3GPP TSG-RAN WG2 Meeting #112-e [R2-200xxxx](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-200xxxx.zip)

Elbonia, 2 – 13 November 2020

**Agenda item: 6.15**

**Source: Nokia (discussion moderator)**

**Title: Summary of [AT112-e][022][R4 NR16] MPE (Nokia)**

**Document for: Discussion and Decision**

# 1 Brief scope of the contributions

This document contains the summary of documents from agenda item 6.15 (“NR Other R4 WIs”) as per below excerpt from the session chair minutes:

* [AT112-e][022][R4 NR16] MPE (Nokia)

 Treat [R2-2009690](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip), [R2-2008910](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008910.zip), [R2-2009164](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009164.zip), [R2-2009906](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip), [R2-2010289](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip), [R2-2009166](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009166.zip), [R2-2010515](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010515.zip), [R2-2009165](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip), [R2-2010516](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip)

 Intended outcome: Intermediate: Determine agreeable parts. Final: For agreeable parts, agreed CRs.

 Deadline: Intermediate deadline(s) by Rapporteur, Final: Discussion stop at Wed Nov 11, 1200 UTC

The contributions belonging to this discussion are listed below.

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| **MPE***MAC*[R2-2009690](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip) Miscellaneous correction on MPE reporting to 38.321 LG Electronics Inc., Ericsson, Apple CR Rel-16 38.321 16.2.1 0936 - F NR\_RF\_FR2\_req\_enh[R2-2008910](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008910.zip) Correction of MPE reporting field name Lenovo, Motorola Mobility CR Rel-16 38.321 16.2.1 0900 - F NR\_RF\_FR2\_req\_enh[R2-2009164](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009164.zip) Corrections to MPE reporting Nokia, Nokia Shanghai Bell CR Rel-16 38.321 16.2.1 0909 - F NR\_RF\_FR2\_req\_enh*MAC - relative threshold trigger*[R2-2009906](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip) 38.321 Correction on MPE reporting triggered by the relative threshold ZTE Corporation, Sanechips CR Rel-16 38.321 16.2.1 0949 - F NR\_RF\_FR2\_req\_enh[R2-2010289](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip) 38.331 Correction on relative threshold for MPE configuration ZTE Corporation, Sanechips CR Rel-16 38.331 16.2.0 2200 - F NR\_RF\_FR2\_req\_enh*Stage 2* [R2-2009166](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009166.zip) Stage-2 description of MPE reporting Nokia (Rapporteur) CR Rel-16 38.300 16.3.0 0299 - F NR\_RF\_FR2\_req\_enh[R2-2010515](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010515.zip) Introduction of MPE reporting Ericsson CR Rel-16 38.300 16.3.0 0319 - F NR\_RF\_FR2\_req\_enh[R2-2010981](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010981.zip) Stage-2 description of MPE reporting Nokia (Rapporteur), Ericsson CR Rel-16 38.300 16.3.0 0299 1 F NR\_RF\_FR2\_req\_enh Late*Dual Connectivity and Handover*[R2-2009165](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip) Corrections to inter-node signalling for MPE reporting Nokia, Nokia Shanghai Bell CR Rel-16 38.331 16.2.0 2037 - F NR\_RF\_FR2\_req\_enh[R2-2010516](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip) MPE for EN-DC, NE-DC, NR-DC and DAPS Ericsson discussion |

These are divided into four main categories: General MAC corrections, relative reporting corrections, Stage-2 description and MPE for DC/HO. Each of these will be handled separately in the next chapter.

# 2 MPE discussion topics

## 2.1 General MAC corrections

The general MAC corrections have both overlap and separate topics, making it difficult to categorize the changes exactly. It seems sensible to first attempt to see which changes are agreeable, and then attempt to merge all these changes to a consolidated CRs. As a first step, the discussion will attempt to collect issues with each of the proposed CRs to see which parts could be generally agreeable.

