3GPP TSG-RAN WG4 Meeting #95-e R4-2008618

Electronic Meeting, 25th May – 5th June, 2020

**Agenda item: 6.11.2**

**Source: Samsung**

**Title: WF on NR eMIMO RRM Requirement**

**Document for: Approval**

# **1 Background**

Rel-16 NR eMIMO WI (i.e., Enhancements on MIMO for NR) is a RAN1 leading WI with below major enhancement in RAN1 area which has potential RRM requirement impact in RAN4:

* Enhancements on multi-beam operation
  + DL/UL beam indication with reduced latency and overhead
  + Beam failure recovery for SCell
  + L1-SINR measurement

This WF is used to capture further agreements from RAN#95.

# **2 Agreement from RAN4#95 Chairman Notes after 1st Round**

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| **Topic #1: L1-SINR Measurement**  Issue 1-1-1: For SSB/CSI-RS-based CMR+IMR, the sharing factor P  Agreement:  For SSB/CSI-RS-based CMR+IMR L1-SINR measurement:   * + No requirement when CMR or IMR is fully overlapped with MG.   + The variable P used for defining L1-SINR measurement period could can be defined as the maximum value between PCMR and PIMR, where     - PCMR is the scaling factor for CMR according to the principles of defining variable P for L1-RSRP measurement.     - PIMR is the scaling factor for IMR according to the principles of defining variable P for L1-RSRP measurement.   Issue 1-1-2: Extend single carrier requirement to CA  Agreement:  For extending single carrier requirement to CA for L1-SINR measurement:   * + Follow the conclusion from extending single carrier requirement to CA for L1-RSRP measurement in Rel-15 TEI.   Issue 1-2-2: For SSB-based CMR+IMR, “repetition = ON” field of IMR  Agreement: For SSB-based CMR+IMR with NZP IMR configured with “repetition = ON”:   * + No measurement period requirement shall be applied.   **Topic #2: SCell Beam Failure Recovery**  Issue 2-1-1: BFD/CBD Sharing factor for FR1 inter-band CA  Agreement:  BFD/CBD Sharing factor for FR1 inter-band CA:   * + The sharing factor is proportional to the number of bands on which UE is performing BFD/CBD only for SCell.   Issue 2-1-3: Sharing factor for BFD/CBD measurement on PCell/PSCell  Agreement  Sharing factor for BFD/CBD measurement on PCell/PSCell:   * + No scaling factor is introduced for BFD/CBD measurements on PCell/PSCell.   Issue 2-2-1: How the requirement for beam failure recovery request should be defined  Agreement  The requirement for beam failure recovery request is defined as:   * + After detecting beam failure in an SCell, UE is required to transmit scheduling request on PUCCH configured for SR for BFR within a period T, where     - T = T1 x Ceil((T2 + D) / T1),       * T1 is equal to the periodicity of PUCCH configured with *schedulingRequestForBFR*.       * T2 is the time to perform the candidate beam detection T2 = TEvaluate\_CBD.         + TEvaluate\_CBD is the evaluation period for candidate beam detection specified in TS38.133 8.5.5 and 8.5.6.       * D is the UE Processing time.   **Topic #3: DL/UL Beam Indication with Reduced Latency and Overhead**  Issue 3-1-1: The necessity of new RRM requirement for MAC-CE based spatial relation update for aperiodic-SRS  Agreement  The necessity of new RRM requirement for MAC-CE based spatial relation update for aperiodic-SRS:   * + No new RRM requirement is introduced for the feature of MAC-CE based spatial relation update for aperiodic SRS.   **Topic #4: Multi-TRxP Transmission**  Issue 4-2-1: For FR1 Intra-band CA, whether or not the same conclusion as intra-band EN-DC can be applied  Agreement  For FR1 Intra-band CA, RRM MRTD requirement impact due to enabling multi-TRxP transmission in Rel-16:   * + RAN4 apply the same conclusion as intra-band EN-DC. |

# **3 Way Forward**

3.1 L1-SINR Measurement

##### 3.1.1 “Repetition” field of NZP-IMR Not Present:

* **For L1-SINR measurement with dedicated configured NZP-IMR, the expected UE behavior if NZP-IMR is not configured with “repetition” field:**
  + In RAN4 requirement, the FR2 scaling factor N is defined only based on CMR configuration.
  + In RAN4 requirement, there is no need to specify the expected UE behavior/requirement if NZP-IMR is not configured with “repetition” field, because the expected UE behavior is already specified in RAN1 and RAN2 specification.

