**3GPP TSG RAN WG1 Meeting #108-e R1-22xxxxx**

**e-Meeting, February 21st - March 3rd, 2022**

**Agenda Item: 5**

**Source: Moderator (Huawei)**

**Title: [Draft] Summary of email discussion [108-e-AI5-LSs-01] on reply LS to R1-2200873**

**Document for: Discussion and Decision**

# Introduction

A RAN5 LS [1] asks RAN1 one question on configuration of p-MaxEUTRA and p-NR-FR1, as copied below.

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| **Overall Description:**  RAN5 is working on RF test cases of power transmission for EN-DC configurations with power class 1.5 (29dBm). There are different opinions on whether the IEs p-MaxEUTRA and p-NR-FR1 shall be configured by the network when UE works in EN-DC connectivity mode.  According to clause 7.6.1 of TS 38.213, the IEs p-MaxEUTRA and p-NR-FR1 shall be configured to UE so that UE could determine the power transmission behaviour in the SCG, such as scaling down or dropping the transmission.  However there is an opinion that those IEs are indicated as optional in TS 36.331 and TS 38.331 and that UE operation for the PC 1.5 UE is specified by the normative text in TS 38.101-3 clauses 6.2B.1.1 and 6.2B.4.1.1. In addition some company believes if IEs p-MaxEUTRA and p-NR-FR1 are absent, value of 26dBm should be assumed and used as the default, although no default value is specified in TS 36.331 and TS 38.331.  RAN5 kindly request RAN1, RAN2 and RAN4 to clarify the power configuration scheme and associated signalling for EN-DC mode.  **Actions:**  **To:** RAN1:  **ACTION:** RAN5 kindly request RAN1 feedback on whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when UE works in EN-DC connectivity mode.  **To:** RAN2:  **ACTION:** RAN5 kindly request RAN2 feedback on whether the RAN2 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when UE works in EN-DC connectivity mode and also consider updating the core specification to clarify the same.  **To:** RAN4:  **ACTION:** RAN5 kindly request RAN4 feedback on whether the RAN4 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when UE works in EN-DC connectivity mode for UEs of power class 1.5 and other power classes. |

As per chair’s guidance, a reply LS is discussed and is expected to complete by February 25.

[108-e-AI5-LSs-01] Email discussion for incoming LS on configuration of p-MaxEUTRA and p-NR-FR1 (R1-2200873) by February 25 – Frank (Huawei)

# Phase I of Discussions

## Q1: whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in EN-DC connectivity mode.

Based on the contribution papers [2-8] this meeting, companies have different views on the answer to the question.

In [2-5], 5 companies (OPPO, ZTE, vivo, Huawei, HiSilicon) think that the IEs *p-MaxEUTRA* and *p-NR-FR1* should always be configured by the network when UE works in EN-DC connectivity mode. Without these parameters, the power control for EN-DC is not specified at all.

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| 7.6.1 EN-DC  If a UE is configured with a MCG using E-UTRA radio access and with a SCG using NR radio access, the UE is configured a maximum power  for transmissions on the MCG by *p-MaxEUTRA* and a maximum power  for transmissions in FR1 on the SCG by *p-NR-FR1*.  The UE determines a transmission power for the MCG as described in [13, TS 36.213] using  as the maximum transmission power. The UE determines transmission power for the SCG in FR1 as described Clauses 7.1 through 7.5 using  as the maximum transmission power. The UE determines transmission power for the SCG in FR2 as described Clauses 7.1 through 7.5. |

In [6-7], 2 companies (Nokia, Samsung) think that IEs *p-MaxEUTRA* and *p-NR-FR1* do not have to be always configured.

In [6], Nokia thinks that there is no functional need to configure the p-MaxEUTRA and p-NR-FR1 when dynamic power sharing or TDM sharing is used. The p-MaxEUTRA and p-NR-FR1 need to be configured when LTE and NR transmissions can take place at the same time and semi-static power sharing is used, e.g. because the UE doesn’t support dynamic power sharing, or if there is some other reason why the network wants to cap the max Tx power of each RAT individually.

In [7], Samsung thinks that the RAN1 agreement below does not request p-MaxEUTRA or p-NR-FR1 to be always configured and UE supports EN-DC operation without configured with either or both of p-MaxEUTRA or p-NR-FR1. The signaling details of p-MaxEUTRA or p-NR-FR1 is up to RAN2, RAN4. If either or both of p-MaxEUTRA and p-NR-FR1 are not configured, Dynamic power sharing or TDM-pattern based power sharing would not be supported.