**Question 1a: Do you agree with the content of the** [**R2-2009690**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip)**?**

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| **Contribution:** [**R2-2009690**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip) *Miscellaneous correction on MPE reporting to 38.321 LG Electronics Inc., Ericsson, Apple CR Rel-16 38.321 16.2.1 0936 - F NR\_RF\_FR2\_req\_enh* |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | Yes |  |
| Qualcomm | Agree partly | * Some of the changes are purely editorial and unnecessary (they don’t improve the text in any way);
* “cancel triggered MPE P-MPR reporting” should not be removed, because an earlier change, “in which case the PHR is referred below to as 'MPE P-MPR report'”, has already separated P-MPR reporting from legacy PHR, so that “cancel all triggered PHR” does not include P-MPR report. In other words, at least in the procedural text, we can keep only one between these two changes.
 |
| ZTE | - | We need to clarify the MPE reporting is just one part of PHR procedure or an independent procedure with reusing the PRH MAC CE format since the independent paragraph of triggering MPE reporting really confused us, If the former understanding is correct, this CR can be agreed and hence the independent MPE reporting paragraph shall be removed as it is in the CR. If the latter understanding is correct, this CR is not correct and the description of MPE reporting in PHR triggered part shall be removed.  |
| LG | Yes |  |
| Nokia, Nokia Shanghai Bell | Partly | Some changes are good but some may cause further issues (numbering aligns to cover page explanations):1. *In S5.4.6, use referring 'MPE P-MPR report' instead of triggering MPE P-MPR reporting, and remove the text to cancel triggered MPE P-MPR reporting.* : We are fine to try to improve the wording here but this seems incorrect since relative MPE reporting is only used once the absolute reporting is triggered: This would make it mandatory in all cases even if the absolute MPE was not triggered. Relative reporting is not triggered until absolute reporting has triggered. Removing the triggering/cancellation makes this more difficult to capture, as that was the intent behind those originally. 3. *In S5.4.6, remove the text to set the corresponding P field.*: The reason here is to remove repetition, but we would like to note that the P-bit interpretation is different depending on the reported P-MPR value. So having that statement would help to clarify that with the MPE, the P-bit means something else also in the procedural text so we would prefer to keep this.4. *In S6.1.3.8 and S6.1.3.9, remove "this field indicates the applied power backoff to meet MPE requirements, as specified in TS 38.101-2 [15]".* : We don't quite see why this is removed - this is now removing the fact that the P-MPR applies only due to MPE. We think this should be kept to ensure this is clear.5. *In S5.4.6, remove "applied by the UE" and change "more than or equal to" to "equal to larger than".*: This is a good change, improving readability.6. *In S6.1.3.8 and S6.1.3.9, add "whether the MAC entity appplies" to align the text of both cases where mpe-reporting is configured and the case that is not configured.* : This is not quite correct: MAC entity reports the P-MPR for MPE but does NOT apply it. PHY layer applies the P-MPR and indicates that to MAC. |
| Apple | Yes |  |
| Intel (Youn Heo) | Yes partially | Agree with Nokia’s comment #3 & #6.  |
| InterDigital | Yes Partly | In general, good editorial changes for text conciseness. However, we agree with Qualcomm and Nokia regarding the change in 5.4.6, and prefer to keep the original wording. |
| MediaTek | Yes partially | We have same views from Qualcomm and Nokia. We think the procedure for “triggering MPE P-MPR report” should be kept, and the “P-bit setting” sentence should not be removed. |
| Samsung | Yes partially | Agree with Qualcomm and Nokia. |
| CATT (Da Wang) | Yes partially | Agree with Qualcomm and Nokia. |
| OPPO | Yes partially | This change is not needed. The original text is clear.Agree with Qualcomm and Nokia for other changes. |

**Table 1. Company comments to** [**R2-2009690**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip)

**Intermediate conclusions to Q1a: TBA**

**Question 1b: Do you agree with the content of the** [**R2-2009164**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009164.zip)**?**

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| **Contribution:** [**R2-2009164**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009164.zip) *Corrections to MPE reporting Nokia, Nokia Shanghai Bell CR Rel-16 38.321 16.2.1 0909 - F NR\_RF\_FR2\_req\_enh* |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | Yes |  |
| Qualcomm | Agree | There is a typo in the last change “, or if the Serving Cell operates on FR1,” |
| Ericsson | Yes |  |
| LG | Partly | We agree with the clarification that MPE is applied for FR2 serving cell and not for FR2 serving cell and the correction on usage of P-MPR\_NN. However, generally, the table number in other specification is not specified in MAC spec. |
| Nokia, Nokia Shanghai Bell | Yes (proponent) | Agree with the QC comment - indeed it should be FR1. Thank you. |
| Apple | See comment | For the 3rd change (i.e. Clarify that for FR1 serving cells, MPE field is treated as R-bits even if P-bit is reported.”, I donot understand why we cannot keep the usage of the P bit for FR1 serving cell.  |
| Intel  | Yes |  |
| InterDigital | Yes |  |
| MediaTek | Yes |  |
| Samsung | Yes | The changes are correct, and provides further clarity. |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| OPPO | Yes  |  |

