**3GPP TSG-RAN WG4 Meeting #104b-e R4-22xxxxx**

Electronic Meeting, 10th-19th, Oct., 2022

**Agenda item:** 4.5.1

**Source:** Moderator (Intel)

**Title:** Email discussion summary for [104-bis-e][205] NR\_feMIMO\_RRM\_1

**Document for:** Information

# Introduction

This e-mail discussion summary captured the discussions for Rel-17 FeMIMO RRM Core requirement maintenance in 4.5.1 in RAN4 #104bis-e meeting.

In RAN4 104-e meeting, WF is approved.

* **WF on FeMIMO RRM impact for unified TCI** was approved in R4-2214481
* **WF on FeMIMO RRM requirements for inter-cell beam management** was approved inR4-2214482

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# Topic #1: Unified TCI state (4.5.1.1)

## Companies’ contributions summary

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| [**R4-2215353**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215353.zip) | Intel Corporation | **Proposal 1: UE don’t need to perform timing/frequency tracking for UL TCI state activation for both serving cell and cell with additional PCI.****Proposal 2: Keep the current clarification for DL TCI state switching in Joint TCI state switch in the specification.****Proposal 3: When SSB is indicated as PL-RS in UL TCI state for FR2, the total delay is:*** **n+THARQ + 3ms + NM*\** (Tfirst\_target-PL-RS + Q\*Ttarget\_PL-RS + 2ms)**

**Where Q is the extended number of SSB resource number, Q is FFS.** |
| [**R4-2215591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215591.zip) | Apple | Active UL TCI state***Observation #1:*** *The UL TCI state provides the spatial TX filter to be used for UL transmission.****Observation #2:*** *The UL timing is determined by the DL serving cell timing and not by the RS associated with active UL TCI state. The UL TCI state could be associated with DL-RS or SRS.* ***Observation #3:*** *We don’t support two-TA in Rel-17, and irrespective of the associated DL-RS the UL timing would be the same****Observation #4:*** *There is no restriction in RAN1/RAN2 specification that the active UL TCI list should be a subset of active DL TCI list.***Proposal #1: The UL timing is derived from the DL serving cell timing for DL-RS of UL TCI associated with serving cell or cell with different PCI.** MAC CE based TCI state Switching delay requirements**Proposal #2: When PL-RS in UL TCI state switch is SSB in FR2, longer delay is expected.**TCI state list update delay***Observation #5:*** *Not defining requirements for unknown TCI state for TCI state list activation doesn’t mean that unknown TCI states are precluded.****Observation #6****: Don’t see benefits of defining delay requirements when one or more TCI states are unknown in active TCI state list update, since the purpose is to capture delay requirements for MAC-CE+DCI based TCI state switch.***Proposal #3: It is sufficient to capture that longer delay applies if any TCI state is unknown in TCI state list update.**  |
| [**R4-2215743**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215743.zip) | Samsung | **Proposal 1: UE doesn’t need to track UL time/frequency for UL TCI state activation when DL-RS is associated with serving cell. UE doesn’t need to track UL time/frequency for UL TCI state activation when DL-RS is associated with non-serving cell in Rel-17.****Proposal 2: For MAC-CE based UL TCI state switching delay when SSB is indicated as PL-RS in UL TCI state for FR2, longer delay is expected.****Proposal 3: For unknown TCI state in the TCI state list, follow the agreements in last meeting and no requirements for unknown TCI state.** |
| [**R4-2215764**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215764.zip) | MediaTek Inc. | **Observation 1: For joint TCI state switch, network does not know whether UE receives DL signal successfully till receiving ACK/NACK from UE.****Proposal 1: To remove the bracket for the following sentence in spec.*** “For DL TCI state switching, [In case of joint TCI state switch, UE is not expected to receive on DL before UE completes the DL and UL TCI state switch.]”.

**Proposal 2: For the case when SSB is indicated as PL-RS, reuse the existing delay requirement of MAC CE based UL TCI state switch.****Proposal 3: For common TCI state, the same existing unified TCI state switch delay requirement can be shared to two different configuration approaches "simultaneousU-TCI-UpdateList1/2/3/4-r17" and "RefUnifiedTCIStateList".****Proposal 4: For MAC CE based TCI state list update, requirement is not applicable if unknown TCI state is included in the TCI state list.** |
| [**R4-2216280**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216280.zip) | Huawei, HiSilicon | ***Proposal 1: For UL TCI state, UE does not need to perform UL timing tracking according to source RS in the UL TCI state and the UL timing is derived from DL timing.******Proposal 2: For UL TCI state switching, when source RS and PL-RS for target UL TCI state is the same SSB, beam sweeping shall be assumed for PL-RS measurement time in FR2.******Proposal 3: For MAC-CE based UL TCI state switching, a longer UL TCI state switch delay is expected when a SSB is indicated as PL-RS in UL TCI state in FR2.******Proposal 4: If no consensus can be achieved in RAN4, we suggest that there is no requirements when SSB is indicated as PL-RS in UL TCI state in FR2.*** |
| [**R4-2216360**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216360.zip) | vivo | **Observation 1 In R17 unified TCI, especially for the inter-cell BM scenario, the UL TCI only provides UL TX spatial filter information, and UL timing of the UE can be determined based on QCL-A/B/C information in the activated DL TCI(s).****Proposal 1 Adding some applicability rules on current RRM requirements for UL TCI switching based on option 2 would be adoptable to RAN4, i.e. RRM requirements for R17 UL TCI switching are only applicable when source RS in active UL TCI state is a subset of source RS in DL active TCI list.****Proposal 2 Remove the square bracket, i.e. confirm that ‘In case of joint TCI state switch, UE is not expected to receive on DL before UE completes the DL and UL TCI state switch.’****Observation 2 In legacy requirements, Rx beam sweeping is not specified for SSB-based measurements for time-frequency tracking and PL-RS update, no matter the SSB is configured for L1-RSRP/L1-SINR measurement or not, since the Rx beam for this SSB reception is already considered as known. For L1-RSRP measurements requirements, the Rx beam sweeping is considered for the worst case, and is not applicable to the case when a tighter requirement is applied.****Proposal 3 MAC-CE based UL TCI state switching delay requirements agreed in RAN4 101-bis-e can be applicable to the case when the PL-RS is the SSB which is configured for L1-RSRP measurements.****Observation 3 In R17, there is no clear evidence in RAN1/2 specs showing that, more than one CCs in one CC list can be configured as the ref CC for all other CCs in the list.** **Proposal 4 No further spec change for TS 38.133 regarding the configuration of unifiedTCI-StateRef or simultaneousU-TCI-UpdateList1/2/3/4-r17 in common TCI state.** **Observation 4 From RAN1/2 design, network may make decision on the set of TCIs to be activated without L1 measurement reporting.****Proposal 5 In R17 TCI state list update requirements, specify requirements for the case when not all activated TCIs are known by considering the worst case, i.e. assuming UE use one Rx beam at a time in FR2, and the RSs with the longest periodicity would be assumed for TL1-RSRP.** |
| [**R4-2216486**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216486.zip) | ZTE Corporation | **Proposal 1: Under mTRP scenario, it is possible that the source RS of UL TCI state is different with source RS of DL TCI state. But here it has been given that the source RS of UL TCI state is the DL RS associated with serving cell, so we support Option 1. The concern referred by Option 2 can be ignored.** **Proposal 2: Option 1 is fine since which only referred in Rel-17. Further more, Option2 is reasonable for Rel-18.****Proposal 3: No matter whether UL TCI state switching completed or not, UE can receive DL by the target DL TCI state given that DL TCI state switching has been finished. So we suggest the bullet in square brackets can be ignored.****Proposal 4: For the case when SSB is indicated as PL-RS in UL TCI state for FR2, which means the source RS is the SSB or QCL-Ded with the SSB. It should be emphasized once more that beam alignment is the precondition based on previous agreements. So not additional Rx beam sweeping is necessary. We prefer Option 2. However to move forward, a compromised solution is needed, e.g. allowing a clear but not too long additional latency.****Proposal 5: No matter which type of signalling is used, we believe the requirement for common TCI state switching delay is applicable. So Option 1 is aligned with our thinking. But even without any additional clarification, it seems workable too.****Proposal 6: During the discussion in last meeting, it has been agreed that unknown TCI state(s) can be in the list. Referring to the detailed delay requirement, we prefer to provide exact requirement instead of uncertain “longer delay”.** |
| [**R4-2216596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216596.zip) | Nokia, Nokia Shanghai Bell | 1. In DL TCI state switch delay, the UE is expected to receive as soon as the DL TCI state switch is completed.
2. For UL TCI state switch, the network is not aware of whether the PL-RS is maintained or not maintained at the UE in case the number of activated TCI states is greater than four.
3. Our understanding is that the UE can receive in DL when the DL TCI state switching is completed. Independently of the UL TCI state switch status.
4. For joint TCI state switch, if the UL TCI state switch delay exceeds the DL TCI state switch delay, the UE is required to receive in DL up to THARQ before it completes UL TCI state switch.
5. when SSB is indicated as PL-RS in UL TCI state for FR2,

**- The number of sample M will not always be fixed as 5 samples.** **- If a UE performs both L1-RSRP measurements and PL-RS measurements on the same SSB, the number of samples used for L1-RSRP is counted for pathloss measurement.**1. Up to Rel-16 the DL/UL relied on channel reciprocity. In Rel-17, decoupled DL and UL is possible.
2. There is no definition of active TCI state for UL.