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| **Company** | **Comments** |
| Moderator | Companies from both sides should be okay with this proposal, since what I can observed is both sides are trying to interpret RAN1/2 specification by believing RAN1/2 specification is the basis for expected UE behavior. If both sides believe RAN1/2 specification is clear enough, then why RAN4 needs to specify requirement by repeating that.  On the other hand, if it is RAN4 consensus that RAN1/2 relevant requirement is not clear or not consistent, we need to send LS to ask RAN1/2 to clarify or correct that.  To make progress, I suggest the following tentative agreement as compromise solution as above. |
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##### 3.1.2 Scheduling Restriction

* **Scheduling restriction due to L1-SINR measurement**
  + The scheduling restriction due to L1-SINR shall be based on the framework of scheduling restriction due to Rel-15 L1-RSRP measurement.

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| **Company** | **Comments** |
| Moderator | Considering it is the last meeting for Rel-16 core part, it is better to collect more views especially for the scheduling restriction section contained in CR (R4-2006371), which is based on framework of scheduling restriction due to Rel-15 L1-RSRP measurement. Therefore, propose the following tentative agreement, and “FFS” part in above proposal 1 can be reflected in CR view-collection. |
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3.2 SCell Beam failure recovery

##### 3.2.1 BFD and CBD on SCell

* **BFD/CBD Sharing factor for FR2 inter-band CA and FR1-FR2 CA**
  + Option 1: The sharing factor is proportional to the number of bands on which UE is performing BFD/CBD only for SCell.
  + Option 2: Define sharing factor as:
    - In FR2 inter-band CA, the sharing factor shall be the number of bands which not contained SpCell, subject to UE is required to perform BFD/ CBD measurement on one cell per band.
      * Define an active “band groups for BFD/CBD” as a set of active bands whose BFD-RS(s)/CBD-RS(s) can be received by the UE through a common Rx beam
      * UE needs to meet BFD-RS/CBD-RS evaluation requirements for only one active band within the active “BFD band group”/” CBD band group”
      * Scaling factor of BFD-RS/CBD-RS evaluation period during FR2 inter-band CA with common beams is equal to the number of active “BFD band groups”/” CBD band groups”.
    - In FR1+FR2 CA, sharing factor shall be introduced, and the sharing factors is the sum of the sharing factor of FR1 and the sharing factor of FR2.

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| **Company** | **Comments** |
| Moderator | In 2nd round discussion, RAN4 need to discuss Option 2 in details to see the introduced RAN1 feature/mechanism can be used and how NW/UE are aligned with the band group information.  Since Huawei as Option 1’s supporter already give CR with text proposal to implement it, it is better Option 2’s supporting companies can also give text proposal to implement Option 2.  To address companies’ comment that it is the in-parallel discussion with FR2 RRM enhancement, as Moderator, we think it is still separate discussion. For Option 1, it is a feasible solution which is compatible with the Rel-16 introduced band group concept in RF session. |
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##### 3.2.2 SCell Beam Failure Recovery Request

* **UE Processing time, D:**
  + Option 1: D = 0, i.e., UE processing time is not necessary in this case.
  + Option 2: Other options.

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| **Company** | **Comments** |
| Moderator | Further view collection and discussion in this meeting. |
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3.3 DL/UL Beam Indication with Reduced Latency and Overhead

##### 3.3.1 RRM requirement impact to enable multi-TRP transmission

* **The necessity of new RRM requirement for MAC-CE based Pathloss RS activation**
  + Option 1: The agreed UE behavior and requirements for MAC-CE based pathloss RS activation when an activated pathloss RS is not being maintained shall be specified in TS 38.133.
  + Option 2: Follow existing agreement from RAN4 chairman notes, as below:

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| < RAN4#92bis Chairman Notes>   * No RAN4 impact has been identified due to newly introduced   + Mechanism of updating pathloss RS for PUSCH/SRS via MAC-CE.   + Mechanism of simultaneous spatial relation update for multiple PUCCH resources with one MAC-CE.   + Default spatial Relation for PUCCH/SRS in FR2. |

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| **Company** | **Comments** |
| Moderator | Further discussion in this meeting. |
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* **How to capture new RRM requirement for MAC-CE based Pathloss RS activation (if any)**
  + If the necessity of new requirement is confirmed (in the discussion on the above listed issue), there are options proposed for how to capture new RRM requirement:
    - Option 1: in Rel-16 TEI.
    - Option 2: in Rel-17 scope.
    - Option 3: in Rel-16 eMIMO WI.
    - Option 4: No new requirement needed at all.