**Table 2. Company comments to** [**R2-2009164**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009164.zip)

**Intermediate conclusions to Q1b: TBA**

**Question 1c: Do you agree with the content of the** [**R2-2008910**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008910.zip)**?**

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| **Contribution:** [**R2-2008910**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008910.zip) *Correction of MPE reporting field name Lenovo, Motorola Mobility CR Rel-16 38.321 16.2.1 0900 - F NR\_RF\_FR2\_req\_enh* |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | Yes |  |
| Qualcomm | Agree | This CR may be merged with R2-2009164, as both of them emphasize P-MPR is for FR2. |
| ZTE | Yes |  |
| LG | Yes | We agree to align the field name in RRC and MAC specification. |
| Nokia, Nokia Shanghai Bell | Yes | We could even merge all the MAC CRs into just one MAC CR once we agree on the exact contents of all CRs. |
| Apple | Yes |  |
| Intel | Yes |  |
| InterDigital | Yes | We are okay to add the suffix but note that the suffix in RRC is “FR2-r16”, not “FR2”. |
| MediaTek | Yes |  |
| Samsung | Yes | We also share the view with Nokia that we could have a single CR for these changes.For the comments from InterDigital, we normally do not use release suffix (e.g. -r16) when we refer the field names, and I will anyway remove all these release suffix during CR implementation. |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| OPPO | Yes  |  |

**Table 3. Company comments to** [**R2-2008910**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008910.zip)

**Intermediate conclusions to Q1c: TBA**

## 2.2 MPE relative threshold triggering

The contributions in [R2-2009906](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip) and [R2-2010289](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip) both concern the same topic: How the relative MPE reporting is defined and triggered. Companies are requested to provide comments for both of these.

**Question 2a: Do you agree with the content of the** [**R2-2009906**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip)**?**

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| **Contribution:** [**R2-2009906**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip) *38.321 Correction on MPE reporting triggered by the relative threshold ZTE Corporation, Sanechips CR Rel-16 38.321 16.2.1 0949 - F NR\_RF\_FR2\_req\_enh* |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | No | We wonder, will the yellow in the following existing condition not be fulfilled at the same time?- *phr-ProhibitTimer* expires or has expired, when the MAC entity has UL resources for new transmission, and the following is true for any of the activated Serving Cells of any MAC entity with configured uplink:- there are UL resources allocated for transmission or there is a PUCCH transmission on this cell, and the required power backoff due to power management (as allowed by P-MPRc as specified in TS 38.101-1 [14], TS 38.101-2 [15], and TS 38.101-3 [16]) for this cell has changed more than *phr-Tx-PowerFactorChange* dB since the last transmission of a PHR when the MAC entity had UL resources allocated for transmission or PUCCH transmission on this cell.The only difference seems to be the green, i.e. that the new trigger does not have a condition on that the UE makes a transmission…? So the difference is that ZTE's new trigger will make the UE trigger the report even when the UE is not scheduled on the particular cell… is that really necessary? It seems like an optimization to us. Usually the UE is in CONNECTED and Active Time because there is data to transmit, so again, is this perhaps only an optimization?Note that [**R2-2009690**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip) makes part of this CR obsolete. |
| Qualcomm | No | We do not think this change CR is needed, because relative threshold is already captured by one of the triggers. |
| ZTE | - | It depends on How to understand the relationship between MPE reporting procedure and PHR procedure, as we mentioned before, if these two procedures are independent, we need to define a MPE reporting procedure triggered by relative threshold. If MPE reporting is a part of PHR, this CR is not needed since this have been included into the current PHR procedure trigger. |
| LG | No | In Post e-mail discussion, RAN2 concluded to reuse phr-Tx-PowerFactorChange with no changes. PHR triggering by relative threshold is already captured in the current MAC specification. |
| Nokia, Nokia Shanghai Bell | Partly | We agree that the working of the relative threshold could be clarified, but this is not fully correct: The relative threshold should only apply once absolute threshold has been triggered. As Ericsson noted, the existing text does seem to cover the triggering part, but it doesn't fully capture the absolute/relative threshold interplay. |
| Apple | No | We also think current spec has covered the relative threshold.  |
| Intel | No | In the last meeting, we agree to reuse existing relative threshold for MPE reporting.  |
| InterDigital | No | This was discussed in the email discussion last meeting and agreed to reuse the phr relative power factor to implement the relative MPE trigger. |
| MediaTek | No | The relative threshold is already covered by one of existing triggers. |
| Samsung | No | We have same understanding as many others above. |
| Huawei, HiSilicon | No | Agree with Ericsson and it is covered by the current spec. |
| CATT | No | Agree with Ericsson and it is covered by the current spec. |
| OPPO | No  | Agree with Ericsson and it is covered by the current spec. |

