**3GPP TSG-RAN WG2 Meeting 110-e R2-2005905**

**Online, 1st – 12th Jun, 2020**

Agenda Item: 6.8.2.4

Source: Huawei, HiSilicon

Title: [AT110-e] [Offline-618][POS] MAC proposals (Huawei)

Document for: Discussion, Decision

# Introduction

In RAN2#110-e, the following two documents have been provided for the tdocs submitted under agenda item 6.8.2.4 that are considered should be discussed.

[1] [R2-2004636](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202006%20-%20RAN2_110-e,%20Online\Extracts\R2-2004636%20MAC%20CE.docx), Discussion and corrections for MAC CE Design for Positioning, Ericsson discussion Rel-16

[2] [R2-2005211](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202006%20-%20RAN2_110-e,%20Online\Extracts\R2-2005211_(38321%20PHR%20corrections).docx), Corrections to Power Headroom Reporting for SRS for positioning Qualcomm Incorporated discussion

The following way-forward with an email discussion was agreed during online

* [AT110-e][618][POS] MAC proposals (Huawei)

Scope: Discuss the proposals in the MAC papers (R2-2004636, R2-2005211) and incorporate agreeable conclusions into the MAC CR.

Intended outcome: Agreeable CR, update of R2-2005087 (in R2-2005905)

Deadline: Wednesday 2020-06-10 1000 UTC

In this email discussion, we progress based on the agreement online.

# Discussions

## 2.1 SP Positioning SRS activation/deactivation MAC CE

In [1], the relationship between SP positioning SRS (de-)activation MAC CE with supplementary uplink is discussed. In MAC CE design apart from normal UL, Supplementary Uplink has been specified to be supported for UL SRS configuration for positioning. The SRS configuration may be switched from SUL to NUL or vice-versa. This has not been as such taken into account or not discussed if it is supported for positioning context or not.

From MAC specification below is mentioned.

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| --- |
| SUL operation The Supplementary UL (SUL) carrier can be configured as a complement to the normal UL (NUL) carrier. Switching between the NUL carrier and the SUL carrier means that the UL transmissions move from one carrier to the other carrier, which is done by:  - an indication in DCI;  - the Random Access procedure as specified in clause 5.1.1.  If the MAC entity receives a UL grant indicating an SUL switch while a Random Access procedure is ongoing, the MAC entity shall ignore the UL grant.  The Serving Cell configured with supplementaryUplink belongs to a single TAG. |

Thus in order to support this, gNB has to inform the LMF that a switching will occur in advance. This is not currently discussed in RAN2. Due to limited time left, it is good to omit SUL impact in Rel-16 for positioning.

Thus, [1] proposed ***not to support uplink carrier indication for supplementary/normal uplink in SP positioning SRS activation/deactivation MAC CE***. Companies are encouraged to provide opinions on the above proposal

Q1: Do companies agree that SP positioning SRS activation/deactivation MAC CE should not include the indication for uplink carrier?

|  |  |  |
| --- | --- | --- |
| Companies | Y/N | Comments |
| Ericsson | Y | RAN2 has not studies the full impact of SUL/NUL carrier switching. It is good to discuss this in Rel-17 and postpone the support of SUL configuration/indication via MAC CE in this release. |
| vivo | N | SUL is by default supported in MAC, we didn’t see any reason to remove those implementations. |
| Qualcomm | N | I understand RAN1 has agreed that carrier switching SRS for positioning is not supported in Release 16. However, I understand this agreement is related to switching for a carrier that does not have UL carrier at all; not between UL of different carriers. Given that this is already in the specification, it may be better to keep it. |
| Huawei, HiSilicon | N | The SUL/NUL switching is only applicable for PUSCH/PRACH. For PUSCH, SUL/NUL indicator in DCI content indicate the UL carrier to transmit PUSCH; for PRACH, the UE selects the UL carrier by comparing the RSRP with configured threshold.  For PosSRS, the above mentioned issue is not relevant. posSRS will be transmitted as long as it is configured/activated on a certain UL carrier. |
| CATT | N | No need to modify the current spec. |
| Nokia |  | If the use of SUL or NUL is transparent to LMF and is handled only at RAN level, then it is fine to support SUL in Rel-16. But it is not clear why gNB has to inform the LMF that a switching will occur in advance. If indeed such knowledge is required at the LMF then we have not discussed the impacts of supporting SUL very well in RAN2. If more discussion is required about such signalling from gNB to LMF then it is better to postpone support of SUL to Rel-17. |
| OPPO | N | We can follow the current spec to support SUL/NUL switching. |

