**3GPP TSG-RAN WG4 Meeting #94-e R4-2002182**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item: 8.11.2**

**Source: Samsung**

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

**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#94-e.

# **2 Agreement from RAN4#94-E Chairman Notes after 1st Round**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Topic #1: L1-SINR Measurement**  Issue 1-1-1: Applicable condition(s) for one-shot L1-SINR measurement report for CMR only scenario:  Agreement: Applicable condition(s) for one-shot L1-SINR measurement report for CMR only scenario:   * M=1 shall be applied if   + aperiodic CSI-RS resource is configured for channel measurement, or   + periodic or semi-persistent CSI-RS resource is configured for channel measurement and higher layer parameter *timeRestrictionForChannelMeasurements* is configured.   Issue 1-3-1: L1-SINR measurement side condition for Es/Iot for CMR+ZP-IMR  Agreement: Es/Iot on CMR:   * + Option 1: SSB or CSI-RS Es/Iot >= -3dB and <=25dB   CRs/TPs   |  |  | | --- | --- | | **CR/TP number** | **Decision** | | R4-2000997 | Endorsed |   **Topic #2: SCell Beam Failure Recovery**  Issue 2-1-4: RS within a deactivated SCC is implicitly configured as the BFD-RS for another activated SCell  Agreement: UE is not required to perform BFD on RS within a deactivated SCC which is implicitly configured as the BFD-RS for another activated SCell  Issue 2-1-5: RS within an activated SCC is implicitly configured as the BFD-RS for another deactivated SCell  Agreement: UE is not required to perform BFD on RS within an activated SCC which is implicitly configured as the BFD-RS for another deactivated SCell.  Issue 2-1-7: RAN1 specification and RAN4 agreement mismatch for SSB-based BFD on SCell  Agreement: RAN4 revert previous agreement by only allowing CSI-RS based BFD for SCell,to align with RAN1 specification.  **Topic #3: DL/UL beam indication with reduced latency and overhead**  Issue 3-2: RAN4 RRM requirement impact due to MAC-CE based spatial relation update for aperiodic SRS  Conclusion: The decision on whether to define MAC-CE based spatial relationship update for AP-SRS should be made in ‘NR RRM core requirement enhancement WI’ scope. Postpone discussion in the scope of NR eMIMO WI scope and wait for respective conclusions. |

# **3 Agreements for Way Forward**

3.1 L1-SINR Measurement

##### 3.1.1 Measurement period for L1-SINR measurement:

* + *[Moderator] Ericsson is asked to check the possibility to compromise to above agreement based on majority view.*
  + *[Ericsson]* If the condition is when NW configures both *timeRestrictionForChannelMeasurements* and *timeRestrictionForInterferenceMeasurements*, we are ok to apply the same measurement time restriction for CMR and IMR.   
    In our understanding, this issue is talking about the case highlighted in yellow in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | CMR measurement restriction  (timeRestrictionForChannelMeasurement) | |
|  |  | Not configured | Configured |
| IMR measurement restriction  (timeRestrictionForInterferenceMeasurements) | Not configured | MCMR=3, MIMR=3 | MCMR=1, MIMR=1 |
| Configured | MCMR=1, MIMR=1 | MCMR=1, MIMR=1 |

* + *[Moderator2] Actually, our original intention is restrict NW configuration, rather than make sure the applicable UE behavior, which should be decided by next topic. Considering that, we are okay to remove the discussion for “restriction btw measurement time restriction on IMR and CMR”, but just focusing on next topic to make progress.*
* **Applicable condition(s) for one-shot L1-SINR measurement report for CMR+IMR scenario:**
  + M=1 shall be applied if
    - aperiodic CSI-RS resource is configured for interference measurement (for SSB-based CMR or aperiodic CSI-RS based CMR), or
    - periodic or semi-persistent CSI-RS resource is configured for channel and/or interference measurement and higher layer parameter timeRestrictionForChannelMeasurements or timeRestrictionForInterferenceMeasurements is configured.
  + *[Moderator] Ericsson is asked to check the possibility to compromise to above agreement based on majority view.*
  + *[Ericsson]* We are ok to set M=1 when higher layer parameter when *timeRestrictionForChannelMeasurements* **or** *timeRestrictionForInterferenceMeasurements* is configured.   
    On the other hand, we don’t understand the note ‘timeRestrictionForChannelMeasurements **and** timeRestrictionForInterferenceMeasurements shall both be configured’. It looks this note is not aligned with previous sentence.   
    We would like to clarify the cases highlighted in pink in the table above. We would like to hear the opinion on those cases.   
    For the progress, we propose to agree with the case highlighted in yellow, but FFS for cases highlighted in pink.
  + *[Moderator2] I suggest to remove the Note. So the description is exactly the same as your table. Hope it is okay to you. As we comment in previous point, it is okay for us to leave the requirement applicability rule as your table but left NW configuration possibility open.*
* **Measurement period for SSB-based CMR+IMR scenario:**
  + By following L1-RSRP measurement requirement and restricting CMR and IMR’s 1-to-1 mapping, measurement period requirements for FR1 and FR2 shall be defined as:

