RRM Configuration OPPO discussion
=> revised to R2-1713947
R2-1713947 Discussion on Remaining Issues for RRM Configuration OPPO discussion
R2-1712241 Discussion on Remaining Issues for RRM Reporting OPPO discussion
R2-1712273 Measurement requirement issue due to different DRX configurations Spreadtrum Communications discussion Rel-15 R2-1710378
R2-1712549 Remaining issues on measurement configuration Huawei, HiSilicon discussion Rel-15
R2-1712581 Cell quality adjustment Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713400 Measurement configurations and signaling for fast setup Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713593 Mobility states and speed based parameter scaling in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713600 Impact of cell quality scaling in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713720 Details of CSI-RS configuration in MO LG Electronics Inc. discussion Rel-15 NR_newRAT-Core
R2-1713741 Measurement priority handling in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713819 ANR for NR LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1709128
R2-1713870 RAN2 impact of non-contiguous CA Samsung discussion Rel-15

#### 10.4.1.4.6 Inter-RAT measurements

*Inter-RAT E-UTRA measurements for the purpose of inter-RAT handover from NR to E-UTRA*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*

R2-1712568 Remaining issue on Events and measurements for handover from NR to E-UTRA Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712607 Inter-RAT measurements for NR handover to EUTRAN ZTE Corporation, Sane Chips discussion Rel-15 R2-1710437

#### 10.4.1.4.7 Other (for non EN-DC)

*Other RRM related aspects that are not relevant for EN-DC*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*

R2-1712571 Speed dependent mobility for connected mode Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713601 Alternative Time To Trigger in NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713602 Support SSTD measurement configuration via NR Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713603 UE behavior upon CGI reporting Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713842 Beam Refinement Considering RRM Measurement based on NR-SS Samsung Electronics discussion R2-1711602
R2-1713844 Discussion on Speed-dependent Scaling of Measurement-related Parameters and Mobility History Reporting in NR Samsung Electronics discussion R2-1711603
R2-1713845 Scenarios of Measurement Gap Considering Bandwidth Part Samsung Electronics discussion R2-1711607
R2-1713846 The Impact of Beam Sweeping on RRM Measurement Samsung Electronics discussion R2-1711606

R2-1713849 Discussion on the Use of Alternative TTT in NR Samsung Electronics discussion
R2-1713871 RRM measurement for multiple numerologies in NR Samsung discussion Rel-15
R2-1713872 RRM considerations for adaptive bandwidth in NR Samsung discussion Rel-15
R2-1713916 NR CSI-RS Configuration for RRM Measurement Samsung Electronics discussion

### 10.4.1.5 Mobility

*No documents should be submitted to 10.4.1.5. Please submit to 10.4.1.5.x.*

#### 10.4.1.5.1 Beam selection for HO access

*This agenda item is relevant to EN-DC completion.*
*Including output from email discussion [99bis#23][NR] TP on beam selection (Ericsson)*
*Maximum 1 tdoc per company*

R2-1712347 Report of email discussion [99bis#23]: MAC text proposal on beam selection Ericsson discussion NR_newRAT-Core

Show of hands
1 Need additional ssb-CommonRACHThreshold to be used in the case of CBRA for handover [4]
2 No need for additional ssb-CommonRACHThreshold to be used in the case of CBRA for handover (ssb-dedicatedRACH-Threshold reused for CBRA as well) [11]

**Agreements**
1 ssb-Threshold signalled in handover command (for both common and dedicated RACH)
2 csirs-dedicatedRACH-Threshold signalled in handover command

=> TP option 1 from the document can be merged into the draft TS, together with the agreements above.

R2-1713171 Remaining issues on beam selection during handover Ericsson discussion Rel-15 NR_newRAT-Core

R2-1712997 Clarification on the measurement used for the beam selection vivo discussion Rel-15 NR_newRAT-Core
R2-1712507 Further discussion on beam selection during handover Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713909 Beam selection enhancement for RACH based HO in NR OPPO discussion

*Late*
R2-1713604 Further details of handover execution in NR Ericsson discussion Rel-15 NR_newRAT-Core

#### 10.4.1.5.2 SCG change for EN-DC

*Stage 3 details of SCG change for EN-DC.*
*This agenda item is relevant to EN-DC completion.*
R2-1712440 UE processing upon inter-MN handover with SN change ZTE CORPORATION discussion Rel-15 NR_newRAT-Core
R2-1713899 SCG change failure in EN-DC Qualcomm Europe Incorporated discussion Rel-15

#### 10.4.1.5.3 SCG failure for EN-DC

*Stage 3 details for SCF failure for EN-DC, including both the NR and LTE aspects of the procedure.*
*This agenda item is relevant to EN-DC completion.*