Spatial relations are to provide alignment between UL and DL resource to facilitate UE UL transmission in desired direction especially for FR2 scenario. Spatial relations are instructions/recommendations that UE should follow but it is not a requirement that UE must follow.

Spatial relations are not needed for FR1 scenario. Alike in LTE, UE may transmit the UL SRS towards serving cell to minimize interference and the eighbour TRP performs the measurement (RTOA).

Similarly, in some confined/controlled area (Factory, indoor I-IOT), where TRPs are located close by, it could be enough to transmit the SRS without the need of spatial relations.

In RRC, spatial relations are OPTIONAL, the MAC CE design should also follow the same. It should be possible to activate/deactivate Semi-Persistent SRS configuration without having to include the spatial relations.

Thus, [1] proposed that *spatial relation is OPTIONAL in MAC CE design. Use one of the reserved bits to indicate presence/absence of spatial relations. By default, bit 0 may indicate the spatial relation is present, while when the bit is 1 the spatial relation is absent.*

Companies are encouraged to provide opinions on the above proposal

Q2: Do companies agree that SP positioning SRS activation/deactivation MAC CE should optionally contain indication of spatial relations?

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| --- | --- | --- |
| Companies | Y/N | Comments |
| Ericsson | Y | Spatial Relation should be optional. Save MAC CE signalling by indicating presence/absence. |
| Vivo | Y |  |
| Qualcomm | Y | The argumentation sounds sensible. However, the same argumentation seems applicable to the MAC CE for “normal” SRS as well. So I wonder why it not optional for “normal” SRS? |
| Huawei, HiSilicon | N | The same issue also exists for R15 MAC CE and RAN2 choses not to resolve the issue. |
| CATT | Y |  |
| Nokia | Y | We are fine with making the configuration of spatial relation using MAC CE signalling optional like the configuration of spatial relations using RRC signalling. |
| OPPO | N | The current MAC CE with explicit spatial relation indication is fine. |

DL PRS is also one of the candidates for the spatial relations for UL SRS. DL PRS is associated with UE specific TRP ID, PRS Resource Set and PRS Resource ID. For Positioning, the spatial relations are prepared based upon UE measurement report obtained in positioning method such as NR ECID. Given a UE specific TRP ID and DL PRS Resource set, UE knows and can judge which is the best neighbor beam to orient its UL SRS transmission. UE can identify the DL PRS resource received with strongest power or fastest arrival time from a given DL PRS Resource set.

If the DL PRS Resource ID is Optional then in scenarios where NW is not able to identify the best beam (example if UE’s orientation is changing rapidly), and it will allow to save one octet in MAC CE design by not including it and letting UE select the best beam.

Thus, [1] proposed that *DL PRS Resource ID is OPTIONAL in MAC CE design. Use one of the reserved bits to indicate presence/absence of DL PRS Resource ID. By default, bit 0 may indicate the DL PRS Resource ID is present, while when the bit is 1 the DL PRS Resource ID is absent.*

Companies are encouraged to provide opinions on the above proposal

Q3: Do companies agree that SP positioning SRS activation/deactivation MAC CE should optionally contain indication of DL PRS resource ID?