**Table x: Measurement period TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR for FR1**

|  |  |
| --- | --- |
| **Configuration** | **TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR (ms)** |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity~~, and it shall be in the CSI-RS resource set with “repletion=OFF”~~ | |

**Table y: Measurement period TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR for FR2**

|  |  |
| --- | --- |
| **Configuration** | **TL1-SINR\_Measurement\_Period\_SSB\_CMR\_IMR (ms)** |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity~~, and it shall be in the CSI-RS resource set with “repletion=OFF”.~~ | |

* + - FFS how to define the value of P, and whether or not a single P value for both CMR and IMR.
    - FFS the scaling factor N under different conditions of “repetition” field of IMR.
  + *[Moderator] We combine companies’ proposed Option 1/1a/1b/1c, and left FFS for P. Ericsson and Nokia is asked to check the possibility to compromise to above agreement based on majority view, especially considering Option 2 is contradicting to approved WF [R4-1915850].*
  + *[MTK] On note 2, it should clarify the CSI-RS resource is in the CSI-RS resource set with “repletion=OFF”. Because different SSB are implying different Tx beam from NW, hence the 1-to-1 mapping rule will be violated if NZP-IMR is configured as “repletion=ON”.*
  + *[Intel] If P is FFS, it seems that the P is the same for both CMR and IMR. Can network guarantee that the confliction of CMR and IMR with SMTC/MG are the same?*
  + *[Ericsson] We are ok to assume the same transmission periods of both CMR and IMR. However since we should not exclude the case NW configures different transmission period of CMR and IMR, we propose to revise the note 2 as follow:.* ”The requirements are applicable provided that the CSI-RS resource configured for interference measurement is 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.”
  + *[Moderator2] I try to solve everyone’s concern in the revised tentative agreement:* 
    - *To MTK: The intention of this tentative agreement is to make sure the requirement structure agreeable to the group, while for the detailed condition of “repetition = OFF/ON”, we have another topic to discuss. If we add your sentence here, it could be another discussion for the expected performance if this condition is not satisfied. I suggest have another bullet to solve your concern, and I think in the end, the issue of “repetition =ON/OFF” should be captured in N value’s condition…..*
    - *To Intel, I think the revision on the bullet of P can solve your concern.*
    - *To Ericsson, your comments are okay to us, and captured.*
* **Measurement period for CSI-RS-based CMR+IMR scenario:**
  + By following L1-RSRP measurement requirement and restricting CMR and IMR’s 1-to-1 mapping, measurement period requirements for FR1 and FR2 shall be defined as:

**Table x: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR for FR1**

|  |  |
| --- | --- |
| **Configuration** | **TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR (ms)** |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.  Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

**Table y: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR for FR2**

|  |  |
| --- | --- |
| **Configuration** | **TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR (ms)** |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.  Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.  Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity. | |

