**3GPP TSG-RAN WG4 Meeting #100-e *DRAFT\_R4-2115129***

**Electronic meeting, August 16-27, 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.101-2** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **16.8.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Big CR to TS 38.101-2 Maintenance Part 1 (Rel-16) |
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| ***Source to WG:*** | MCC, Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-CoreNR\_CA\_R16\_intraWI code #3 |  | ***Date:*** | 2021-08-29 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | This big CRs merge the mutile endorsed draf CRs. The reason for change in each endorsed draft CR is copied below.R15 Incl. R4-2112025F, R4-2112140F, R4-2112366F, R4-2113103D, R4-2114473F, R4-2114891FR16 Incl. R4-2112026A (added), R4-2112141A, R4-2112367A, R4-2112583A, R4-2113104A, R4-2114388A, R4-2113106F, R4-2113570F…..R4-2112026 CR to 38.101-2 on handling of fallbacks for FR2 CAThis specification is not aligned with other specifications (38.331 and 38.306) with regards to which fallback band combinations are supported for the class of band combinations which consist of mixed contiguous and non-contiguous intra-band CA within FR2. In an effort to reconcile this issue, it has been recognized that mandating additional in-gap requirements for all possible mixed contiguous and non-contiguous fallback band combinations results in a high number of requirements and is a burden on UE development. Together with per-UE capability signaling, this CR aligns the RAN4 specification with RAN2 specifications.R4-2112141 Correction of FR2 UE configured transmitted powerIn Clause 6.2.4, the term of PPowerclass is not clearly defined to refer to UE minimum peak EIRP, since FR2 definition of power class consists of four components: minimum peak EIRP, maximum TRP, maximum EIRP, and EIRP spherical coverage. Therefore, it is proposed to define PPowerclass as minimum peak EIRP.R4-2112367 Draft n side conditions for beam correspondence based on SSB and CSI-RS for n257, n258, n260, n261The minimum SSB\_RP is defined as:* Minimum SSB\_RP = EIS spherical coverage PC3, n260, 50MHz +Z -10Log10(PRBRefsens x 12) – SNRRefsens + SSB Ês/Iot + ΣMBS

In Table 6.6.4.3.1-1 and Table 6.6.4.3.1-2 the SSB Es/Iot and CSI-RS Es/Iot are defined as ≥6 dB. The result for minimum SSB and minimum CSI-RS are not correct in the specification, and these values need to be corrected considering the Es/Iot parameter as defined in the specification.R4-2113104 Draft CR for Rel-15 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.1 of side conditions for beam correspondenceReplace ΣMBS with MBS,n in section of side conditions for beam correspondence.R4-2114388 Draft CR on Minor correction on UL additional reference channels parameters for TDD 60kHz SCSThere is an inconsistency in table A.2.3-1 regarding UL-DL configuration for UL Reference Measurement Channel for SCS=60kHz: while *nrofUplinkSymbols* is configured to 0, Special Slot Configuration indicates S=4D+6G+4UR4-2112583 CR to 38.101-2: P\_min requirements update(MIRROR to R4-2114891) Pmin relaxed for 2L UL cases.R4-2113106 Draft CR Rel-16 for 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.3 of side conditions for beam correspondenceReplace ΣMBS with MBS,n in section of side conditions for beam correspondence R4-2113570 CR for corrections of band combinations in 38.101-2Corrections 38.101-2 |
|  |  |
| ***Summary of change:*** | R4-2112026 CR to 38.101-2 on handling of fallbacks for FR2 CAFor FR2 intra-band CA combinations with multiple sub-blocks, where at least one of the sub-blocks consists of a contiguous CA combination, the following two changes are implemented:1. Remove the requirement of direct fallback to single FR2 carrier2. Based on UE signaling a capability bit, introduce an applicability rule for Rx requirements (impacting clauses 7.5A, 7.5D, 7.6A, 7.6D) for fallbacks with multiple sub-blocks, where at least one of the sub-blocks consists of a contiguous CA combinationChanges to RAN2 specifications on UE capabilities (38.306) and RRC (38.331) are needed to introduce per-UE capability.**Impact analysis**Impacted functionality:Requirements for band combinations.Inter-operability:No inter-operability issues are foreseen.R4-2112141 Correction of FR2 UE configured transmitted powerThe definition of PPowerclass as minimum peak EIRP.R4-2112367 Draft n side conditions for beam correspondence based on SSB and CSI-RS for n257, n258, n260, n261The minimum SSB and minimum CSI-RS values in Table 6.6.4.3.1-1R4-2113104 Draft CR for Rel-15 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.1 of side conditions for beam correspondenceThe Minimum SSB\_RP values and Minimum CSI-RS\_RP values are defined per band in the section of side conditions for beam correspondence. Therefore, For UEs that support multiple FR2 bands, the Minimum SSB\_RP values and Minimum CSI-RS\_RP values should be increased by MBS,nnot ΣMBS.In addition, to resolve the testability concerns for multi-band requirement (MBR) framework provided by RAN5 in R5-199424, in Rel-15, RAN4 has introduced a maximum cap on to the per-band relaxation factors MBP,n and MBS,n in Rel-15 (CR R4-2003652); in Rel-16, RAN4 has obsoleted the definition of MBP and MBS from Rel-16 and beyond (CR R4-2003655) and defined the fixed per-band relaxation factors MBP,n and MBS,n to replace MBP and MBS.Correspondingly, ΣMBS should be replaced with MBS,n in section of side conditions for beam correspondenceR4-2114388 Draft CR on Minor correction on UL additional reference channels parameters for TDD 60kHz SCSConsidering the agreement in R4-1816610, *nrofUplinkSymbols* is set to 4.R4-2112583 CR to 38.101-2: P\_min requirements updateChange Pmin 1. D-suffix requirements: Pmin scales by BW \* number of layers
2. Editorial changes to move phrases repeated for every power class to the general section.

