**3GPP TSG-RAN4 Meeting # 112**

 **Maastricht, Netherlands, August 19th – 23th 2024**

|  |
| --- |
| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-2** | **CR** |  | **rev** | **1**  | **Current version:** | **18.6.0** |  |
|  |
| *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)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | [NR\_NTN\_enh\_HAPS-Perf] CR for 38.141-2 on PRACH format 1 demodulation requirements  |
|  |  |
| ***Source to WG:*** | Ericsson, NTT DOCOMO  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | TEI18  |  | ***Date:*** | 2024-08-19 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | The HAPS is a deployed scenario in some regions which has large cell range (up to 100 km). NR PRACH format 1 would be the most typical format used in this scenario due to large covered cell range (~108 km), but there is no corresponding demodulation requirements in existing specifications. As requested by operators, it should be considered for adding the requirement to secure the product performance.  |
|  |  |
| ***Summary of change:*** | * Adding manufactory declarations.
* Adding FR1 PRACH format 1 demodulation requirements.
* Adding PRACH configurations.
 |
|  |  |
| ***Consequences if not approved:*** | There is no demodulation requirements for HAPS scenario and the access performance of the product can’t be tested. |
|  |  |
| ***Clauses affected:*** | 4.6, 8.4, A.6 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revised from R4-2412311. |

################## Start of Change #1 ######################

## 4.6 Manufacturer's declarations

The following BS manufacturer's declarations listed in table 4.6-1, when applicable to the BS under test, are required to be provided by the manufacturer for radiated requirements testing for *BS type 1-H,* *BS type 1-O* and *BS type 2-O*.

For the *BS type 1-H* declarations required for the conducted requirements testing, refer to TS 38.141-1 [3], clause 4.6.

Table 4.6-1 Manufacturers declarations for *BS type 1-H, BS type 1-O* and *BS type 2-O* radiated test requirements