**Table 4. Company comments to** [**R2-2009906**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip)

**Intermediate conclusions to Q2a: TBA**

**Question 2b: Do you agree with the content of the** [**R2-2010289**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip)**?**

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| **Contribution:** [**R2-2010289**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip) *38.331 Correction on relative threshold for MPE configuration ZTE Corporation, Sanechips CR Rel-16 38.331 16.2.0 2200 - F NR\_RF\_FR2\_req\_enh* |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | No | Even if the CR in [**R2-2009906**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip) is agreed, this CR is not needed.The existing RRC wording is "*Value in dB for PHR reporting as specified in TS 38.321 [3].* ".The MPE is part of "PHR reporting", so we don’t need to change anything.The formatting of the CR is wrong, and there is a word added without change marks. |
| Qualcomm | No | See our comment on Q2a |
| ZTE | - | It depends on the understanding the relationship between PHR and MPE as we mentioned before. |
| LG | No | With answer in Q2a, this change is not needed. |
| Nokia, Nokia Shanghai Bell | Yes | Currently it is not clear that the same parameter serves two purposes - this should be visible to avoid later issues. |
| Apple | No |  |
| Intel | No | Not so essential to clarify because phr-Tx-PowerFactorChange is a mandatory IE for PHR reporting and we reuse PHR reporting for MPE reporting. It doesn’t seem likely there is any chance for NW to miss this information for MPE reporting configuration.  |
| InterDigital | No | Per the previous comment. |
| MediaTek | No |  |
| Samsung | - | We think the changes are okay, but can follow the majorities. |
| Huawei, HiSilicon | No |  |
| CATT | No |  |
| OPPO | No  |  |

**Table 5. Company comments to** [**R2-2010289**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip)

**Intermediate conclusions to Q2b: TBA**

## 2.3 MPE Stage-2 description

There were originally two contributions with Stage-2 descriptions provided, but they have been combined into one input co-signed by both original contributors. Therefore it makes sense to only consider the latest input in this discussion.

**Question 3: Do you agree with the content of the** [**R2-2010981**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010981.zip)**?**

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| **Contribution:** [**R2-2010981**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010981.zip) *Stage-2 description of MPE reporting Nokia (Rapporteur), Ericsson* |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | Yes |  |
| Qualcomm | Agree with changes | We’d like to suggest the following change, because there are other types of triggers for P-MPR in addition to MPE and the proposed text reads as if P-MPR and MPE are equivalent.To allow network to detect UL power reduction, the PHR reports may also contain Power Management Maximum Power Reduction (P-MPR, see TS 38.101-2 [35]) information when such a reduction is applied by UE to ensure UE compliance with the Maximum Permissible Exposure (MPE) exposure regulation for FR2 |
| ZTE | Yes |  |
| LG | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes (proponent) | On the QC proposals, "when" is not quite correct as RAN4 left it up to UE whether to apply the P-MPR before reporting the MPE or whether to do it after reporting MPE. So we think "that" instead of "when" is better for that reason - otherwise the proposed addedtext seem OK to us:To allow network to detect UL power reduction, the PHR reports may also contain Power Management Maximum Power Reduction (P-MPR, see TS 38.101-2 [35]) information that such a reduction is applied by UE to ensure UE compliance with the Maximum Permissible Exposure (MPE) exposure regulation for FR2 |
| Apple | Yes |  |
| Intel | Yes |  |
| InterDigital | Yes | A stage-2 description is useful. “which is set for limiting RF exposure on human body” is redundant, as this is already conveyed by “the Maximum Permissible Exposure (MPE)”, so we suggest removing it. |
| MediaTek | Yes |  |
| Samsung | Yes | - |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| OPPO | Yes  |  |

**Table 6. Company comments to** [**R2-2010981**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010981.zip)

**Intermediate conclusions to Q3: TBA**

## 2.4 MPE impacts to DC and handover

The documents under this sub-topic concern the following questions:

* During handover, should source node indicate the MPE status of FR2 serving cells received from UE to the target node?
* Is MPE reporting supported for (some) MR-DC architecture options? If yes, to which extent, e.g. should LTE MAC support MPE reporting?
* Is MPE supported during DAPS handover?