* + - FFS how to define the value of P, and whether or not a single P value for both CMR and IMR.
    - FFS the scaling factor N under different conditions of “repetition” field of CMR and IMR.
  + *[Moderator] Similar approach as the above SSB-based CMR+IMR scenario.*
  + [MTK] It should be noted that this measurement period only applies on the valid configurations of NZP-IMR/ZP-IMR, regarding the “repetition”, depending on the discussion of issue “NZP-IMR: “repetition = on”.
  + *[Ericsson] Same comments as SSB-based CMR+IMR scenario. We propose to revise note 2 as follows:* The requirements are applicable provided that the CSI-RS resource configured for interference measurement is 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.
  + *[Moderator2] Changed accordingly:* 
    - *To Ericsson: same change;*
    - *To MTK: same bullet is added for repetition field. Yes, requirements are applicable if configuration are valid, as all other requirements did. Whether and when some configuration is regarded as “invalid”, I assume companies are still not aligned as below discussion. Because of having that discussion, I initially don’t believe we have to repeat this thing in everywhere, but anyway.*
    - *To Intel: same bullet added for the value of P, although you don’t comment here….*
* **Side condition for measurement accuracy:**
  + Following previous meeting’s simulation assumption, i.e., -3dB for ideal SINR
    - For NZP-IMR: Side condition (SNR) on CMR and Side condition (INR) on IMR are both 0dB
    - For ZP-IMR: Side condition (SNR) on CMR are -3dB.
  + *[Moderator] MTK and Huawei is asked to check the above side condition, which follows previous meeting’s simulation assumption.*
  + *[MTK] we can comprise to the suggested agreement.*
  + *[Intel] please clarify for the side condition of CMR where SNR=0dB. Did interference transmitted on CMR and interference power is identical to that on the IMR? Or only useful signal and noise are transmitted on CMR?*
  + *[Huawei] we can comprise to the suggested agreements. However, we still want to point out that the L1-SINR measurement error includes two inputs, signal measurement error on CMR and interference measurement error on IMR. The interference measurement error on IMR is very small. So, the L1-SINR measurement error mainly depends on the signal measurement error on CMR. Obviously, the signal measurement with CMR SNR=0dB will show a better accuracy that with CMR SNR=-3dB.*
  + *[Moderator2] To MTK and Huawei, thanks for your compromise. To Huawei, I have the same understanding as you for the expected performance. To Intel, only useful signal are transmitted on CMR, so just useful signal and noise on CMR REs.*
* **Number of Samples for L1-SINR Measurement:**
  + M = [3] if single shot measurement is not applicable for CMR-only, SSB+NZP-IMR, SSB+ZP-IMR, CSI-RS+NZP-IMR and CSI-RS+ZP-IMR.
  + *[Moderator] The confusing wording “common accuracy requirement” is removed, and I assume the above bullet should be agreeable based on the 1st round feedback.*
* **Number of Scaling for FR2 (value of N)**
  + For the cases of CMR only,
    - the variable N can be defined as same as L1-RSRP.
  + For the case of CSI-RS+NZP-IMR, SSB+IMR, CSI-RS+ZP-IMR
    - FFS the variable N.
  + *[Moderator] Since some companies are questioning N value for CSI-RS+NZP-IMR, Moderator suggest the above tentative agreement to FFS N value for CSI-RS+NZP-IMR scenario.*
  + *[MTK] It needs more discussion, even for the case of SSB+IMR, CSI-RS+ZP-IMR,. E.g. for SSB+IMR, should the N follow SSB L1-RSRP, i.e. N=8, or it should follow CSI-RS L1-RSRP’s N factor? CMR only case is ok.*
  + *[Moderator2] To MTK, although our original tentative agreement follows your 1st round comment but just consider Huawei’s comment on CSI-RS+NZP-IMR case, anyway we are okay with your 2nd round comment. Btw, from Samsung’s understanding, we don’t see any reason why SSB+IMR should not follow N=8 and CSI-RS+ZP-IMR should not follow L1-CSI-RSRP requirement.*