R4-2113106 Draft CR Rel-16 for 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.3 of side conditions for beam correspondence The Minimum SSB\_RP values and Minimum CSI-RS\_RP values are defined per band in the section of side conditions for beam correspondence. Therefore, For UEs that support multiple FR2 bands, the Minimum SSB\_RP values and Minimum CSI-RS\_RP values should be increased by MBS,nnot ΣMBS.The definition of MBP and MBS have been obsoleted from Rel-16 in the CR R4-2003655 due to implementation unreliability based on the LS from R5-199424 and have been replaceed with equivalent per-band relaxations MBP,n and MBS,n.R4-2113570 CR for corrections of band combinations in 38.101-2Corrections:* Move erroneus BW and BCS info for CA\_n260(4A-3O)
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|  |  |
| ***Consequences if not approved:*** | R4-2112026 CR to 38.101-2 on handling of fallbacks for FR2 CAThis specification is not aligned with other specifications (38.331 and 38.306) with regards to which fallback band combinations are supported.R4-2112141 Correction of FR2 UE configured transmitted powerThere is ambiguity in the specification.R4-2112367 Draft n side conditions for beam correspondence based on SSB and CSI-RS for n257, n258, n260, n261Wrong values for minimum SSB and CSI-RS remain in the specification.R4-2113104 Draft CR for Rel-15 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.1 of side conditions for beam correspondenceThe denotation has some mistake.R4-2114388 Draft CR on Minor correction on UL additional reference channels parameters for TDD 60kHz SCSSpecification will be misleading.R4-2112583 CR to 38.101-2: P\_min requirements updateMirror CR.R4-2113106 Draft CR Rel-16 for 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.3 of side conditions for beam correspondenceThe denotation has some mistake.R4-2113570 CR for corrections of band combinations in 38.101-2Corrections 38.101-2 are not made |
|  |  |
| ***Clauses affected:*** | R4-2112026 CR to 38.101-2 on handling of fallbacks for FR2 CA4.2 R4-2112141 Correction of FR2 UE configured transmitted power6.2.4R4-2112367 Draft n side conditions for beam correspondence based on SSB and CSI-RS for n257, n258, n260, n2616.6.4.3.1R4-2113104 Draft CR for Rel-15 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.1 of side conditions for beam correspondence6.6.4.3.1R4-2114388 Draft CR on Minor correction on UL additional reference channels parameters for TDD 60kHz SCSA.2.3R4-2112583 CR to 38.101-2: P\_min requirements update6.3D.1, 6.4DR4-2113106 Draft CR Rel-16 for 38.101-2 to replace ΣMBS with MBS,n in section 6.6.4.3.3 of side conditions for beam correspondence 6.6.4.3.3R4-2113570 CR for corrections of band combinations in 38.101-25.5 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS38.306 CR0481,TS38.331 CR2297 |
| ***affected:*** | **X** |  |  Test specifications | TS/TR 38.521-2 CR 0609 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** | R4-2112026 CR to 38.101-2 on handling of fallbacks for FR2 CAThis CR implements the principles for handling the FR2 fallback issue as described in RP-202556 |
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| ***This CR's revision history:*** | R4-2112026 CR to 38.101-2 on handling of fallbacks for FR2 CARP-201873 was postponed during the RAN #89e meeting. This CR is a revision of RP-202576. During the RAN #90e meeting this CR was approved in RP-202916 but not implemented in the specification. |

***<Start of change1>***

***NOTE: please merge the endorsed draft CRs in the way that the clause number is arranged in the same order as in the specifications to facilitate the implementaion of MCC.***

## 4.2 Applicability of minimum requirements

a) In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios

b) For specific scenarios for which an additional requirement is specified, in addition to meeting the general requirement, the UE is mandated to meet the additional requirements.

c) The spurious emissions power requirements are for the long-term average of the power. For the purpose of reducing measurement uncertainty it is acceptable to average the measured power over a period of time sufficient to reduce the uncertainty due to the statistical nature of the signal

d) All the requirements for intra-band contiguous and non-contiguous CA apply under the assumption of the same slot format indicated by *TDD-UL-DL-ConfigurationCommon and TDD-UL-DL-ConfigurationDedicated* in the PCell and SCells for NR SA.

For FR2 intra-band CA configurations with multiple FR2 subblocks, where at least one of the subblocks is a contiguous CA configuration:

- if the field *partialFR2-FallbackRX-Req* is not present, the UE shall meet all applicable UE RF requirements for the highest order CA configuration and all associated fallback CA configurations;

- if the field *partialFR2-FallbackRX-Req* is present, for each FR2 intra-band CA configuration with multiple sub-blocks that the UE indicates support for explicitly in UE capability signalling: the in-gap UE RF requirements in clauses 7.5A, 7.5D, 7.6A, 7.6D apply as the equivalent requirements for the associated fallback CA configurations with the same number of sub-blocks, where at least one of the sub-blocks consists of a contiguous CA configuration. The UE shall meet all applicable UE RF requirements for fallback CA configurations with a lesser number of sub-blocks;

- regardless of the field *partialFR2-FallbackRX-Req*, the UE shall meet all DL out-of-gap requirements for all lower order fallback CA configurations.

***<End of change1>***

***<Start of change2>***

Table 5.5A.2-2: NR CA configurations with multiple CA bandwidth classes defined for intra-band non-contiguous CA

