**3GPP TSG-RAN4 Meeting #95-e *R4-2008420***

**Online, 25th May 2020 - 4th June 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.101-2** | **CR** | **0150** | **rev** | **1** | **Current version:** | **15.9.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | CR to 38.101-2 on correction of reference point for beam correspondence side conditions | | | | | | | | | |
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| ***Source to WG:*** | Apple Inc. | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2020-05-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-15 |
|  | *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 can be 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | Tables 6.6.4.2-1 and 6.6.4.2-2 specify the side conditions for the beam correspondence test with values defined at the “reference point.” This term, however, is not defined in TS38.101-2. The term is defined for RRM testing methodology in TR38.810, Figure 6.2.1.4.2-1.  A new term is needed to clarify the radiated requirements reference point. The beam correspondence side conditions need to be corrected to refer to the radiated requirements reference point. | | | | | | | | |
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| ***Summary of change:*** | | Change 1: define the term “radiated requirements reference point”  Change 2: correct “reference point” to “radiated requirements reference point” in the beam correspondence side conditions | | | | | | | | |
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| ***Consequences if not approved:*** | | The side conditions for the beam correspondence requirement are not clear. | | | | | | | | |
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| ***Clauses affected:*** | | 3.1, 6.6.4.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | |  | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS38.521-2 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<< start of change 1 >>

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**Aggregated Channel Bandwidth:** The RF bandwidth in which a UE transmits and receives multiple contiguously aggregated carriers.

**Beam correspondence:** the ability of the UE to select a suitable beam for UL transmission based on DL measurements with or without relying on UL beam sweeping.

**Carrier aggregation:** Aggregation of two or more component carriers in order to support wider transmission bandwidths.

**Carrier aggregation band:** A set of one or more operating bands across which multiple carriers are aggregated with a specific set of technical requirements.

**Carrier aggregation bandwidth class:** A class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by a UE.

**Carrier aggregation configuration**: A combination of CA operating band(s) and CA bandwidth class(es) supported by a UE.

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

**EIRP(Link=Link angle, Meas=Link angle):** measurement of the UE such that the link angle is aligned with the measurement angle. EIRP (indicator to be measured) can be replaced by EIS, Frequency, EVM, carrier Leakage, In-band eission and OBW.

**EIRP(Link=TX beam peak direction, Meas=Link angle):** measurement of the EIRP of the UE such that the measurement angle is aligned with the beam peak direction within an acceptable measurement error uncertainty. EIRP (indicator to be measured) can be replaced by Frequency, EVM, carrier Leakage, In-band eission and OBW

**EIRP(Link=Spherical coverage grid, Meas=Link angle):** measurement of the EIRP spherical coverage of the UE such that the EIRP link and measurement angles are aligned with the directions along the spherical coverage grid within an acceptable measurement error uncertainty. Alternatively, the spherical coverage grid can be replaced by the beam peak search grid as the results from the beam peak search can be re-used for spherical coverage.

**EIS (equivalent isotropic sensitivity):** sensitivity for an isotropic directivity device equivalent to the sensitivity of the discussed device exposed to an incoming wave from a defined AoA

**EIS(Link=RX beam peak direction, Meas=Link angle):** measurement of the EIS of the UE such that the measurement angle is aligned with the RX beam peak direction within an acceptable measurement error uncertainty.

NOTE 1: The sensitivity is the minimum received power level at which specific requirement is met.

NOTE 2: Isotropic directivity is equal in all directions (i.e. 0 dBi).

**Fallback group:** Group of carrier aggregation bandwidth classes for which it is mandatory for a UE to be able to fallback to lower order CA bandwidth class configuration. It is not mandatory for a UE to be able to fallback to lower order CA bandwidth class configuration that belong to a different fallback group

**Inter-band carrier aggregation:** Carrier aggregation of component carriers in different operating bands.

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

**Intra-band contiguous carrier aggregation:** Contiguous carriers aggregated in the same operating band.

**Intra-band non-contiguous carrier aggregation:** Non-contiguous carriers aggregated in the same operating band.

**Link angle:** a DL-signal AoA from the view point of the UE, as described in Annex J. If the beam lock function is used to lock the UE beam(s), the link angle can become any arbitrary AoA once the beam lock has been activated.