##### 3.1.2 Measurement Restriction and Scheduling Availability

* **NZP-IMR: QCL indication**
  + For L1-SINR reporting with CMR + NZP-IMR configured in one CSI report, L1-SINR measurement requirements apply only if the NZP-IMR is not configured in another CSI report whose CMR is not Type-D QCLed; otherwise, longer measurement requirement is expected.
  + *[Moderator] Above tentative agreement is based on majority view.*
  + *[Moderator] Pre requested, we can clarify on option 1, i.e., NZP-IMR in 1st CSI report can be configured as either CMR in 2nd CSI report or NZP-IMR in 2nd CSI report. In both situations, CMRs in 1st and 2nd CSI reports shall be QCL-ed, otherwise long measurement requirement is expect. Therefore, Option 1 contains the 1st sub-bullet in Option 2. With this clarification, MTK is asked to check the possibility to compromise the above tentative agreement based on majority view.*
  + *[MTK] To confirm our understanding that if the CMRs in 2 CSI reports are SSBs, then it implies they are the same SSB (with the same SSB index)? If that is the correct understanding, the suggested agreement is fine for us.*
  + *[Moderator2] To MTK, yes your understanding is correct.*
* **NZP-IMR: “repetition = on”:** 
  + For CSI-RS configured as NZP-IMR in FR2, whether “repetition = on” is configurable:
    - Option-1: NZP-IMR can be configured with “repetition = off” or “repetition = on”:
      * The configuration of “repetition = on/off” is present only if its CSI-RS resource set is used for the other purpose than this L1-SINR measurement report;
      * RX beam for NZP-IMR for L1-SINR measurement shall always follow CMR, i.e., same RX filter shall be used.
    - Option-2: NZP-IMR can be configured with “repetition = off” or “repetition = on”:
      * CMR and NZP-IMR should be configured with the same repetition pattern.
      * CMR and NZP-IMR should not overlap in time domain if they are configured with “repetition = on”.
    - Option-3: Depending on scenarios (i.e., configuration restriction):
      * SSB based CMR and NZP-IMR with “repetition = ON” is error configuration;
      * SSB based CMR and NZP-IMR with “repetition = OFF” is correct configuration;
      * NZP CSI-RS based CMR with “repetition = ON” and NZP-IMR with “repetition = ON” is correct configuration;
      * NZP CSI-RS based CMR with “repetition = ON” and NZP-IMR with “repetition = OFF” is correct configuration;
      * NZP CSI-RS based CMR with “repetition = OFF” and NZP-IMR with “repetition = ON” is error configuration;
      * NZP CSI-RS based CMR with “repetition = OFF” and NZP-IMR with “repetition = OFF” is correct configuration.
  + *[Moderator] Consider the different views remains, we suggest to keep all suggested options open for further discussion in next meeting.*
* **ZP-IMR: “repetition = on”:** 
  + For CSI-RS configured as ZP-IMR in FR2, whether “repetition = on” is configurable:
    - Option-1: “Repetition” field should not be present for ZP-IMR’s CSI-RS resource set configuration.
    - Option-2: ZP-IMR CSI-RS shall only be configured with “repetition = off” in FR2.
  + *[Moderator] No big difference between Option 1 and Option 3, but depending on RAN1 and detailed RAN2 signaling design. Therefore we suggest to keep both options open for further discussion in next meeting.*
* **Measurement restriction between L1-SINR and L1-RSRP**
  + For CMR+IMR scenario, FFS when the measurement restrictions need to be applied between L1-SINR measurement and L1-RSRP measurements.
  + *[Moderator] FFS this issue.*
  + *[MTK] We support to FFS this issue.*
  + *[Ericsson] We support it to FFS in this meeting.*
  + *[Moderator2] Thanks and I think we are aligned on this.*

##### 3.1.3 Side condition and Others

* **L1-SINR measurement side condition for Es/Iot for CMR+NZP-IMR**
  + Es/Iot on CMR and NZP-IMR:
    - Option-1: Es/Iot >= -3dB and <=25dB
    - Option-2: Es/Iot >=0dB and <=25dB, and the resultant L1-SINR should also lie between -3 dB and 25 dB.
  + *[Moderator] FFS this issue by keeping both options open.*