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| NR CA configuration / Bandwidth combination set |
| CA configuration | Uplink CA configurations | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | Sub-block | (BWChannel,block) (MHz) | BCS |
|
| CA\_n260(A-D) | - | n260A | CA\_n260D |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(2A-D) | - | CA\_n260(2A) | CA\_n260D |  |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(A-2D) | - | n260A | CA\_n260(2D) |  |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-2D) | - | CA\_n260(2A) | CA\_n260(2D) |  |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(A-D-O) | - | n260A | CA\_n260D | CA\_n260O |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(2A-D-O) | - | CA\_n260(2A) | CA\_n260D | CA\_n260O |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(A-D-2O) | - | n260A | CA\_n260D | CA\_n260(2O) |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-D-2O) | - | CA\_n260(2A) | CA\_n260D | CA\_n260(2O) |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(A-G) | CA\_n260G | n260A | CA\_n260G |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n260(2A-G) | CA\_n260G | CA\_n260(2A) | CA\_n260G |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(A-2G) | CA\_n260G | n260A | CA\_n260(2G) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(2A-2G) | CA\_n260G | CA\_n260(2A) | CA\_n260(2G) |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-2G-O) | - | CA\_n260(2A) | CA\_n260(2G) | CA\_n260O |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(2A-2G-2O) | - | CA\_n260(2A) | CA\_n260(2G) | CA\_n260(2O) |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(3A-2G) | - | CA\_n260(3A) | CA\_n260(2G) |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(4A-G) | - | CA\_n260(4A) | CA\_n260G |  |  |  |  |  |  |  | 1800 | 0 |
| CA\_n260(4A-2G) | - | CA\_n260(4A) | CA\_n260(2G) |  |  |  |  |  |  | 2000 | 0 |
| CA\_n260(A-2G-2O) | - | n260A | CA\_n260(2G) | CA\_n260(2O) |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-G-2O) | - | CA\_n260(2A) | CA\_n260G | CA\_n260(2O) |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(3A-G) | CA\_n260G | CA\_n260(3A) | CA\_n260G |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(A-2H) | - | n260A | CA\_n260(2H) |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(2A-H) | - | CA\_n260(2A) | CA\_n260H |  |  |  |  |  |  |  |  |  | 1100 | 0 |
| CA\_n260(2A-2H) | - | CA\_n260(2A) | CA\_n260(2H) |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(A-H) | CA\_n260GCA\_n260H | n260A | CA\_n260H |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n260(A-O) | - | n260A | CA\_n260O |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n260(A-O-P) | - | n260A | CA\_n260O | CA\_n260P |  |  |  |  |  |  |  |  |  | 900 | 0 |
| CA\_n260(A-O-2P) | - | n260A | CA\_n260O | CA\_n260(2P) |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-O-P) | - | CA\_n260(2A) | CA\_n260O | CA\_n260P |  |  |  |  |  |  |  |  | 1300 | 0 |
| CA\_n260(2A-O-2P) | - | CA\_n260(2A) | CA\_n260O | CA\_n260(2P) |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(2A-2O-P) | - | CA\_n260(2A) | CA\_n260(2O) | CA\_n260P |  |  |  |  |  |  |  | 1500 | 0 |
| CA\_n260(A-O-Q) | - | n260A | CA\_n260O | CA\_n260Q |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(A-O-2Q) | - | n260A | CA\_n260O | CA\_n260(2Q) |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(2A-O-Q) | - | CA\_n260(2A) | CA\_n260O | CA\_n260Q |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(2A-O-2Q) | - | CA\_n260(2A) | CA\_n260O | CA\_n260(2Q) |  |  |  |  |  |  |  | 1800 | 0 |
| CA\_n260(2A-2O-Q) | - | CA\_n260(2A) | CA\_n260(2O) | CA\_n260Q |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(2A-O) | - | CA\_n260(2A) | CA\_n260O |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(A-2O) | - | n260A | CA\_n260(2O) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(A-2O-P) | - | n260A | CA\_n260(2O) | CA\_n260P |  |  |  |  |  |  |  |  | 1100 | 0 |
| CA\_n260(A-2O-2P) | - | n260A | CA\_n260(2O) | CA\_n260(2P) |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(A-2O-Q) | - | n260A | CA\_n260(2O) | CA\_n260Q |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(A-2O-2Q) | - | n260A | CA\_n260(2O) | CA\_n260(2Q) |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(2A-2O) | - | CA\_n260(2A) | CA\_n260(2O) |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-2O-2P) | - | CA\_n260(2A) | CA\_n260(2O) | CA\_n260(2P) |  |  |  |  |  |  | 1800 | 0 |
| CA\_n260(2A-2O-2Q) | - | CA\_n260(2A) | CA\_n260(2O) | CA\_n260(2Q) |  |  |  |  |  |  | 2000 | 0 |
| CA\_n260(2A-3O) | - | CA\_n260(2A) | CA\_n260(3O) |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(3A-2O) | - | CA\_n260(3A) | CA\_n260(2O) |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(4A-O) | - | CA\_n260(4A) | CA\_n260O |  |  |  |  |  |  |  | 1800 | 0 |
| CA\_n260(4A-3O) | - | CA\_n260(4A) | CA\_n260(3O) |  |  |  |  |  |  |  | 2200 | 0 |
| CA\_n260(5A-O) | - | CA\_n260(5A) | CA\_n260O |  |  |  |  |  |  | 2200 | 0 |
| CA\_n260(6A-O) | - | CA\_n260(6A) | CA\_n260O |  |  |  |  |  | 2600 | 0 |
| CA\_n260(7A-O) | - | CA\_n260(7A) | CA\_n260O |  |  |  |  | 2950 | 0 |
| CA\_n260(8A-O) | - | CA\_n260(8A) | CA\_n260O |  |  |  | 2950 | 0 |
| CA\_n260(4A-2O) | - | CA\_n260(4A) | CA\_n260(2O) |  |  |  |  |  |  | 2000 | 0 |
| CA\_n260(4A-2Q) | - | CA\_n260(4A) | CA\_n260(2Q) |  |  |  |  |  |  | 2400 | 0 |
| CA\_n260(3A-3O) | - | CA\_n260(3A) | CA\_n260(3O) |  |  |  |  |  |  | 1800 | 0 |
| CA\_n260(A-G-O) | - | n260A | CA\_n260G | CA\_n260O |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(A-G-2O) | - | n260A | CA\_n260G | CA\_n260(2O) |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(2A-G-O) | - | CA\_n260(2A) | CA\_n260G | CA\_n260O |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(A-2G-O) | - | n260A | CA\_n260(2G) | CA\_n260O |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(A-3O) | - | n260A | CA\_n260(3O) |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(3A-O) | - | CA\_n260(3A) | CA\_n260O |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(3A-O-P) | CA\_n260O CA\_n260P | CA\_n260(3A) | CA\_n260O | CA\_n260P |  |  |  |  |  |  |  | 1700 | 0 |