| Declaration identifier | Declaration | Description | Applicability(Note 1) |
| --- | --- | --- | --- |
|  |  |  | BS type 1-H(Note 2) | BS type 1-O | BS type 2-O |
| D.1 | Coordinate system reference point | Location of coordinated system reference point in reference to an identifiable physical feature of the BS enclosure. | x | x | x |
| D.2 | Coordinate system orientation | Orientation of the coordinate system in reference to an identifiable physical feature of the BS enclosure. | x | x | x |
| D.3 | Beam identifier | A unique title to identify a beam, e.g. a, b, c or 1, 2, 3. The vendor may declare any number of beams with unique identifiers. The minimum set to declare for conformance, corresponds to the beams at the reference beam direction with the highest intended EIRP, and covering the properties listed below:1) A beam with the narrowest intended BeWθ and narrowest intended BeWϕ possible when narrowest intended BeWθ is used.2) A beam with the narrowest intended BeWϕ and narrowest intended BeWθ possible when narrowest intended BeWϕ is used.3) A beam with the widest intended BeWθ and widest intended BeWϕ possible when widest intended BeWθ is used.4) A beam with the widest intended BeWϕ and widest intended BeWθ possible when widest intended BeWϕ is used.5) A beam which provides the highest intended EIRP of all possible beams.When selecting the above five beam widths for declaration, all beams that the BS is intended to produce shall be considered, including beams that during operation may be identified by any kind of cell or UE specific reference signals, with the exception of any type of beam that is created from a group of transmitters that are not all phase synchronised.(Note 3) | x | x | x |
| D.4 | *Operating bands* and frequency ranges | List of NR *operating band(s)* supported by the BS and if applicable, frequency range(s) within the *operating band(s)* that the BS can operate in. Supported bands declared for every beam (D.3).(Note 4) | c | x | x |
| D.5 | BS requirements set | Declaration of one of the NR base station *requirement*'*s set* as defined for *BS type 1-H*, *BS type 1-O*, *or BS type 2-O*. | c | x | x |
| D.6 | BS class | Declared as Wide Area BS, Medium Range BS, or Local Area BS. | c | x | x |
| D.7 | BS channel band width and SCS support | BS supported SCS and channel bandwidth per supported SCS. Declared for each beam (D.3) and each *operating band* (D.4). | c | x | x |
| D.8 | *OTA peak directions set* reference beam direction pair | The beam direction pair, describing the reference beam peak direction and the reference beam centre direction. Declared for every beam (D.3). | x | x | x |
| D.9 | OTA peak directions set | The OTA peak directions set for each beam. Declared for every beam (D.3). | x | x | x |
| D.10 | *OTA peak directions set* maximum steering direction(s) | The *beam direction pair(s)* corresponding to the following points:1) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the positive Φ direction, while the θ value being the closest possible to the reference beam centre direction.2) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the negative *Φ* direction, while the *θ value being the closest possible to the* reference beam centre direction*.*3) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the positive *θ* direction, while the *Φ value being the closest possible to the* reference beam centre direction.4) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the negative *θ* direction, while the *Φ value being the closest possible to the* reference beam centre direction*.*The maximum steering direction(s) may coincide with *the reference beam centre direction*.Declared for every beam (D.3). | x | x | x |
| D.11 | Rated beam EIRP | The rated EIRP level per carrier (Prated,c,EIRP) at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.8). Declared for every beam (D.3).(Note 12, 14, 18, 20) | x | x | x |
| D.12 | Beamwidth | The *beamwidth* for the reference *beam direction pair* and the four maximum steering directions. Declared for every beam (D.3). | x | x | x |
| D.13 | Equivalent beams | List of beams which are declared to be equivalent.Equivalent beams imply that the beams are expected to have identical *OTA peak directions sets* and intended to have identical spatial properties at all steering directions within the *OTA peak directions set* when presented with identical signals. All declarations (D.4 – D.12) made for the beams are identical and the transmitter unit*,* RDN and antenna array responsible for generating the beam are of identical design. | x | x | x |
| D.14 | Parallel beams | List of beams which have been declared equivalent (D.13) and can be generated in parallel using independent RF power resources.Independent power resources mean that the beams are transmitted from mutually exclusive transmitter units. | x | x | x |
| D.15 | Number of carriers at maximum TRP | The number of carriers per operating band the BS is capable of generating at maximum TRP declared for every beam (D.3). | n/a | x | x |
| D.16 | Operating bands with multi-band dependencies | List of *operating bands* which are generated using transceiver units supporting operation in multiple *operating bands* through common active RF components. Declared for each *operating band* for which multi-band transceiver is used. | c | x | n/a |
| D.17 | Maximum radiated Base Station RF Bandwidth | Maximum *Base Station RF Bandwidth* in the *operating band*, declared for each supported operating band (D.4).(Note 15) | c | x | x |
| D.18 | Maximum *Radio Bandwidth* of the *operating band* with multi-band dependencies | Largest *Radio Bandwidth* that can be supported by the *operating bands* with multi-band dependencies.Declared for each supported *operating band* which has multi-band dependencies (D.16). | c | x | n/a |
| D.19 | Total RF bandwidth (BWtot) | Total RF bandwidth BWtot of transmitter and receiver, declared per the band combinations (D.52).  | c | x | x |
| D.20 | CA-only operation | Declared of CA-only (with equal power spectral density among carriers) but not multiple carriers operation, declared per *operating band* (D.4) and per beam (D.3). | c | x | x |
| D.21 | Maximum number of supported carriers per *operating band* in multi-band operations  | Maximum number of supported carriers per supported *operating band* declared to have multi-band dependencies (D.16). | c | x | n/a |
| D.22 | Contiguous or non-contiguous spectrum operation support | Ability of BS to support contiguous or non-contiguous (or both) frequency distribution of carriers when operating multi-carrier in an operating band. | c | x | x |