3.2 SCell Beam failure recovery

##### 3.2.1 BFD on SCell

* **Necessity of BFD procedure on multiple serving cell on the same FR2 band**
  + No restriction introduced in RAN4. No RAN4 performance requirement will be defined for performing BFD measurement on more than 1 serving cell ~~per band~~.
  + *[Moderator] Based on the discussion for SCell BFR UE capability, seems no restriction is needed in RAN4 for multiple serving cell on the same FR2 band. On the other hand, majority companies’ view is no RAN4 performance requirement will be defined for more than 1 serving cell perform BFR procedure. In other words, if SCell BFR is configured over multiple SCells which is allowed by UE capability, the NW configuration is allowed, while no RAN4 requirement will guarantee the performance.*
  + [MTK] The current wording on “perform BFR procedure”is not clear enough.
    - Fist, BFD-RS can be configured implicitly, which means if BFD-RS list is not provided for CC#1, UE will perform BFD on the TCIstate of PDCCH of CC#1. As a result, for CA, it seems BFD procedure will be performed on all CCs. And it is strange to say no BFD requirement for CA scenario.
    - Second, another scenario could be, FR1:PSCell#1 & SCell#1 and FR2: SCell#2. In this case, BFD on only one serving cell is not enough.
    - Therefore, we would suggest the wording like “performing BFD measurement on more than 1 serving cell **per band**.”.
  + [Moderator2] To MTK:
    - Why the tentative agreement restrict BFD for CA scenario? Pls. notice the sub-bullet is under the main bullet, i.e., “Necessity of BFD procedure on multiple serving cell on the same FR2 band”
    - “per-band” is not needed, because it is already very clearly say in the main bullet, i.e., “on the same FR2 band”. In other words, the sub-bullet is to discuss something for “multiple serving cells on the same FR2 band”, even further than”per-band”. We don’t need to repeat main bullet.
    - To you second comment, again, pls. not the main bullet, we are discussing “multiple serving cell on the same FR2 band”, your example should not be this case, right?
    - Pls check the revised tentative agreement is okay or not.
* **Sharing factor for BFD Time Period for FR1 and FR2**
  + No BFD evaluation period will be specified for performing BFD measurement on more than 1 serving cell per band:
    - Sharing factor for BFD evaluation period due to BFD over multiple Sells will not be introduced for FR2 intra-band CA
    - No RAN4 performance requirement will be defined for more than 1 serving cell per band perform BFD measurement
    - FFS Sharing factor for BFD evaluation period for FR1 CA , FR2 inter-band CA and FR1-FR2 CA.
  + *[Moderator] Based on previous tentative agreement, seem the above tentative agreement is reasonable.*
  + [MTK] The current wording on “BFR is configured over multiple SCells”is not clear enough.
    - As discussed in the above issue, BFD-RS can be configured implicitly, so it will be always configured over multiple SCells in CA scenario.
    - Therefore, we would suggest the wording like “performing BFD measurement on more than 1 serving cell **per band**.”, and then no sharing factor will be needed for one **FR2 intra band**.
    - For FR1, we think the sharing factor would be needed for multiple bands, e.g. FR1-FR2 combinations. For FR2 inter-band CA, the requirement should be revisited if FR2 inter-band scenario is introduced. But not sure it is agreeable to companies, so I add FFS as 3rd sub-bullet.
  + [Huawei] We are fine with no requirements for more than 1 serving cell per band. However, the following aspects need to be further clarified:
    - When a PCC or PSCC is within a band, does UE is not required to perform BFD on SCCs in the same band?
    - Assuming that CC1 and CC2 are within the same band, if BFD-RS#1 for CC1 and BFD-RS#2 for CC2 are both transmitted on CC1, does UE only need to perform BFD measurement on BFD-RS#1, or on both BFD-RS#1 and BFD-RS#2
  + [Moderator2] To MTK, pls. find my revision above. We are okay with your revision. To Huawei, I assume the above MTK’s revision can also solve your concern, i.e., no requirement for BFD “on” more than 1 serving cell per band, including both SpCell and SCell.
* **When more than 2 BFD-RSs are transmitted on a CC for current SCell and (implicitly configured for) other SCell**
  + When more than 2 BFD-RSs are transmitted on a CC for current SCell and (implicitly configured for) other SCell, it is up to UE implementation to select two BFD-RSs in active BWP in current CC to perform BFD (either for current SCell or for other Sell(s)).
  + *[Moderator] Suggest the above tentative agreement based on majority view. Huawei is asked to check the above tentative agreement.*
  + *[Huawei] We can agree on the above agreement.*
  + *[Moderator2] Thank you for checking.*

##### 3.2.2 CBD on SCell

* **Sharing factor for CBD Time Period**
  + No CBD evaluation period will be specified for performing CBD measurement on more than 1 serving cell per band:
    - Sharing factor for CBD evaluation period (due to CBD over multiple SCells) will not be introduced for FR2 intra-band CA.
    - No RAN4 performance requirement will be defined for more than 1 serving cell perform CBD measurement.
    - FFS Sharing factor for CBD evaluation period for FR1 CA , FR2 inter-band CA and FR1-FR2 CA.
  + *[Moderator] Based on previous tentative agreement, seem the above tentative agreement is reasonable.*
  + *[MTK] Same coments as “Sharing factor for BFD Time Period for FR1 and FR2”. It should be clarified as “1 serving cell per band”*
  + *[Moderator2] Same revision based on MTK’s revision.*