| CA\_n260(A-4O) | - | n260A | CA\_n260(4O) |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-4O) | - | CA\_n260(2A) | CA\_n260(4O) |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(3A-4O) | - | CA\_n260(3A) | CA\_n260(4O) |  |  |  |  |  | 2000 | 0 |
| CA\_n260(4A-4O) | - | CA\_n260(4A) | CA\_n260(4O) |  |  |  |  | 2400 | 0 |
| CA\_n260(5A-4O) | - | CA\_n260(5A) | CA\_n260(4O) |  |  |  | 2800 | 0 |
| CA\_n260(A-P) | - | n260A | CA\_n260P |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n260(A-3P) | - | n260A | CA\_n260(3P) |  |  |  |  |  |  |  |  | 1300 | 0 |
| CA\_n260(A-4P) | - | n260A | CA\_n260(4P) |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(A-P-Q) | CA\_n260P CA\_n260Q | n260A | CA\_n260P | CA\_n260Q |  |  |  |  |  |  |  |  |  | 1100 | 0 |
| CA\_n260(2A-P) | **-** | CA\_n260(2A) | CA\_n260P |  |  |  |  |  |  |  |  |  | 1100 | 0 |
| CA\_n260(3A-P) | - | CA\_n260(3A) | CA\_n260P |  |  |  |  |  |  |  |  | 1500 | 0 |
| CA\_n260(4A-P) | - | CA\_n260(4A) | CA\_n260P |  |  |  |  |  |  |  | 1900 | 0 |
| CA\_n260(5A-P) | - | CA\_n260(5A) | CA\_n260P |  |  |  |  |  |  | 2300 | 0 |
| CA\_n260(6A-P) | - | CA\_n260(6A) | CA\_n260P |  |  |  |  |  | 2700 | 0 |
| CA\_n260(A-2P) | - | n260A | CA\_n260(2P) |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(2A-2P) | - | CA\_n260(2A) | CA\_n260(2P) |  |  |  |  |  |  |  |  | 1400 | 0 |
| CA\_n260(2A-3P) | - | CA\_n260(2A) | CA\_n260(3P) |  |  |  |  |  |  |  | 1700 | 0 |
| CA\_n260(2A-4P) | - | CA\_n260(2A) | CA\_n260(4P) |  |  |  |  |  |  | 2000 | 0 |
| CA\_n260(3A-2P) | - | CA\_n260(3A) | CA\_n260(2P) |  |  |  |  |  |  |  | 1800 | 0 |
| CA\_n260(4A-2P) | - | CA\_n260(4A) | CA\_n260(2P) |  |  |  |  |  |  | 2200 | 0 |
| CA\_n260(5A-2P) | - | CA\_n260(5A) | CA\_n260(2P) |  |  |  |  |  | 2600 | 0 |
| CA\_n260(5A-2O) | - | CA\_n260(5A) | CA\_n260(2O) |  |  |  |  |  | 2400 | 0 |
| CA\_n260(6A-2O) | - | CA\_n260(6A) | CA\_n260(2O) |  |  |  |  | 2800 | 0 |
| CA\_n260(5A-3O) | - | CA\_n260(5A) | CA\_n260(3O) |  |  |  |  | 2600 | 0 |
| CA\_n260(6A-3O) | - | CA\_n260(6A) | CA\_n260(3O) |  |  |  | 2950 | 0 |
| CA\_n260(7A-2O) | - | CA\_n260(7A) | CA\_n260(2O) |  |  |  | 2950 | 0 |
| CA\_n260(7A-3O) | - | CA\_n260(7A) | CA\_n260(3O) |  |  | 2950 | 0 |
| CA\_n260(6A-2P) | - | CA\_n260(6A) | CA\_n260(2P) |  |  |  |  | 2950 | 0 |
| CA\_n260(8A-2O) | - | CA\_n260(8A) | CA\_n260(2O) |  |  | 2550 | 0 |
| CA\_n260(A-Q) | - | n260A | CA\_n260Q |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(A-2Q) | - | n260A | CA\_n260(2Q) |  |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-Q) | - | CA\_n260(2A) | CA\_n260Q |  |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(2A-2Q) | - | CA\_n260(2A) | CA\_n260(2Q) |  |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(3A-Q) | - | CA\_n260(3A) | CA\_n260Q |  |  |  |  |  |  |  |  | 1600 | 0 |
| CA\_n260(3A-2Q) | - | CA\_n260(3A) | CA\_n260(2Q) |  |  |  |  |  |  |  | 2000 | 0 |
| CA\_n260(4A-Q) | - | CA\_n260(4A) | CA\_n260Q |  |  |  |  |  |  |  | 2000 | 0 |
| CA\_n260(D-2G) | - | CA\_n260D | CA\_n260(2G) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(2D-O) | - | CA\_n260(2D) | CA\_n260O |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(D-2O) | - | CA\_n260D | CA\_n260(2O) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(A-I) | CA\_n260I | n260A | CA\_n260I |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(D-G) | CA\_n260D CA\_n260G | CA\_n260D | CA\_n260G |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
|
| CA\_n260(D-H) | CA\_n260D CA\_n260H | CA\_n260D | CA\_n260H |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
|
| CA\_n260(D-I) | CA\_n260D CA\_n260I | CA\_n260D | CA\_n260I |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n260(D-O) | CA\_n260D CA\_n260O | CA\_n260D | CA\_n260O |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
|
| CA\_n260(D-P) | CA\_n260D CA\_n260P | CA\_n260D | CA\_n260P |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
|
| CA\_n260(D-Q) | CA\_n260D CA\_n260Q | CA\_n260D | CA\_n260Q |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n260(E-O) | CA\_n260E CA\_n260O | CA\_n260O | CA\_n260E |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n260(E-P) | CA\_n260E CA\_n260P | CA\_n260E | CA\_n260P |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n260(E-Q) | CA\_n260E CA\_n260Q | CA\_n260E | CA\_n260Q |  |  |  |  |  |  |  |  |  |  | 1000 | 0 |
|
| CA\_n260(G-H) | CA\_n260GCA\_n260H | CA\_n260G | CA\_n260H |  |  |  |  |  |  |  |  |  |  | 500 | 0 |
| CA\_n260(G-I) | CA\_n260G CA\_n260I | CA\_n260G | CA\_n260I |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
|
| CA\_n260(G-O) | - | CA\_n260G | CA\_n260O |  |  |  |  |  |  |  |  |  |  | 400 | 0 |
| CA\_n260(G-2O) | - | CA\_n260G | CA\_n260(2O) |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n260(2G-O) | - | CA\_n260(2G) | CA\_n260O |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n260(2G-2O) | - | CA\_n260(2G) | CA\_n260(2O) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(G-3O) | - | CA\_n260G | CA\_n260(3O) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(3G-O) | - | CA\_n260(3G) | CA\_n260O |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(2G-3O) | - | CA\_n260(2G) | CA\_n260(3O) |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(G-4O) | - | CA\_n260G | CA\_n260(4O) |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(2G-4O) | - | CA\_n260(2G) | CA\_n260(4O) |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(4G-O) | - | CA\_n260(4G) | CA\_n260O |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(H-O) | - | CA\_n260H | CA\_n260O |  |  |  |  |  |  |  |  |  |  | 500 | 0 |
| CA\_n260(2H-O) | - | CA\_n260(2H) | CA\_n260O |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(O-2P) | - | CA\_n260O | CA\_n260(2P) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(O-2Q) | - | CA\_n260O | CA\_n260(2Q) |  |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(O-P) | - | CA\_n260O | CA\_n260P |  |  |  |  |  |  |  | 500 | 0 |
| CA\_n260(2O-P) | - | CA\_n260(2O) | CA\_n260P |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n260(2O-2P) | - | CA\_n260(2P) | CA\_n260(2O) |  |  |  |  |  |  |  |  | 1000 | 0 |
| CA\_n260(O-Q) | - | CA\_n260O | CA\_n260Q |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n260(2O-Q) | - | CA\_n260(2O) | CA\_n260Q |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n260(2O-2Q) | - | CA\_n260(2O) | CA\_n260(2Q) |  |  |  |  |  |  |  |  | 1200 | 0 |