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| RAN1#90  Agreements:   * At least for LTE-NR NSA operation   + Maximum allowed power values for LTE (P\_LTE) and NR (P\_NR) are set separately     - i.e., when UE is configured for NR, P\_LTE can be configured up to P\_cmax and  P\_NR can be configured up to P\_cmax.     - e.g. P\_LTE + P\_NR > P\_cmax or P\_LTE + P\_NR = P\_cmax   + Signaling details for P\_LTE, P\_NR are left to RAN2, RAN4.   + Note: ‘P\_cmax’ is a limit that is similar to ‘The configured maximum UE output power’ that was specified for LTE.   + Note: The network will still have flexibility to prioritize or reserve certain NR transmission power depending on network implementation   + All UEs are mandated to handle P\_LTE + P\_NR = P\_cmax while handling of P\_LTE + P\_NR > P\_cmax depends on UE capability   + At least, when DL/UL LTE sTTI/reduced UE processing time based operation is not configured for the UE, if total transmit power exceeds P\_cmax when there is simultaneous NR and LTE UL tx,     - For NR, UE scales down/drops NR transmission and NR power scaling details are left to UE implementation (note: it is not intended to have RAN4 test from RAN1 perspective)       * If there are two or more UL carriers, the power scaling or tx dropping can be performed for each of the UL carriers separately or jointly up to UE implementation     - For LTE, no change in power control procedure   + FFS the case when DL/UL LTE sTTI/reduced UE processing time based operation is configured for the UE   + The following is FFS     - The case when P\_NR is configured such that P\_NR < P\_cmax, and UE can use power up to P\_cmax in NR when it knows that there will be no UL transmission in LTE by semi-static configuration (e.g., measurement gap, DL/UL configuration)   Send an LS to RAN2 and RAN4 to be drafted in [R1-1715237](file:///C:\Users\dan77.park\AppData\Roaming\Microsoft\Docs\R1-1715237.zip) |

In [8], Qualcomm think that RAN1 does not see an issue on this and expects that RAN4 will discuss whether and how to determine the maximum power for transmissions on MCG and/or for transmissions on SCG when *p-MaxEUTRA* and/or *p-NR-FR1* is/are not provided for EN-DC.

Furthermore, according to the excerpt of TS 38.331 in Appendix, **there is no default value specified for *p-NR-FR1* if the parameter is absent. Neither is for *p-MaxEUTRA*.**

### Question 1-1: For the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value, whether any UE behavior of uplink power control for FR1-FR1 EN-DC has been specified in current Rel-15 RAN1 specification? If yes, please elaborate a bit its source.

Companies’ views are very welcome.

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| *Company* | *View* |
| OPPO | The UE behavior of uplink power control for FR1-FR1 EN-DC has NOT been specified in current Rel-15 RAN1 specification, when p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value. |
| ZTE | From the current RAN1 specification itself, it seems that no UE behavior of uplink power control for FR1-FR1 EN-DC has been specified for the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value.  However, if RAN4 sees the issue of this situation and requires RAN1 to update the RAN1 spec to include the UE behavior for the case where p-MaxEUTRA or p-NR-FR1 is not configured, RAN1 can also update its spec later. |
| vivo | From current specification in RAN2 and RAN4, IEs p-MaxEUTRA and p-NR-FR1 can be optionally configured. However, from current specification in RAN1, the UE behavior was unspecified in the absence of IEs p-MaxEUTRA or p-NR-FR1 when it works in EN-DC connectivity mode. |
| Nokia, NSB | It is clear that the LTE and NR uplink PC specification works without the presence of p-MaxEUTRA and p-NR-FR1 for single-RAT configuration (LTE-only as well as NR-only config). There is no functional need for requiring these IEs to be provided with EN-DC configuration either, if there is no need to deviate from the LTE-only UL PC specification for the LTE, and NR-only UL PC specification for the NR.  According to 38.213 subclause 7.6.1 the p-NR-FR1 and p-MaxEUTRA take the place of PNR and PLTE in subclauses 7.1-7.5, but nor any more in subclause 7.6, and thus the only subclause that is specific to EN-DC is not considering these parameters as inputs when determining if dynamic power sharing is to be used.  Only if the UE does not support dynamic power sharing and is not configured to TDM the two RATs is there a need to configure a semi-static power sharing for the two RATs and configure the two parameters.  The formulation in TS38.213 subclause 7.6.1 is somewhat unfortunate, and could be updated. |
| Qualcomm | RAN4 specifies how the UE determines max output power. For this, *p-MaxEUTRA* and *p-NR-FR1* are just one component of the equations that are configured in specific scenarios where the max output power must be limited.  However, RAN1 spec is written such that they are configured for any EN-DC operations in FR1. |
| NTT DOCOMO | In current RAN1 specification, UE behavior of uplink power control for FR1-FR1 EN-DC has been specified only for the case where p-MaxEUTRA and p-NR-FR1 are configured, and no UE behavior has been specified for the case without p-MaxEUTRA and p-NR-FR1 for FR1-FR1 EN-DC. |
| Samsung | Current RAN 1 specification does not have clarification on UE behavior without *p-MaxEUTRA* or *p-NR-FR1*. So it would be read that UE is not expected to support any of introduced power sharing scheme in TS 38.213, but is expected to perform separated UL PC for LTE UL and NR UL. |
| CATT | If p-MaxEUTRA or p-NR-FR1 are not present in RRC, UE uses the maximum power for LTE in TS36.101 and for NR in TS38.101. Current power control behavior in 38.213 is clear. |
| Ericsson1 | Uplink power control for EN-DC is specified in sub clause 7.6.1 of 38.213 including any sub clauses referenced therein. There is no additional RAN1 specification. |
| Apple | Our understanding is that there is no power control behavior defined in RAN1 spec for the case that p-MaxEUTRA or p-NR-FR1 is not configured. |
| Intel | The power sharing procedure is not defined if p-MaxEUTRA or p-NR-FR1 are not present |
| Moderator | **Brief summary**: No company has shown any RAN1 specification that specifies UE behaviors for the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value but FR1-FR1 EN-DC is configured to a UE.  @Nokia, Not sure if fully understand your view, but here tries to reach common understanding on current specification first. Your view seems not sustained by the current Rel-15 specs. If any spec text, please elaborate it.  @Qualcomm, RAN1 does not have to discuss RAN4 spec here, but just FYI, *p-NR-FR1* seems always required in S6.2B.4.1.3 and S6.2B.4.1.1 of TS 38.101-3 for the lower/upper bound calculation of Pcmax.   |  | | --- | | PCMAX\_L,f,*c,,NR* = MIN { PEMAX, EN-DC , (PPowerClass, EN-DC – ΔPPowerClass,EN-DC ), MIN(PEMAX,c , PNR ) - TC\_NR, *c*, (PPowerClass,NR – ΔPPowerClass,NR) – MAX(MAX(MPRc, A-MPRc)+ ΔTIB,c + TC\_NR, *c* + ∆TRxSRS, P-MPRc) }  PCMAX\_H,f,*c,NR* = MIN {PEMAX,c, PEMAX, EN-DC , (PPowerClass, EN-DC – ΔPPowerClass,EN-DC ), PNR , PPowerClass,NR – ΔPPowerClass,NR }  where  - PEMAX,EN-DC is the value given by the field *p-maxUE-FR1* of the *RRCConnectionReconfiguration-v1530* IE as defined in TS 36.331 [8];  - PLTE is the value given by the field *p-maxEUTRA-r15* of the *RRCConnectionReconfiguration-v1510* IE as defined in TS 36.331 [8];  - PNR is the value given by the field *p-NR-FR1* of the *PhysicalCellGroupConfig* IE as defined TS 38.331 [9]; |   @CATT, as the question itself, would you please elaborate the specification a bit to support your view?  Based on the feedback, a proposal is  ***FL Proposal****: As an observation to be included in the reply LS, there is no specified UE behavior in existing RAN1 specifications for the case where FR1-FR1 EN-DC is configured but p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value.* |
| CATT2 | UE will the maximum power for the FR1 from RRC parameter *p-Max* as follows,  p-Max  Maximum transmit power allowed in this serving cell. The maximum transmit power that the UE may use on this serving cell may be additionally limited by p-NR-FR1 (configured for the cell group) and by p-UE-FR1 (configured total for all serving cells operating on FR1). If absent, the UE applies the maximum power according to TS 38.101-1 [15] in case of an FR1 cell or TS 38.101-2 [39] in case of an FR2 cell. In this release of the specification, if p-Max is present on a carrier frequency in FR2, the UE shall ignore the field and applies the maximum power according to TS 38.101-2 [39]. Value in dBm. This field is ignored by IAB-MT, the IAB-MT applies output power and emissions requirements, as specified in TS 38.174 [63].  It is clear that *p-UE-FR1* is additional constraint of maximum power. If the additional constraint *p-UE-FR1* is not present, the default maximum power is used as in TS38.101. |

