**3GPP TSG- Meeting #- *R4-2206513***

**, Feb 21 – Mar 03**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **XXXX** | **rev** | **-** | **Current version:** |  |  |
|  | | | | | | | | |
| *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:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | |  | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.521-2 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### **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 power class 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.

*maxUplinkDutyCycle-FR2,* as defined in TS 38.306 [14], is a UE capability to facilitate electromagnetic power density exposure requirements. This UE capability is applicable to all FR2 power classes.

If the field of UE capability *maxUplinkDutyCycle-FR2* is present and the percentage of uplink symbols transmitted within any 1 s evaluation period is larger than *maxUplinkDutyCycle-FR2*, the UE follows the uplink scheduling and can apply P-MPRf,c.

If the field of UE capability *maxUplinkDutyCycle-FR2* is absent, the compliance to electromagnetic power density exposure requirements are ensured by means of scaling down the power density or by other means.

Start of Change 1

P-MPRf,c is the power management maximum output power reduction. The UE shall apply P-MPRf,c for carrier f of serving cell c only for the cases described below. For UE conformance testing P-MPRf,c shall be 0 dB,  except for the testing of UL gap for Tx power management, where P-MPRf,c may be non-zero dB.

End of Change 1

a) ensuring compliance with applicable electromagnetic power density exposure requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications;

b) ensuring compliance with applicable electromagnetic power density exposure requirements in case of proximity detection is used to address such requirements that require a lower maximum output power.

NOTE 1: P-MPRf,c was introduced in the PCMAX,f,c equation such that the UE can report to the gNB the available maximum output transmit power. This information can be used by the gNB for scheduling decisions.

NOTE 2: P-MPRf,c and *maxUplinkDutyCycle-FR2* may impact the maximum uplink performance for the selected UL transmission path.

NOTE 3: MPE P-MPR Reporting, as defined in TS 38.306 [14], is an optional UE capability to report P-MPRf,c when the reporting conditions configured by gNB are met. This UE capability is applicable to all FR2 power classes.

The tolerance T(∆P) for applicable values of ∆P (values in dB) is specified in Table 6.2.4-1.

Table 6.2.4-1: PUMAX,f,c tolerance

|  |  |  |
| --- | --- | --- |
| Operating Band | ∆P (dB) | Tolerance T(∆P)  (dB) |
| n257, n258, n259, n260, n261, n262 | DP = 0 | 0 |
|  | 0 < DP ≤ 2 | 1.5 |
|  | 2 < DP ≤ 3 | 2.0 |
|  | 3 < DP ≤ 4 | 3.0 |
|  | 4 < DP ≤ 5 | 4.0 |
|  | 5 < DP ≤ 10 | 5.0 |
|  | 10 < DP ≤ 15 | 7.0 |
|  | 15 < DP ≤ X | 8.0 |
| NOTE: X is the value such that Pumax,f,c lower bound, PPowerclass - DP – T(DP) = minimum output power specified in clause 6.3.1 | | |

Start of Change 2

### **6.2.5 Requirements for UL gap for TX power management**

The difference of the measured peak EIRP PUMAX,f,c\_GAP\_ON when UL gap for TX power management is configured and activated, and the measured peak EIRP PUMAX,f,c\_GAP\_OFF when UL gap is not configured or de-activated, shall meet the following requirement:

PUMAX,f,c\_GAP\_ON - PUMAX,f,c\_GAP\_OFF max((EIRPmeas\_peak – 23) + 10 \* log10(Z/20), 3)dB

where EIRPmeas\_peak  is the measured UE peak EIRP with zero MPR/A-MPR/P-MPR, and Z% is duty cycle of the reference measurement channel. The period of measurement shall be at least 4s. The requirement is verified with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle) and in the test Z is set to 20 when *maxUplinkDutyCycle-FR2* is less than 20 or not reported, and should be larger than *maxUplinkDutyCycle-FR2* when *maxUplinkDutyCycle-FR2* is equal to or greater than 20*.*

When UL gap for Tx power management is configured and activated, the reported P-MPRf,c shall be less than 3dB. When UL gap for Tx power management is not configured and activated, UE shall set the P bit in PHR to 1 in the test.