| CA\_n260(P-Q) | - | CA\_n260P | CA\_n260Q |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n261(A-D) | - | n261A | CA\_n261D |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-2D) | - | n261A | CA\_n261(2D) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-D-H) | - | n261A | CA\_n261D | CA\_n261H |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-D-O) | - | n261A | CA\_n261D | CA\_n261O |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-D-2O) | - | n261A | CA\_n261D | CA\_n261(2O) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-G) | CA\_n261G | n261A | CA\_n261G |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n261(A-G-H) | CA\_n261GCA\_n261H | n261A | CA\_n261G | CA\_n261H |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-G-I) | CA\_n261GCA\_n261HCA\_n261I | n261A | CA\_n261G | CA\_n261I |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-G-O) | - | n261A | CA\_n261G | CA\_n261O |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-G-2O) | - | n261A | CA\_n261G | CA\_n261(2O) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-2G-O) | - | n261A | CA\_n261(2G) | CA\_n261O |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-2G-2O) | - | n261A | CA\_n261(2G) | CA\_n261(2O) |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-3G) | - | n261A | CA\_n261(3G) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-3G-O) | - | n261A | CA\_n261(3G) | CA\_n261O |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-2G) | CA\_n261G | n261A | CA\_n261(2G) |  |  |  |  |  |  |  |  |  | 800 |  |
| CA\_n261(A-4G) | - | n261A | CA\_n261(4G) |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-H) | CA\_n261GCA\_n261H | n261A | CA\_n261H |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n261(A-2H) | - | n261A | CA\_n261(2H) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-H-I) | - | n261A | CA\_n261H | CA\_n261I |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-I) | CA\_n261GCA\_n261HCA\_n261I | n261A | CA\_n261I |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-2I) | - | n261A | CA\_n261(2I) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-J) | CA\_n261GCA\_n261HCA\_n261I | n261A | CA\_n261J |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n261(A-K) | CA\_n261GCA\_n261HCA\_n261I | n261A | CA\_n261K |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-O) | - | n261A | CA\_n261O |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n261(A-2O) | - | n261A | CA\_n261(2O) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-3O) | - | n261A | CA\_n261(3O) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-4O) | - | n261A | CA\_n261(4O) |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-5O) | - | n261A | CA\_n261(5O) |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-6O) | - | n261A | CA\_n261(6O) |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-7O) | - | n261A | CA\_n261(7O) |  |  |  |  | 800 | 0 |
| CA\_n261(A-P) | - | n261A | CA\_n261P |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| CA\_n261(A-2P) | - | n261A | CA\_n261(2P) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-Q) | - | n261A | CA\_n261Q |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(A-2Q) | - | n261A | CA\_n261(2Q) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(2A-G) | CA\_n261G | CA\_n261(2A) | CA\_n261G |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(2A-H) | CA\_n261GCA\_n261H | CA\_n261(2A) | CA\_n261H |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(2A-I) | CA\_n261GCA\_n261HCA\_n261I | CA\_n261(2A) | CA\_n261I |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(3A-G) | CA\_n261G | CA\_n261(3A) | CA\_n261G |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(D-G) | CA\_n261D CA\_n261G | CA\_n261D | CA\_n261G |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
|
| CA\_n261(D-H) | CA\_n261D CA\_n261H | CA\_n261D | CA\_n261H |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
|
| CA\_n261(D-I) | CA\_n261D CA\_n261I | CA\_n261D | CA\_n261I |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n261(D-O) | CA\_n261D CA\_n261O | CA\_n261D | CA\_n261O |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
|
| CA\_n261(D-2O) | - | CA\_n261D | CA\_n261(2O) |  |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(D-P) | CA\_n261D CA\_n261P | CA\_n261D | CA\_n261P |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
|
| CA\_n261(D-Q) | CA\_n261D CA\_n261Q | CA\_n261D | CA\_n261Q |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n261(E-O) | CA\_n261E CA\_n261O | CA\_n261E | CA\_n261O |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n261(E-P) | CA\_n261E CA\_n261P | CA\_n261E | CA\_n261P |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n261(E-Q) | CA\_n261E CA\_n261Q | CA\_n261E | CA\_n261Q |  |  |  |  |  |  |  |  |  |  | 800 | 0 |
|
| CA\_n261(G-I) | CA\_n261GCA\_n261HCA\_n261I | CA\_n261G | CA\_n261I |  |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n261(G-H) | CA\_n261GCA\_n261H | CA\_n261G | CA\_n261H |  |  |  |  |  |  |  |  |  |  | 500 | 0 |
| CA\_n261(2G-2O) | - | CA\_n261(2G) | CA\_n261(2O) |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(G-O) | - | CA\_n261G | CA\_n261O |  |  |  |  |  |  |  |  |  |  | 400 | 0 |
| CA\_n261(G-2O) | - | CA\_n261G | CA\_n261(2O) |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n261(2G-O) | - | CA\_n261(2G) | CA\_n261O |  |  |  |  |  |  |  |  |  | 600 | 0 |
| CA\_n261(3G-O) | - | CA\_n261(3G) | CA\_n261O |  |  |  |  |  |  |  |  | 800 | 0 |
| CA\_n261(H-I) | CA\_n261GCA\_n261HCA\_n261I | CA\_n261H | CA\_n261I |  |  |  |  |  |  |  |  |  |  | 700 | 0 |
| NOTE 1: VoidNOTE 2: VoidNOTE 3: Channel bandwidth per operating band defined in Table 5.3.5-1NOTE 4: Configurations for intra-band contiguous CA defined in Table 5.5A.1-1 NOTE 5: Configurations for intra-band non-contiguous CA defined in Table 5.5A.2-1NOTE 6: VoidNOTE 7: Unless otherwise stated, BCS0 is referred in each constituent CA configuration.NOTE 8: (BWChannel,block) denotes the maximum total bandwidth from the summation of the sub-block bandwidths and shall be less than the bandwidth of the operating band. |