A UE need to acquire and keep time and frequency tracking on the DL source RS associated to the UL TCI state t1. *maxNumberActiveTCI-PerBWP* under *tci-StatePDSCH* should be about activated TCI-states with UE synchronization for both DL and UL. The current spec addresses about DL only.
2. o be allowed to transmit in UL.
3. Rel-17 active UL TCI state should be under time and frequency tracking. This means that active UL TCI list belongs to active DL TCI state list. Add the time and frequency tracking condition to the active TCI state for UL.
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| [**R4-2216817**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216817.zip) | Ericsson | **Proposal 1:** RAN4 to agree that UL TCI state needs to follow the time and frequency tracking of the DL-RS configured in the UL TCI state.**Proposal 2**: RAN4 to agree that existing delay requirement of MAC CE based UL TCI state switch.**Proposal 3:** RAN4 to define requirement per carrier without referring any of the IEs for common TCI state switching**Proposal 4:** If all the TCIs in the active TCI state list are not known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new target TCI states at the first slot that is after n + + (THARQ + TL1-RSRP + Tfirst-SSB\_List + TSSB-proc) / *NR slot length****.***  |

## Open issues summary

### Sub-topic 1-1 Active UL TCI state

**Issue1-1-1 Whether UE need to track UL time/frequency for UL TCI state activation**

* Proposals:
	+ Proposal 1(Intel, Apple, Samsung,, Huawei):
		- No
	+ Proposal 2(vivo, ZTE):
		- Adding some applicability rules on current RRM requirements for UL TCI switching, i.e. RRM requirements for R17 UL TCI switching are only applicable when source RS in active UL TCI state is a subset of source RS in DL active TCI list.
	+ Proposal 3(Ericsson):
		- UL TCI state needs to follow the time and frequency tracking of the DL-RS configured in the UL TCI state.
	+ Proposal 3a(Nokia):
		- Rel-17 active UL TCI state should be under time and frequency tracking. This means that active UL TCI list belongs to active DL TCI state list. Add the time and frequency tracking condition to the active TCI state for UL.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

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| **Company** | **Comments** |
| MediaTek | Prefer proposal 2 and 3a. For proposal 3, it seems UE may need to perform tracking additionally if the target UL TCI state is not in DL active TCI state list. |
| Ericsson | Looking at the below IE, our understanding is maximum number of DL and UL TCI across CC seems independent. Unless there is a maximum RS (including DL and UL TCI) UE need to track is specified, our understanding is they are independent. We are fine to check with RAN1 if companies have different understanding. We do not want to introduce additional restriction in RAN4 than what is specified in RAN1/2. unifiedSeparateTCI-r17                      SEQUENCE{         maxConfiguredDL-TCI-r17                     ENUMERATED {n4, n8, n12, n16, n24, n32, n48, n64, n128},         maxConfiguredUL-TCI-r17                     ENUMERATED {n4, n8, n12, n16, n24, n32, n48, n64},         maxActivatedDL-TCIAcrossCC-r17              ENUMERATED {n1, n2, n4, n8, n16},         maxActivatedUL-TCIAcrossCC-r17              ENUMERATED {n1, n2, n4, n8, n16}     } OPTIONAL,  |
| vivo | Prefer option 2.For option 3, in our understanding it contradicts with RAN1. In TS 38.214, UL TCI state only provide spatial relation information. For option 3a, our understanding of the proposal is that, all source DL RSs of UL TCIs in active UL TCI state list are automatically counted in the active DL TCI list. If so, we think this should not be discussed in RAN4. More clarification is needed. |
| Apple | We support option 1.The UL TCI state only provides spatial or TX beam RS – QCL Type D and not other QCL information, hence UE need not track TO/FO for UL TCI state. The UL timing is determined by DL cserving cell timing. With proposal 2 we are introducing additional constraints that don’t exist in RAN1Could proponents of Proposal 3 please clarify what is UE behavior if the UL TCI is SRS instead of DL-RS?  |
| Nokia | Proposals 3 and 3a.Our understanding of the feature is that an UL TCI state will always be configured with a DL RS. The question here is whether UE need to track the UL timing time and frequency for an UL TCI state activation. Hence, whether the UE need to track the time frequency associated with the activated UL TCI state when the UL TCI state is activated (our understanding of the question). RAN4 has already defined requirements related to UE transmit timing. To us it clear that such UL transmit timing requirements are general and applicable to any UE UL transmission. They also apply to UL transmission after an UL TCI state switch. If the source of the target UL TCI state (associated DL RS) is the same as the source of the associated DL RS for the current UL TCI state, there is no need to update timing as DL PL delay can be assumed the same. However, if this is not the case, and the source of the DL RS associated with the target UL TCI is different from current DL RS source, the timing of the DL RS associated with the target UL TCI state shall be used as reference timing.Hence, the UE need the DL timing acquired from the DL RS associated with the target UL TCI state before the UE is allowed to transmit using the new UL TCI state.This means that the UE shall track time and frequency of the DL-RS associated with the UL TCI state, when the TCI state is activated. We are fine with Proposals 3 and 3a. In general, we have concerns with proposal 1. Initially, a UE shall acquire DL timing before the UE is allowed to transmit. Hence, it is not clear how this basic requirement can be fulfilled if we go along with P1? Our concern with this proposal is that it is not clear which DL timing the UE will use as reference for the UL transmission. And this can impact network. |
| ZTE | Support Proposal 2 and 3a.For Proposal 3, we understand if the UL TCI state list and DL TCI state list are independent, it is possible that the source DL RS of some UL TCI state is not any source DL RS of DL TCI state. We should address the acquisition of time and frequency tracking under such situation. |
| Huawei | Support Proposal 1.The source RS in UL TCI state only provides the reference for UL beam information. UE only needs to perform time-tracking for DL, and the UL transmit timing is just derived from the DL reception timing no matters whether the source RS in UL TCI state is same as the source RS in a DL TCI state. |
| Apple2 | To Nokia: The RS for UL TCI state can be DL-RS or SRS. From 38.331:In RAN4 we only define Ul TCI state switch requirements when the RS is a DL-RS.The UL TCI state is for the TX spatial filter . From 38.213 for PUCCH:The UL TCI state only provides QCL Type D and not other types QCL information, it is an extension to UL Spatial relation info. Hence, we don’t think UE needs to track TO/FO for activated separate UL TCI states. The UL transmission should follow the DL timing, we don’t think anything has changed since Rel-15 with the introduction of UL TCI state/ Joint TCI.  |
| Intel | Prefer proposal 1.SRS can be configured in UL TCI state activation, while RAN4 didn’t define requirement for it.The source RS in UL TCI state only provides the reference for UL beam information and timing will be depends on the current DL timing of serving cell. It’s possible that the source RS in target UL TCI is different from the RS which is the reference of current DL timing. It needs clarification whether there will be performance loss due to timing mismatch. If yes, NW may try to avoid such configuration. UE will not spend more effort for time tracking for the case.It’s something like previous discussion about Rel-16 uplink spatial info switch with PL-RS activation. Where RL-RS may be different from source RS in UL TCI, then the uplink power calculation may not be accurate. However, since there is no limitation in RAN1/RAN2, the final requirement didn’t consider add constraints. |
| Samsung | Support proposal 1. The UL TCI only reflects the spatial info. The uplink timing can be derived from the current serving cell DL timing. UE doesn't need to track time/frequency. |
| Qualcomm | We prefer proposal 3 or 3a. The UE needs to track the DL RS that is QCL-ed with the UL TCI otherwise the timing/frequency could be completely off. |

### Sub-topic 1-2 MAC CE based TCI state Switching delay requirements

**Issue 1-2-1 Joint TCI switching delay requirement for DL TCI state switch**

* Proposals:
	+ Proposal 1(Intel, MTK, vivo):
		- Remove the square bracket:

- In case of joint TCI state switch, UE is not expected to receive on DL before UE completes the DL and UL TCI state switch.

