**3GPP TSG-RAN2#127**  ***R2-2407767***

**Maastricht, Netherlands, 19th – 23th Aug, 2024**

**Agenda item:** 6.1.2 (NR\_feMIMO-Core)

**Source:** LG Electronics Inc., ZTE

**Title:** Report of [AT127][006][R17 UP] PHR for mTRP (LG, ZTE)

**Document for:** Discussion and Decision

# 1. Introduction

For PHR for mTRP, RAN2 made agreements in main session in Monday as follows.

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| **Agreements**1. No Type 3 PH value is reported for *a* serving cell configured with mTRP PUSCH repetition, if the MAC entity the serving cell belongs to is configured with twoPHRMode. FFS whether a UE capability is needed [CB]
2. FFS Remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE
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Based on above agreements, RAN2 further discuss to make proposals and CR as follows.

* [AT127][006][R17 UP] PHR for mTRP (LG/ZTE)

 Intended outcome: discuss FFSs, agree on proposals and agree to CRs

 Deadline: 08-22-24

# 2. Discussion

RAN2 agreed that No Type 3 PH value is reported for a serving cell configured with mTRP PUSCH repetition, if the MAC entity the serving cell belongs to is configured with twoPHRMode.

For this, the change for Rel-17 is suggested in [1]. Note that in Rel-18 MIMO session, RAN2 agreed that type 3 PH is not reported for serving cell configured with multiple TRP PUSCH repetition or multipanelSchemeSDM or multipanelSchemeSFN, so the change for Rel-18 may be handled in Rel-18 MIMO session.

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| **[R2-2407565 (R17)]**4> if this MAC entity is configured with *twoPHRMode*:5> if this Serving Cell is configured with multiple TRP PUSCH repetition and the MAC entity this Serving Cell belongs to is configured with *twoPHRMode*:6> obtain two values of the Type 1 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell.5> else:6> 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> else (i.e. this MAC entity is not configured with *twoPHRMode*):5> if this Serving Cell is configured with multiple TRP PUSCH repetition and the MAC entity this Serving Cell belongs to is configured with *twoPHRMode*:6> if there is at least one real PUSCH transmission at the slot where the PHR MAC CE is transmitted:7> obtain the value of the Type 1 power headroom of the first real transmission of the corresponding uplink carrier as specified in clause 7.7 of TS 38.213[6] for NR Serving Cell.6> else if there is no real PUSCH transmission at the slot where the PHR MAC CE is transmitted:7> obtain the value of the type 1 power headroom of the reference PUSCH transmission associated with the *SRS-ResourceSet* with a lower *SRS-resourceSetID* for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213[6] for NR Serving Cell. |

**Q1. Does company agree with above changes?**

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| --- | --- | --- |
| **Company** | **Y/N** | **Reason/Comment** |
| Subin Narayanan (Nokia) | Yes | Based on RAN1 LS reply and to address the Type 3/Type 1 ambiguity, the proposed solution is simple and has less RAN2 impact (to include both Rel-Type 3 PHR, Rel.17 and Rel.18 MAC CE must be re-construct) |
| LGE | Yes |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Qualcomm | Yes | Based on RAN2 agreement. |
| Ericsson | Yes |  |
| vivo | Comments | The proposed change is okay for Rel-18 behavior. But we think the R17 behavior should be kept and not changed. I.e.,4> if this MAC entity is configured with *twoPHRMode*:5> if this Serving Cell is configured with multiple TRP PUSCH repetition and the MAC entity this Serving Cell belongs to is configured with *twoPHRMode*:6> If UE supports the new capability, obtain two values of the Type 1 or the value of Type 3power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell.6> else, obtain two values of the Type 1 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell. |
| Apple | Yes |  |

**Summary of Q1:**

Majority companies agree with the above the change text proposed in clause 5.4.6 in R2-2407565, but one company think that the UE behiavour of R17 to obtain Type 3 PH value needs to be specified separately depending on the support of the new UE capability. However, whether to introduce the UE capability is not concluded in Q2.

Therefore, rapporteur think that it would be better to first agree with the change text proposed in R2-2407565, and then additional CRs (e.g. 38.321, 38.331, 38.304) will be submitted in the next meeting based on the conclusion of the new UE capability discussion.