### Question 1-2: whether the current RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in FR1-FR1 EN-DC connectivity mode? If no, please elaborate a bit your interpretation on the excerpt of TS 38.213 above.

Companies’ views are very welcome.

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| *Company* | *View* |
| OPPO | Yes. Even when dynamic power sharing or TDM sharing is used, the spec is described based on and , which can only be derived from the Ies p-MaxEUTRA and p-NR-FR1. |
| ZTE | From the current RAN1 specification itself, Ies p-MaxEUTRA and p-NR-FR1 are always required by the UE when the UE is in FR1-FR1 EN-DC connectivity mode.  We assume that RAN4 will determine whether to support the case where p-MaxEUTRA or p-NR-FR1 is not configured. RAN1 can also update the spec later if RAN4 requests RAN1 to do so. |
| Vivo | Yes. |
| Nokia, NSB | The way the beginning of subclause 7.6.1 of TS38.213 is formlulated can be read so that the two Ies would need to be present always if the UE is in EN-DC. However, this may not reflect the reality in the field, and as said in answer to 2.1.1, 38.213 subclauses 7.1-7.5 are designed to work without the two Ies, and 7.6 is not considering the two Ies, so by definition 38.213 works without the two in EN-DC as well. |
| Qualcomm | Yes |
| NTT DOCOMO | Yes |
| Samsung | No. As explained by our response above, without those two Ies, current RAN1 specification would clarify that dynamic power sharing or TDM pattern based operation is not supported. |
| CATT | No. It is clearly stated in 38.331 as follows,  p-Max  Maximum transmit power allowed in this serving cell. The maximum transmit power that the UE may use on this serving cell may be additionally limited by p-NR-FR1 (configured for the cell group) and by p-UE-FR1 (configured total for all serving cells operating on FR1). If absent, the UE applies the maximum power according to TS 38.101-1 [15] in case of an FR1 cell or TS 38.101-2 [39] in case of an FR2 cell. In this release of the specification, if p-Max is present on a carrier frequency in FR2, the UE shall ignore the field and applies the maximum power according to TS 38.101-2 [39]. Value in dBm. This field is ignored by IAB-MT, the IAB-MT applies output power and emissions requirements, as specified in TS 38.174 [63]. |
| Ericsson1 | If a default configuration to apply when the fields are not present were to be included by RAN2/4, current text in 38.213 7.6.1 could still cover that case without need for additional update. |
| Apple | Our reading of the clause 7.6.1 of TS 38.213 is that these two Ies form the basis for EN-DC power control operation, including semi-static, dynamic power sharing and TDM scheme. |
| Intel | Yes. Power sharing is impossible without knowing the maximum power of each CG |
| Huawei, HiSilicon | Yes. |
| Moderator | **Brief summary**,  Yes: 9 companies (1 company also feels that the RAN1 spec may not reflect the reality in the field).  No: 2 companies (1 company also believes that no specified RAN1 UE behavior in this case)  @Nokia, The UL power control of EN-DC is only specified in S7.6.1 of TS 38.213. In this subclause, all UE behaviors are based on and , which are *p-MaxEUTRA* and p-NR-FR1. Not sure why S7.6 is taken as a supporting material to your view. S7.1-7.5 are power control for each serving cell but don’t cover any power control coordination across serving cells. Therefore, without S7.6.1, it seems not true to say that S7.1-7.5 is the working specified solutions for EN-DC. It is unfortunate if the field operation is not in line with the specifications. But in FL understanding, here only to clarify existing specifications, whether any spec update is necessary is a separate topic.  @Samsung, your comments seem that a gNB is able to configure none of them, but in this case, UE behavior is not specified in RAN1 yet. Please correct me if any misunderstanding.  @CATT, *p-Max* is different RRC parameter from *p-NR-FR1*. Not sure why its spec text was quoted. Could you please clarify it?  @Samsung, CATT, since your answers are No, could you please clarify a bit what your interpretation on the “is configured” within the following spec text?  TS 38.213:  the UE is configured a maximum power  for transmissions on the MCG by *p-MaxEUTRA* and a maximum power  for transmissions in FR1 on the SCG by *p-NR-FR1*.  Based on the feedbacks and the current RAN1 specifications, a proposal could be  ***FL Proposal:*** *As a conclusion to be included in the reply LS, from RAN1 perspective, if a UE is configured with FR1-FR1 EN-DC, the UE is configured a maximum power  for transmissions on the MCG by p-MaxEUTRA and a maximum power  for transmissions in FR1 on the SCG by p-NR-FR1.* |
| CATT2 | The default maximum power in 38.101 would be used for *p-Max* if the additional parameter *p-UE-FR1* is not present. |
| Nokia, NSB | Agree with CATT2 |