| D.23 | OSDD identifier | A unique identifier for the OSDD. | x | x | n/a |
| D.24 | OSDD operating band support | Operating band supported by the OSDD, declared for every OSDD (D.23).(Note 5) | x | x | n/a |
| D.25 | OTA sensitivity supported BS channel bandwidth and SCS | The *BS* supported SCS and channel bandwidth per supported SCS by each OSDD. | x | x | n/a |
| D.26 | Redirection of receiver target support | Ability to redirect the receiver target related to the OSDD. | x | x | n/a |
| D.27 | Minimum EIS for FR1 (EISminSENS) | The minimum EISminSENS requirement (i.e. maximum allowable EIS value) applicable to all sensitivity RoAoA per OSDD.Declared per NR supported channel BW for the OSDD (D.30).The lowest EIS value for all the declared OSDD's is called minSENS, while its related range of angles of arrival is called *minSENS RoAoA*.(Note 6) | x | x | n/a |
| D.28 | EIS REFSENS for FR2 (EISREFSENS\_50M) | The EISREFSENS\_50M level applicable in the OTA REFSENS RoAoA, (used as a basis for the derivation of the FR2 EISREFSENS for other channel bandwidths supported by BS).(Note 7) | n/a | n/a | x |
| D.29 | Receiver target reference direction Sensitivity Range of Angle of Arrival | The sensitivity RoAoA associated with the receiver target reference direction (D.31) for each OSDD. | x | x | n/a |
| D.30 | Receiver target redirection range | For each OSDD the associated union of all the sensitivity RoAoA achievable through redirecting the receiver target related to the OSDD.(Note 8) | x | x | n/a |
| D.31 | Receiver target reference direction | For each OSDD an associated direction inside the receiver target redirection range (D.30).(Note 9) | x | x | n/a |
| D.32 | Conformance test directions sensitivity RoAoA | For each OSDD that includes a receiver target redirection range, four sensitivity RoAoA comprising the conformance test directions (D.33). | x | x | n/a |
| D.33 | Conformance test directions | For each OSDD four conformance test directions.If the OSDD includes a receiver target redirection range the following four directions shall be declared:1) The direction determined by the maximum φ value achievable inside the receiver target redirection range, while θ value being the closest possible to the receiver target reference direction.2) The direction determined by the minimum φ value achievable inside the receiver target redirection range, while θ value being the closest possible to the receiver target reference direction.3) The direction determined by the maximum θ value achievable inside the receiver target redirection range, while φ value being the closest possible to the receiver target reference direction.4) The direction determined by the minimum θ value achievable inside the receiver target redirection range, while φ value being the closest possible to the receiver target reference direction.If an OSDD does not include a receiver target redirection range the following 4 directions shall be declared:1) The direction determined by the maximum φ value achievable inside the sensitivity RoAoA, while θ value being the closest possible to the receiver target reference direction.2) The direction determined by the minimum φ value achievable inside the sensitivity RoAoA, while θ value being the closest possible to the receiver target reference direction.3) The direction determined by the maximum θ value achievable inside the sensitivity RoAoA, while φ value being the closest possible to the receiver target reference direction.4) The direction determined by the minimum θ value achievable inside the sensitivity RoAoA, while φ value being the closest possible to the receiver target reference direction. | x | x | n/a |
| D.34 | OTA coverage range | Declared as a single range of directions within which selected TX OTA requirements are intended to be met.(Note 10) | x | x | x |
| D.35 | *OTA coverage range* reference direction | The direction describing the reference direction of the *OTA converge range* (D.34).(Note 11) | x | x | x |
| D.36 | OTA coverage range maximum directions | The directions corresponding to the following points:1) The direction determined by the maximum φ value achievable inside the *OTA coverage range*, while θ value being the closest possible to the *OTA coverage range* reference direction.2) The direction determined by the minimum φ value achievable inside the *OTA coverage range*, while θ value being the closest possible to the *OTA coverage range* reference direction.3) The direction determined by the maximum θ value achievable inside the *OTA coverage range*, while φ value being the closest possible to the *OTA coverage range* reference direction.4) The direction determined by the minimum θ value achievable inside the OTA coverage range, while φ value being the closest possible to the OTA coverage range reference direction. | x | x | x |
| D.37 | The rated carrier OTA BS power, Prated,c,TRP | Prated,c,TRP is declared as TRP OTA power per carrier, declared per supported operating band.(Note 12, 14, 18, 20) | n/a | x | x |
| D.38 | Rated transmitter TRP, Prated,t,TRP | Rated total radiated output power*.*Declared per supported *operating band*.(Note 12,14, 18, 20) | n/a | x | x |
| D.39 | CLTA placement for co-location test | The manufacturer shall declare the side of EUT where radiating elements are placed closest to the edge of EUT when applicable. The CLTA shall be placed at the EUT side where radiating elements are placed closest. | n/a | x | n/a |
| D.40 | Spurious emission category | Declare the BS spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [5]. | c | x | x |
| D.41 | Additional operating band unwanted emissions | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where the additional operating band unwanted emission limits defined in clause 6.7.4 apply.(Note 16, Note 19) | c | x | x |
| D.42 | Co-existence with other systems | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA, PHS and/or NR operating in another operating band are deployed. | c | x | x |
| D.43 | Co-location with other base stations | The manufacturer shall declare whether the BS under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or NR operating in another operating band. | c | x | n/a |
| D.44 | Single-band RIB or multi-band RIB | List of single-band RIB and/or multi-band RIB for the supported operating bands (D.4).  | c | x | n/a |
| D.45 | Single or multiple carrier | BS capability to operate with a single carrier (only) or multiple carriers. Declared per supported operating band, per RIB. (Note 17) | c | x | x |
| D.46 | Maximum number of supported carriers per *operating band* | Maximum number of supported carriers. Declared per supported operating band, per RIB.(Note 15) | c | x | x |