**Proposal 1. RAN2 agree with the change text proposed in R2-2407565 as follows.**

* **6> obtain two values of the Type 1 ~~or the value of Type 3~~ power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell.**
* **7> obtain the value of the type 1 power headroom of the reference PUSCH transmission associated with the SRS-ResourceSet with a lower SRS-resourceSetID ~~or the value of the type 3 power headroom~~ for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213[6] for NR Serving Cell.**

**Proposal 2. For R17, RAN2 is encouraged to submit CRs for the new UE capability in the next meeting, based on the conclusion of the new UE capabilitiy discussion.**

For the above case, some companies think a new UE capability needs to be introduced to indicate whether the UE can report Type 3 PH value since, in RAN1 discussion, there is no consensus on whether UE can report type 3 PH value when a serving cell is configured with SUL, that means companies may have different implementation methods on type 3 PH value reporting in this case. In addition, it is also beneficial for NW vendor to distinguish the new UE from old UE to avoid the potential risk of misalignment between NW and old UE and then this is captured as FFS.

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| R2-2407564 Discussion on PHR for mTRP PUSCH repetition LG Electronics Inc. discussion Rel-17 NR\_FeMIMO-Core*…**Proposal 2. One or two Type 1 PH values are always obtained for a serving cell configured with mTRP PUSCH repetition, if the MAC entity the serving cell belongs to is configured with twoPHRMode.*- Qualcomm thinks that we would need a UE capability as the network wouldn’t know what the UE is reporting. **Agreements**1. No Type 3 PH value is reported for *a* serving cell configured with mTRP PUSCH repetition, if the MAC entity the serving cell belongs to is configured with twoPHRMode. FFS whether a UE capability is needed [CB]
2. FFS Remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE
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**Q2. Does company agree that a new UE capability needs to be introduced to indicate whether the UE can report Type 3 PH value or not for this case?**

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| --- | --- | --- |
| **Company** | **Y/N** | **Reason/Comment** |
| Subin Narayanan (Nokia) | No |  |
| LGE | Yes | Due to the ambiguity from RAN1 specification, there is an old UE that is implemented to report Type 3 PH for a serving cell, which the serving cell configured with mTRP PUSCH repetition and the MAC entity the serving cell belongs to is configured with twoPHRMode. In order to differentiate the old UE and the new UE, we think that a new capability is needed |
| Samsung | No | We don’t think the current RAN1 specification supports type3 PH reporting in this case, so no UE capability is needed. |
| ZTE | Yes | Considering there is still ambiguities of the understandings from different companies during RAN1 discussion and the R17 specification ha been frozen for a long time, may a UE capability is a safe way to go. |
| Qualcomm | Yes | Good for both UE and network. |
| Ericsson | No | Although we can indicate for RAN1 to determine if this is required. |
| vivo | Yes | Agree with ZTE. |
| Apple | No | If current UE and network implementation handles the type3 PH in different way, it’s not useful to introduce a capability for it.  |

**Summary of Q2:**

4 companies agree to introduce the new UE capability but 4 companies don’t agree this. Companies that are positive about introducing the new UE capability think that there is an old UE implemented to report Type 3 PH, so the network should be able to differentiate the old UE and the new UE by the new UE capability. Companies that are negative about introducing the new UE capability think that the current RAN1 specification does not support Type 3 PH reporting.

Since companies view are separated almost half and half, rapporteur suggest further discussion on whether to introduce the new UE capability.

**Proposal 3. RAN2 discuss further whether to introduce a new UE capability indicating whether the UE can report Type 3 PH value or not.**

In [2], it is proposed to remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE. However, some companies have concerns on this and it was captured as FFS.

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| R2-2407564 Discussion on PHR for mTRP PUSCH repetition LG Electronics Inc. discussion Rel-17 NR\_FeMIMO-Core… *Proposal 3. Remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE.*- MEdiatek is concerned that this is a NBC change. ZTE explains that this is only for LTE MAC CE and it is optional.**Agreements**1. No Type 3 PH value is reported for *a* serving cell configured with mTRP PUSCH repetition, if the MAC entity the serving cell belongs to is configured with twoPHRMode. FFS whether a UE capability is needed [CB]
2. FFS Remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE
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**Q3. Does company agree to remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE?**

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| **Company** | **Y/N** | **Reason/Comment** |
| Subin Narayanan (Nokia) | Yes | Type 2 PH can only be reported for SpCell being part of E-UTRA MAC entity, hence there would never be two PH reported as Type 2 PH.  |
| LGE | Yes | Type 2 PH value is obtained for E-UTRA MAC entity and E-UTRA MAC is not support mTRP PUSCH repetition.  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Ericsson | Yes |  |
| vivo | Yes |  |
| Apple | Yes |  |

**Summary of Q3:**

All companies agree to remove Type 2 PH2 field for SpCell in PHR for mTRP MAC CE.