## Draft Text for reply LS

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| **1. Overall Description:**  RAN1 thanks RAN5 for the LS on configuration of p-MaxEUTRA and p-NR-FR1. RAN1 answers are as follows.  **Q1:** Whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when UE works in EN-DC connectivity mode.  **Answer**: TBD  **2. Actions:**  **To:** RAN5  **ACTION:** RAN1 respectfully asks RAN5 to take the above answer into account in their future work. |

Comments are welcome only after more progress in Section 2.1.

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| *Company* | *View* |
| No comment needed yet |  |
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## Other Issues

Issues or comments that do not fit in any of the previous sections of this document can be provided in this section.

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# Phase II of Discussions

## Q1: whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in EN-DC connectivity mode.

### Question 1-1: For the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value, whether any UE behavior of uplink power control for FR1-FR1 EN-DC has been specified in current Rel-15 RAN1 specification? If yes, please elaborate a bit its source.

**Brief summary**: No company has shown any RAN1 specification that specifies UE behaviors for the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value but FR1-FR1 EN-DC is configured to a UE.

@Nokia, Not sure if fully understand your view, but here tries to reach common understanding on current specification first. Your view seems not sustained by the current Rel-15 specs. If any spec text, please elaborate it.

@Qualcomm, RAN1 does not have to discuss RAN4 spec here, but just FYI, *p-NR-FR1* seems always required in S6.2B.4.1.3 and S6.2B.4.1.1 of TS 38.101-3 for the lower/upper bound calculation of Pcmax.

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| PCMAX\_L,f,*c,,NR* = MIN { PEMAX, EN-DC , (PPowerClass, EN-DC – ΔPPowerClass,EN-DC ), MIN(PEMAX,c , PNR ) - TC\_NR, *c*, (PPowerClass,NR – ΔPPowerClass,NR) – MAX(MAX(MPRc, A-MPRc)+ ΔTIB,c + TC\_NR, *c* + ∆TRxSRS, P-MPRc) }  PCMAX\_H,f,*c,NR* = MIN {PEMAX,c, PEMAX, EN-DC , (PPowerClass, EN-DC – ΔPPowerClass,EN-DC ), PNR , PPowerClass,NR – ΔPPowerClass,NR }  where  - PEMAX,EN-DC is the value given by the field *p-maxUE-FR1* of the *RRCConnectionReconfiguration-v1530* IE as defined in TS 36.331 [8];  - PLTE is the value given by the field *p-maxEUTRA-r15* of the *RRCConnectionReconfiguration-v1510* IE as defined in TS 36.331 [8];  - PNR is the value given by the field *p-NR-FR1* of the *PhysicalCellGroupConfig* IE as defined TS 38.331 [9]; |

@CATT, as the question itself, would you please elaborate the specification a bit to support your view?

Based on the feedback, a proposal is

***FL Proposal 1****: As an observation to be included in the reply LS, there is no specified UE behavior in existing RAN1 specifications for the case where FR1-FR1 EN-DC is configured but p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value.*

Comments on the proposal and **your responses to FL questions above** are welcome.