| D.47 | Total maximum number of supported carriers | Maximum number of supported carriers for all supported operating bands. Declared per RIB. | c | x | x |
| D.48 | Other band combination multi-band restrictions | Declare any other limitation under simultaneous operation in the declared band combinations (D.16), which have any impact on the test configuration generation. | c | x | n/a |
| D.49 | Ncells | Number corresponding to the minimum number of cells that can be transmitted by a BS in a particular *operating band*. Declared per *operating band* (D.4). | c | n/a | n/a |
| D.50 | Maximum supported power difference between carriers | Maximum supported power difference between carriers in each supported *operating band*. Declared per *operating band* (D.4). | c | x | x |
| D.51 | Maximum supported power difference between carriers is different *operating bands* | Maximum supported power difference between any two carriers in any two different supported *operating bands*. Declared per operating bands combination (D.52). | c | x | n/a |
| D.52 | Operating band combination support | List of *operating bands* combinations supported by *single-band RIB(s)* and/or *multi-band RIB(s)* of the BS.  | c | x | n/a |
| D.53 | OTA REFSENS RoAoA | Range of angles of arrival associated with the OTA REFSENS.  | n/a | x | x |
| D.54 | OTA REFSENS receiver target reference direction | Reference direction inside the OTA REFSENS RoAoA (D.53). | n/a | x | x |
| D.55 | OTA REFSENS conformance test directions | The following four OTA REFSENS conformance test directions shall be declared:1) The direction determined by the maximum φ value achievable inside the OTA REFSENS RoAoA, while θ value being the closest possible to the OTA REFSENS receiver target reference direction.2) The direction determined by the minimum φ value achievable inside the OTA REFSENS RoAoA, while θ value being the closest possible to the OTA REFSENS receiver target reference direction.3) The direction determined by the maximum θ value achievable inside the OTA REFSENS RoAoA, while φ value being the closest possible to the OTA REFSENS receiver target reference direction.4) The direction determined by the minimum θ value achievable inside the OTA REFSENS RoAoA, while φ value being the closest possible to the OTA REFSENS receiver target reference direction. | n/a | x | x |
| D.56 | Supported frequency range of the NR *operating band* | List of supported frequency ranges representing *fractional bandwidths* (FBW) of *operating bands* with FBW larger than 6%. | x | x | x |
| D.57 | Rated beam EIRP at lower end of the *fractional bandwidth* (Prated,c,FBWlow) | The rated EIRP level per carrier at lower frequency range of the *fractional bandwidth* (Prated,c,FBWlow), at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.8).Declared per beam for all supported frequency ranges (D.56).(Note 12, 13, 14, 15, 18, 20) | x | x | x |
| D.58 | Rated beam EIRP at higher frequency range of the *fractional bandwidth* (Prated,c,FBWhigh) | The rated EIRP level per carrier at higher frequency range of the *fractional bandwidth* (Prated,c,FBWhigh), at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.8).Declared per beam for all supported frequency ranges in (D.56).(Note 12, 13, 14 ,15, 18, 20) | x | x | x |
| D.59 | Relation between supported maximum RF bandwidth, number of carriers and Rated maximum TRP  | If the rated transmitter TRP and total number of supported carriers are not simultaneously supported, the manufacturer shall declare the following additional parameters:- The reduced number of supported carriers at the rated transmitter TRP;- The reduced total output power at the maximum number of supported carriers. | n/a | x | x |
| D.60 | Inter-band CA  | Declaration of operating band(s) combinations supporting inter‑band CA. Declared per operating band combination (D.52).  | c | x | x |
| D.61 | Intra-band contiguous CA  | Declaration of operating band(s) supporting intra-band contiguous CA. Declared per *operating band* with CA support. | c | x | x |
| D.62 | Intra-band non-contiguous CA  | Declaration of operating band(s) supporting intra-band non‑contiguous CA. Declared per operating band with CA support.  | c | x | x |
| D.63 | Total maximum number of supported carriers in multi-band operation | Maximum number of supported carriers for all supported *operating bands* declared to have multi-band dependencies (D.16)*.*  | c | x | n/a |
| D.100 | PUSCH mapping type | Declaration of the supported PUSCH mapping type for FR1 as specified in TS 38.211 [20], i.e., type A, type B or both. | c | x | n/a |
| D.101 | PUSCH additional DM-RS positions | Declaration of the supported additional DM-RS position(s) for FR2, i.e., pos0, pos1, or both. | n/a | n/a | x |
| D.102 | PUCCH format | Declaration of the supported PUCCH format(s) as specified in TS 38.211 [20], i.e., format 0, format 1, format 2, format 3, format 4. | c | x | x |
| D.103 | PRACH format and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [20], i.e., format: 0, A1, A2, A3, B4, C0, C2.Declaration of the supported SCS(s) per supported PRACH format with short sequence, as specified in TS 38.211 [20], i.e.: - For *BS type 1-O*: 15 kHz, 30 kHz or both.- For *BS type 2-O*: 60 kHz, 120 kHz or both. | c | x | x |
| D.104 | Additional DM-RS for PUCCH format 3 | Declaration of the supported additional DM-RS for PUCCH format 3: without additional DM-RS, with additional DM-RS or both. | c | x | x |
| D.105 | Additional DM-RS for PUCCH format 4 | Declaration of the supported additional DM-RS for PUCCH format 4: without additional DM-RS, with additional DM-RS or both. | c | x | x |
| D.106 | PUSCH PT-RS  | Declaration of PT-RS in PUSCH support: without PT-RS, with PT-RS or both. | n/a | n/a | x |
| D.107 | PUCCH multi-slot  | Declaration of multi-slot PUCCH support. | c | x | n/a |
| D.108 | UL CA | For the highest supported SCS, declaration of the carrier combination with the largest aggregated bandwidth. If there is more than one combination, the carrier combination with the largest number of carriers shall be declared. | c | x | x |
| D.109 | High speed train | Declaration of high speed train scenario support, i.e. HST support or no HST support | c | x | x |
| D.110 | Maximum speed of high speed train for PUSCH | Declaration of supported maximum speed for high speed train scenario, i.e. 350 km/h or 500 km/h. This declaration is applicable to PUSCH for high speed train and UL timing adjustment only if BS declares to support high speed train in D.109. | c | x | n/a |