##### 3.2.3 SCell Beam Failure Recovery ReQuest (BFRQ) Mechanism

* **RAN4 requirement defined for two step BFRQ mechanism**
  + RAN4 FFS whether and how the requirement could be defined for step 1 of BFR, where UE reports beam failure event through a dedicated SR like PUCCH resources:
    - No RRM core requirement is defined for UE conveying new beam information and failed CC indices via MAC-CE.
    - Applicable scenario:
      * Option-1: SCells with DL only and SCells with DL and UL
      * Option-2: SCells with DL only
  + *[Moderator] Suggest the above compromised proposed based on Option-2/2a. Companies can further check the applicable scenario in next meeting. Huawei and MTK are asked to check the above tentative agreement as compromise.*
  + *[MTK] More discussion is needed. Unclear about how to define the starting time for the step 1 of BFR, and not sure it is testable, because NW does not know when new beam indication has been determined in UE side.*
  + *[Huawei] We are still unclear which kind of RMM requirements need to be defined for BFRQ Step1. Measurement requirements, or delay requirements?*
  + *[Ericsson] We support this way forward. We share the same view as moderator* “the reason why Rel-15 CFRA based link recovery has only requirement for BFD and CBD but not having requirement on CFRA procedure is because BFR-CFRA is already captured in random access requirement, so no duplication is needed”*. As specified in TS38.133 6.2.2.2.2 Non-Contention based random access, RAN4 specifies the beam failure recovery reporting requirements. Since BFRQ on SCell uses SR-like PUCCH resources instead of CFRA resource, we prefer RAN4 specify the corresponding requirements.*
  + *[Moderator2] I changed the tentative agreement for more open discussion.* 
    - *To MTK: pls refer to how we define requirement for random access triggered by BFR for Rel-15 CFRA-BFR in random access part. UE behavior is provided in core requirement. Your question is more related to how performance requirement is defined.*
    - *To Huawei: for step 1, for core requirement, UE behavior of step-1 will be specified.*
* **FFS BFRQ requirement details, if the requirement of step-1 of BFR is agreed to be introduced:**
  + Option-1: After detecting beam failure in an Scell and determining that the L1-RSRP of one candidate beam in SCell is greater than the configured threshold, UE is required to transmit scheduling request in the PSCell within a period T
    - Where T is equal to the periodicity of PUCCH that has been configured with schedulingRequestForBFR.
  + Other options are not precluded.
  + *[Moderator] Depending on previous issue,*
  + *[MTK] More discussion is needed. Unclear about how to define the starting time of T. Because NW does not know when new beam indication has been determined in UE side.*
  + *[Huawei] The suggested BFRQ requirements seems to define the procedure for Step1, which I think shall be captured in RAN1’s spec TS38.213. The period T is configured by signaling.*
  + *[Moderator2] Add the condition which depends on whether or not this requirement will be introduced. To Huawei, I assume you are talking about 38.321 for the procedure. To MTK, the requirement is about UE’s behavior, why NW know or not know the starting of T matters? Anyway, with the condition newly added, hope companies are okay with the proposal.*
  + *[MTK2] we suggest to put this issue as FFS. If the starting time is unknown, then what’s the point to have requirement? Even it has specified certain delay requirement, because of the unknown starting time, network still doesn’t have idea about when the procedure can be completed.*
  + *[Moderator3] Not all delay requirements are provided with networking knowing the start point, for instance, RLM, how NW knows UE will receive RLF from its lower layer, which is triggered by TE simulated low power in the test; however, we still define UE behaviors, right? We can name more in the list…. Anyway, we can compromise as FFS but only revising main bullet is not enough. See the further revision.*

##### 3.2.4 UE Capability and Others

* **UE Capability of Number of SCells for BFR:**
  + RAN4 requirement should not block the possibility of configuring BFR on multiple SCells, and no RAN4 performance requirement will be defined for more than 1 serving cell per band perform BFD/CBD measurement.
  + *[Moderator] Tentative agreement based on majority view. Huawei is asked to check the above tentative agreement as compromise. Also related to 1st topic in 3.2.1 (BFD on SCell).*
  + *[MTK] The current wording on “configuring BFR on multiple SCells”is not clear enough, as discussed in 3.2.1. Besides the wording on “configuring”, it should be clarified as “1 serving cell per band”*
  + *[Huawei] We are fine to agree the above agreements.*
  + *[Moderator2] To MTK, “configuring BFR” of course includes explicit and implicit configuration. Both are included in this proposal, any concern on that? We are okay with your revision.*
* **When CBD-RS not configured, UE’s expected behavior:**
  + FFS UE is not required to perform BFD and CBD for a SCell which is not configured with CBD-RS resources.
  + FFS UE is required to perform BFD and CBD for a SCell if some RS resources are configured in SPCell but if they are implicitly configured as CBD-RS resources for SCell.
  + *[Moderator] FFS UE behavior.*
  + *[MTK] For the 1st FFS, we are fine. To our understanding the 2nd FFS can be removed, because implicitly configured CBD-RS is not supported in current specification 38.213.*
  + *[Moderator2] To MTK, I agree with you, but I think it could be not harmful to put another FFS here to allow company who raised concern in 1st round to double check. Is that okay to you?*