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| *Company* | *View* |
| ZTE | We are ok to make this observation in the reply LS. |
| vivo | We are fine with the core idea of this observation. To avoid ambiguity, it is better not to involve the description of default value in the final reply LS. |
| Qualcomm | FL Proposal 1 is fine.  Regarding the RAN4 spec, as you cited, *PNR* is one component of the equation and is not the max output power for NR cell-group. This is same exercise as for max output power determination for single uplink transmission. As seen below, PEMAX,c is one component of the equation, but *p-Max* is not mandatory parameter.    Therefore, from RAN4 point of view, our understanding is that the *p-NR-FR1* is not always required. |
| NTT DOCOMO | We are fine with FL proposal 1. |
| Samsung | We don’t see how this observation can help RAN5’s understanding. As a general sense, specification does not capture all of UE behavior if not necessary. The key point should be, weather no description on corresponding UE behavior would cause problem or not.  In other point, RAN1 may achieve easy consensus that not configuring either or both of IEs would cause performance degradation, but it should not mean that those IEs should be configured. |
| Nokia, NSB | Agree with Samsung in principle, although not sure why there would even be any performance degradation.  On the question to Nokia, seems our original comment was slightly confused on what the 7.6.1 text was saying. |
| Intel | We are OK with FL proposal 1 |
| Ericsson2 | We are OK with FL proposal 1. |

### Question 1-2: whether the current RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in FR1-FR1 EN-DC connectivity mode? If no, please elaborate a bit your interpretation on the excerpt of TS 38.213 above.

**Brief summary**,

**Yes**: 8 companies (1 company also feels that the RAN1 spec may not reflect the reality in the field).

**No**: 2 companies (1 company also believes that no specified RAN1 UE behavior in this case)

@Nokia, The UL power control of EN-DC is only specified in S7.6.1 of TS 38.213. In this subclause, all UE behaviors are based on and , which are *p-MaxEUTRA* and p-NR-FR1. Not sure why S7.6 is taken as a supporting material to your view. S7.1-7.5 are power control for each serving cell but don’t cover any power control coordination across serving cells. Therefore, without S7.6.1, it seems not true to say that S7.1-7.5 is the working specified solutions for EN-DC. It is unfortunate if the field operation is not in line with the specifications. But in FL understanding, here only to clarify existing specifications, whether any spec update is necessary is a separate topic.

@Samsung, your comments seem that a gNB is able to configure none of them, but in this case, UE behavior is not specified in RAN1 yet. Please correct me if any misunderstanding.

@CATT, *p-Max* is different RRC parameter from *p-NR-FR1*. Not sure why its spec text was quoted. If any real connection between them, could you please clarify it?

@Samsung, CATT, since your answers are No, **could you please clarify a bit what your interpretation on the text “is configured” within the following spec text**?

TS 38.213:

the UE is configured a maximum power  for transmissions on the MCG by *p-MaxEUTRA* and a maximum power  for transmissions in FR1 on the SCG by *p-NR-FR1*.

Based on the feedbacks and the current RAN1 specifications, a proposal could be

***FL Proposal 2:*** *As a conclusion to be included in the reply LS, from RAN1 perspective, if a UE is configured with FR1-FR1 EN-DC, the UE is configured a maximum power  for transmissions on the MCG by p-MaxEUTRA and a maximum power  for transmissions in FR1 on the SCG by p-NR-FR1.*

Comments on the proposal and **your responses to FL questions above** are welcome.

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| *Company* | *View* |
| ZTE | If we have included an observation in the reply LS as in question 1-1, we don’t need to add this conclusion in the reply LS. Because RAN4 may want to address this potential conflict between working groups and if RAN4 requires RAN1 to update RAN1’s spec, RAN1 can still update the corresponding spec.  Thus, we think the observation in question 1-1 is sufficient. |
| vivo | We prefer to have this conclusion to address RAN5’s RF test problem. |
| Qualcomm | We do not think we have to state as FL proposal 2. To avoid conflict conclusion between RAN1 and RAN4, we can wait a bit of RAN4’s discussion and then decide our action. |
| NTT DOCOMO | We support FL proposal 2 to be included in the reply LS. |
| Samsung | As response to moderator’s first question, you made correct understanding on our view. Corresponding UE behavior would not be not captured in the current RAN1 specification. But we don’t think no description means any problem.  As response to moderator’s second question, we can be open for further discussion whether current text is good enough or needs modification. But we prefer to check RAN1’s logic first, whether there is any critical problem when those IEs are not configured. |
| Nokia, NSB | Againd tend to agree with Samsung. The FL proposal #2 seems correct otherwise, but we would think it should be “…, the UE can be configured a maximum power…”  As with the question to Nokia, the same confusion plague as with the 1st answer. |
| Intel | We are OK with FL proposal 2. Instead of saying ‘from RAN1 perspective’, an alternative is to say ‘from RAN1 specification’ |
| Ericsson2 | We are OK to wait for checking discussions in other WGs as suggested by other companies. So, a reply including just FL proposal 1 is OK with us. |

## Draft Text for reply LS

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| **Title:** Draft reply LS on configuration of p-MaxEUTRA and p-NR-FR1  **Response to:** R1-2200873/R5-217995  **Release:** Rel-15  **Work Item:** NR\_newRAT-Core  **Source:** Huawei [RAN WG1]  **To:** RAN WG5  **CC:** RAN WG2, RAN WG4  **Contact Person:**  **Name:** Frank Long  **E-mail Address:**  **Attachments:**  **1. Overall Description:**  RAN1 thanks RAN5 for the LS on configuration of p-MaxEUTRA and p-NR-FR1. RAN1 answers are as follows.  **Q1:** Whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when UE works in EN-DC connectivity mode.  **Answer**: [include the agreed proposals in S3.1.1 and S3.1.2]  **2. Actions:**  **To:** RAN5  **ACTION:** RAN1 respectfully asks RAN5 to take the above answer into account in their future work. |

Comments on the reply text except for the exact answer (highlighted text) are welcome.