**Handover**: The first part of the CR [**R2-2009165**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip) proposes that inter-node signalling should indicate UE-reported MPE status of FR2 serving cells. This was not truly discussed before, but RAN2 often defines such inter-node signalling rather late.

**Question 4a: Should reported MPE results of FR2 serving cells be conveyed from source cell to target cell during handover? (**[**R2-2009165**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip)**)**

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| --- | --- | --- |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | No? | The motivation (on the cover page) is that the "*target cell can take appropriate actions*" if it gets the MPE forwarded from the source. The scenario is not clear to us though.The UE will only send MPE indications for activated serving cells. This means that the gNB (e.g. the target) must keep SCells in activated state in order to receive MPE indications.If the target activates serving cells for the UE after the handover, a PHR will be triggered. And if the UE still has MPE-issues, the target will see this when it receives the PHR from the UE.Perhaps the only motivation for this, i.e. one "appropriate action" is that the target can decide to **not** activate FR2 cells after the handover. But how long is this going to last? The target must at some point activate the FR2 cells to receive an MPE indication. And we are back again to that the target must activate the FR2 SCells to get the report.So, we don’t see a strong motivation for this. |
| Qualcomm | No | PHR is triggered when UE connects to target cell. P-MPR is reported if MPE reporting is configured by the target cell. |
| ZTE | No | Share the same view with Qualcomm, anyway the PHR will be triggered and P-MPR information will be sent to target cell if MPE reporting is configured. |
| LG | No | We think the benefit is unclear. The applied MPE value is changed after handover and the MPE value in source cell is useless. Moreover, in legacy NR, there is no method to inform target cell of that power backoff is used in source cell, but it works well without issue. |
| Nokia, Nokia Shanghai Bell | Yes | There are at least two aspects to consider: First, FR2 cells may be deactivated when MPE event occurs, or even released. Target cell should know whether they should be kept deactivated or activated. **Second, if the FR2 cells were released but their RRM measurements remain good, how does the target cell know it should not configure them after HO?** Without MPE information, this may cause target cell to configure them and only then seeing that MPE is there. This causes waste to both UE (who has to try to utilize the cells) as well as network (who configures them for the UE). It would be better to prevent this happening altogether.We would also note that this is a network-only change and has zero UE impacts. If target cell wishes not to use the information, it need not do that. |
| Apple | No | We share Qualcomm’s view, and think UE can report the P-MPR to the target cell after handover to target cell completion. |
| Intel | No | Not so big motivation to add.  |
| InterDigital | No | If the target cell is also FR2 and configured with MPE reporting, a new MPE PHR can be triggered new target cell if and the MPE P-MPR is above the threshold (value of which is then based on the new target cell).  |
| MediaTek | No | Share same view with Qualcomm. UE can report P-MPR to the target cell after handover. |
| Samsung | No | We share the view with Qualcomm and Intel. |
| Huawei, HiSilicon | No | Share same view with Qualcomm. |
| CATT | No | Share same view with Qualcomm. |
| OPPO | No  |  |

**Table 7. Company comments to** [**R2-2009165**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip)**: MPE indication in inter-node messages**

**Intermediate conclusions to Q4: TBA**

**NR-DC**: The second part of [**R2-2009165**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip) and the proposal 5 of [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip) are NR-DC support of MPE reporting, so these questions are considered jointly. The main questions are two-fold:

1. Should MN/SN convey MPE information to each other when MPE reporting is configured (as MN/SN may not know whether MPE reporting is configured in the other MAC entity)? ([**R2-2009165**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip))
2. Should UE with NR-DC indicate MPE status for MN/SN/all FR2 serving cells when configured with MPE reporting? (Proposal 5 from [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip))