* + Proposal 2(Nokia):
		- For joint TCI state switch, if the UL TCI state switch delay exceeds the DL TCI state switch delay, the UE is required to receive in DL up to THARQ before it completes UL TCI state switch.
	+ Proposal 3(ZTE):
		- No matter whether UL TCI state switching completed or not, UE can receive DL by the target DL TCI state given that DL TCI state switching has been finished. So we suggest the bullet in square brackets can be ignored.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

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| **Company** | **Comments** |
| MediaTek | Support proposal 1. We do not see the need why UE is required to receive the DL signals if ACK/NACK feedback may not be transmitted on the UL channels successfully. To our understanding, network does not know whether the PDSCH is received by UE or not due to lack of ACK/NACK feedback. In that case, network will transmit the PDSCH again to the UE, and UE may need to receive it again until the UL TCI state switch is complete if we go with proposal 2 and 3. |
| Ericsson | Support proposal 1 as it is already agreed in previous meeting. |
| vivo | Support proposal 1. Actually, the intention of the proposal is to save UE power. For PDSCH and PDCCH transmission, feedback from UE are needed, e.g. ACK/NACK. Without UL TCI being ready for such UL transmission, the related DL transmissions would be wasted. The UE should not to be forced get ready for the corresponding DL transmission too early, if UL transmission is not ready yet. UE may have some flexibility in managing corresponding measurement and sync procedure in time domain so as to save UE’s power. For proposal 2, such THARQ is not known for the UE in advanced, and the gain of it is un-certain. Moreover, procedure-wise, this issue was discussed and agreed for 4 meetings. Proposal 2 and 3 clearly are not any clarification of the sentence. As agreed in last meeting’s GTW, only clarification can be discussed |
| Apple | We support proposal 1. This was already agreed in last meeting, but is not reflected in current spec. |
| Nokia | Proposal 2.We have a similar view as ZTE. The UE can receive in DL as soon as the DL TCI state switch delay is completed. From the discussions in the last meeting, we understood that the concern of companies with proposal 3 is that it would not be clear in which UL TCI state the UE would send HARQ feedback for the DL reception. However, in one approach this is directly related to the UL TCI switch delay only. Hence, the UE receives the DL once the DL TCI state switch is completed and send HARQ feedback in UL once the UL TCI state switch is completed.Therefore, our option proposes such an alternative, in which the UE can be scheduled in DL during the TCI switch (which is of course always an option from network side) and including a few slots before the UL TCI state is completed. and the UE send the HARQ feedback in the new UL TCI state once that switch is completed. |
| ZTE | Still square brackets were kept in the WF of 104 meeting, so we do not believe the agreements have been identified.Referring the issue itself, even the UE can not transmit HARQ feedback since of unfinish of UL TCI state switching, the UE can still transmit HARQ feedback via old UL TCI state switching. We wonder if this can work. |
| Apple2 | We checked the agreements from last meeting and realized that this was in “[ ]” for DL TCI state switch. We support proposal 1.We would like to understand what it means that UE can start receiving up to THARQ symbols. The DL TCI state switching time (for known TCI and target TCI in active list) is n+3ms+THARQ. It can receive with the old TCI state until slot n+ 3ms, after which it starts to switch the TCI state. After completing the DL TCI state switch in n+3ms+THARQ slots, in case of joint TCI it needs to wait for UL switching to complete before it can receive any new DL signal to be able to send HARQ-ACK feedback.  |
| Intel | Support option 1. Without HARQ feedback, NW can’t ensure that UE can receive correctly. Besides, it’s agreed in previous meeting and only needs some clarification. we don’t think new modification of requirement is needed. |
| Samsung | We are fine to remove the bracket.  |
| Qualcomm | We support option 1. The advantages of Options 2/3 are not clear since UE cannot send channel state feedback so the scheduling will be sub-optimal anyway and UE cannot send ACK/NAK |
| vivo2 | To ZTE, UE is not able to transmit HARQ using old TCI state. This was discussed in last meeting. In our understanding, UE should begin to maintain new PL-RS after the MAC CE is received. For UE capable of track only one UL TCI, TCI switching is needed, and during this procedure the UL performance is ensured. Therefore, it is risky to schedule UL during this stage.To Nokia, as discussed in GTW, the gain of your proposal is very small. Based on GTW conclusions in last meeting, only clarification on the sentence is needed. This proposal 2, in our view, is out-of-scope for the clarification. |

**Issue 1-2-2 MAC-CE based UL TCI state switching delay when SSB is indicated as PL-RS in UL TCI state for FR2**

* Proposals
	+ Proposal 1(Apple, Samsung, Huawei):
		- When PL-RS in UL TCI state switch is SSB in FR2, longer delay is expected.
	+ Proposal 2(Huawei):
		- If no consensus can be achieved in RAN4, we suggest that there is no requirements when SSB is indicated as PL-RS in UL TCI state in FR2.
	+ Proposal 3(Intel):
		- When SSB is indicated as PL-RS in UL TCI state for FR2, the total delay is:

 - n+THARQ + 3ms + NM*\** (Tfirst\_target-PL-RS + Q\*Ttarget\_PL-RS + 2ms)

 - Where Q is the extended number of SSB resource number, Q is FFS.

* + Proposal 4(MTK, vivo, Ericsson, ZTE):
		- Reuse the existing delay requirement of MAC CE based UL TCI state switch.
	+ Proposal 5(Nokia):
		- The number of sample M will not always be fixed as 5 samples.
		- If a UE performs both L1-RSRP measurements and PL-RS measurements on the same SSB, the number of samples used for L1-RSRP is counted for pathloss measurement.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

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| **Company** | **Comments** |
| MediaTek | Support proposal 4. |
| Ericsson | Support proposal 4. We do not understand the need for RX beam sweeping for all the pathloss samples. May be a clarification question. In case of PRACH, UE determine transmit power based on SSB received power. We do not think UE need to get 5 samples with RX beam sweeping for calculating TX power for PRACH transmission. We do not see the difference here w.r.t PRACH transmission. |
| vivo | Support proposal 4. This issue is also related to R16 eMIMO maintenance. We do not think it is ok to revise R16 spec at this late stage, and the same requirements for R16 and R17 are preferred. |
| Apple | We support Proposals 1, 2. For SSB based measurement, time for RX beam sweeping should be allowed, based on principles of defining requirements since Rel-15. For proposal 3, what is the range of value of Q being proposed?  |
| Nokia | As mentioned also under Issue 1-1-1 any UL TCI state is associated (configured) with a DL RS. This may be SSB or CSI-RS. Anyhow, it may be relevant to make sure that RAN4 has a common understanding about which PL-RS we are discussing here. Our understanding the PL-RS is the DL RS associated with the target UL TCI state (as configured by the netwok).In this case the UE will obviously have acquired measurements of the DL RS associated with the UL TCI state before UL TCI state switch request is received, as otherwise the network should not request TCI switch to that UL TCI state.Hence, we assume the UE will always have some DL RS related measurements available for the target UL TCI state and hence, we do not see the justification for always having additional 5 samples.Our understanding is that any additional time needed would be the same as RAN4 have defined in section 8.12 for UL spatial relation switch as starting point – one additional sample.Hence, although the current requirements might be used for discussion it all depends on MN:* NM = 1, if the target PL-RS is not maintained by the UE, 0 otherwise