***<End of change2 >***

***<Start of change3>***

### 6.2.4 Configured transmitted power

The UE can configure its maximum output power. The configured UE maximum output power PCMAX,f,c for carrier f of a serving cell c is defined as that available to the reference point of a given transmitter branch that corresponds to the reference point of the higher-layer filtered RSRP measurement as specified in TS 38.215 [11].

The configured UE maximum output power PCMAX,f,c for carrier *f* of a serving cell *c* shall be set such that the corresponding measured peak EIRP PUMAX,f,c is within the following bounds

PPowerclass + DPIBE – MAX(MAX(MPRf,c, A- MPRf,c,) + ΔMBP,n, P-MPRf,c) – MAX{T(MAX(MPRf,c, A- MPRf,c,)), T(P-MPRf,c)} ≤ PUMAX,f,c ≤ EIRPmax

while the corresponding measured total radiated power PTMAX,f,c is bounded by

PTMAX,f,c ≤ TRPmax

with PPowerclass the UE minimum peak EIRP as specified in sub-clause 6.2.1, EIRPmax the applicable maximum EIRP as specified in sub-clause 6.2.1, MPRf,c as specified in sub-clause 6.2.2 , A-MPRf,c as specified in sub-clause 6.2.3, ΔMBP,n the peak EIRP relaxation as specified in clause 6.2.1 and TRPmax the maximum TRP for the UE power class as specified in sub-clause 6.2.1. DPIBE is 1.0 dB if UE declares support for *mpr-PowerBoost-FR2-r16*, UL transmission is QPSK, MPRf,c = 0 and when NS\_200 applies and the network configures the UE to operate with *mpr-PowerBoost-FR2-r16*otherwise DPIBE is 0.0 dB. The requirement is verified in beam peak direction.

***<End of change3>***

***<Start of change4>***

## 6.3D Output power dynamics for UL MIMO

### 6.3D.0 General

The requirements in subclause 6.3D shall be met with configurations specified in sub-clause 6.2D.1.x, where ‘x’ depends on power class. Unless otherwise specified, the requirements shall be verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

### 6.3D.1 Minimum output power for UL MIMO

6.3D.1.0 General

The minimum output power is defined as the mean power in at least one sub frame (1ms). The minimum controlled output power is defined as the EIRP, i.e. the sum of the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the UE power is set to a minimum value.

#### 6.3D.1.1 Minimum output power for UL MIMO for power class 1

For UE supporting UL MIMO, the minimum output power shall not exceed the sum of the values specified in Table 6.3.1.1-1 and the quantity 10\*log10(Number of Layers). The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

#### 6.3D.1.2 Minimum output power for UL MIMO for power class 2, 3 and 4

For UE supporting UL MIMO, the minimum output power shall not exceed the sum of the values specified in Table 6.3.1.2-1 and the quantity 10\*log10(Number of Layers).

### 6.3D.2 Transmit OFF power for UL MIMO

For UE supporting UL MIMO, the transmit OFF power is defined as the TRP in the channel bandwidth when the transmitter is OFF. The transmitter is considered OFF when the UE is not allowed to transmit on any of its ports. During DTX and measurements gaps, the transmitter is not considered OFF. The minimum output power shall not exceed the values specified in Table 6.3.2-1. The requirement is verified with the test metric of TRP (Link=TX beam peak direction, Meas=TRP grid).

### 6.3D.3 Transmit ON/OFF time mask for UL MIMO

For UE supporting UL MIMO, the ON/OFF time mask requirements in clause 6.3.3 apply.

***<End of change4>***

***<Start of change5>***

## 6.4D Transmit signal quality for UL MIMO

### 6.4D.0 General

For a UE supporting UL MIMO, the transmit modulation quality requirements in clause 6.4 apply but with all references to sub-clauses 6.3.1.x in clause 6.4 redirected to sub-clauses 6.3D.1.x, where ‘x’ depends on power class. The requirements apply when the UE is configured for 2-layer UL MIMO transmission as specified in Table 6.2D.1.0-1.

The requirement may alternatively be verified in each of the single layer UL MIMO configurations as specified in Table 6.4D.0-1. In this case, the transmit modulation quality requirements in clause 6.4 apply without modification.

Table 6.4D.0-1: Alternative UL MIMO configuration for transmit signal quality tests

|  |  |  |
| --- | --- | --- |
| **Transmission scheme** | **DCI format** | **TPMI Index** |
| Codebook based uplink | DCI format 0\_1 | 0 |
| Codebook based uplink | DCI format 0\_1 | 1 |

### 6.4D.1 Frequency error for UL MIMO

For a UE supporting UL MIMO, the UE basic measurement interval of modulated carrier frequency is 1 UL slot. The mean value of basic measurements of UE modulated carrier frequency at each layer shall be accurate to within ± 0.1 PPM observed over a period of 1ms of cumulated measurement intevals compared to the carrier frequency received from the NR Node B.

### 6.4D.2 Transmit modulation quality for UL MIMO

For UE supporting UL MIMO, the transmit modulation quality requirements are specified at each layer separately.

The transmit modulation quality requirements are specified in terms of:

Error Vector Magnitude (EVM) for the allocated resource blocks (RBs)

EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process

Carrier leakage (caused by IQ offset)

In-band emissions for the non-allocated RB

In case the parameter 3300 or 3301 is reported from UE via the parameter *txDirectCurrentLocation* in *UplinkTxDirectCurrentList* IE (as defined in TS 38.331 [13]), carrier leakage measurement requirement in clause 6.4D.2.2 and 6.4D.2.3 shall be waived, and the RF correction with regard to the carrier leakage and IQ image shall be omitted during the calculation of transmit modulation quality.

### 6.4D.3 Time alignment error for UL MIMO

For a UE with multiple physical antenna ports supporting UL MIMO, this requirement applies to frame timing differences between transmissions on multiple physical antenna ports in the codebook transmission scheme.

The time alignment error (TAE) is defined as the average frame timing difference between any two transmissions on different physical antenna ports.

For a UE with multiple physical antenna ports, the Time Alignment Error (TAE) shall not exceed 130 ns.

### 6.4D.4 Requirements for coherent UL MIMO

For coherent UL MIMO, Table 6.4D.4-1 lists the maximum allowable difference between the measured relative power and phase errors between different physical antenna ports in any slot within the specified time window from the last transmitted SRS on the same antenna ports, for the purpose of uplink transmission (codebook or non-codebook usage) and those measured at that last SRS. The requirements in Table 6.4D.4-1 apply when the UL transmission power at each physical antenna port is larger than 0 dBm for SRS transmission and for the duration of time window. The requirement is verified with the test metric of EIRP (Link=TX Beam peak direction, Meas=Link angle).