**Question 5a: Should MN/SN convey MPE information to each other when MPE reporting is configured (as MN/SN may not know whether MPE reporting is configured in the other MAC entity)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | No | If cross-reporting is deemed necessary (i.e. RAN2 concludes that the answer to question 5b is "Yes"): we think that it is sufficient that the MN receives MPE-indications for SN-cells from the UE. So in this case the answer to this question (5a) is "No".If cross-reporting is deemed **not** necessary (i.e. RAN2 concludes that the answer to question 5b is "No"): this means that RAN2 deems it not meaningful for the SN to receive MPE-indications from the MN, and vice versa. And also in this case the answer to this question (5a) is "No".  |
| Qualcomm | No | The proposed changes do not seem necessary because:* In EN-DC, LTE MN would consider the P-MPR field as reserved bits;
* In FR1+FR2 NR-DC, FR1 and FR2 don't share power. So there is no need for cross-CG reporting;
* FR2+FR2 NR-DC: we do not expect actual deployment of this architecture any time soon.

Since no cross-CG reporting is necessary, there is no need to share MPE information between MN/SN. |
| ZTE | No | Share the same view with Qualcomm |
| LG | No | WE don’t see a strong motivation for cross-CG reporting. As Qualcomm mentioned, power sharing between FR1 and FR2 is not supported and we don't think FR2+FR2 is consider in actual deployment. Moreover, even if there is a case where FR2+FR2 is needed, it is a very rare case, and even in the case, network may configure MPE reporting in both CG. |
| Nokia, Nokia Shanghai Bell | Yes | We agree that for EN-DC, NGEN-DC and NE-DC nothing is needed.But for NR-DC, it is not about power sharing but knowing the MPE situation. It is also possible to have DC with (FR1+FR2 CA) and FR2 CA.As network may use different mechanisms after MPE detection (e.g. deactivate, release or even do nothing), it's necessary to let this information be known after HO. The same applies for other cases like IDC - if we signal to target information about IDC situation, why would the same not apply to MPE as well?Finally, as for QC comment on FR2-FR2 NR-DC, this is a strawman: By the same token we could say that most of the Rel-16 features should not be defined since they will not be deployed any time soon. |
| Apple | No | We donot see the strong motivation for cross-CG reporting. Maybe we should check with RAN4 on the necessity first.  |
| Intel | No |  |
| InterDigital | No | No strong opinion, but it seems like FR2-FR2 DC is not a common deployment. It should be possible for the multiple entry PHR to report MPE (or RR if not configured) for multiple cells anyway. |
| MediaTek | No | We share the same view with Qualcomm. |
| Samsung | No | We also share the same view with Qualcomm… |
| Huawei, HiSilicon | No | Share same view with Qualcomm. |
| CATT | No | Share same view with Qualcomm. |
| OPPO | No  |  |

**Table 10. Company comments to MN/SN MPE inter-node signalling in NR-DC as per** [**R2-2009165**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip)

**Intermediate conclusions to Q5a: TBA**

**Question 5b: Should UE with NR-DC indicate MPE status for MN/SN/all serving cells when configured with MPE reporting? (Proposal 5 from** [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip)**)?**

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| --- |
| **Proposal 5 In NR-DC, if MPE is configured for a MAC entity, that MAC entity shall report MPE for all serving cells (also the cells of the other MAC entity).** |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | Yes | This is about "cross-reporting", i.e. UE reports MPE-info **for** MN cells **to** SN, and vice versa.Since cross-reporting of PHR is supported, we think we can also support cross-reporting for MPE.------------------**Updated input:**Based on the current status, it seems that, even though we do "cross-reporting" for PHR, we will **not** do it for the MPE-indications. Ericsson is fine with this conclusion.Now, we wonder how we would ensure that "cross-reporting" is not performed.Below is the PHR-procedure text from MAC. This procedure text results in that PCMAX,f,c-value are obtained also for cells of the "other" MAC entity. Similarly, the MPE-values for the "other" MAC entity will also be obtained. So we should perhaps add the red words:

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| --- |
| If the MAC entity has UL resources allocated for a new transmission the MAC entity shall:1> if it is the first UL resource allocated for a new transmission since the last MAC reset:2> start *phr-PeriodicTimer*;1> if the Power Headroom reporting procedure determines that at least one PHR has been triggered and not cancelled; and1> if the allocated UL resources can accommodate the MAC CE for PHR which the MAC entity is configured to transmit, plus its subheader, as a result of LCP as defined in clause 5.4.3.1:2> if *multiplePHR* with value *true* is configured:3> for each activated Serving Cell with configured uplink associated with any MAC entity of which the active DL BWP is not dormant BWP:4> obtain the value of the Type 1 or Type 3 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell and clause 5.1.1.2 of TS 36.213 [17] for E-UTRA Serving Cell;4> if this MAC entity has UL resources allocated for transmission on this Serving Cell; or4> if the other MAC entity, if configured, has UL resources allocated for transmission on this Serving Cell and *phr-ModeOtherCG* is set to *real* by upper layers:5> obtain the value for the corresponding PCMAX,f,c field from the physical layer.5> if *mpe-Reporting* is configured and this Serving Cell is associated with this MAC entity:6> obtain the P-MPR value for the corresponding MPE field from the physical layer;6> set the corresponding P field according to the obtained P-MPR value.3> if *phr-Type2OtherCell* with value *true* is configured:4> if the other MAC entity is E-UTRA MAC entity:5> obtain the value of the Type 2 power headroom for the SpCell of the other MAC entity (i.e. E-UTRA MAC entity);5> if *phr-ModeOtherCG* is set to *real* by upper layers:6> obtain the value for the corresponding PCMAX,f,c field for the SpCell of the other MAC entity (i.e. E-UTRA MAC entity) from the physical layer.3> instruct the Multiplexing and Assembly procedure to generate and transmit the Multiple Entry PHR MAC CE as defined in clause 6.1.3.9 based on the values reported by the physical layer.2> else (i.e. Single Entry PHR format is used):3> obtain the value of the Type 1 power headroom from the physical layer for the corresponding uplink carrier of the PCell;3> obtain the value for the corresponding PCMAX,f,c field from the physical layer;3> if *mpe-Reporting* is configured:4> obtain the P-MPR value for the corresponding MPE field from the physical layer;4> set the corresponding P field according to the obtained P-MPR value.3> instruct the Multiplexing and Assembly procedure to generate and transmit the Single Entry PHR MAC CE as defined in clause 6.1.3.8 based on the values reported by the physical layer.2> if MPE P-MPR reporting has been triggered:3> start or restart the *mpe-ProhibitTimer*;3> cancel triggered MPE P-MPR reporting for Serving Cells included in the PHR MAC CE.2> start or restart *phr-PeriodicTimer*;2> start or restart *phr-ProhibitTimer*;2> cancel all triggered PHR(s). |

And in RRC:

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| ***mpe-Reporting-FR2***Indicates whether the MAC entity of the UE shall report MPE P-MPR for the serving cell of this MAC entity in the PHR MAC control element, as specified in TS 38.321 [3]. |

 |
| Qualcomm | No | See our comments on Q5a |
| ZTE | No |  |
| LG | No | Please see answer in Q5a. |
| Nokia, Nokia Shanghai Bell | No | MPE is only applicable for FR2 serving cells so it doesn't apply to all cells. If the MAC entity is configured with PHR, it will report MPE according to the configuration. |
| Apple | No |  |
| Intel | No |  |
| InterDigital | No |  |
| MediaTek | No |  |
| Samsung | No |  |
| Huawei, HiSilicon | No |  |
| CATT | No |  |
| OPPO | Yes  | We reuse PHR MAC CE, it can follow PHR principles.  |

**Table 10. Company comments to NR-DC and DAPS proposals of** [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip)

**Intermediate conclusions to Q5b: TBA**

**LTE MAC support**: The remainder of [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip) discussed multiple proposals on various topics related to MR-DC support of MPE. The main question in the contribution seems to be whether MPE reporting should be supported towards LTE cells or only to NR FR2 cells, which has obvious consequences for MR-DC cases. The proposals 1-4 essentially propose that MPE reporting is only supported towards NR and no modifications should be done to LTE MAC to enable MPE reporting, as shown below:

**Proposal 1 RAN2 confirms that MPE reporting for SCG-cells to the MN is not supported in EN-DC.**

**Proposal 2 MPE reporting is supported for EN-DC, but UE only reports MPE for the SCG FR2-cells towards the SN (not the MN).**

**Proposal 3 RAN2 confirms that MPE reporting for MCG-cells to the SN is not supported in NE-DC.**

**Proposal 4 MPE reporting to is supported for NE-DC, but UE only reports MPE for the MN FR2-cells towards the MN (not the SN).**

