**3GPP TSG-RAN WG4 Meeting #104bis-eR4-221xxxx**

Electronic Meeting, October 10 – 19, 2022

**Title:** **WF on FeMIMO RRM requirements for inter-cell beam management**

**Source:** **Huawei, HiSilicon**

**Agenda item: 4.5.1**

**Document for: Approval**

# Introduction

This contribution is to capture the agreements for the email discussion for Rel-17 FeMIMO RRM in RAN4 #104bis-e meeting.

# Way-forward

## Sub-topic 2-1: Sharing factor

**Issue 2-1-1 Sharing factor design**

* Proposals:
  + Proposal 1(Intel, Huawei, vivo, Apple):
    - Remove the bracket in the corresponding CR.
  + Proposal 2(Ericsson, MTK):
    - RAN4 to agree following sharing factor for CDP
* For FR1:
  + PCDP= Ntotal\_CDP / Noutside\_MG\_CDP
* For FR2:
  + if Navailable,SSB\_CDP\_SMTC\_MG = 0,
    - If measurement occasions of SSB CDP is also used for L3 measurements which are measured outside gap, then PCDP = Psharing SMTC \* Psharing SSB \* Ntotal\_CDP / Noutside\_MG\_CDP
    - Else, PCDP = Psharing SSB \* Ntotal\_CDP / Noutside\_MG\_CDP
    - Where, Psharing SSB = N, where N is the number overlapping SSB from different cells.
  + If Navailable,SSB\_CDP\_SMTC\_MG ≠ 0
    - PCDP = Psharing SSB \* Ntotal / Navailable,SSB\_CDP\_SMTC\_MG
    - RAN4 to agree following sharing factor for SC
* For FR1:
  + PSC= Ntotal\_SC / Noutside\_MG\_SC
* For FR2:
  + if Navailable,SSB\_SC\_SMTC\_MG = 0,
    - If measurement occasions of SSB CDP is also used for L3 measurements which are measured outside gap, then PSC = Psharing SMTC \* Psharing SSB \* Ntotal\_SC / Noutside\_MG\_SC
    - Else, PSC = Psharing SSB \* Ntotal\_SC / Noutside\_MG\_SC
    - Where, Psharing SSB = N, where N is the number overlapping SSB from different cells.
  + If Navailable,SSB\_SC\_SMTC\_MG ≠ 0
    - PSC = Psharing SSB \* Ntotal\_SC / Navailable,SSB\_SC\_SMTC\_MG

Collect companies’ view in 2nd round

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| **Company** | **Comments** |
| Ericsson | We think option 2 has better forward compatibility. Moreover, Rel-17 sharing factors in MG work item are captured using option 2 framework. We should follow one approach for all the sharing factors design of Rel-17. |
| Intel | Support option 1.  We prefer to re-use the legacy spec structure as much as possible for easy understanding, re-use legacy P factor as much as possible.  For forward compatible, the similar method can be extended to more than 2 cells. Since we already have sharing factor between two cells, the available occasion outside MG and SMTC for the two cells can be calculated by applying the sharing factor first. Then considering the sharing between the available occasions with the 3rd cell.  Please also note that when cell number is more than two, the possible measurement occasion for each cell will be further reduced, the delay will be greatly increased, some constraints may need further discussion. |
| Samsung | We are fine with option 1. |
| vivo | Option 1 is preferred.  For R17 measurement gap related, it can be further discussed in issue 2-3. |

## Sub-topic 2-2: Scheduling Restriction

**Issue 2-2-1 Scheduling restriction for dynamic TDD**

* Proposals:
  + Proposal 1(Apple, Ericsson):
    - RAN4 need not discuss the scheduling restriction for dynamic TDD as its already captured in RAN1 specification.
  + Proposal 2(vivo):
    - Do not introduce scheduling restriction for dynamic TDD when L1-RSRP measurement on cell with different PCI overlaps with serving cell UL slots. Clarify longer L1 measurement delay is expected for this case.
  + Proposal 3(MTK, ZTE, Samsung):
    - Introduce scheduling restriction for dynamic TDD on serving cell UL symbols which fully or partially (because of TA) overlaps with the SSB for L1-RSRP measurement on cell with different PCI.
  + Proposal 3a(Samsung, ZTE):
    - Introduce scheduling restriction for dynamic TDD when L1-RSRP measurement on the cell with different PCI. It is enough to add the scheduling restriction on 1 symbol before SSB and one symbol after SSB.
  + Proposal 3b(ZTE,Samsung):
    - For the scheduling restriction due to L1-RSRP measurement on cell with different PCI, reusing the scheduling restriction due to L1-RSRP measurement on serving cell is fine. Whether the adjacent symbol before and after SSB should be restricted, which should be aligned with the specification for L1-RSRP measurement on serving cell.