Whether MN=0 or MN=1 depends on the status of the PL-RS. Hence, whether PL-RS is ‘maintained’ or not.Our understanding is that PL-RS for the UL TCI state is the associated DL RS. As mentioned, such DL/PL RS is always configured for an UL TCI state. Based on the current requirements we see that ‘maintained’ seems to be conditioned whether the UE is performing time and frequency tracking on the target UL TCI state. Otherwise, the switch requirements with MN=0 (and PL-RS ‘maintained’) seem misaligned with other requirements for DL switch delay (slot n+THARQ + ) when time tracking of the TCI state is performed.As we do not have the concept of an UL active TCI state list, we suggest defining the ‘maintained’ as when the PL/DL-RS associated with the UL TCI state is in the active TCI state list for DL (hence, UE perform time tracking of the TCI state). Alternative is to define UL active TCI state list.With such understanding we propose:known conditions:The UE shall be able to transmit uplink signal with the target TCI state in the slot n+THARQ + + NM*\** (1\*Ttarget\_PL-RS + Tprocessingms) / *NR slot length*. where:- NM = 1, if the target PL-RS is not maintained by the UE, 0 otherwise.- PL-RS is considered maintained if the DL RS associated with the UL TCI state is in the active TCI state list. |
| ZTE | Prefer proposal 4.It is somehow related with UE implementation, but Rel-17 should be aligned with Rel-16, in Rel-16 PL-RS switching, we do not consider additional Rx beam sweeping, so here we suggest to align with Rel-16. |
| Huawei | Support Proposal 1, and compromise to Proposal 2.There is no TCI configuration for a SSB resource, which means no source RS for a SSB resource. UE needs to perform beam sweeping for SSB based PL-RS measurements in FR2. Besides, SSB is usually indicated as source RS to provide a reference for other DL-RSs. Beam sweeping shall be always assumed for SSB in FR2. |
| Intel | Proposal 3 is compromise solution for the purpose of fast TCI activation. Since the SNR condition is above -2dB for TCI activation, less samples can be used for pathloss calculation compared with L3 measurement where SNR is -6dB. Similar with L1-RSRP measurement, where 1 sample is used. Here we propose to use 1\*8=8 samples. Then Q can be 7.To Apple:we suggest Q=7. |
| Samsung | Support P1 and can accept P2. CSI-RS is more common usage as PL-RS than SSB, we can accept Proposal 2. |
| Qualcomm | Pposal 4 is the simplest to implement. |
|  |  |

### Sub-topic 1-3 Common TCI state switching in CA case

**Issue 1-3-1 Common TCI state switching delay requirement**

* Proposals
	+ Proposal 1(MTK):
		- For common TCI state, the same existing unified TCI state switch delay requirement can be shared to two different configuration approaches "simultaneousU-TCI-UpdateList1/2/3/4-r17" and "RefUnifiedTCIStateList".
	+ Proposal 2(vivo):
		- No further spec change for TS 38.133 regarding the configuration of unifiedTCI-StateRef or simultaneousU-TCI-UpdateList1/2/3/4-r17 in common TCI state.
	+ Proposal 3(ZTE):
		- No matter which type of signaling is used, we believe the requirement for common TCI state switching delay is applicable. So Option 1 is aligned with our thinking. But even without any additional clarification, it seems workable too. I.e. Define the requirement without differentiating the triggering signaling, e.g. unifiedTCI-StateRef or simultaneousU-TCI-UpdateList1/2/3/4-r17.
	+ Proposal 4(Ericsson):
		- RAN4 to define requirement per carrier without referring any of the IEs for common TCI state switching
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | We can compromise to proposal 2 and 3 which are the same. |
| Ericsson | Our intention of proposal 4 is that no spec change is needed.  |
| vivo | Support option 2. |
| Apple | We agree with Proposal 2 that no further spec change is needed to capture that requirements are also applicable to common TCI.  |
| Nokia | The TCI switching delay requirement is defined per CC that refers to the common TCI indicated by simultaneous-TCI-UpdateList The TCI switching mechanism by simultaneous-TCI-UpdateList-rel17 has existed since Rel-16, and introduced to switch TCI over multiple CC in the legacy manner. Rel-17 still supports the legacy mechanism under unified TCI framework. |
| ZTE | Fine with Proposal 2 and 3. |
| Intel | Fine with proposal 2 and 4 where no spec change is needed. |
| Samsung | Support P2 &P4 no spec change is needed.  |

### Sub-topic 1-4 TCI state list update delay

**Issue 1-4-1 MAC CE based TCI state list update delay for unknown TCI state**

* Proposals
	+ Proposal 1(Apple):
		- It is sufficient to capture that longer delay applies if any TCI state is unknown in TCI state list update.
	+ Proposal 2(Samsung):
		- For unknown TCI state in the TCI state list, follow the agreements in last meeting and no requirements for unknown TCI state.
	+ Proposal 3(MTK):
		- For MAC CE based TCI state list update, requirement is not applicable if unknown TCI state is included in the TCI state list.
	+ Proposal 4(Ericsson):
		- If all the TCIs in the active TCI state list are not known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new target TCI states at the first slot that is after n + + (THARQ + TL1-RSRP + Tfirst-SSB\_List + TSSB-proc) / *NR slot length.*
	+ Proposal 4a(vivo):
		- In R17 TCI state list update requirements, specify requirements for the case when not all activated TCIs are known by considering the worst case, i.e. assuming UE use one Rx beam at a time in FR2, and the RSs with the longest periodicity would be assumed for TL1-RSRP.
	+ Proposal 4b(ZTE):
		- Referring to the detailed delay requirement, we prefer to provide exact requirement instead of uncertain “longer delay”.
* Recommended WF
	+ Further discussion.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Support proposal 1, 2 and 3. |
| Ericsson | In RAN4 we specify longer delay is needed only when there is uncertainty in determining the exact delay. We do not think that is the case here. We should specify exact delay so that UE and NW behaviour clear. Exact delay can be discussed in the CR. |
| vivo | We support proposal 4a but open to discuss. |
| Apple | We support proposals 1,2 and 3. We don’t see the purpose to capture the delay when any one of the target TCI states is unknown, as that would not be the target use case. If more than one TCI state is unknown, UE needs to measure L1-RSRP on all the unknown TCI states in addition to time tracking of the target TCI states.  |
| Nokia | We have concerns with proposals 1, 2 and 3. Especially as it is difficult for the network to know when a TCI state is known or unknown as it depends on the UE conditions.Our preference is to define requirements like proposed by ZTE. The exact requirements could be as proposed by Ericsson where the UE is allowed additional measurement time due to the unknown conditions.Where we in 1-2-2 discussed known condition requirements, we would define unknown condition requirements as follows:Unknown conditions:The UE shall be able to transmit uplink signal with the target TCI state in the slot n+THARQ + + 1\*Ttarget\_PL-RS + Tprocessingms + TL1-RSRP / *NR slot length*. which seems aligned with proposal 4. |
| ZTE | Support Proposal 4, 4a and 4b. |
| Huawei | Support Proposal 2 and 3, no requirements for unknown TCI state. |
| Samsung | Support Proposal 1&2&3. For P4, the condition is “If all the TCIs in the active TCI state list are not known”, it is the worst case. So for some TCI in the active TCI state list are unknown, there is still no requirements.  |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2215592**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215592.zip)Apple | CR for unified TCI |
| MediaTek: Depending on the discussion of open issue |
| Vivo: In clause 81.5.5 and 8.16.5, the following is not needed and shall be removed:‘In case of joint TCI state list,’This is already covered by the highlighted part below.(Taking 8.15.5 as example)‘When UE receives PDSCH carrying MAC-CE for active TCI state list update, and - higher layer configuration ‘*unifiedTCI-StateType-r17*’ is set to ‘*joint*’, or - higher layer configuration ‘*unifiedTCI-StateType-r17*’ is set to ‘*separate*’, while the target TCI list comprises at least one DL TCIs and at least one UL TCIs,’ |
| Apple: Thanks Vivo for the clarification. I think we need an indent to make the last sentence applicable to the condition, otherwise seems like a separate sentence.  |
| Intel: Depends on open issues. By the way, some contents are conflicting with [R4-2216361](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216361.zip), R4-2216818, merge is needed. |
| [**R4-2216281**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216281.zip)Huawei, HiSilicon | CR on maintaining TCI state switching requirements for R17 unified TCI |
| MediaTek: Depending on the discussion of open issue |
|  |
| [**R4-2216361**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216361.zip)vivo | CR on unified TCI in R17 feMIMO |
| MediaTek: Depending on the discussion of open issue |
| Apple: Depending on outcome of some of the open issues being discussed.  |
| Intel: Depends on open issues. By the way, some contents are conflicting with R4-2215592, R4-2216818, merge is needed. |
| [**R4-2216818**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216818.zip)Ericsson | CR on maintenance of unified TCI state switching requirements |
| MediaTek: Depending on the discussion of open issue |
| Apple: Depending on outcome of some of the open issues being discussed. |
| Intel: Depends on open issues. By the way, some contents are conflicting with R4-2216361, R4-2216818, merge is needed. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
|  | **Issue1-1-1 Whether UE need to track UL time/frequency for UL TCI state activation***Tentative agreements: No.**Recommendations for 2nd round: It seems that all the company agree that no UL T/F tracking when DL RS in UL TCI state is in the active DL TCI state. the controversial part is when DL RS in UL TCI state is in the active DL TCI state. we suggest to split the case in 2nd round. For issue 1-1-1a, double check whether it’s agreed or not. For issue 1-1-1b, further discussion.***Issue1-1-1a If source RS in UL TCI state is in the DL active TCI list:*** Proposals:
	+ No time/frequency tracking is needed.