*SCG failure with split SRB/DRB*
R2-1713640 UL path switch upon SCG failure Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1712867 SCG Failure and Split SRB MediaTek Inc. discussion Rel-15 NR_newRAT-Core
R2-1712767 Remainning issues on SCG failure vivo discussion Rel-15 NR_newRAT-Core R2-1710931

R2-1713393 Discussion and TP on remaining issues on SCG Failure Ericsson discussion Rel-15 NR_newRAT-Core

*Other*

R2-1712892 TP for RLF Timers & Constants configuration in 38.331 MediaTek Inc. discussion
R2-1713346 Remaining open issues for RRC timers in EN-DC Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713143 Handling upon joint configuration failure Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713394 Discussion and TP regarding resuming radio bearers and SCG transmission after SCG failure Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713923 Remaining Issues for SCG Failure Samsung discussion
R2-1713139 TP on 38.331 to support UP IP check failure handling Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713395 Scell-RLF discussion Ericsson discussion Rel-15 NR_newRAT-Core

*Withdrawn*
R2-1713919 Remaining Issues for SCG Failure Samsung discussion Withdrawn

### 10.4.1.6 System information

*No documents should be submitted to 10.4.1.6. Please submit to 10.4.1.6.x.*

#### 10.4.1.6.1 MIB content

*Any further details of the MIB content required for EN-DC operation.*
*This agenda item is relevant to EN-DC completion*
*Needed for EN-DC*
R2-1712418 SI info transmission on f1 interface CATT discussion
R2-1712492 Transmission time interval for NR-MIB and NR-SIB1 Ericsson discussion NR_newRAT-Core

*Other*
R2-1713281 Discussion on barring indication in NR-MIB Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1712225 Discussion on CellBarred Info in NR MIB and SIB1 OPPO, Coolpad discussion Rel-15 NR_newRAT-Core
R2-1712598 Remaining issues on NR-PBCH ZTE Corporation, Sane Chips discussion Rel-15
R2-1712971 Single cellBarred IE in NR System Information vivo, Qualcomm Incorporated, Xiaomi, CATR, China Telecom, China Unicom discussion Rel-15 NR_newRAT-Core
R2-1713282 Discussion on maximum idle mode DRX value in NR Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710455
R2-1713552 Duration of the Barring Timer Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1713283 [DRAFT] Reply LS on maximum idle mode DRX value Huawei, HiSilicon LS out Rel-15 NR_newRAT-Core R2-1710456 To:SA2

#### 10.4.1.6.2 System information content/structure

*Progress details of the content and structure of system information (excluding MIB content covered in AI 10.4.1.5.2)*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows .*
R2-1712229 Initial considerations on Content of Other SI for NR OPPO discussion Rel-15 NR_newRAT-Core R2-1710180
R2-1712483 System information structure and contents Ericsson discussion NR_newRAT-Core
R2-1712484 SS Block index dependent system information Ericsson discussion NR_newRAT-Core
R2-1712489 SIBs needed for stand-alone NR deployments Ericsson discussion NR_newRAT-Core R2-1710389
R2-1712491 System information content at network sharing Ericsson discussion NR_newRAT-Core
R2-1712599 Consideration on the Content of NR-RMSI ZTE Corporation, Sane Chips discussion Rel-15

R2-1712984 Optional configuration in NR system information Ericsson discussion Rel-15 NR_newRAT-Core
R2-1713284 Detailed design of the contents of System Information Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core
R2-1713433 Some SIB1 contents and clean-up of Section 7.3 in Stage-2 Samsung R&D Institute India discussion
R2-1713636 Organization of NR System Information Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core

### 10.4.1.6.3 Stored system information

*Further details of stored SI including index/identifier format*
*This agenda item is not relevant to EN-DC completion but will be treated if time allows.*
*Maximum 1 tdoc per company*

R2-1712244 Area ID and details on value tag message structure for NR Gemalto N.V. discussion R2-1710139
R2-1712409 Considerations for the SI index design PANASONIC R&D Center Germany discussion Rel-15
R2-1712419 Indexed SI in NR CATT discussion R2-1710285
R2-1712485 Stored System Information Ericsson discussion NR_newRAT-Core
R2-1712600 Consideration on the Stored other SI ZTE Corporation, Sane Chips discussion Rel-15 R2-1710418
R2-1712768 Stored system information in NR vivo discussion Rel-15 NR_newRAT-Core R2-1710939
R2-1712799 Details of Stored System Information for NR InterDigital discussion Rel-15 NR_newRAT-Core R2-1710673
R2-1712819 The index of stored system information Fujtisu discussion Rel-15 NR_newRAT-Core Withdrawn
R2-1712825 The index of stored system information Fujitsu discussion Rel-15 NR_newRAT-Core R2-1710361
R2-1713073 On structure of SI index MediaTek Inc. discussion
R2-1713285 Area ID and value tag for SIBs Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710460
R2-1713444 Index based approach and Stored SI Samsung R&D Institute India discussion R2-1711752
R2-1713556 Signalling of System Information Area Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1713637 NR SI area ID and value tag Qualcomm Incorporated discussion Rel-15 NR_newRAT-Core
R2-1713726 SI valid area configuration LG Electronics Inc. discussion Rel-15 NR_newRAT-Core R2-1710814