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| **Company** | **Comments** |
| Moderator | Further discussion in this meeting. |
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3.4 Multi-TRxP Transmission

##### 3.3.1 RRM requirement impact to enable multi-TRxP transmission

* **“Co-located deployment assumption” and its impact on multi-TRxP transmission**
  + After “For intra-band EN-DC, only co-located deployment is applied.”, the explanatory sentence is added in Rel-16 specification: “For multi-TRxP transmission used in NR PSCell or NR SCell, co-located deployment is applied which shall require LTE eNodeB to be co-located deployed with at least one TRxP for this NR cell”.
  + RAN4 confirm that the existing MRTD/MTTD requirements for synchronous intra-band EN-DC can be applied if multi-TRxP transmission used in NR PSCell or NR SCell.
    - FFS the reference timing of each multi-TRxP enabled carrier to find MRTD/MTTD in EN-DC scenarios.

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| **Company** | **Comments** |
| Moderator | By considering the concerns from both sides, moderator suggest the group to discuss the compromise solution as above.  If the above compromise solution is not acceptable to the group, Moderator may like to suggest the group to consider the other option, i.e., sending LS to RAN1 for clarification. |
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# **4 Reference**

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| R4-2006205 | Discussion on requirements for L1-SINR measurements | Apple | discussion |
| R4-2006370 | Discussion on L1-SINR Measurement Requirement | Samsung | discussion |
| R4-2006371 | CR to TS38.133 on introduction of L1-SINR Measurement Requirement (Section 3.3 and 9) | Samsung | CR |
| R4-2006864 | Discussion on RRM requirements for L1-SINR | MediaTek inc. | discussion |
| R4-2007483 | RRM requirements for L1-SINR estimation | Qualcomm | discussion |
| R4-2007767 | Discussion on L1-SINR measurement requirements for NR eMIMO | Huawei, HiSilicon | discussion |
| R4-2007768 | Discussion on L1-SINR measurement accuracy for NR eMIMO | Huawei, HiSilicon | discussion |
| R4-2007769 | DraftCR on L1-SINR measurement accuracy requirements | Huawei, HiSilicon | draftCR |
| R4-2008091 | Discussions on Rel-16 NR eMIMO L1-SINR measurements | Nokia, Nokia Shanghai Bell | other |
| R4-2006372 | Discussion on SCell Beam Failure Recovery RRM Requirement | Samsung | discussion |
| R4-2006373 | CR to TS38.133 on introduction of SCell BFD and CBD (Section 8.5) | Samsung | CR |
| R4-2006374 | CR to TS38.133 on introduction of SCell BFRQ Procedure (Section 8.5) | Samsung | CR |
| R4-2006865 | Discussion on RRM requirements for BFR on SCell | MediaTek inc. | discussion |
| R4-2007378 | BFRQ on SR-like PUCCH resource | Ericsson | discussion |
| R4-2007379 | Draft CR: Correction of SCell BFRQ Procedure (Section 8.5) | Ericsson | draftCR |
| R4-2007484 | SCell Beam Failure Detection and Recovery | Qualcomm | discussion |
| R4-2007770 | Discussion on SCell BFD and CBD requiremetns for NR eMIMO | Huawei, HiSilicon | discussion |
| R4-2007771 | CR on SCell BFD and CBD requirements | Huawei, HiSilicon | CR |
| R4-2006375 | Discussion on MAC-CE based spatial relation update for aperiodic SRS | Samsung | discussion |
| R4-2006065 | Discussion on applicable timing for the unknown PL RS activated by MAC-CE | ZTE Corporation | discussion |
| R4-2006206 | Discussion on RRM requirements for Multi-TRP | Apple | discussion |
| R4-2006376 | Discussion on MRTD/MTTD requirement to Enable Multi-TRP Transmission | Samsung | discussion |
| R4-2006377 | CR to TS38.133 on introduction of multi-TRP transmission (Section 7.5 and 7.6) | Samsung | CR |
| R4-2006866 | Discussion on MRTD for multiple TRPs scenario | MediaTek inc. | discussion |
| R4-2006867 | Discussion on PL RS activation requirement via MAC CE | MediaTek inc. | discussion |
| R4-2006868 | CR for introduction of pathloss reference signal switching delay | MediaTek inc. | CR |
| R4-2007380 | MRTD/MTTD requirements for Multi-TRP deployment for MIMO+CA and MIMO+DC | Ericsson | discussion |
| R4-2007485 | MRTD/MTTD in CA/DC with multiple TRPs | Qualcomm | discussion |
| R4-2007772 | Discussion on MRTD and MTTD requirements for multi-TRP transmissions | Huawei, HiSilicon | discussion |
| R4-2008092 | Discussions on Rel-16 NR eMIMO multi-TRP transmissions | Nokia, Nokia Shanghai Bell | other |