**Issue1-1-1b If source RS in UL TCI state is not in the DL active TCI list:*** Proposals:
	+ Proposal 1: No time/frequency tracking is needed.
	+ Proposal 2: Time/frequency tracking is needed.
	+ Proposal 3: No requirement for the case. Adding applicability rules for current UL TCI switching when source RS in active UL TCI state is a subset of source RS in DL active TCI list.
	+ Proposal 4: other option.
 |
|  | **Issue 1-2-1 Joint TCI switching delay requirement for DL TCI state switch***Tentative agreements: No.**Recommendations for 2nd round: Further discussion. Company please check whether proposal 1 can be compromised?** Proposals:
	+ Proposal 1(Intel, MTK, vivo, Ericsson, Apple, Samsung,vivo, Qualcomm):
		- Remove the square bracket:

- In case of joint TCI state switch, UE is not expected to receive on DL before UE completes the DL and UL TCI state switch.* + Proposal 2(Nokia):
		- For joint TCI state switch, if the UL TCI state switch delay exceeds the DL TCI state switch delay, the UE is required to receive in DL up to THARQ before it completes UL TCI state switch.
	+ Proposal 3(ZTE):
		- No matter whether UL TCI state switching completed or not, UE can receive DL by the target DL TCI state given that DL TCI state switching has been finished. So we suggest the bullet in square brackets can be ignored.
 |
|  | **Issue 1-2-2 MAC-CE based UL TCI state switching delay when SSB is indicated as PL-RS in UL TCI state for FR2***Tentative agreements: No.**Recommendations for 2nd round: Further discussion.** Proposals
	+ Proposal 1(Apple, Samsung, Huawei):
		- When PL-RS in UL TCI state switch is SSB in FR2, longer delay is expected.
	+ Proposal 2(Huawei, Apple, Samsung):
		- If no consensus can be achieved in RAN4, we suggest that there is no requirements when SSB is indicated as PL-RS in UL TCI state in FR2.
	+ Proposal 3(Intel):
		- When SSB is indicated as PL-RS in UL TCI state for FR2, the total delay is:

 - n+THARQ + 3ms + NM*\** (Tfirst\_target-PL-RS + 7\*Ttarget\_PL-RS + 2ms)* + Proposal 4(MTK, vivo, Ericsson, ZTE, Qualcomm):
		- Reuse the existing delay requirement of MAC CE based UL TCI state switch.
	+ Proposal 5(Nokia):
		- known conditions:
		- The UE shall be able to transmit uplink signal with the target TCI state in the slot n+THARQ + + NM*\** (1\*Ttarget\_PL-RS + Tprocessingms) / *NR slot length*.

where: - NM = 1, if the target PL-RS is not maintained by the UE, 0 otherwise. - PL-RS is considered maintained if the DL RS associated with the UL TCI state is in the active TCI state list. |
|  | **Issue 1-3-1 Common TCI state switching delay requirement** *Tentative agreements: Yes.** + No further spec change is needed

*Recommendations for 2nd round: No further discussion.* |
|  | **Issue 1-4-1 MAC CE based TCI state list update delay for unknown TCI state***Tentative agreements: No.** Proposals
	+ Proposal 1(Apple, MTK, Samsung):
		- It is sufficient to capture that longer delay applies if any TCI state is unknown in TCI state list update.
	+ Proposal 2(Samsung, Apple, MTK, Huawei):
		- For unknown TCI state in the TCI state list, follow the agreements in last meeting and no requirements for unknown TCI state.
	+ Proposal 3(MTK, Apple, Huawei, Samsung):
		- For MAC CE based TCI state list update, requirement is not applicable if unknown TCI state is included in the TCI state list.
	+ Proposal 4(Ericsson, Nokia, ZTE):
		- If all the TCIs in the active TCI state list are not known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new target TCI states at the first slot that is after n + + (THARQ + TL1-RSRP + Tfirst-SSB\_List + TSSB-proc) / *NR slot length.*
	+ Proposal 4a(vivo, ZTE):
		- In R17 TCI state list update requirements, specify requirements for the case when not all activated TCIs are known by considering the worst case, i.e. assuming UE use one Rx beam at a time in FR2, and the RSs with the longest periodicity would be assumed for TL1-RSRP.
	+ Proposal 4b(ZTE,Nokia):
		- Referring to the detailed delay requirement, we prefer to provide exact requirement instead of uncertain “longer delay”.

*Recommendations for 2nd round: Further discussion. The options are further organized according to majority view to reduce the option number** + Proposal 1(Samsung, Apple, MTK, Huawei):
		- Longer delay applies if any TCI state is unknown in TCI state list update. Active TCI state list can contain known and unknown TCI states.
	+ Proposal 2(Ericsson, Nokia, ZTE,vivo):
		- Define the detailed delay requirement
 |
|  |  |

## Discussion on 2nd round (if applicable)

*Suggest to discuss in the WF. Comments will be pasted here later.*

# Topic #2: Inter-cell beam measurement (4.5.1.2)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| [**R4-2215354**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215354.zip) | Intel Corporation | **Proposal 1: Sharing factor is designed by two-step:*** **Step 1: Consider the sharing between L1-RSRP and SMTC/MG for each cell respectively**
* **Step 2: Consider L1-RSRP sharing between two cells on remaining occasions**

**Proposal 2: Sharing factor for serving cell and cell with different PCI are as follows:****For serving cell measurement:** **- P = , if P1\*TSSB\_SC < P2\*TSSB\_CDP where P2 is defined in 9.13.4.1.** **- P = 1\*P1, if P1\*TSSB\_SC > P2\*TSSB\_CDP where P2 is defined in 9.13.4.1**  **- P = 2\*P1, if P1\*TSSB\_SC = P2\*TSSB\_CDP where P2 is defined in 9.13.4.1.****For cell with different PCI:** **- P = , if P2\*TSSB\_CDP < P1\*TSSB\_SC where P1 is defined in 9.5.4.1.** **- P = 1\*P2, if P2\*TSSB\_CDP> P1\*TSSB\_SC where P1 is defined in 9.5.4.1.** **- P = 2\*P2, if P1\*TSSB\_SC = P2\*TSSB\_CDP where P1 is defined in 9.5.4.1.****Proposal 3: Clarify that performance degradation is expected when overlapping happen in RAN4 spec.** |
| [**R4-2215593**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215593.zip) | Apple | **Sharing factors*****Observation #1:*** *The tentatively agreed sharing factor design doesn’t impact existing L3 measurements and considers the occasions after considering SMTC and MG into account.* **Proposal #1: Either confirm the tentatively agreed sharing factors in last meeting or define the sharing factors by considering the number of measurement occasions as:**

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Scenario** | **P for Serving cell** | **P for cell with different PCI** |
| 1 | TSSB,SC = TSSB,CDP < TSMTC or MGRP |  |   |
| 2 | TSSB,SC < TSSB,CDP < TSMTC or MGRPAll occasions of SSB of SC collide with CDP, MG and/or SMTC |  |   |
| 3 | TSSB,CDP < TSSB,SC ≤ TSMTC or MGRPAll occasions of SSB of SC collide with CDP, MG and/or SMTC |  |   |
| 4 | TSSB,SC < TSSB,CDP < TSMTC or MGRPNot all occasions of SSB of SC collide with CDP, MG and/or SMTC |  |  |
| 5 | TSSB,CDP < TSSB,SC ≤ TSMTC or MGRPNot all occasions of SSB of CDP collide with SC, MG and/or SMTC |  |  |
| SSBSC1 is the number of SSB occasions of serving cell which are colliding with CDP but not colliding with MG or SMTC within time max(MGRP, SMTC)SSBCDP1 is number of SSB occasions of CDP which are colliding with SC but not colliding with MG or SMTC within max(MGRP,SMTC)SSBSC2 is the number of SSB occasions of serving cell which are not colliding with CDP, MG or SMTC within time max(MGRP, SMTC)SSBCDP2 is number of SSB occasions of CDP which are not colliding with SC, MG or SMTC within max(MGRP,SMTC) |