~~When UE supports UL gap for Tx power management, UE is mandated to support MPE P-MPR Reporting as defined in TS 38.306 [14].~~

End of Change 2

### 6.2A.4 Configured transmitted power for CA

A UE configured with carrier aggregation can configure its maximum output power for each uplink activated serving cell *c* and its total configured maximum output power PCMAX. The definition of the configured UE maximum output power PCMAX,*f,c* for each carrier *f* of a serving cell *c* is used for power headroom reporting for carrier *f* of serving cell *c* only and is in accordance with that specified in clause 6.2.4 with parameters MPR, A-MPR and P-MPR replaced with those specified in subclause 6.2A.2, 6.2A.3 and 6.2.4, respectively. The UE maximum configured power PCMAX in a transmission occasion is determined by the UL grants for carriers *f* of all serving cells *c* with non-zero granted power in the respective reference point.

For uplink intra-band contiguous carrier aggregation, MPR is specified in clause 6.2A.2. PCMAX is calculated under the assumption that power spectral density for each RB in each component carrier is same.

The configured UE maximum output power PCMAX shall be set such that the corresponding measured total peak EIRP PUMAX is within the following bounds

PPowerclass – MAX(MAX(MPR, A-MPR) + ΔMBP,n, P-MPR) – MAX{T(MAX(MPR, A-MPR)),T(P-MPR)} ≤ PUMAX ≤ EIRPmax

with PPowerclass the peak EIRP as specified in sub-clause 6.2A.1, EIRPmax the applicable maximum EIRP as specified in sub-clause 6.2A.1, MPR as specified in sub-clause 6.2A.2, A-MPR as specified in sub-clause 6.2A.3, ΔMBP,n the peak EIRP relaxation as specified in clause 6.2.1, P-MPR the power management term for the UE as described in 6.2.4.

The measured configured power PUMAX for carrier aggregation is defined as

where pUMAX,f,c is the linear value of the measured power PUMAX,f,c for carrier *f=f(c)* of serving cell *c*. The measured total radiated power PTMAX for carrier aggregation is defined as

where pTMAX,f,c is the linear value of the measured total radiated power PTMAX,f,c for carrier *f* = *f*(*c*) of serving cell *c*. The total radiated power PTMAX is bounded by

PTMAX ≤ TRPmax

where TRPmax the maximum TRP for the UE power class as specified in sub-clause 6.2A.1.

The tolerance T(ΔP) for applicable values of ΔP (values in dB) is specified in Table 6.2A.4-1.

Table 6.2A.4-1: PUMAX tolerance

|  |  |  |
| --- | --- | --- |
| Operating Band | ∆P (dB) | Tolerance T(∆P)  (dB) |
| n257, n258, n259, n260, n261, n262 | P = 0 | 0 |
|  | 0 < P ≤ 2 | 1.5 |
|  | 2 < P ≤ 3 | 2.0 |
|  | 3 < P ≤ 4 | 3.0 |
|  | 4 < P ≤ 5 | 4.0 |
|  | 5 < P ≤ 10 | 5.0 |
|  | 10 < P ≤ 15 | 7.0 |
|  | 15 < P ≤ X | 8.0 |
| NOTE: X is the value such that Pumax lower bound, PPowerclass - P – T(P) = minimum output power specified in clause 6.3A.1 | | |

Start of Change 3

### **6.2A.5 Requirements for UL gap for TX power management in CA**

The difference of the measured peak EIRP PUMAX\_GAP\_ON for CA when UL gap for TX power management is configured and activated, and the measured peak EIRP PUMAX\_GAP\_OFF when UL gap is not configured or de-activated, shall meet the following requirement:

PUMAX\_GAP\_ON - PUMAX\_GAP\_OFF max((EIRPmeas\_peak – 23) + 10 \* log10(Z/20), 3)dB

where EIRPmeas\_peak  is the measured UE peak EIRP with zero MPR/A-MPR/P-MPR, and Z% is duty cycle of the reference measurement channel. The period of measurement shall be at least 4s. The requirement is verified with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle) and in the test Z is set to 20 when *maxUplinkDutyCycle-FR2* is less than 20 or not reported, and should be larger than *maxUplinkDutyCycle-FR2* when *maxUplinkDutyCycle-FR2* is equal to or greater than 20, assuming all CCs share the same TX beam peak direction.

When UL gap for Tx power management is configured and activated, the reported P-MPRf,c should be less than 3dB. When UL gap for Tx power management is not configured and activated, UE shall set the P bit in PHR to 1 in the test.

End of Change 3