Table 6.4D.4-1: Maximum allowable difference of relative phase and power errors in a given slot compared to those measured at last SRS transmitted

|  |  |  |
| --- | --- | --- |
| Difference of relative phase error | Difference of relative power error | Time window |
| 40 degrees | 4 dB | 20 msec |

The above requirements apply when all of the following conditions are met within the specified time window:

- UE is not signaled with a change in number of SRS ports in *SRS-config*, or a change in *PUSCH-config*

- UE remains in DRX active time (UE does not enter DRX OFF time)

- No measurement gap occurs

- No instance of SRS transmission with the usage antenna switching occurs

- Active BWP remains the same

- EN-DC and CA configuration is not changed for the UE (UE is not configured or de-configured with PScell or SCell(s))

***<End of change5>***

***<Start of change6>***

#### 6.6.4.3 Side Conditions

##### 6.6.4.3.1 Side Condition for beam correspondence based on SSB and CSI-RS

The beam correspondence requirements are only applied under the following side conditions:

- The downlink reference signals including both SSB and CSI-RS are provided and Type D QCL shall be maintained between SSB and CSI-RS.

- The reference measurement channel for beam correspondence are fulfilled according to the CSI-RS configuration in Annex A.3.

- For beam correspondence, conditions for L1-RSRP measurements are fulfilled according to Table 6.6.4.3.1-1 and Table 6.6.4.3.1-2.

Table 6.6.4.3.1-1: Conditions for SSB based L1-RSRP measurements for beam correspondence

|  |  |  |  |
| --- | --- | --- | --- |
| Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2 | SSB Ês/Iot |
|  |  | dBm / SCSSSB | dB |
|  |  | SCSSSB = 120 kHz |  |
| All angles **Note 1** | n257 | -92.2 | ≥6 |
|  | n258 | -96.2 |  |
|  | n259 | -90.7 |  |
|  | n260 | -91.9 |  |
|  | n261 | -96.2 |  |
| NOTE 1: For UEs that support multiple FR2 bands, the Minimum SSB\_RP values for all angles are increased by MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1.NOTE 2: Values specified at the radiated requirements reference point to give minimum SSB Ês/Iot, with no applied noise. |

Table 6.6.4.3.1-2: Conditions for CSI-RS based L1-RSRP measurements for beam correspondence

|  |  |  |  |
| --- | --- | --- | --- |
| Angle of arrival | NR operating bands | Minimum CSI-RS\_RP Note 2 | CSI-RS Ês/Iot |
|  |  | dBm / SCSCSI-RS | dB |
|  |  | SCSCSI-RS = 120 kHz |  |
| All angles **Note 1** | n257 | -96.2 | ≥6 |
|  | n258 | -96.2 |  |
|  | n259 | -90.7 |  |
|  | n260 | -91.9 |  |
|  | n261 | -96.2 |  |
| NOTE 1: For UEs that support multiple FR2 bands, the Minimum CSI-RS\_RP values are increased by MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1.NOTE 2: Values specified at the radiated requirements reference point to give minimum CSI-RS Ês/Iot, with no applied noise. |

***<End of change6>***

***<Start of change7>***

##### 6.6.4.3.3 Side Condition for CSI-RS based enhanced Beam Correspondence requirements

The beam correspondence requirements for beam correspondence based on CSI-RS are only applied under the following side conditions:

- The downlink reference signals including both SSB and CSI-RS are provided.

- The reference measurement channel for beam correspondence are fulfilled according to the CSI-RS configuration in Annex A.3.

- For beam correspondence, conditions for L1-RSRP measurements are fulfilled according to Table 6.6.4.3.1-2 and SSB signal is provided according to Table 6.6.4.3.3-1.

Table 6.6.4.3.3-1: SSB signal conditions for CSI-RS based beam correspondence requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2 | SSB Ês/Iot |
|  |  | dBm / SCSSSB | dB |
|  |  | SCSSSB = 120 kHz |  |
| All angles **Note 1** | n257 | -101,4 | ≥1 |
|  | n258 | -101,4 |  |
|  | n259 | -97,1 |  |
|  | n260 | -97,1 |  |
|  | n261 | -101,4 |  |
| NOTE 1: For UEs that support multiple FR2 bands, the Minimum SSB\_RP values for all angles are increased by MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1.NOTE 2: Values specified at the radiated requirements reference point to give minimum SSB Ês/Iot, with no applied noise. |

***<End of change7>***

***<Start of change8>***

## A.2.3 Reference measurement channels for TDD

For UL RMCs defined below, TDD slot pattern defined in Table A.2.3-1 will be used for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, TDD slot patterns defined for reference sensitivity tests in Table A.3.3.1-1 will be used.

Table A.2.3-1: Additional reference channels parameters for TDD

|  |  |
| --- | --- |
| Parameter | Value |
|  | SCS 60 kHz (µ=2) | SCS 120 kHz (µ=3) |
| TDD Slot Configuration pattern (Note 1) | DDDSUUUU | 7DS8U |
| Special Slot Configuration (Note 2) | S=4D+6G+4U | S=12D+2G |
| *referenceSubcarrierSpacing* | 60 kHz | 120 kHz |
| UL-DL configuration |  *dl-UL-TransmissionPeriodicity* | 2 ms | 2 ms |
|  |  *nrofDownlinkSlots* | 3 | 7 |
|  |  *nrofDownlinkSymbols* | 4 | 12 |
|  |  *nrofUplinkSlot* | 4 | 8 |
|  |  *nrofUplinkSymbols* | 4 | 0 |
| Indexes of active UL slots | mod(slot index, 40) = {36,…,39} | mod(slot index, 80) = {72,…,79} |
| NOTE 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information.NOTE 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information. |

### A.2.3.1 DFT-s-OFDM Pi/2-BPSK

Table A.2.3.1-1: Reference Channels for DFT-s-OFDM pi/2-BPSK

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | pi/2 BPSK | 0 | 32 | 16 | 2 | 1 | 132 | 132 |
|   | 16 | 11 | pi/2 BPSK | 0 | 504 | 16 | 2 | 1 | 2112 | 2112 |
|   | 32 | 11 | pi/2 BPSK | 0 | 1032 | 16 | 2 | 1 | 4224 | 4224 |
|   | 64 | 11 | pi/2 BPSK | 0 | 2024 | 16 | 2 | 1 | 8448 | 8448 |
|   | 128 | 11 | pi/2 BPSK | 0 | 3976 | 24 | 2 | 2 | 16896 | 16896 |
|   | 256 | 11 | pi/2 BPSK | 0 | 7944 | 24 | 2 | 3 | 33792 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.1-2: Void