| D.111 | PRACH format for high speed train | Declaration of supported PRACH format(s) for high speed train scenario, i.e. format 0 restricted set type A, format 0 restricted set type B, format A2, format B4, format C2.This declaration is applicable to PRACH for high speed train only if BS declares to support high speed train in D.109. | c | x | x |
| D.112 | Interlaced formats | Declaration of support of interlaced PUSCH and PUCCH formats, i.e. interlaced format support or no interlaced format support.  | c | x | n/a |
| D.113 | PRACH format with LRA = 1151 for 15 kHz SCS and LRA = 571 for 30 kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. | c | x | n/a |
| D.114 | CG-UCI | Declaration of support of GC-UCI multiplexed on PUSCH as specified in TS 38.211 [17].  | c | x | n/a |
| D.115 | 2-step RA | Declaration of support of 2-step RA type.  | c | x | x |
| D.116 | PUSCH 256QAM | Declaration of PUSCH 256QAM support | c | x | x |
| D.117 | Additional DM-RS for FR2 high speed train | Declaration of supported additional DM-RS position(s) for FR2 high speed train scenario for PUSCH and UL timing adjustment, i.e., pos0, pos1, pos2, or any combination | n/a | n/a | x |
| D.118 | PUCCH sub-slot based repetition formats | Declaration of PUCCH sub-slot based repetition formats. | c | x | n/a |
| D.119 | PUSCH TB over multi-slots | BS support TBoMS over physical consecutive UL slots | c | x | x |
| D.120 | PUSCH TB over multi-slots | BS support TBoMS over physical non-consecutive UL slots | c | x | x |
| D.121 | Supported SCS for TDD PUSCH DM-RS bundling and PUCCH DM-RS bundling | Declaration of supported SCS for TDD PUSCH DM-RS bundling and and PUCCH DM-RS bundling and, i.e. {15 kHz, 30 kHz, 60 kHz 120 kHz} | c | x | x |
| D.122 | Supported FDD PUSCH DM-RS bundling and and PUCCH DM-RS bundling and | Declaration of supporting FDD PUSCH DM-RS bundling and PUCCH DM-RS bundling | c | x | x |
| D.123 | MCS index table 3 | Declaration of support MCS index table 3 as specified in TS 38.214 [18].  | c | x | n/a |
| D.124 | PUSCH repetition type A | Declaration of support PUSCH repetition type A | c | x | x |
| D.125 | Air-to-ground scenario | Declaration of air-to-ground scenario support, i.e. ATG support or no ATG support | c | x | n/a |
| D.126 | PRACH format and SCS for Multiple PRACH transmission | Declaration of the supported PRACH format(s) as specified in TS 38.211 [20] for Multiple PRACH transmission, i.e., format: A2, B4, C2.Declaration of the supported SCS(s) per supported PRACH format with short sequence for Multiple PRACH transmission, as specified in TS 38.211 [20], i.e.: - For BS type 2-O: 120 kHz. | c | x | x |
| D.127 | PUSCH with enhanced DM-RS type | Declaration of support enhanced DM-RS typeas specified in TS 38.211 [17]. | x | x | n/a |
| D.xxx | PRACH format for HAPS scenario | Declaration of supported PRACH format(s) for HAPS scenario, i.e., format 1. | x | x | n/a |
| NOTE 1: Manufacturer declarations applicable per BS *requirement set* were marked as "x". Manufacturer declarations not applicable per BS *requirement set* were marked as "n/a".NOTE 2: For *BS type 1-H*, the only radiated declarations are related to EIRP and EIS requirements. For *BS type 1-H* declarations required for the conducted requirements testing, refer to TS 38.141-1 [3]. For declarations marked as 'c', related conducted declarations in TS 38.141-1 [3] apply. When separately declared, they shall still use the same declaration identifier.NOTE 3: Depending on the capability of the system some of these beams may be the same. For those same beams, testing is not repeated.NOTE 4: These *operating bands* are related to their respective single‑band RIBs.NOTE 5: As each identified OSDD has a declared minimum EIS value (D.27), multiple operating band can only be declared if they have the same minimum EIS declaration.NOTE 6: If the *BS type 1-H* or *BS type 1-O* is not capable of redirecting the receiver target related to the OSDD then there is only one RoAoA applicable to the OSDD.NOTE 7: Although EISREFSENS\_50M level is based on a reference measurement channel with BWChannel = 50 MHz, it does not imply that BS has to support 50 MHz channel bandwidth.NOTE 8: Not applicable for *BS type 2-O*.NOTE 9: For an OSDD without receiver target redirection range, this is a direction inside the sensitivity RoAoA.NOTE 10: *OTA coverage range* is used for conformance testing of such TX OTA requirements as occupied bandwidth, frequency error, TAE or EVM.NOTE 11: The *OTA coverage reference* direction may be the same as the Reference beam direction pair (D.8) but does not have to be.NOTE 12: If a *BS type 2-O* is capable of 64QAM DL operation but not capable of 256QAM DL operation, then up to two rated output power declarations may be made. One declaration is applicable when configured for 64QAM transmissions and the other declaration is applicable when not configured for 64QAM transmissions.NOTE 13: If D.57 and D.58 are declared for certain frequency range (D.56), there shall be no "Rated beam EIRP" declaration (D.11) for the *operating band* containing that particular frequency range.NOTE 14: If a BS is capable of 1024QAM DL operation then up to three rated output power declarations may be made. One declaration is applicable when configured for 1024QAM transmissions, a different declaration is applicable when configured 256QAM transmissions and the other declaration is applicable when configured neither for 256QAM nor 1024QAM transmissions.NOTE 15: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared.NOTE 16: If BS is declared to support Band n20 (D.4), the manufacturer shall declare if the BS may operate in geographical areas allocated to broadcasting (DTT). Additionally, related declarations of the emission levels and maximum output power shall be declared. NOTE 17: In case of BS type 1-H, this declaration applies per *TAB connector*. NOTE 18: If a *BS type 2-O* is capable of 256QAM DL operation, then up to three rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions, a different declaration is applicable when configured for 64QAM transmissions and the other declaration is applicable when not configured neither for 256QAM nor 64QAM transmissions.NOTE 19: If BS is declared to support Band n24 (D.4), the manufacturer shall declare if the BS may operate in geographical areas where FCC regulations apply. Additionally, related declarations of the emission levels and maximum output power shall be declared.NOTE 20: If a BS is capable of 256QAM DL operation but not capable of 1024QAM DL operation then up to two rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions, and the other declaration is applicable when not configured for 256QAM transmissions |