**Scheduling Restriction*****Observation #2:*** *The UE behaviour for inter-cell L1-RSRP measurement in dynamic TDD is captured in RAN1 specification.***Proposal #2: RAN4 need not discuss the scheduling restriction for dynamic TDD as its already captured in RAN1 specification.** **Proposal #3: The existing scheduling restrictions defined for L1 measurements on serving cell are applicable when UE is receiving PDCCH/PDSCH from cell with different PCI and no further clarification is required in specification.** **Applicability of ICBM feature*****Observation #3:*** *Without prior agreement, we don’t extend or define requirements for concurrent WIs in the same release.* **Proposal #4: Do not extend the ICBM feature and/or requirements to other concurrent Rel-17 WIs*****Observation #4:*** *The cell with different PCI is nor a serving cell or serving CC, hence common TCI would not be applicable to it.***Proposal #5: Common TCI configurations do not include cell with different PCI configured for ICBM per RAN1/ RAN2 design. No further clarification is needed in RAN4.**  |
| [**R4-2215744**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215744.zip) | Samsung | **Proposal 1: 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 2: It is not needed to introduce scheduling restriction on non-serving cell.****Proposal 3: RAN4 not extend ICBM requirements for concurrent R17 WIs in Release 17. It can be postponed to further release.** |
| [**R4-2215765**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215765.zip) | MediaTek Inc. | **Proposal 1: FR 2-2 is not applicable to R17 inter cell beam management.****Proposal 2: 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 3: Whether to define the requirement of overlap between SSB and PDCCH/PDSCH in the same RE should wait for RAN1 conclusion.** |
| [**R4-2216282**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216282.zip) | Huawei, HiSilicon | ***Proposal 1: After punctured by L3 measurements, the sharing strategy between SC SSB and CDP SSB for L1-RSRP measurements can be defined as follows:**** ***When the remaining SSB periodicity of SC is equal to the remaining SSB periodicity of CDP, the remaining L1-RSRP measurement opportunities are equally shared between SC SSB and CDP SSB.***
* ***When the remaining SSB periodicity of SC is shorter than the remaining SSB periodicity of CDP, the L1-RSRP measurements on SC SSB can be further punctured by L1-RSRP measurements on CDP SSB.***
* ***When the remaining SSB periodicity of SC is longer than the remaining SSB periodicity of CDP, the L1-RSRP measurements on CDP SSB can be further punctured by L1-RSRP measurements on SC SSB.***

***Proposal 2: The sharing factors PSC and PCDP for inter-cell L1-RSRP measurements can be defined as option 1:**** + Option 1:

|  |  |  |  |
| --- | --- | --- | --- |
| # | Scenario | PSC | PCDP |
| 1 | T’SSB,SC = T’SSB,CDP  | 2 | 2 |
| 2 | T’SSB,SC < T’SSB,CDP  |  | 1 |
| 3 | T’SSB,CDP < T’SSB,SC  | 1 |  |

***Proposal 3: The measurement restrictions are applied between SC SSB for RLM/BFD/CBD and CDP SSB for L1-RSRP.******Proposal 4: The measurement restrictions are applied between CDP SSB for BFD/CBD and SC SSB for L1-RSRP.*** |
| [**R4-2216362**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216362.zip) | vivo | **Proposal 1 Remove square brackets for L1 measurement sharing factor in TS 38.133.****Proposal 2 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 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.****Proposal 4 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.****Proposal 5 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.****Proposal 6 RAN4 can revisit whether any clarification or update is needed in RAN4 spec when SSB and PDCCH/PDSCH are overlapped on the same RE** |
| [**R4-2216485**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216485.zip) | ZTE Corporation | **Observation 1: According to legacy requirement, both RRM measurement and L1-RSRP measurement are prioritized than DL/UL transmission. The difference between scheduling restriction since of RRM measurement and L1-RSRP measurement are whether adjacent symbol before and after SSB should be restricted.****Proposal 1: 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.****Proposal 2: Given that the cell with different PCI also belongs to serving cell, which is a TRP of serving cell, so not need to introduce any additional scheduling restriction on the cell with different PCI. Directly reusing the scheduling restriction specified on serving cell since of L1-SINR measurement, BFD, CBD, RLM on serving cell is enough.** **Proposal 3: To sum up, for all sub-bullets in Option 1, the following sub-bullets can be supported:*** **For intra-band ICBM using common TCI configurations, different reference CCs in the same CC list between the serving cell and a cell with different PCI is not supported in R17. Same reference CC is applicable for serving cell and a cell with different PCI in a CC list. The serving cell and cell with different PCI in the reference CC are referenced by other serving cells and cells with different PCI respectively in the CC list.**
* **For intra-band ICBM using common TCI configurations, requirements are defined for the case when SSB measurements for a cell with different PCI are only performed in the cell that has the same SSB frequency as the reference CC.**
* **R17 ICBM feature is applicable to FR1 HST and FR2 HST. If RAN4 identifies any issue in applying HST related enhancements to ICBM related RRM requirements, RAN4 solve them in the R17 maintenance phase.**
 |
| [**R4-2216819**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216819.zip) | Ericsson | **Proposal 1: 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**

**Proposal 2: 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**

**Proposal 3: When SSB and PDCCH/PDSCH are overlapped on the same RE, whether any clarification is needed in RAN4 spec to be discussed under Demod agenda.** |

## Open issues summary

### Sub-topic 2-1: Sharing factor

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

* Proposals:
	+ Proposal 1(Intel, Huawei, vivo):
		- Remove the bracket in the corresponding CR.
	+ Proposal 1a(Apple):
		- Either confirm the tentatively agreed sharing factors in last meeting or define the sharing factors by considering the number of measurement occasions as:

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Scenario** | **P for Serving cell** | **P for cell with different PCI** |
| 1 | TSSB,SC = TSSB,CDP < TSMTC or MGRP |  |   |
| 2 | TSSB,SC < TSSB,CDP < TSMTC or MGRPAll occasions of SSB of SC collide with CDP, MG and/or SMTC |  |   |
| 3 | TSSB,CDP < TSSB,SC ≤ TSMTC or MGRPAll occasions of SSB of SC collide with CDP, MG and/or SMTC |  |   |
| 4 | TSSB,SC < TSSB,CDP < TSMTC or MGRPNot all occasions of SSB of SC collide with CDP, MG and/or SMTC |  |  |
| 5 | TSSB,CDP < TSSB,SC ≤ TSMTC or MGRPNot all occasions of SSB of CDP collide with SC, MG and/or SMTC |  |  |
| SSBSC1 is the number of SSB occasions of serving cell which are colliding with CDP but not colliding with MG or SMTC within time max(MGRP, SMTC)SSBCDP1 is number of SSB occasions of CDP which are colliding with SC but not colliding with MG or SMTC within max(MGRP,SMTC)SSBSC2 is the number of SSB occasions of serving cell which are not colliding with CDP, MG or SMTC within time max(MGRP, SMTC)SSBCDP2 is number of SSB occasions of CDP which are not colliding with SC, MG or SMTC within max(MGRP,SMTC) |

* + Proposal 2(Ericsson)：
		- 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
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | In general, we prefer proposal 2 but detail can be further discussed. For example, the Navailable,SSB\_CDP seems should be considered in the equation.The reason why we prefer proposal 2 is because it has better forward compatibility. If we go with option 1 and 1a, the sharing factor would be very complicated if more than two cells are further considered. Note: in R18 L1/L2 mobility, more than two cells may be considered.  |
| Ericsson | We support proposal 2. We also think that it is easy to read and understand the spec for proposal 2 and more forward compatible for L1/L2 mobility. We are fine to discuss the details of the proposal 2.  |
| vivo | Prefer option 1.Option 2 propose to use consider a more general form for R17 ICBM and concurrent gaps. We think this can be FFS after the concurrent R17 WI issue in 2-3 is resolved. Moreover, note that this may also change the form of legacy requirements. For R17 UE/NW not supporting ICBM, it would cause confusion. |
| Apple | We are fine with proposal 1. In our understanding option 1a is also based on similar principle as option 2. But with option 2, the legacy sharing factors are not maintained/ unclear. We should consider a period of max(MGRP, SMTC) for counting the occasions. Also, in our understanding - if Navailable,SSB\_CDP\_SMTC\_MG = 0 is an error condition.  |
| Huawei | Support Proposal 1.The wordings of sharing factors definition in brackets in current spec are clear for us, which shows no impacts on L3 measurements, and the sharing strategy is also easy to understand. |
| Intel | Support Proposal 1. We prefer to re-use the legacy spec structure as much as possible for easy understanding. Proposal 2 seems quite different from current spec.For forward compatible, if cell number is more than two, the similar method can be taken. First consider the available occasion except for MG and SMTC for each cell first. Then consider how to derive the sharing factor between the left occasions. 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. |