### A.2.3.2 DFT-s-OFDM QPSK

Table A.2.3.2-1: Reference Channels for DFT-s-OFDM QPSK

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | QPSK | 2 | 48 | 16 | 2 | 1 | 264 | 132 |
|   | 16 | 11 | QPSK | 2 | 808 | 16 | 2 | 1 | 4224 | 2112 |
|   | 20 | 11 | QPSK | 2 | 1032 | 16 | 2 | 1 | 5280 | 2640 |
|   | 32 | 11 | QPSK | 2 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|   | 64 | 11 | QPSK | 2 | 3240 | 16 | 2 | 1 | 16896 | 8448 |
|   | 128 | 11 | QPSK | 2 | 6408 | 24 | 2 | 2 | 33792 | 16896 |
|   | 256 | 11 | QPSK | 2 | 12808 | 24 | 2 | 4 | 67584 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.2-2: Void

### A.2.3.3 DFT-s-OFDM 16QAM

Table A.2.3.3-1: Reference Channels for DFT-s-OFDM 16QAM

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | 16QAM | 10 | 176 | 16 | 2 | 1 | 528 | 132 |
|   | 16 | 11 | 16QAM | 10 | 2792 | 16 | 2 | 1 | 8448 | 2112 |
|   | 32 | 11 | 16QAM | 10 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|   | 64 | 11 | 16QAM | 10 | 11272 | 24 | 1 | 2 | 33792 | 8448 |
|   | 128 | 11 | 16QAM | 10 | 22536 | 24 | 1 | 3 | 67584 | 16896 |
|   | 256 | 11 | 16QAM | 10 | 45096 | 24 | 1 | 6 | 135168 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.3-2: Void

### A.2.3.4 DFT-s-OFDM 64QAM

Table A.2.3.4-1: Reference Channels for DFT-s-OFDM 64QAM

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | 64QAM | 18 | 408 | 16 | 2 | 1 | 792 | 132 |
|   | 16 | 11 | 64QAM | 18 | 6400 | 24 | 1 | 1 | 12672 | 2112 |
|   | 32 | 11 | 64QAM | 18 | 12808 | 24 | 1 | 2 | 25344 | 4224 |
|   | 64 | 11 | 64QAM | 18 | 25608 | 24 | 1 | 4 | 50688 | 8448 |
|   | 128 | 11 | 64QAM | 18 | 51216 | 24 | 1 | 7 | 101376 | 16896 |
|   | 256 | 11 | 64QAM | 18 | 102416 | 24 | 1 | 13 | 202752 | 33792 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.4-2: Void

### A.2.3.5 CP-OFDM QPSK

Table A.2.3.5-1: Reference Channels for CP-OFDM QPSK

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | QPSK | 2 | 48 | 16 | 2 | 1 | 264 | 132 |
|   | 16 | 11 | QPSK | 2 | 808 | 16 | 2 | 1 | 4224 | 2112 |
|   | 32 | 11 | QPSK | 2 | 1608 | 16 | 2 | 1 | 8448 | 4224 |
|   | 33 | 11 | QPSK | 2 | 1672 | 16 | 2 | 1 | 8712 | 4356 |
|   | 66 | 11 | QPSK | 2 | 3368 | 16 | 2 | 1 | 17424 | 8712 |
|   | 132 | 11 | QPSK | 2 | 6536 | 24 | 2 | 2 | 34848 | 17424 |
|  | 264 | 11 | QPSK | 2 | 13064 | 24 | 2 | 4 | 69696 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.5-2: Void

### A.2.3.6 CP-OFDM 16QAM

Table A.2.3.6-1: Reference Channels for CP-OFDM 16QAM

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | 16QAM | 10 | 176 | 16 | 2 | 1 | 528 | 132 |
|   | 16 | 11 | 16QAM | 10 | 2792 | 16 | 2 | 1 | 8448 | 2112 |
|   | 32 | 11 | 16QAM | 10 | 5632 | 24 | 1 | 1 | 16896 | 4224 |
|   | 33 | 11 | 16QAM | 10 | 5760 | 24 | 1 | 1 | 17424 | 4356 |
|   | 66 | 11 | 16QAM | 10 | 11528 | 24 | 1 | 2 | 34848 | 8712 |
|   | 132 | 11 | 16QAM | 10 | 23040 | 24 | 1 | 3 | 69696 | 17424 |
|  | 264 | 11 | 16QAM | 10 | 46104 | 24 | 1 | 6 | 139392 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.6-2: Void

### A.2.3.7 CP-OFDM 64QAM

Table A.2.3.7-1: Reference Channels for CP-OFDM 64QAM

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Allocated resource blocks (LCRB) | DFT-s-OFDM Symbols per slot (Note 1) | Modulation | MCS Index (Note 2) | Payload size | Transport block CRC | LDPC Base Graph | Number of code blocks per slot (Note 3) | Total number of bits per slot | Total modulated symbols per slot |
| Unit |   |   |   |   | Bits | Bits |   |   | Bits |   |
|   | 1 | 11 | 64QAM | 19 | 408 | 16 | 2 | 1 | 792 | 132 |
|   | 16 | 11 | 64QAM | 19 | 6400 | 24 | 1 | 1 | 12672 | 2112 |
|   | 32 | 11 | 64QAM | 19 | 12808 | 24 | 1 | 2 | 25344 | 4224 |
|   | 33 | 11 | 64QAM | 19 | 13064 | 24 | 1 | 2 | 26136 | 4356 |
|   | 66 | 11 | 64QAM | 19 | 26120 | 24 | 1 | 4 | 52272 | 8712 |
|   | 132 | 11 | 64QAM | 19 | 53288 | 24 | 1 | 7 | 104544 | 17424 |
|  | 264 | 11 | 64QAM | 19 | 106576 | 24 | 1 | 13 | 209088 | 34848 |
| NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in 38.214.NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)NOTE 4: Indexes of active UL slots are given by Table A.2.3-1 with TDD UL-DL configuration specified in A2.3 for the requirements requiring at least one sub frame (1ms) for the measurement period. For other requirements, indexes of active UL slots are given by the slots satisfying mod(slot index+1, 5) = 0 with TDD UL-DL configuration specified in A.3.3.1.NOTE 5: The RMCs apply to all channel bandwidth where LCRB ≤ NRB. |

Table A.2.3.7-2: Void

***<End of change8>***