If yes in Q3, we need to discuss the change to remove Type 2 PH2 field for SpCell. The changed PHR format is suggested in [1] as follows.

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**Q4. If yes in Q3, does company agree with above change?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Reason/Comment** |
| Subin Narayanan (Nokia) | Yes |  |
| LGE | Yes | There is no case where Type 2 PH 2 is obtained in the legacy and Type 2 PH2 is optional field. Thus, we can just remove Type 2 PH 2 field without NBC issue. |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Ericsson | Yes |  |
| vivo | Yes |  |
| Apple | Yes |  |

**Summary of Q4**

All companies agree with PHR MAC CE format for mTRP proposed in R2-2407565.

Based on companies view on Q3 and Q4, it is proposed that RAN2 agree with removing Type 2 PH2 field for SpCell in PHR for mTRP MAC CE and the changed PHR MAC CE format for mTRP proposed in R2-2407565.

**Proposal 4. RAN2 agree with removing Type 2 PH2 field for SpCell in PHR for mTRP MAC CE and the changed PHR MAC CE format for mTRP proposed in R2-2407565.**

In addition to FFS, in [3], an editorial change was proposed to clarify that one or multiple Type 1 PH field is reported for the case where the MAC entity is configured with twoPHRMode and the PCell is configured with mTRP PUSCH repetition.

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| [R2-2407432](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_127%5CDocs%5CR2-2407432.zip) Clarification On PHR and PHR MAC CE for mTRP ZTE Corporation, Samsung, Nokia, CATT, Apple discussion Rel-17 NR\_FeMIMO-Core…Proposal 3: Clarify in the subclause 6.1.3.51, one or multiple of type PH fields shall be present for the Pcell.[TP in [R2-2407432](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_127%5CDocs%5CR2-2407432.zip)]It has a variable size, and includes the bitmaps, a Type 2 PH field and an octet containing the associated PCMAX,f,c field (if reported) for SpCell of the other MAC entity, one or multiple Type 1 PH fields and an octet containing the associated PCMAX,f,c field (if reported) for the Pcell. It further includes, in ascending order based on the *ServCellIndex*, one or multiple of Type X PH fields and octets containing the associated PCMAX,f,c fields (if reported) for Serving Cells other than Pcell indicated in the bitmap for indicating the presence of PH(s). X is either 1 or 3 according to TS 38.213 [6] and TS 36.213 [17]. |

**Q5. Does company agree with above change in the subclause 6.1.3.51?**

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| --- | --- | --- |
| **Company** | **Y/N** | **Reason/Comment** |
| Subin Narayanan (Nokia) | Yes | One or multiple Type 1 PH field is reported for the case where the MAC entity is configured with twoPHRMode and the Pcell is configured with mTRP PUSCH repetition. |
| LGE | Yes | This is a correct clarification. |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Ericsson | Yes |  |
| vivo | No strong view | It is clarification.  |
| Apple | Yes |  |

**Summary of Q5**

Almost companies think that the clarification proposed in R2-2407432 is needed, and one company have no strong view.

Therefore, it is propsed that RAN2 agree with the change text proposed R2-2407432.

**Proposal 5. RAN2 agree with the text proposed in R2-2407565 as follows.**

* It has a variable size, and includes the bitmaps, a Type 2 PH field and an octet containing the associated PCMAX,f,c field (if reported) for SpCell of the other MAC entity, one or multiple~~a~~ Type 1 PH field~~s~~ and an octet containing the associated PCMAX,f,c field (if reported) for the Pcell.

Besides, there is another change text proposed in the TP of [3] to make the PH i fields description more accurate which clarifies that the association between *srs-Resourceset* and PH i field is only available for the type 1 PH value.

TP in R2-2407432

- Power Headroom i (PH i): This field indicates the power headroom level, For type 1 PH value, where PH 1 is associated with the *SRS-ResourceSet* with a lower *srs-ResourceSetId* and PH 2 is associated with the SRS-ResourceSet with a higher *srs-ResourceSetId*.; For type 2 PH value and type 3 PH value, only PH 1 field is present. PH fields for a Serving Cell are included in ascending order based on i. The length of the field is 6 bits. The reported PH and the corresponding power headroom levels are shown in Table 6.1.3.8-1 (the corresponding measured values in dB for the NR Serving Cell are specified in TS 38.133 [11] while the corresponding measured values in dB for the E-UTRA Serving Cell are specified in TS 36.133 [12]);

