**3GPP TSG-RAN WG4 Meeting #103-e *R4-220xxxx***

**Electronic Meeting, 9 - 20 May, 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-2** | **CR** | **0460** | **rev** | **1** | **Current version:** | **17.5.0** |  |
|  |
| *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 for 38.101-2 to correct the errors and add the missing requirements for FR2 RedCap UE |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_redcap-Core |  | ***Date:*** | 2022-05-16 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | 1. Based on the agreed CR R4-2206643, the contents in clause 6.2.2.7, 6.2.3.3.7, 6.2.3.4.7 and 6.3.1.4 were not implemented in current RAN4 spec.
2. Minimum SSB\_RP / CSI-RS\_RP in side condition clause for beam correspondence are incorrect based on the formula: **Minimum SSB\_RP / CSI-RS\_RP = REFSENS\_50MHz + (Ês/Iot + 1) -10\*lg(NRB \* 12 \* 0.12 / 0.12) + gaindrop.**
3. EVM requirements for PC7 should be added.
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|  |  |
| ***Summary of change:*** | 1. The requirements in clause 6.2.2.7, 6.2.3.3.7, 6.2.3.4.7 and 6.3.1.4 are added.
2. Minimum SSB\_RP / CSI-RS\_RP in side condition clause for beam correspondence are corrected.
3. EVM requirements for PC7 are added.
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|  |  |
| ***Consequences if not approved:*** | 1. The requirements in clause 6.2.2.7, 6.2.3.3.7, 6.2.3.4.7 and 6.3.1.4 are missing.2. Minimum SSB\_RP / CSI-RS\_RP in side condition clause for beam correspondence are incorrect.3.EVM requirements for PC7 are missing in current spec. |
|  |  |
| ***Clauses affected:*** | 6.2.2.7, 6.2.3.3.7, 6.2.3.4.7, 6.3.1.4, 6.4.2.1 and 6.6.8.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.521-2  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## **<<Start of Change>>**

#### 6.2.2.7 UE maximum output power reduction for power class 7

For power class 7, MPR specified in sub-clause 6.2.2.3 for transmission bandwidth configuration less than or equal to 200MHz applies.

## **<<End of Change>>**

## **<<Start of Change>>**

##### 6.2.3.3.7 A-MPR for NS\_202 for power class 7

For power class 7, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

## **<<End of Change>>**

## **<<Start of Change>>**

##### 6.2.3.4.7 A-MPR for NS\_203 for power class 7

For power class 7, AMPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

## **<<End of Change>>**

## **<<Start of Change>>**

#### 6.3.1.4 Minimum output power for power class 7

The minimum output power shall not exceed the values specified in Table 6.3.1.4-1 for each operating band supported. The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.3.1.4-1: Minimum output power for power class 7

|  |  |  |  |
| --- | --- | --- | --- |
| Operating band | Channel bandwidth(MHz) | Minimum output power(dBm) | Measurement bandwidth(MHz) |
| n257, n258, n261 | 50 | -13 | 47.58 |
|  | 100 | -13 | 95.16 |

## **<<End of Change>>**

## **<<Start of Change>>**

#### 6.4.2.1 Error vector magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM, the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further equalised using the channel estimates subjected to the EVM equaliser spectrum flatness requirement specified in sub-clauses 6.4.2.4 and 6.4.2.5. For DFT-s-OFDM waveforms, the EVM result is defined after the front-end FFT and IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. For CP-OFDM waveforms, the EVM result is defined after the front-end FFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

The basic EVM measurement interval in the time domain is one preamble sequence for the PRACH and one slot for PUCCH and PUSCH in the time domain. The EVM measurement interval is reduced by any symbols that contains an allowable power transient in the measurement interval as as defined in clause 6.3.3.

The RMS average of the basic EVM measurements over 10 subframes for the average EVM case, and over 60 subframes for the reference signal EVM case, for the different modulation schemes shall not exceed the values specified in Table 6.4.2.1-1 for the parameters defined in Table 6.4.2.1-2 or 6.4.2.1-3, depending on UE power class. For EVM evaluation purposes, all 13 PRACH preamble formats and all 5 PUCCH formats are considered to have the same EVM requirement as QPSK modulated.

The requirement is verified with the test metric of EVM (Link=TX beam peak direction, Meas=Link angle).

Table 6.4.2.1-1: Minimum requirements for error vector magnitude

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Average EVM level | Reference signal EVM level |
| Pi/2 BPSK  | % | 30.0 | 30.0 |
| QPSK  | % | 17.5 | 17.5 |
| 16 QAM  | % | 12.5 | 12.5 |
| 64 QAM  | % | 8.0 | 8.0 |

Table 6.4.2.1-2: Parameters for Error Vector Magnitude for power class 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| UE EIRP | dBm | ≥ 4 |
| UE EIRP for UL 16 QAM | dBm | ≥ 7 |
| UE EIRP for UL 64 QAM | dBm | ≥ 11 |
| Operating conditions |  | Normal conditions |

Table 6.4.2.1-3: Parameters for Error Vector Magnitude for power class 2, 3, 4 and 7

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| UE EIRP | dBm | ≥ -13 |
| UE EIRP for UL 16 QAM | dBm | ≥ -10 |
| UE EIRP for UL 64 QAM | dBm | ≥ -6 |
| Operating conditions |  | Normal conditions |

Table 6.4.2.1-4: Parameters for Error Vector Magnitude for power class 5

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| UE EIRP | dBm | ≥ -6 |
| UE EIRP for UL 16 QAM | dBm | ≥ -3 |
| UE EIRP for UL 64 QAM | dBm | ≥ 1 |
| Operating conditions |  | Normal conditions |

## **<<End of Change>>**

## **<<Start of Change>>**

#### 6.6.8.3 Side Conditions

##### 6.6.8.3.1 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 6.6.8.3.1-1 and Table 6.6.8.3.1-2.

Table 6.6.8.3.1-1: 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 | -93.2 | ≥6 |
|  | n258 | -93.2 |  |
|  | n261 | -93.2 |  |
| NOTE 1: VoidNOTE 2: Values specified at the radiated requirements reference point to give minimum SSB Ês/Iot, with no applied noise. |

Table 6.6.8.3.1-2: 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 | -93.2 | ≥6 |
|  | n258 | -93.2 |  |
|  | n261 | -93.2 |  |
| 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 CSI-RS Ês/Iot, with no applied noise. |

##### 6.6.8.3.2 Side Condition for SSB based enhanced Beam Correspondence requirements

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

- The downlink reference signal SSB is provided and CSI-RS is not provided.

- For beam correspondence, conditions for L1-RSRP measurements are fulfilled according to Table 6.6.8.3.1-1.

##### 6.6.8.3.3 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 6.6.8.3.1-2 and SSB signal is provided according to Table 6.6.8.3.3-1.

Table 6.6.8.3.3-1: 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 | -98.2 | ≥1 |
|  | n258 | -98.2 |  |
|  | n261 | -98.2 |  |
| 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. |

## **<<End of Change>>**