### Sub-topic 2-2: Scheduling Restriction

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

* Proposals:
	+ Proposal 1(Apple):
		- 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):
		- 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):
		- 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):
		- 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.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Prefer proposal 3. Some companies mention this has already defined in TS 38.213. But it is unclear to us. We are wondering what is the UE behaviour for the following two cases:* if *dl-OrJoint-TCIStateList* is provided, and the SSB indicated by *ssb-PositionsInBurst* in *SSB-MTCAdditionalPCI* is overlapped with other UL channels/signals?
* If SSB is configured by *ssb-PositionsInBurst* in *SSB-MTCAdditionalPCI* as QCL source for other RS (e.g. tracking RS) but not configured for L1 beam measurement/reporting?

Content in TS 38.213 is provided as below for reference.

|  |
| --- |
| For operation on a single carrier in unpaired spectrum, for a set of symbols of a slot indicated to a UE for reception of SS/PBCH blocks by *ssb-PositionsInBurst* in *SIB1* or by *ssb-PositionsInBurst* in *ServingCellConfigCommon* or, if the UE is not provided *dl-OrJoint-TCIStateList*,by *ssb-PositionsInBurst* in *SSB-MTCAdditionalPCI* associated to physical cell ID with active TCI states for PDCCH or PDSCH, or for a set of symbols of a slot corresponding to SS/PBCH blocks configured for L1 beam measurement/reporting, the UE does not transmit PUSCH, PUCCH, PRACH in the slot if a transmission would overlap with any symbol from the set of symbols and the UE does not transmit SRS in the set of symbols of the slot. The UE does not expect the set of symbols of the slot to be indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, when provided to the UE. |

 |
| Ericsson | Prefer proposal 1. |
| vivo | Thanks very much MTK for providing information about latest RAN1 spec.Checking with our RAN1 colleagues, we agree that the RAN1 spec may need further revision for this. We are open to FFS this issue after RAN1 clarifies their spec. |
| ZTE | Support Proposal 3, 3a and 3b.  |
| Huawei | In R17, SSB with additional PCI can be configured for BFD, CBD and L1-RSRP measurements, and the corresponding scheduling restrictions due to L1 measurements on SSB with additional PCI include both DL symbols and UL symbols.*- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.*UE behaviour for the 1st case mentioned by MTK has been captured in RAN4 spec.For the 2nd case, when a SSB with additional PCI is used as QCL source for other DL-RS, typically this SSB needs to be configured for L1-RSRP measurements. |
| Apple2 | In our understanding from RAN1 spec the UE doesn’t transmit UL signals in symbols overlapping with SSB for L1-RSRP measurement and SSB used as active TCI for PDCCH/PDSCH (point 2 in MTK’s comments above).  We are not sure about the condition - UE is not provided *dl-OrJoint-TCIStateList* in 38.213.We are fine to further clarify with RAN1 by sending LS.  |
| Samsung | Support 3&3a&3b |

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

* Proposals:
	+ Option 1(Apple, Samsung, ZTE):
		- No
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Our understanding was it was already defined.  |
| vivo | Ok to option 1. Serving cell is not changed in R17. |
| ZTE | Support Option 1. |
| Huawei | Support option 1 |
| Samsung | Support option 1.  |

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

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

* Proposals:
	+ Proposal 1(Apple):
		- Do not extend the ICBM feature and/or requirements to other concurrent Rel-17 Wis
		- Common TCI configurations do not include cell with different PCI configured for ICBM per RAN1/ RAN2 design. No further clarification is needed in RAN4.
	+ Proposal 1a (Samsung):
		- RAN4 not extend ICBM requirements for concurrent R17 Wis in Release 17. It can be postponed to further release.
	+ Proposal 2(vivo):
		- 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.
	+ Proposal 3(ZTE):
		- For intra-band ICBM using common TCI configurations, different reference CCs in the same CC list between the serving cell and a cell with different PCI is not supported in R17. Same reference CC is applicable for serving cell and a cell with different PCI in a CC list. The serving cell and cell with different PCI in the reference CC are referenced by other serving cells and cells with different PCI respectively in the CC list.
		- For intra-band ICBM using common TCI configurations, requirements are defined for the case when SSB measurements for a cell with different PCI are only performed in the cell that has the same SSB frequency as the reference CC.
		- R17 ICBM feature is applicable to FR1 HST and FR2 HST. If RAN4 identifies any issue in applying HST related enhancements to ICBM related RRM requirements, RAN4 solve them in the R17 maintenance phase.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Support proposal 1a. |
| Ericsson | Support proposal 1a. |
| vivo | Support proposal 2.We think HST would be one of the important scenarios for ICBM. Moreover, they should be applicable to both FR1 and FR2.For the 1st bullet in proposal 1 and first two bullets in proposal 3, we think the situation is already clear according to latest RAN1/RAN2 spec. No need for further clarifications in RAN4. |
| Apple | We support proposal 1, 1a. We don’t support to extend ICBM requirement to concurrent R17 Wis in Rel-17 and it needs more discussion. The 2nd bullet in Proposal 1 is trying to clarify that first 2 bullets in proposal 3 is not needed as its not supported in Rel-17 design.  |
| ZTE | We are open to discuss whether we can extend ICBM to concurrent R17 Wis. If majority agree such extension, we can further discuss the details. |
| Huawei | Support proposal 1a |
| CMCC | Support Proposal 2. We do not see issues to apply R17 requirements for inter-cell L1 measurements to HST. If issues are observed by companies, we are open to have discussion.  |
| Intel | Prefer option 1a |
| Samsung | Support proposal 1a. they are out of the scope of this WI. And it needs more discussion, we don’t think it should be concluded in R17. |
| Vivo2 | Note that FR1 HST is a R16 WI. We do not think the comment on con-current WI make sense.We share the view from CMCC. |

### 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**

* Proposals:
	+ Proposal 1(MTK):
		- Whether to define the requirement of overlap between SSB and PDCCH/PDSCH in the same RE should wait for RAN1 conclusion.
	+ Proposal 1a(vivo):
		- RAN4 can revisit whether any clarification or update is needed in RAN4 spec when SSB and PDCCH/PDSCH are overlapped on the same RE
	+ Proposal 2(Intel):
		- Clarify that performance degradation is expected when overlapping happen in RAN4 spec.
	+ Proposal 3(Ericsson):
		- When SSB and PDCCH/PDSCH are overlapped on the same RE, whether any clarification is needed in RAN4 spec to be discussed under Demod agenda.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | Support proposal 1. In the last meeting, RAN4 sends the LS to RAN1 to clarify the current status of TS 38.133. We can further discuss this issue if RAN1 does not define any requirement for it. |
| Ericsson | Proposal 1 and 3 are fine with us. |
| vivo | Support proposal 1 and 1a. We think they are the same. |
| Apple | Is this for SSB and PDSCH/PDCCH from different cells in FR1? If RAN1 agrees on the working assumption, no additional clarification is needed in RAN4 spec. Otherwise, okay to clarify this.  |
| ZTE | Prefer Proposal 1 and 1a. |
| Huawei | We are fine with Proposal 1 and 3.From RRM perspective, no further clarification or update is needed for the case when SSB and PDCCH/PDSCH are overlapped on the same RE. |
| Intel | Fine with proposal 1. |
| Samsung | Fine with Proposal 1. |
| Qualcomm | We are with Proposal 1. right now the requirements are defined with a side condition of SINR per RE, this would also cover this case. |