### 10.4.1.6.4 System information modification

*This agenda item is not relevant to EN-DC completion but will be treated if time allows*
*Maximum 1 tdoc per company*

R2-1712227 Discussion on NR SI Modification OPPO discussion Rel-15 NR_newRAT-Core R2-1710181
R2-1712420 SI Modification CATT discussion R2-1710286
R2-1712486 Change of System information in NR Ericsson discussion NR_newRAT-Core
R2-1712769 SI Change Notification vivo discussion Rel-15 NR_newRAT-Core R2-1710940
R2-1712800 SI Modification Procedure in NR InterDigital discussion Rel-15 NR_newRAT-Core R2-1710674
R2-1713074 NR SI Modification MediaTek Inc. discussion
R2-1713286 SI Update procedure Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710461
R2-1713375 System Information Update in NR Samsung R&D Institute India discussion Rel-15 NR_newRAT-Core R2-1707676
R2-1713557 System Information Modification in NR Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1713570 Discussion on the granularity of SI change notification ITRI discussion NR_newRAT-Core R2-1711767



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R2-1713698 System information modification Core R2-1711390 LG Electronics Inc. discussion Rel-15 NR_newRAT-
R2-1713861 SI modification for Stored SI ITL discussion Rel-15 R2-1711566

### 10.4.1.6.5 System information scheduling

*This agenda item is not relevant to EN-DC completion and but will be treated if time allows*
*Maximum 1 tdoc per company*

R2-1712230 Consideration on NR SI Scheduling R2-1710179 OPPO discussion Rel-15 NR_newRAT-Core
R2-1712487 System Information Scheduling 1710387 Ericsson discussion NR_newRAT-Core R2-
R2-1712770 Scheduling of Other SI vivo discussion Rel-15 NR_newRAT-Core R2-1710941
R2-1713287 Considerations on System Information scheduling Huawei, HiSilicon discussion Rel-15 NR_newRAT-Core R2-1710462
R2-1713373 SI Message TX/RX in NR Core R2-1707677 Samsung R&D Institute India discussion Rel-15 NR_newRAT-
R2-1713554 Indication for On-Demand SI Broadcast Nokia, Nokia Shanghai Bell discussion Rel-15 NR_newRAT-Core
R2-1713577 Details of Other SI scheduling information R2-1711089 ETRI discussion Rel-15 NR_newRAT-Core
R2-1713704 System information scheduling Core R2-1711391 LG Electronics Inc. discussion Rel-15 NR_newRAT-

### 10.4.1.6.6 On demand system information

*Including need for additional bit to indicate if SI message is actually being broadcast*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*

R2-1712214 Discussion on On-demand system information request in NR Rel-15 NR_newRAT-Core ASUSTeK discussion
R2-1712228 Discussion on Remaining Issues of On-Demand SI NR_newRAT-Core R2-1710178 OPPO discussion Rel-15
R2-1712307 On demand system information SHARP Corporation discussion R2-1710250
R2-1712421 Remaining issues of on-demand SI CATT discussion R2-1707905
R2-1712488 Open issues on On-demand SI 1710388 Ericsson discussion NR_newRAT-Core R2-
R2-1712496 On-demand SI reject procedure Ericsson discussion NR_newRAT-Core
R2-1712498 On-demand SI in RRC connected Ericsson discussion NR_newRAT-Core
R2-1712499 Duration of on-demand SI broadcast Ericsson discussion NR_newRAT-Core
R2-1712771 Remaining issues of on demand SI R2-1710942 vivo discussion Rel-15 NR_newRAT-Core
R2-1712801 On Demand SI Request Procedure Core R2-1710676 InterDigital discussion Rel-15 NR_newRAT-
R2-1712968 Msg4 content for SI request Potevio discussion Rel-15
R2-1712988 Necessity of indication that on demand SI is being broadcast 15 NR_newRAT-Core Sony discussion Rel-
R2-1713075 Indicator for Other SI Transmission MediaTek Inc. discussion
R2-1713288 On demand SI acquisition and failure handling 15 NR_newRAT-Core R2-1710463 Huawei, HiSilicon discussion Rel-
R2-1713369 On Demand SI: Remaining Issues Samsung R&D Institute India discussion
R2-1713571 Discussion on the additional indication for on-demand SI Core R2-1711768 ITRI discussion NR_newRAT-
R2-1713579 Other SI broadcast indication mechanism R2-1707946 ETRI discussion Rel-15 NR_newRAT-Core
R2-1713638 Open issues on NR on-demand SI Core Qualcomm Incorporated discussion Rel-15 NR_newRAT-
R2-1713697 Remaining issues on on-demand SI request procedure Rel-15 NR_newRAT-Core R2-1711389 LG Electronics Inc. discussion
R2-1713723 Other-SI request and acquisition in CONNECTED 15 NR_newRAT-Core R2-1710812 LG Electronics Inc. discussion Rel-