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# Phase III of Discussions

## Q1: whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in EN-DC connectivity mode.

### Question 1-1: For the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value, whether any UE behavior of uplink power control for FR1-FR1 EN-DC has been specified in current Rel-15 RAN1 specification? If yes, please elaborate a bit its source.

**Brief summary**: All companies are OK with the proposal except that 2 companies wonder if the information is useful to RAN5.

@Samsung, Nokia, In FL understanding, the proposal is technically correct and provides core information to RAN5. As long as the information is correct, how to use the information can be up to RAN5. If helpful, one potential benefit for RAN5 could be that what RAN1 behavior can be tested becomes clarified since RAN5 is not expected to test an unspecified UE behavior.

@vivo, could you please elaborate a bit your concern? The involvement of default value is to explore all potential cases and seems not to cause any ambiguity.

@Qualcomm, Thank you very much for your response. We may go too far beyond RAN1 specifications. In a mathematic function z = Min (x,y), if x has no value, then z got no value. Thus, the RAN4 requirement on Pcmax,c (z) becomes undefined if *p-NR-FR1 (x)* has no value*.* Just to share my understanding.

@CATT, Not sure if fully understand your point. Just kind reminder that RRC *p-UE-FR1* is not concerned by the RAN5 LS. Or you just referred to p-MaxEUTRA or p-NR-FR1? In any case, it seems very unclear how the current spec sustains your view. Your clarification is appreciated.

Based on the summary, **no change to proposal 1:**

***FL Proposal 1****: As an observation to be included in the reply LS, there is no specified UE behavior in existing RAN1 specifications for the case where FR1-FR1 EN-DC is configured but p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value.*

Comments on the proposal and **your responses to FL questions above** are welcome.

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| CATT | The default maximum power for each cell in FR1 is specified in 38.101. The maximum power parameters *P-Max, P-NR-FR1, P-UE-FR1* are the additional maximum power constraint configured by RRC. If *P-NR-FR1* is not configured (not present in *PhysicalCellGroupConfig* IE) by RRC, UE would use the default maximum power specified in 38.101. Same for p-MaxEUTRA.  Both p-MaxEUTRA and p-NR-FR1 are configured to further constraint the maximum transit power for EN-DC. Our understanding is that the default maximum value defined in 36.101 and 38.101 would be used for EN-DC if p-MaxEUTRA and p-NR-FR1 are not present in RRC configuration. |
| vivo | From current RRC parameter descriptions as follows, it is clear that neither *p-MaxEUTRA* nor *p-NR-FR1* has a default value. We don’t see the needs to add ‘assigned with any default value’ in above proposal. In our understanding, assigning default value for *p-MaxEUTRA* or *p-NR-FR1* is beyond the scope of our discussion, which requires to change current specification. We don’t want to change Rel-15 specification at this late stage.  TS 38.331   |  | | --- | | ***p-NR-FR1***  The maximum total transmit power to be used by the UE in this NR cell group across all serving cells in frequency range 1 (FR1). The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-UE-FR1* (configured total for all serving cells operating on FR1). |   TS 36.331   |  | | --- | | ***p-MaxEUTRA***  Indicates the *p-MaxEUTRA* in the source PCell. | |
| OPPO | We are fine with the proposal, and also the comment from vivo.  Regarding the response from CATT, we cannot find any description for “the default maximum value defined in 36.101 and 38.101 would be used for EN-DC if p-MaxEUTRA and p-NR-FR1 are not present in RRC configuration.” in any specification. The proposal “*there is no specified UE behavior in existing RAN1 specifications*” should be the situation. |
| Qualcomm | What CATT wrote above should be technically correct and should be confirmed by RAN4. After that, RAN1 can discuss if any action is necessary.  We don’t disagree with what FL wrote, but it is unclear whether just inform RAN5 of the current RAN1 spec can help something. We think we should consider two options: (1) wait for RAN4’s progress (no LS reply for now) or (2) send a LS reply to RAN5 to inform the current RAN1 spec with stating “RAN1 may discuss potential action, if any, after RAN4 reaches conclusion”. |
| Nokia, NSB | Agree with the CATT assessment, this is how things actually work. Qualcomm assessment of the situation appears accurate, and we could take one of the two actions as outlined by Qualcomm |
| Samsung | Sharing similar view with CATT how UE would actually work, and we do not believe providing ‘part of’ information to RAN5 will help their understanding.  If RAN1 would share the information provided by FL above, RAN1 should also provide information that RAN1 does not have a consensus whether absence of those IEs would cause any problem. |
| Ericsson3 | OK with FL Proposal 1. |

### Question 1-2: whether the current RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in FR1-FR1 EN-DC connectivity mode? If no, please elaborate a bit your interpretation on the excerpt of TS 38.213 above.

**Brief summary**,

Only two companies have concerns that RAN4 discussion is precluded by the proposal.