################## End of Change #1 ######################

################## Start of Change #2 ######################

#### 8.1.2.3 Applicability of PRACH performance requirements

##### 8.1.2.3.1 Applicability of requirements for different formats

Unless otherwise stated, PRACH requirement tests shall apply only for each PRACH format declared to be supported (see D.103 in table 4.6-1).

Unless otherwise stated, PRACH requirement tests for high speed train shall apply only for each PRACH formats declared to be supported (see D.111 in table 4.6-1).

Unless otherwise stated, PRACH requirement tests for HAPS scenario shall apply only for each PRACH formats declared to be supported (see D.xxx in table 4.6-1).

##### 8.1.2.3.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, for each PRACH format with short sequence declared to be supported, for each FR, the tests shall apply only for the smallest supported subcarrier spacing in the FR (see D.103 in table 4.6-1).

##### 8.1.2.3.3 Applicability of requirements for different channel bandwidths

Unless otherwise stated, for the subcarrier spacing to be tested, the test requirements shall apply only for anyone channel bandwidth declared to be supported (see D.7 in table 4.6-1).

Unless otherwise stated, for BS declaring to support less than 5MHz carrier bandwidth (see D.7 in table 4.6-1), only test requirements relating to RACH preamble formats with 15kHz SCS with sequence length LRA=139, and PRACH formats with 1.25kHz SCS with sequence length LRA=839 shall apply.

##### 8.1.2.3.4 Applicability of requirements for different restricted set types of long PRACH format 0

Unless otherwise stated, PRACH requirement tests for long PRACH preamble format 0 with restricted set Type A and B shall apply only for the restricted set type declared to be supported (see D.111 in table 4.6-1). If both restricted set type A and type B are declared to be supported, the tests shall be done for type B; the same chosen mapping type shall then be used for all tests.

Unless otherwise stated, for BS declaring to support less than 5MHz carrier bandwidth (see D.7 in table 4.6-1), only test requirements relating to RACH preamble formats with 15kHz SCS with sequence length LRA=139, and PRACH formats with 1.25kHz SCS with sequence length LRA=839 shall apply.

#### 8.1.2.4 Applicability of PUSCH for high speed train performance requirements

################## End of Change #2 ######################

################## Start of Change #3 ######################

## 8.4 OTA performance requirements for PRACH

### 8.4.1 PRACH false alarm probability and missed detection

#### 8.4.1.1 Definition and applicability

The performance requirement of PRACH for preamble detection is determined by the two parameters: total probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required SNR at probability of detection, Pd of 99%. Pfa shall be 0.1% or less.

Pfa is defined as a conditional total probability of erroneous detection of the preamble (i.e. erroneous detection from any detector) when input is only noise.

Pd is defined as conditional probability of detection of the preamble when the signal is present. The erroneous detection consists of several error cases – detecting only different preamble(s) than the one that was sent, not detecting any preamble at all, or detecting the correct preamble but with the out-of-bounds timing estimation value. For AWGN, TDLC300-100, TDLA30-10, TDLA30-300, TDLA30-650, and TDLA10-650, a timing estimation error occurs if the estimation error of the timing of the strongest path is larger than the time error tolerance values given in table 8.4.1.1-1.

Table 8.4.1.1-1: Time error tolerance for AWGN, TDLC300-100, TDLA30-10, TDLA30-300, TDLA30-650 and TDLA10-650

|  |  |  |  |
| --- | --- | --- | --- |
| PRACH | PRACH SCS |  | Time error tolerance |
| preamble | (kHz) | AWGN | TDLC300-100 | TDLA30-10 | TDLA30-300 | TDLA30-650 | TDLA10-650 |
| 0 | 1.25 | 1.04 us | 2.55 us | N/A | N/A | N/A | N/A |
| 1 | 1.25 | 1.04 us | N/A | N/A | N/A | N/A | N/A |
| A1, A2, A3, B4, C0, C2 | 15 | 0.52 us | 2.03 us | 0.67 us | N/A | N/A | N/A |
|  | 30 | 0.26 us | 1.77 us | 0.41 us | N/A | N/A | N/A |
|  | 60 (FR2) | 0.13 us | N/A | N/A | 0.28 us | N/A | N/A |
|  | 120 | 0.07 us | N/A | N/A | 0.22 us | 0.22 us | N/A |
|  | 480 | 18 ns | N/A | N/A | N/A | N/A | 68 ns |

The test preambles for normal mode are listed in table A.6-1 and A.6-2. The test preambles for high speed train restricted set type A are listed in table A.6-3 and the test preambles for high speed train restricted set type B are listed in table A.6-4. The test preambles for high speed train short formats are listed in table A.6-5. The test preambles for Multiple PRACH transmission are listed in table A.6-9.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2. The performance requirements for high speed train (table 8.4.1.6.1-1 to 8.4.1.6.1-4 and table 8.4.1.6.2-1) are optional. and only applicable for FR2-1 below 30 GHz The test preambles for PRACH with LRA=1151 and LRA=571 are listed in table A.6-6.