**Question 6: Should MPE reporting be supported for LTE MAC?**

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| --- | --- | --- |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Ericsson | No | RAN2 was not requested to do this so we don’t think it should be done. The above proposals (1-4) are consequences of this. |
| Qualcomm | No | We agree with all four proposals above. |
| ZTE | No |  |
| LG | No | RAN4 does not request to introduce MPE reporting for LTE MAC, and the benefit is unclear from RAN2 point of view. |
| Nokia, Nokia Shanghai Bell | No | While we think this would be straightforward to add to LTE, RAN4 neither discussed nor requested to do that.  |
| Apple | No |  |
| Intel | No |  |
| InterDigital | No |  |
| MediaTek | No |  |
| Samsung | No |  |
| Huawei, HiSilicon | No |  |
| CATT | No |  |
| OPPO | No  |  |

**Table 8. Company comments to LTE support of MPE signalling (proposals 1-4 of** [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip)**)**

**Intermediate conclusions to Q6: TBA**

**DAPS and MPE**: The remaining question is about support of MPE during DAPS: When DAPS is being executed and MCG MAC entity is configured for MPE reporting, does UE report MPE for both source and target PCell (since neither MR-DC nor SCells are not supported during DAPS handover in Rel-16)?

**Question 7: Do you agree with the proposal 6 of** [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip)**?**

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| **Proposal 6 In DAPS, if MPE is configured for a MAC entity, that MAC entity shall report MPE for all serving cells (also the cell of the other MAC entity).** |
| **Company** | **Agree (Yes/No/Partly)** | **Comments** |
| Qualcomm | No | Please see our comment on Q5a. |
| LG | No | Please see answer in Q4a |
| Nokia, Nokia Shanghai Bell | No | We should follow the PHR reporting as defined for DAPS: We don't see it necessary to add anything extra to that case - if the MAC entity is configured with MPE, that can be reported, otherwise not. |
| Apple | No |  |
| Intel | No strong view | It is possible to support MPE reporting by using Type 1 PHR MAC CE. However, no strong view.  |
| InterDigital | No | Assuming DAPS between FR2 and FR2 cells is not possible |
| MediaTek | No |  |
| Samsung | No |  |
| Huawei, HiSilicon | No |  |
| CATT | No |  |
| OPPO | No  |  |

**Table 10. Company comments to NR-DC and DAPS proposals of** [**R2-2010516**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip)

**Intermediate conclusions to Q7: TBA**

# 3 Conclusions

**TBA**

# 4 List of referenced documents

[1] [R2-2009690](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009690.zip) Miscellaneous correction on MPE reporting to 38.321 LG Electronics Inc., Ericsson, Apple CR Rel-16 38.321 16.2.1 0936 - F NR\_RF\_FR2\_req\_enh

[2] [R2-2008910](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008910.zip) Correction of MPE reporting field name Lenovo, Motorola Mobility CR Rel-16 38.321 16.2.1 0900 - F NR\_RF\_FR2\_req\_enh

[3] [R2-2009164](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009164.zip) Corrections to MPE reporting Nokia, Nokia Shanghai Bell CR Rel-16 38.321 16.2.1 0909 - F NR\_RF\_FR2\_req\_enh

[4] [R2-2009906](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009906.zip) 38.321 Correction on MPE reporting triggered by the relative threshold ZTE Corporation, Sanechips CR Rel-16 38.321 16.2.1 0949 - F NR\_RF\_FR2\_req\_enh

[5] [R2-2010289](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010289.zip) 38.331 Correction on relative threshold for MPE configuration ZTE Corporation, Sanechips CR Rel-16 38.331 16.2.0 2200 - F NR\_RF\_FR2\_req\_enh

[6] [R2-2009166](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009166.zip) Stage-2 description of MPE reporting Nokia (Rapporteur) CR Rel-16 38.300 16.3.0 0299 - F NR\_RF\_FR2\_req\_enh

[7] [R2-2010515](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010515.zip) Introduction of MPE reporting Ericsson CR Rel-16 38.300 16.3.0 0319 - F NR\_RF\_FR2\_req\_enh

[8] [R2-2010981](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010981.zip) Stage-2 description of MPE reporting Nokia (Rapporteur), Ericsson CR Rel-16 38.300 16.3.0 0299 1 F NR\_RF\_FR2\_req\_enh Late

[9] [R2-2009165](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2009165.zip) Corrections to inter-node signalling for MPE reporting Nokia, Nokia Shanghai Bell CR Rel-16 38.331 16.2.0 2037 - F NR\_RF\_FR2\_req\_enh

[10] [R2-2010516](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010516.zip) MPE for EN-DC, NE-DC, NR-DC and DAPS Ericsson discussion