@ZTE, Qualcomm, the proposal is explicitly written with “from RAN1 perspective” to provide more flexibility to other WGs, and it is just the same text as the following excerpt in TS 38.213, with just some minor changes. The existing RAN1 spec text does not rely on any RAN4 discussion. It seems not reasonable to require the existing RAN1 spec not to conflict with any future RAN4 conclusion. If helpful to address your concern, it can be added that “RAN4 discussion on the RAN5 request is not precluded.”

@All, the focus should be what the current RAN1 spec is, as requested by the LS, instead of whether an update to the RAN1 spec text is needed. This is about Rel-15 UE behavior, in FL understanding, a Rel-15 CR can be discussed as long as essential issue has been identified. Anyway, any Rel-15 CR seems out of scope of this reply LS email thread.

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| 7.6.1 EN-DC  If a UE is configured with a MCG using E-UTRA radio access and with a SCG using NR radio access, the UE is configured a maximum power  for transmissions on the MCG by *p-MaxEUTRA* and a maximum power  for transmissions in FR1 on the SCG by *p-NR-FR1*. |

***FL Proposal 2-rev:*** *As a conclusion to be included in the reply LS, from RAN1 perspective, if a UE is configured with FR1-FR1 EN-DC, the UE is configured a maximum power  for transmissions on the MCG by p-MaxEUTRA and a maximum power  for transmissions in FR1 on the SCG by p-NR-FR1. RAN4 discussion on the RAN5 request is not precluded.*

Comments on the proposal are welcome.

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| *Company* | *View* |
| CATT | The parameters of p-MaxEUTRA and p-NR-FR1 are not mandatory to be present for EN-DC. |
| vivo | We are fine with the revision in proposal 2. |
| OPPO | We support the proposal. The two parameters are mandatory according to current 38.213. |
| Qualcomm | We think FL Proposal 2-rev is correct. However, it is unclear whether just inform RAN5 of the current RAN1 spec can help something. We think we should consider two options: (1) wait for RAN4’s progress (no LS reply for now) or (2) send a LS reply to RAN5 to inform the current RAN1 spec with stating “RAN1 may discuss potential action, if any, after RAN4 reaches conclusion”. |
| Nokia, NSB | Agree with CATT, and as commented on the Q1-1, Qualcomm assessment of the situation appears accurate. |
| Samsung | We suggest to wait RAN4’s LS |
| Ericsson3 | As indicated earlier, we are OK to wait for checking discussions in other WGs before this. So, a reply including just FL proposal 1 is OK with us. |

# Phase IV of Discussions

## Q1: whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in EN-DC connectivity mode.

### Question 1-1: For the case where p-MaxEUTRA or p-NR-FR1 is not configured nor assigned with any default value, whether any UE behavior of uplink power control for FR1-FR1 EN-DC has been specified in current Rel-15 RAN1 specification? If yes, please elaborate a bit its source.

***Summary:***

No specification has been shown by any company against this proposal. With all specifications discussed, RRC parameter p-MaxEUTRA and p-NR-FR1 have no default value if they are absent.

@CATT, Nokia, Samsung, your views are clear, but which spec text support your views are still missing. Please assist to provide such spec text. Otherwise, we have to go with what spec have been discussed now.

@vivo, the proposal does not require any introduction of default value. But we can get your revision a try.

@Qualcomm, here is about what RAN1 spec is and inform it to RAN5. Whether there is RAN4 progress is not certain. If any LS from RAN4 is received, any response is the second step. From FL perspective, the RAN1 reply LS does not reply on any RAN4 decision, as long as the message is correct.

Based on the summary**:**

***FL Proposal 1-rev****: As an observation to be included in the reply LS, there is no specified UE behavior in existing RAN1 specifications for the case where FR1-FR1 EN-DC is configured but p-MaxEUTRA or p-NR-FR1 is not configured ~~nor assigned with any default value~~.*

Comments on the proposal and **your responses to FL questions above** are welcome.

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### Question 1-2: whether the current RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when the UE is in FR1-FR1 EN-DC connectivity mode? If no, please elaborate a bit your interpretation on the excerpt of TS 38.213 above.

**Brief summary**,

The proposal is technically correct. But some companies hesitate to send the conclusion to RAN5 now. From FL perspective, at least one of proposal 1-rev or proposal 2-rev should be sent to RAN5, as requested by the LS. A way-forward could be to send the proposal 1-rev only.

@Qualcomm, your comment looks confusing that RAN1 cannot provide its view on its own specifications until RAN4 makes decision first. The proposal is the same as what is written in the spec. There is no RAN4 conclusion yet, not sure how to address your concern on RAN4 conclusion.

If any different view on sending proposal 1-rev only, comments are welcome here.

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## Draft Text for reply LS

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| **Title:** Draft reply LS on configuration of p-MaxEUTRA and p-NR-FR1  **Response to:** R1-2200873/R5-217995  **Release:** Rel-15  **Work Item:** NR\_newRAT-Core  **Source:** Huawei [RAN WG1]  **To:** RAN WG5  **CC:** RAN WG2, RAN WG4  **Contact Person:**  **Name:** Frank Long  **E-mail Address:**  **Attachments:**  **1. Overall Description:**  RAN1 thanks RAN5 for the LS on configuration of p-MaxEUTRA and p-NR-FR1. RAN1 answers are as follows.  **Q1:** Whether the RAN1 specifications require that the IEs p-MaxEUTRA and p-NR-FR1 are always configured by the network when UE works in EN-DC connectivity mode.  **Answer**: [include the agreed proposals in S3.1.1 and S3.1.2]  **2. Actions:**  **To:** RAN5  **ACTION:** RAN1 respectfully asks RAN5 to take the above answer into account in their future work. |

Comments on the reply text except for the exact answer (highlighted text) are welcome.