#### 8.4.1.2 Minimum requirement

For *BS type 1-O*, the minimum requirement is in TS 38.104 [2] clause 11.4.1.1 and 11.4.1.2.

For *BS type 2-O*, the minimum requirement is in TS 38.104 [2] clause 11.4.2.1 and 11.4.2.2.

#### 8.4.1.3 Test purpose

The test shall verify the receiver's ability to detect PRACH preamble under static conditions and multipath fading propagation conditions for a given SNR.

#### 8.4.1.4 Method of test

##### 8.4.1.4.1 Initial conditions

Test environment: Normal, see clause B.2.

RF channels to be tested: for single carrier: M; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

##### 8.4.1.4.2 Procedure

1) Place the BS with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the BS with the test system.

3) Set the BS in the declared direction to be tested.

4) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameter *msg1-FrequencyStart* is set to 0.

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the AWGN generator, according to the SCS and channel bandwidth. The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.4.1.4.2-1.

Table 8.4.1.4.2-1: AWGN power level at the BS input

|  |  |  |  |
| --- | --- | --- | --- |
| BS type | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| BS type 1-O (Note 4) | 15 | 5 | -83.5 - ΔOTAREFSENS dBm / 4.5MHz |
|  |  | 10 | -80.3 - ΔOTAREFSENS dBm / 9.36MHz |
|  |  | 20 | -77.2 - ΔOTAREFSENS dBm / 19.08MHz |
|  | 30 | 10 | -80.6 - ΔOTAREFSENS dBm / 8.64MHz |
|  |  | 20 | -77.4 - ΔOTAREFSENS dBm / 18.36MHz |
|  |  | 40 | -74.2 - ΔOTAREFSENS dBm / 38.16MHz |
|  |  | 100 | -70.1 - ΔOTAREFSENS dBm / 98.28MHz |
| BS type 2-O (Note 5) | 60 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52 MHz |
|  |  | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz |
|  | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
|  |  | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz |
|  |  | 200 | EISREFSENS\_50M + ΔFR2\_REFSENS + 21 dBm / 190.08 MHz |
|  |  | 400 | EISREFSENS\_50M + ΔFR2\_REFSENS + 24 dBm / 380.16 MHz |
|  | 480 | 400 | EISREFSENS\_50M + ΔFR2\_REFSENS + 24 dBm / 380.16 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS receiver target reference direction (as declared in D.54 in table 4.6-1) is used for testing.NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1.NOTE 4: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level.NOTE 5: The AWGN power level contains an AWGN offset of 15dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. |

8) Adjust the frequency offset of the test signal according to table 8.4.1.5.1-1 or 8.4.1.5.1-2 or 8.4.1.5.1-3 or 8.4.1.6.1-1 or 8.4.1.6.1-2 or 8.4.1.6.1-3 or 8.4.1.6.1-4 or 8.4.1.5.2-1 or 8.4.1.5.2-2 or 8.4.1.5.2-3 or 8.4.1.5.2-4 or 8.4.1.5.2-5 or 8.4.1.7.1-1 or 8.4.1.7.1-2 or 8.4.1.6.2-1 or 8.4.1.7.x-1 or 8.4.1.7.x-2 or 8.4.1.7.x-3.

9) Adjust the equipment so that the SNR specified in table 8.4.1.5.1-1 or 8.4.1.5.1-2 or 8.4.1.5.1-3 or 8.4.1.6.1-1 or 8.4.1.6.1-2 or 8.4.1.6.1-3 or 8.4.1.6.1-4 or 8.4.1.5.2-1 or 8.4.1.5.2-2 or 8.4.1.5.2-3 or 8.4.1.5.2-4 or 8.4.1.5.2-5 or 8.4.1.7.1-1 or 8.4.1.7.1-2 or 8.4.1.6.2-1 or 8.4.1.7.x-1 or 8.4.1.7.x-2 or 8.4.1.7.x-3 is achieved at the BS input during the PRACH preambles.

10) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated as illustrated in figure 8.4.1.4.2-1. The preambles are sent with certain timing offsets as described below. The following statistics are kept: the number of preambles detected in the idle period and the number of missed preambles.



Figure 8.4.1.4.2-1: PRACH preamble test pattern

Unless otherwise stated, the timing offset base value for PRACH preamble format 0 is set to 50% of Ncs. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.9us. Then the loop is being reset and the timing offset is set again to 50% of Ncs. The timing offset scheme for PRACH preamble format 0 and 1 is presented in Figure 8.4.1.4.2-2.