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#### 10.4.1.6.7 System information -other

*Other system information related aspects*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting*

| | | | | |
|---|---|---|---|---|
| R2-1712490 | Dedicated System Information | Ericsson | discussion | NR_newRAT-Core |
| R2-1712493 | NR-SIB1 content for NSA and ANR | Ericsson | discussion | NR_newRAT-Core |
| R2-1712494 | Defining reserved resources in NR-SIB1 | Ericsson | discussion | NR_newRAT-Core |
| R2-1712495 | Open issues on cell barring | Ericsson | discussion | NR_newRAT-Core |
| R2-1712497 | Update of SI Area common SI | Ericsson | discussion | NR_newRAT-Core |
| R2-1712839 | On supporting multiple modification periods in NR | Samsung | discussion | NR_newRAT-Core |
| R2-1713289 | Public Warning system for NR | Huawei, HiSilicon | discussion | Rel-15 NR_newRAT-Core R2-1710465 |
| R2-1713374 | SI Reception in RRC Connected: Bandwidth Part Aspects | Samsung R&D Institute India | discussion | |
| R2-1713705 | UE dedicated on-demand SI delivery in NR | LG Electronics Inc. | discussion | Rel-15 NR_newRAT-Core R2-1711392 |
| R2-1713912 | UE capability for increased number of carrier monitoring | Ericsson | discussion | NR_newRAT-Core |
| R2-1713913 | Measurement Requirements for Deactivated Secondary Component Carriers | Ericsson | discussion | NR_newRAT-Core |
| R2-1713914 | Mobility Enhancements in NR | Ericsson | discussion | NR_newRAT-Core |
| R2-1713915 | LocationInfo reporting | Ericsson | discussion | NR_newRAT-Core |

### 10.4.1.7 Inactive state

*No documents should be submitted to 10.4.1.6. Please submit to 10.4.1.6.x.*

#### 10.4.1.7.1 RAN area configuration

*Any further details of RAN area configuration given LS response to RAN3 from RAN2#99bis.*
*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*
*Maximum 1 tdoc per company*

| | | | | |
|---|---|---|---|---|
| R2-1712670 | TP on RAN notification area configuration | Intel Corporation | discussion | Rel-15 NR_newRAT-Core |
| R2-1712193 | Further considerations on RAN paging area for NR | Samsung | discussion | Rel-15 NR_newRAT-Core |
| R2-1712252 | Discussion on Assistance Information for RAN-based Notification Area Decision | OPPO | discussion | |
| R2-1712576 | RAN-based notification area configuration | Huawei, HiSilicon | discussion | Rel-15 NR_newRAT-Core |

*Late*

| | | | | |
|---|---|---|---|---|
| R2-1712614 | Consideration on RAN area configuration | ZTE Corporation, Sane Chips | discussion | Rel-15 R2-1710428 |

#### 10.4.1.7.2 RAN area update procedure

*This agenda item is not relevant to EN-DC completion and is not expected to be treated at this meeting.*
*Maximum 1 tdoc per company*

| | | | | |
|---|---|---|---|---|
| R2-1712194 | RRC procedures for the RAN paging area | Samsung | discussion | Rel-15 NR_newRAT-Core |
| R2-1712423 | RAN-based notification area update procedure | CATT | discussion | R2-1711760 |
| R2-1712572 | Discussion on CN location Update and RNA Update for inactive state | Huawei, HiSilicon | discussion | Rel-15 NR_newRAT-Core |
| R2-1712615 | Consideration on periodic RAN area update procedure | ZTE Corporation, Sane Chips | discussion | Rel-15 R2-1710429 |
| R2-1712802 | RAN Location Area Update Procedure for NR | InterDigital | discussion | Rel-15 NR_newRAT-Core |
| R2-1713296 | RAN area update in RRC_INACTIVE | Ericsson | discussion | Rel-15 NR_newRAT-Core |