**Measurement angle:** the angle of measurement of the desired metric from the view point of the UE, as described in Annex J

**radiated interface boundary**: operating band specific radiated requirements reference point where the radiated requirements apply

**radiated requirements reference point**: for the RF measurement setup, the radiated requirements reference point is located at the centre of the quiet zone. From the UE perspective the reference point is the input of the UE antenna array.

**RX beam peak direction**: direction where the maximum total component of RSRP and thus best total component of EIS is found

**Sub-block:** This is one contiguous allocated block of spectrum for transmission and reception by the same UE. There may be multiple instances of sub-blocks within an RF bandwidth.

**TX beam peak direction:** direction where the maximum total component of EIRP is found

**TRP(Link=TX beam peak direction, Meas=TRP grid):** measurement of the TRP of the UE such that the measurement angles are aligned with the directions of the TRP grid points within an acceptable measurement uncertainty while the link angle is aligned with the TX beam peak direction

NOTE: For requirements based on EIRP/EIS, the radiated interface boundary is associated to the far-field region

**UE transmission bandwidth configuration:** Set of resource blocks located within the UE channel bandwidth which may be used for transmitting or receiving by the UE.

**Vehicular UE:** A UE embedded in a vehicle

<< end of change 1 >>

<< start of change 2 >>

### 6.6.4 Beam correspondence for power class 3

#### 6.6.4.1 General

The beam correspondence requirement for power class 3 UEs consists of three components: UE minimum peak EIRP (as defined in Clause 6.2.1.3), UE spherical coverage (as defined in Clause 6.2.1.3), and beam correspondence tolerance (as defined in Clause 6.6.4.2). The beam correspondence requirement is fulfilled if the UE satisfies one of the following conditions, depending on the UE's beam correspondence capability, as defined in TS 38.306 [14]:

- If [bit-1], the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 with its autonomously chosen UL beams and without uplink beam sweeping. Such a UE is considered to have met the beam correspondence tolerance requirement.

- If [bit-0], the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 with uplink beam sweeping. Such a UE shall meet the beam correspondence tolerance requirement defined in Clause 6.6.4.2 and shall support uplink beam management, as defined in TS 38.306 [14].

#### 6.6.4.2 Beam correspondence tolerance for power class 3

The beam correspondence tolerance requirement ∆EIRPBC for power class 3 UEs is defined based on a percentile of the distribution of ∆EIRPBC, defined as ∆EIRPBC = EIRP2 - EIRP1 over the link angles spanning a subset of the spherical coverage grid points, such that

- EIRP1 is the total EIRP in dBm calculated based on the beam the UE chooses autonomously (corresponding beam) to transmit in the direction of the incoming DL signal, which is based on beam correspondence without relying on UL beam sweeping.

- EIRP2 is the best total EIRP (beam yielding highest EIRP in a given direction) in dBm which is based on beam correspondence with relying on UL beam sweeping.

- The link angles are the ones corresponding to the top Nth percentile of the EIRP2 measurement over the whole sphere, where the value of N is according to the test point of EIRP spherical coverage requirement for power class 3, i.e. N = 50.

For power class 3 UEs, the requirement is fulfilled if the UE’s corresponding UL beams satisfy the maximum limit in Table 6.6.4.2-1.

Table 6.6.4.2-1: UE beam correspondence tolerance for power class 3

|  |  |
| --- | --- |
| Operating band | Max ∆EIRPBC at 85th %-tile ∆EIRPBC CDF (dB) |
| n257 | [3.0] |
| n258 | [3.0] |
| n260 | [3.2] |
| n261 | [3.0] |
| NOTE: The requirements in this table are verified only under normal temperature conditions as defined in Annex E.2.1 | |

#### 6.6.4.3 Side Conditions

#### 6.6.4.3.1 Side Condition for 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 | -96.4 | ≥6 |
| n258 | -96.4 |
| n260 | -92.1 |
| n261 | -96.4 |
| NOTE 1: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMBP and Spherical coverage values are increased by ΣMBS, 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. | | | |
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**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 | -96.4 | ≥6 |
| n258 | -96.4 |
| n260 | -92.1 |
| n261 | -96.4 |
| NOTE 1: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMBP and Spherical coverage values are increased by ΣMBS, 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 change 2 >>