Figure 8.4.1.4.2-2: Timing offset scheme for PRACH preamble format 0 and 1

Unless otherwise stated, the timing offset base value for PRACH preamble format A1, A2, A3, B4, C0 and C2 is set to 0. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.8us. Then the loop is being reset and the timing offset is set again to 0. The timing offset scheme for PRACH preamble format A1, A2, A3, B4, C0 and C2 is presented in Figure 8.4.1.4.2-3 for 15 kHz, 30 kHz, 60 kHz, and 120 kHz SCS.



Figure 8.4.1.4.2-3: Timing offset scheme for PRACH preamble format A1 A2, A3, B4, C0 and C2 using 15 kHz, 30 kHz, 60 kHz, and 120 kHz SCS

For test requirement specified in Table 8.4.1.6.2-1, the timing offset base value for PRACH preamble format C2 is set to 0. This offset is increased within the loop, by adding in each step a value of 0.48us, until the end of the tested range, which is 4.8us. Then the loop is being reset and the timing offset is set again to 0. The timing offset scheme for PRACH preamble format C2 is presented in Figure 8.4.1.4.2-4.



Figure 8.4.1.4.2-4: Timing offset scheme for PRACH preamble format C2

For test requirements with 480 kHz SCS, the timing offset base value for PRACH preamble format A2, B4, and C2 is set to 0. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.4us. Then the loop is being reset and the timing offset is set again to 0. The timing offset scheme for PRACH preamble format A2, B4, and C2 is presented in Figure 8.4.1.4.2-5.



Figure 8.4.1.4.2-5: Timing offset scheme for PRACH preamble format A2, B4, and C2 using 480 kHz SCS

#### 8.4.1.5 Test requirement for Normal Mode

##### 8.4.1.5.1 Test requirement for *BS type 1-O*

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.5.1-1 to 8.4.1.5.1-3.

Table 8.4.1.5.1-1: PRACH missed detection test requirements for Normal Mode, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX | Number of demodulation | Propagation conditions and | Frequency offset | SNR (dB) |
| antennas | branches | correlation matrix (annex J) |  | Burst format 0 | Burst format 1 (Note 1) |
| 1 | 2 | AWGN | 0 | -14.2 | -16.2 |
| TDLC300-100 Low | 400 Hz  | -6.0 | N/A |
| Note 1: The requirement is optional and only for a BS declare to support HAPS scenario. |

Table 8.4.1.5.1-2: PRACH missed detection test requirements for Normal Mode, 15 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | Number of | Propagation | Frequency | SNR (dB) |
| of TX antennas | demodulation branches | conditions and correlation matrix (annex J) | offset | Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -9.0 | -12.3 | -13.9 | -16.5 | -6.0 | -12.2 |
|  |  | TDLC300-100 Low | 400 Hz | -1.5 | -4.2 | -6.0 | -8.2 | 1.4 | -4.3 |

Table 8.4.1.5.1-3: PRACH missed detection test requirements for Normal Mode, 30 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | Number of | Propagation | Frequency | SNR (dB) |
| of TX antennas | demodulation branches | conditions and correlation matrix (annex J) | offset | Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -8.8 | -11.7 | -13.5 | -16.2 | -5.8 | -11.6 |
|  |  | TDLC300-100 Low | 400 Hz | -2.2 | -5.1 | -6.8 | -9.3 | 0.7 | -5.0 |

Table 8.4.1.5.1-4: Void

Table 8.4.1.5.1-5: Void

##### 8.4.1.5.2 Test requirement for *BS type 2-O*

################## End of Change #2 ######################

################## End of Change #3 ######################

# A.6 PRACH Test preambles

Table A.6-1 Test preambles for Normal Mode in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 13 | 22 | 32 |
| 1 | 1.25 | 0 | 22 | 0 |
| A1, A2, A3, | 15 | 23 | 0 | 0 |
| B4, C0, C2 | 30 | 46 | 0 | 0 |

Table A.6-2 Test preambles for Normal Mode in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A1, A2, A3 | 60 | 69 | 0 | 0 |
| , B4, C0, C2 | 120 | 69 | 0 | 0 |

Table A.6-3: Test preambles for high speed train restricted set type A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 15 | 384 | 0 |

Table A.6-4: Test preambles for high speed train restricted set type B

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 15 | 30 | 30 |

Table A.6-5: Test preambles for high speed train short formats in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 15 | 23 | 0 | 0 |
|  | 30 | 46 | 0 | 0 |

Table A.6-6: Test preambles for PRACH with LRA=1151 and LRA=571

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 15 | 164 | 0 | 0 |
|  | 30 | 190 | 0 | 0 |

Table A.6-7: Test preambles for high speed train short formats in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| C2 | 120 | 0 | 0 | 0 |

Table A.6-8 Test preambles for PRACH with LRA=139, LRA=571 and LRA=1151 for 120 KHz and 480 KHz SCS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | LRA | Ncs | Logical sequence index | v |
| A2,, B4, C2 | 120 | 571 | 285 | 0 | 0 |
|  | 120 | 1151 | 575 | 0 | 0 |
|  | 480 | 139 | 69 | 0 | 0 |
|  | 480 | 571 | 285 | 0 | 0 |

Table A.6-9: Test preambles for normal mode PRACH with repetitions, LRA=139

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 120 | 69 | 0 | 0 |

################## End of Change #3 ######################