3.3 DL/UL beam indication with reduced latency and overhead

##### 3.3.1 Simultaneous TCI States Activation/Selection across Multiple CCs/BWPs

* **Simultaneous TCI States Activation/Selection across Multiple CCs/BWPs:**
  + No new requirement is introduced for the simultaneous TCI states activation/selection.
    - Rel-15 active TCI state switching delay requirements shall still be followed if simultaneous TCI states activation or selection across multiple CCs/BWPs is performed.
  + *[Moderator] Tentative agreement based on majority view. Qualcomm and Nokia are asked to check the tentative agreement as compromise.*
  + *[MTK] Opponents should provide more details on why the R15 delay requirement would need to be updated.*

# **4 Reference**

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc Number** | Title | Source | Type |
| [**R4-2000285**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000285.zip) | On the Remaining Issues for L1-SINR Measurement Requirement | Samsung | discussion |
| [**R4-2000286**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000286.zip) | Simulation Results for L1-SINR Measurement Accuracy | Samsung | discussion |
| R4-2000287 | Simulation Results Summary for L1-SINR Measurement Accuracy | Samsung | discussion |
| [**R4-2000288**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000288.zip) | CR to TS38.133 on L1-SINR Measurement Requirement (Section 3.3 and 9) | Samsung | CR |
| [**R4-2000289**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000289.zip) | On the Remaining Issues for SCell Beam Failure Recovery RRM Requirement | Samsung | discussion |
| [**R4-2000290**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000290.zip) | CR to TS38.133 on SCell BFD and CBD (Section 8.5) | Samsung | CR |
| [**R4-2000291**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000291.zip) | CR to TS38.133 on SCell BFRQ Procedure (Section 8.5) | Samsung | CR |
| [**R4-2000292**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000292.zip) | On the Remaining Issues for Enhancement on UL/DL Transmit Beam Selection with Reduced Latency and Overhead | Samsung | discussion |
| [**R4-2000384**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000384.zip) | Discussion about L1-SINR measurement requirements | Intel Corporation | discussion |
| [**R4-2000635**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000635.zip) | Simulation results on L1-SINR | CMCC | discussion |
| [**R4-2000935**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000935.zip) | Discussion on RRM requirements for L1-SINR | MediaTek inc. | discussion |
| [**R4-2000936**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000936.zip) | Discussion on L1-SINR delay requirement | MediaTek inc. | discussion |
| [**R4-2000937**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000937.zip) | Discussion on L1-SINR accuracy requirement | MediaTek inc. | discussion |
| [**R4-2000938**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000938.zip) | Discussion on RRM requirements for BFR on Scell | MediaTek inc. | discussion |
| [**R4-2000997**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000997.zip) | CR on SS-SINR and CSI-SINR measurement report mapping (section 10.1.16.1) | OPPO | draftCR |
| [**R4-2001362**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001362.zip) | L1-SINR measurement period | Ericsson | discussion |
| [**R4-2001578**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001578.zip) | Discussion on L1-SINR measurement requirements for NR eMIMO | Huawei, HiSilicon | discussion |
| [**R4-2001579**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001579.zip) | Discussion on measurement restrictions for L1-SINR measurement | Huawei, HiSilicon | discussion |
| [**R4-2001580**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001580.zip) | discussion on SCell BFR requiremetns for NR eMIMO | Huawei, HiSilicon | discussion |
| [**R4-2002120**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002120.zip) | RRM requirements for L1-SINR estimation | Qualcomm | discussion |
| [**R4-2002121**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002121.zip) | RRM requirements for SCell BFD, CBD and BFR | Qualcomm | discussion |
| [**R4-2002122**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002122.zip) | DL/UL beam indication with reduced latency and overhead | Qualcomm | discussion |