**Q6. Does company agree with above change in the subclause 6.1.3.51?**

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| **Company** | **Y/N** | **Reason/Comment** |
| Subin Narayanan (Nokia) | yes |  |
| LGE | Yes, but | We agree with the intention, but the text can be differently specified.- Power Headroom i (PH i): This field indicates the power headroom level, where PH 1 is associated with the *SRS-ResourceSet* with a lower *srs-ResourceSetId* and PH 2 is associatedd with the SRS-ResourceSet with a higher *srs-ResourceSetId*. PH 1 and PH 2 are present if two values of the Type 1 PH are obtained as specified in clause 5.4.6, otherwise only PH 1 field is present. PH fields for a Serving Cell are included in ascending order based on i. The length of the field is 6 bits. The reported PH and the corresponding power headroom levels are shown in Table 6.1.3.8-1 (the corresponding measured values in dB for the NR Serving Cell are specified in TS 38.133 [11] while the corresponding measured values in dB for the E-UTRA Serving Cell are specified in TS 36.133 [12]); |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Qualcomm | Yes,  | However, for type 2 PH value, there is no PH 1 field. It seems LGE’s TP is a little better. |
| Ericsson | Yes | LGE TP better in our opinion. |
| vivo | Yes | Agree with LGE.  |
| Apple | Yes | LGE TP is better.  |

**Summary of Q6**

All companies agree that the description of PH i field needs to be clarified. One company suggest a different way for the change text, and ZTE accept this.

Therefore, it is propsed that RAN2 agree that the field description of PH i field is modified to clarify that the association between srs-Resourceset and PH i field is only available for the type 1 PH value.

**Proposal 6. RAN2 agree that the field description of PH i field is modified to clarify that the association between srs-Resourceset and PH i field is only available for the type 1 PH value as follows.**

* Power Headroom i (PH i): This field indicates the power headroom level, where PH 1 is associated with the *SRS-ResourceSet* with a lower *srs-ResourceSetId* and PH 2 is associatedd with the SRS-ResourceSet with a higher *srs-ResourceSetId*. PH 1 and PH 2 are present if two values of the Type 1 PH are obtained as specified in clause 5.4.6, otherwise only PH 1 field is present. PH fields for a Serving Cell are included in ascending order based on i.

# 3. Conclusion

Based on discussion of [AT127][006][R17 UP] PHR for mTRP, RAN2 made proposals as follows:

**Proposal 1. RAN2 agree with the change text proposed in R2-2407565 as follows.**

* **6> obtain two values of the Type 1 ~~or the value of Type 3~~ power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell.**
* **7> obtain the value of the type 1 power headroom of the reference PUSCH transmission associated with the SRS-ResourceSet with a lower SRS-resourceSetID ~~or the value of the type 3 power headroom~~ for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213[6] for NR Serving Cell.**

**Proposal 2. For R17, RAN2 is encouraged to submit CRs for the new UE capability in the next meeting, based on the conclusion of the new UE capabilitiy discussion.**

**Proposal 3. RAN2 discuss further whether to introduce a new UE capability indicating whether the UE can report Type 3 PH value or not.**

**Proposal 4. RAN2 agree with removing Type 2 PH2 field for SpCell in PHR for mTRP MAC CE and the changed PHR MAC CE format for mTRP proposed in R2-2407565.**

**Proposal 5. RAN2 agree with the text proposed in R2-2407565 as follows.**

* It has a variable size, and includes the bitmaps, a Type 2 PH field and an octet containing the associated PCMAX,f,c field (if reported) for SpCell of the other MAC entity, one or multiple~~a~~ Type 1 PH field~~s~~ and an octet containing the associated PCMAX,f,c field (if reported) for the Pcell.

**Proposal 6. RAN2 agree that the field description of PH i field is modified to clarify that the association between srs-Resourceset and PH i field is only available for the type 1 PH value as follows.**

* Power Headroom i (PH i): This field indicates the power headroom level, where PH 1 is associated with the *SRS-ResourceSet* with a lower *srs-ResourceSetId* and PH 2 is associatedd with the SRS-ResourceSet with a higher *srs-ResourceSetId*. PH 1 and PH 2 are present if two values of the Type 1 PH are obtained as specified in clause 5.4.6, otherwise only PH 1 field is present. PH fields for a Serving Cell are included in ascending order based on i.

# 4. Reference

1. R2-2407565 Correction on PHR for mTRP PUSCH repetition LG Electronics Inc., Ericsson
2. R2-2407564 Discussion on PHR for mTRP PUSCH repetition LG Electronics Inc., Ericsson
3. R2-2407432 Clarification On PHR and PHR MAC CE for mTRP ZTE Corporation, Samsung, Nokia, CATT, Apple