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| *Company* | *View* |
| Moderator | **Summary**: No comments received for two rounds.  The draft LS except for the answer part seems stable. |
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# Conclusions

TBD

# References

1. R1-2200873 LS on configuration of p-MaxEUTRA and p-NR-FR1, RAN5
2. R1-2201233 Discussion on LS on configuration of p-MaxEUTRA and p-NR-FR1 OPPO
3. R1-2201150 [Draft] Reply LS on configuration of p-MaxEUTRA and p-NR-FR1 ZTE
4. R1-2201045 [DRAFT] Reply LS on configuration of p-MaxEUTRA and p-NR-FR1 vivo
5. R1-2201213 Draft reply LS on configuration of p-MaxEUTRA and p-NR-FR1 Huawei, HiSilicon
6. R1-2202269 On configuration of p-MaxEUTRA and p-NR-FR1 Nokia, Nokia Shanghai Bell
7. R1-2201984 Discussion for rely LS on configuration of p-MaxEUTRA and p-NR-FR1 Samsung
8. R1-2202102 Draft reply LS on configuration of p-MaxEUTRA and p-NR-FR1 Qualcomm Incorporated

# Appendix:

**RRC parameter p-NR-FR1 in TS 38.331:** No default value is specified for the case where the parameter is absent.

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| PhysicalCellGroupConfig ::= SEQUENCE {  harq-ACK-SpatialBundlingPUCCH ENUMERATED {true} OPTIONAL, -- Need S  harq-ACK-SpatialBundlingPUSCH ENUMERATED {true} OPTIONAL, -- Need S  p-NR-FR1 P-Max OPTIONAL, -- Need R  pdsch-HARQ-ACK-Codebook ENUMERATED {semiStatic, dynamic},  tpc-SRS-RNTI RNTI-Value OPTIONAL, -- Need R  tpc-PUCCH-RNTI RNTI-Value OPTIONAL, -- Need R  tpc-PUSCH-RNTI RNTI-Value OPTIONAL, -- Need R  sp-CSI-RNTI RNTI-Value OPTIONAL, -- Need R  cs-RNTI SetupRelease { RNTI-Value } OPTIONAL, -- Need M  ...,  [[  mcs-C-RNTI RNTI-Value OPTIONAL, -- Need R  p-UE-FR1 P-Max OPTIONAL -- Cond MCG-Only  ]],  [[  xScale ENUMERATED {dB0, dB6, spare2, spare1} OPTIONAL -- Cond SCG-Only  ]],  [[  pdcch-BlindDetection SetupRelease { PDCCH-BlindDetection } OPTIONAL -- Need M  ]]  } |

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| ***p-NR-FR1***  The maximum total transmit power to be used by the UE in this NR cell group across all serving cells in frequency range 1 (FR1). The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-UE-FR1* (configured total for all serving cells operating on FR1). |
| ***p-UE-FR1***  The maximum total transmit power to be used by the UE across all serving cells in frequency range 1 (FR1) across all cell groups. The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-NR-FR1* (configured for the cell group). |

**RRC parameter p-maxEUTRA in TS 38.331:** No default value is specified for the case where the parameter is absent.

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| ConfigRestrictInfoSCG ::= SEQUENCE {  allowedBC-ListMRDC BandCombinationInfoList OPTIONAL,  powerCoordination-FR1 SEQUENCE {  p-maxNR-FR1 P-Max OPTIONAL,  p-maxEUTRA P-Max OPTIONAL,  p-maxUE-FR1 P-Max OPTIONAL  } OPTIONAL,  servCellIndexRangeSCG SEQUENCE {  lowBound ServCellIndex,  upBound ServCellIndex  } OPTIONAL, -- Cond SN-AddMod  maxMeasFreqsSCG INTEGER(1..maxMeasFreqsMN) OPTIONAL,  dummy INTEGER(1..maxMeasIdentitiesMN) OPTIONAL,  ...,  [[  selectedBandEntriesMNList SEQUENCE (SIZE (1..maxBandComb)) OF SelectedBandEntriesMN OPTIONAL,  pdcch-BlindDetectionSCG INTEGER (1..15) OPTIONAL,  maxNumberROHC-ContextSessionsSN INTEGER(0.. 16384) OPTIONAL  ]],  [[  maxIntraFreqMeasIdentitiesSCG INTEGER(1..maxMeasIdentitiesMN) OPTIONAL,  maxInterFreqMeasIdentitiesSCG INTEGER(1..maxMeasIdentitiesMN) OPTIONAL  ]]  } |

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| ***p-maxEUTRA***  Indicates the maximum total transmit power to be used by the UE in the E-UTRA cell group (see TS 36.104 [33]). This field is used in (NG)EN-DC and NE-DC. |
| ***p-maxNR-FR1***  Indicates the maximum total transmit power to be used by the UE in the NR cell group across all serving cells in frequency range 1 (FR1) (see TS 38.104 [12]). The field is used in (NG)EN-DC and NE-DC. |
| ***p-maxUE-FR1***  Indicates the maximum total transmit power to be used by the UE across all serving cells in frequency range 1 (FR1). |