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| --- | --- | --- |
| Companies | Y/N | Comments |
| Ericsson | Y | DL PRS Resource ID can be optional as UE can identify the resource ID based upon TRP ID and Resource Set. It will save MAC CE signalling. |
| vivo | Y |  |
| Qualcomm | N (for consistency) | Also the SSB Index is mandatory for a PCI. Why should the DL PRS Resource ID then changed to optional? If the argumentation is valid, it should apply to all RSs. |
| Huawei, HiSilicon | Y | We have agreed in RRC that DL PRS can be optional.  DL-PRS-Info-r16 ::= SEQUENCE {  trp-Id-r16 INTEGER (0..255),  dl-PRS-ResourceSetId-r16 INTEGER (0..7),  dl-PRS-ResourceId-r16 INTEGER (0..63) OPTIONAL -- Need R  }  If this field is not configured, there is no need to indicate the PRS resource id in the MAC CE. For us this is a new issue. |
| CATT | Y |  |
| Nokia | Y | Isn’t the DL PRS Resource ID included only if the spatial relation configuration is signalled in MAC CE? If this is the case, then it is fine to optionally include the DL PRS resource ID. |
| OPPO | N |  |

## 2.2 PHR MAC CE and Positioning SRS

Power Headroom Reporting (PHR) is specified in TS 38.321, clause 5.4.6. Type 3 power headroom is related to SRS transmission per activated Serving Cell.

The PHR reporting procedure requires a PHR to be triggered when the pathloss on the current pathloss reference differs from the pathloss measured on the pathloss reference in use at the time of the previous PHR. Specifically, the TS 38.321, clause 5.4.6 text is as follows [1]:

|  |
| --- |
| A Power Headroom Report (PHR) shall be triggered if any of the following events occur:  - *phr-ProhibitTimer* expires or has expired and the path loss has changed more than *phr-Tx-PowerFactorChange* dB for at least one activated Serving Cell of any MAC entity which is used as a pathloss reference since the last transmission of a PHR in this MAC entity when the MAC entity has UL resources for new transmission;  NOTE 1: The path loss variation for one cell assessed above is between the pathloss measured at present time on the current pathloss reference and the pathloss measured at the transmission time of the last transmission of PHR on the pathloss reference in use at that time, irrespective of whether the pathloss reference has changed in between. |

Rel-16 Positioning introduced new pathloss-references from non-serving cells. The procedure as defined above implies that pathloss as measured using these new pathloss references could also cause PHR to be triggered. Further, as per NOTE 1 above, PHR may be triggered even due to change of pathloss as measured between pathloss-references from different cells (a serving cell and a nonserving cell). This leads to unnecessary triggering of PHR, because the pathlosses of serving and nonserving cells may be very different, and this doesn’t necessarily indicate a significant change in available transmit power at the UE.

Therefore, [2] proposes that ***the pathloss references configured by pathlossReferenceRS-Pos should be excluded from the triggering of PHR***. [2] also pointed out that this is in agreement with the RAN1#100bis-e:

Conclusion:

For release 16, type3 PHR based on SRS for positioning is not supported.

Companies are encouraged to provide opinions on the above proposal

Q4: Do companies agree that PHR should not be triggered when pathloss reference for positioning SRS has changed more than *phr-TxPowerFactorChange*?

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| --- | --- | --- |
| Companies | Y/N | Comments |
| Ericsson | Y | We agree with the motivation |
| vivo | Y |  |
| Qualcomm | Y | It may create confusion otherwise. |
| Huawei, HiSilicon | Y | We agree that there is no need to trigger the PHR when the pathloss exceeds the configured threshold. Even if the PHR is triggered, the calculation of PH does not take into account posSRS. |
| CATT | Y |  |
| Nokia | Y | We have not discussed PHR reporting impacts for positioning. So, it is good to clarify the PHR reporting for positioning. If the decision is to not trigger PHR for pathloss reference defined for positioning SRS, we are fine with it. |
| OPPO | N | PHR is still needed for serving cell to know the power budget since pathloss reference for neighbour cell also occupy UE power. |

# Conclusion

In this email discussion, we progress based on the result of the online discussion during R2#110-e and propose the following:

# Text Proposal