Collect companies’ view in 2nd round

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| **Company** | **Comments** |
| Apple | Options 3, 3a, 3b are in favor of introducing scheduling restriction.  RAN1 spec 38.213:    In RAN1 spec, there is no additional 1 symbol scheduling restriction due to TA. Hence we think option 3a would be the best option and we support it.  Could MTK please clarify with option 3 what would be the scheduling restriction taking into account TA? Isn’t 1 symbol before and after SSB sufficient? |
| Ericsson | Option 1 |
| ZTE | Prefer Option 3, 3a, 3b. |
| Samsung | Support option 3/3a. |
| vivo | We do not think RAN4 can proceed with unclear RAN1 spec. RAN1 will discuss the corresponding maintenance in their next meeting. RAN4 can further discuss the issue in the future meeting. |

**Issue 2-2-2: Whether to define scheduling restriction for non-serving cell**

* Agreements
  + Not to define scheduling restriction for non-serving cell

## Sub-topic 2-3: Applicability of ICBM feature

**Issue 2-3-1 Applicability of ICBM feature**

* Proposals:
  + Proposal 1(Apple, MTK, Ericsson, Samusng, Intel, Huawei):
    - RAN4 not extend ICBM requirements for concurrent R17 Wis in Release 17. It can be postponed to further release.
  + Proposal 2(vivo, CMCC):
    - Confirm that R17 requirements for inter-cell L1 measurements can be applicable to FR1 HST. The square brackets related to FR1 HST should be removed.
    - Confirm that R17 requirements for inter-cell L1 measurements can be applicable to FR2 HST, with the assumption that only one active UE panel is used.
    - Clarify in TS 38.133 that there is no R17 requirements when inter-cell L1 measurements and R17 enhance gap related features are configured simultaneously to one UE.

Collect companies’ view in 2nd round

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| **Company** | **Comments** |
| Apple | Support option 1.  We need further discussion on extending ICBM to R17 HST for FR1 and FR2 and don’t support it at this stage. |
| Ericsson | Option 1 |
| ZTE | Fine with Proposal 1. |
| Samsung | Support option 1. |
| vivo | Support option 2.  FR1 HST is R16 feature.  Moreover, we think both FR1 and FR2 HST are important scenario for R17 ICBM. There is no big technical issue for supporting them. |

## Sub-topic 2-4: SSB and PDCCH/PDSCH are overlapped on the same RE

**Issue 2-4-1: Whether any clarification or update is needed in RAN4 spec when SSB and PDCCH/PDSCH are overlapped on the same RE**

* Agreements
  + Whether to define the requirement of overlap between SSB and PDCCH/PDSCH in the same RE should wait for RAN1 conclusion.

## Sub-topic 2-5: Measurement restriction

**Issue 2-5-1 Measurement restriction for SSB based L1-RSRP**

* Proposals:
  + Proposal 1(Huawei):
    - The measurement restrictions are applied between SC SSB for RLM/BFD/CBD and CDP SSB for L1-RSRP.
    - The measurement restrictions are applied between CDP SSB for BFD/CBD and SC SSB for L1-RSRP.
  + Proposal 2(Ericsson, Intel):
    - Further study the possibility of sharing under some scenarios

Collect companies’ view in 2nd round

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| **Company** | **Comments** |
| Apple | We support option 1. |
| Ericsson | We support option 2 at present. |
| Intel | Support option 2.  In current spec, sharing between SSB L1-RSRP for cell and cell with different PCI has already been defined. However, it’s possible that SSB resource for RLM/BFD/CBD is configured for L1-RSRP measurement as well.  therefore, when SSB for L1-RSRP on serving cell is fully overlapped or partially overlapped with SSB for RLM/CBD/BFD for cell with different PCI, it is also the scenario that SSB for L1-RSRP on serving cell is overlapped with SSB for L1-RSRP for cell with different PCI.  we need to further discuss the issue depending on the overlap case. |
| Samsung | We are fine with option 2. |
| vivo | We think the key point of option 1 is to preclude using CDP SSB for RLM, which is technically correct. However, the wording is not clear enough. For example, it has not mentioned any measurement restriction on CSI-RS based L1 measurement when performing SSB-based BFD/CBD on CDP SSB. We think further study is needed.  Currently if different Rx beam is used, there are already measurement restrictions in the spec. The key is to extend the case when different Rx beam is assumed to be used by UE. The case when SSB from CDP is measured in BFD/CBD should be added.  Therefore, we think option 2 would be better at current stage. |

## Sub-topic 2-6: Applicability of FR 2-2

**Issue 2-6-1 Applicability of FR 2-2**

* Agreements
  + FR 2-2 is not applicable to R17 inter cell beam management.