### 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.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MediaTek | More discussion is needed. We are not sure whether the CBD and BFD can be applied for CDP. The reason is because the CBD-RS should be included in *candidateBeamRSList1* according to TS 38.213. However, *candidateBeamRSList1* seems not applicable to CDP. |
| Ericsson | We are fine to further look into it. We would like to study the option of defining sharing factor too. |
| vivo | In our understanding CDP SSB can also be configured for RLM as long as RLM is based on the source RS of TCI by default. Therefore, we would prefer to consider more general form for this clarification, e.g.‘The measurement restriction applies when either SSB of SC or SSB of CDP is used for RLM/BFD/CBD.’ |
| Apple | In general agree that we need to further consider these measurement restrictions, but need to further check and discuss if all combinations are possible.Our assumption is for TRP specific BFD/CBD the RS could be from CDP in case of inter-cell mTRP – is that the target scenario for bullet 2? |
| ZTE | It seems that RAN4 has identified the measurement restriction between SC SSB for L1-RSRP/RLM/BFD/CBD and CDP SSB for L1-RSRP during CR discussion in previous meeting if we remember correctly. So maybe the 2nd sub-bullet is necessary to discuss. |
| Huawei | For TRP specific BFD/CBD, additionalPCI can be configured.BeamFailureDetection-r17 ::= SEQUENCE { failureDetectionSet1-r17 BeamFailureDetectionSet-r17 OPTIONAL, -- Need R failureDetectionSet2-r17 BeamFailureDetectionSet-r17 OPTIONAL, -- Need R additionalPCI-r17 AdditionalPCIIndex-r17 OPTIONAL -- Need R}When additionalPCI is configured, SSBs in both BFD set q01 and CBD set q11 are CDP SSB.***additionalPCI***Indicates the physical cell IDs (PCI) of the SSBs in the *failureDetectionSet2*. If *candidateBeamRS-List2* is configured in IE *BeamFailureRecoveryRSConfig* the field indicates the physical cell IDs (PCI) of the SSBs in the *candidateBeamRS-List2*.So, the 2nd sub-bullet is also possible in R17. |
| Intel | It’s possible that SSB resource for RLM/BFD/CBD is configured for L1-RSRP measurement as well. SSB resource for L1-RSRP may be fully overlapped or partially overlapped with SSB for RLM/CBD/BFD.Since we already define sharing while not confliction between SSB L1-RSRP for cell and cell with different PCI, when two SSB conflicted from two cells, we may need further check whether to define sharing or confliction or other way, which depends on the overlapping case. |

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

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

* Proposals:
	+ Proposal 1(MTK):
		- FR 2-2 is not applicable to R17 inter cell beam management.
* Recommended WF
	+ Collect companies’ view for these proposals in 1st round

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| --- | --- |
| **Company** | **Comments** |
| MediaTek | Support proposal 1. We do not discuss any joint requirement between R17 inter cell BM and R17 FR2-2. |
| Ericsson | We would like to check RAN1 scope regarding this. |
| vivo | OK to proposal 1. |
| Apple | We support the proposal as there was no prior agreement or discussion to extend ICBM requirements to FR2-2. |
| Huawei | Fine with Proposal 1. |
| Intel | Fine with proposal 1. |
| Samsung | Support proposal 1. |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2215594**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215594.zip)Apple | CR for inter-cell beam management |
| MediaTek: Depending on open issues. |
| vivo: We are a little bit confused about ‘additional cell’ and ‘cell with different PCI’. What is the definition for them? Are they the same cell?Apple: @Vivo, if the question is related to our change in 9.13.6, we tried to simplify the wording as the previous wording had additional PCI, different PCI and it wasn’t clear. We hope the current wording captures the purpose more accurately. Vivo2: @Apple, yes, the comment is intended for the change in 9.13.6. We are fine with your wording but looking them together with other sub-clauses there is slightly confusion. We prefer to have an issue to discuss this, so as to allow more careful check on all sub-clauses of this 9.13 and make the wording aligned. |
| Intel: depends on open issues. Modification in 9.13.3 is conflicting with R4-2216820. Modification in 9.13.4.1 is conflicting with R4-2216283, R4-2216363. Merge is considered if necessary. |
| [**R4-2215767**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215767.zip)MediaTek Inc. | CR on applicability of R17 inter cell beam management for FR2-2 |
| MediaTek: It is related to issue 2-6-1. Support this CR. |
|  |
| [**R4-2216283**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216283.zip)Huawei, HiSilicon | CR on maintaining L1-RSRP measurement requirements for R17 inter-cell BM |
| MediaTek: Depending on open issues. |
| Apple: Pending some open issues related to measurement restrictions.  |
| Intel: depends on open issues. Modification in 9.13.4.1 is conflicting with R4-2215594, R4-2216363. Merge is considered if necessary.In section 9.5.4.1, P can’t be changed to P1 for some scenarios when SSB for SC L1-RSRP is on occasion of SMTC. For SC, L1-RSRP may be shared with SMTC. While for NSC, L1-RSRP can only be performed outside SMTC. Therefore, for such cases, the SSB for NSC and SSB for SC will not overlap. There is no sharing between them.By the way, in section 8.5.5.3, it seems that the confliction is between SSB and CSI-RS. |
| [**R4-2216363**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216363.zip)vivo | CR on inter-cell beam managements in R17 feMIMO |
| MediaTek: Depending on open issues. |
| Apple: Pending some open issues being discussed |
| Intel: Depending on open issues. Modification in 9.13.4.1 is conflicting with R4-2215594, R4-2216363. Merge is considered if necessary. |
| [**R4-2216820**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216820.zip)Ericsson | Maintenance CR on inter-cell BM |
| MediaTek: Depending on open issues. |
| Vivo: We do not think the following should be removed. They should be kept as the same for L1-RSRP measurement for serving cell.[In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.]Vivo2: Based on offline discussion it seems there is duplication in 9.5.1 and 9.5.3. With this, we are fine to this change. |
| Intel: modification in 9.13.3 is conflicting with R4-2215594. Merge is considered if necessary. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
|  | **Issue 2-1-1: Sharing factor design***Tentative agreements: No.**Recommendations for 2nd round: Further discussion.** 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
 |
|  | **Issue 2-2-1 Scheduling restriction for dynamic TDD***Tentative agreements: No.**Recommendations for 2nd round: Further discussion.** 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.
 |
|  | **Issue 2-2-2 Whether to define scheduling restriction for non-serving cell***Tentative agreements: Yes.** + No

*Recommendations for 2nd round: No further discussion.* |
|  | **Issue 2-3-1: Applicability of ICBM feature***Tentative agreements: No.**Recommendations for 2nd round: Further discussion. The options are further reduced according to majority view.** 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.
 |
|  | **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***Tentative agreements: Yes.** + Whether to define the requirement of overlap between SSB and PDCCH/PDSCH in the same RE should wait for RAN1 conclusion.

*Recommendations for 2nd round: No further discussion.* |
|  | **Issue 2-5-1: Measurement restriction for SSB based L1-RSRP***Tentative agreements: No.**Recommendations for 2nd round: Further discussion. Options are added according to comments.** 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
 |
|  | **Issue 2-6-1: Applicability of FR 2-2***Tentative agreements: Yes.** + FR 2-2 is not applicable to R17 inter cell beam management.

*Recommendations for 2nd round: No further discussion.* |
|  |  |
|  |  |

## Discussion on 2nd round (if applicable)

*Suggest to discuss in the WF. Comments will be pasted here later.*

# Topic #3: Other RRM requirements (4.5.1.3)

## Companies’ contributions summary

No.

## Open issues summary

No.

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2215747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215747.zip)Samsung | Correction on requirements for TRP specific link recovery procedures |
| MediaTek: OK |
| Ericsson: Ok |
| Huawei: OK with this CR |
| [**R4-2216487**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216487.zip)ZTE Corporation | CR on SFN based RLM and LRP |
| MediaTek: OKEricsson: OKHuawei: the change is not correct. The BLER for RLM/BFD shall be configured as fixed values, and the corresponding SNR under hypothetical PDCCH parameters is up to UE implementation. |
| ZTE: To Huawei, firstly, the CR tries to revise the current description in the spec more align with previous approved agreement.

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| *Agreements**For a CORESET with two activated TCI states, UE evaluates the RLM/BFD based on single hypothetical PDCCH BLER for the CORESET.* |

Secondly, In our opinion, here the ‘hypothetical PDCCH BLER’ is the real value, not the threshold, it is derived from hypothetical SINR, so it is not a fixed value.Further more, just remind, the draft CR has already noted as endorsement during 104 meeting. This formal CR is identical with the draft CR. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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NA.

## Discussion on 2nd round (if applicable)

NA.

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on FeMIMO Unified TCI state | Intel |  |
|  | WF on FeMIMO RRM requirements for inter-cell beam management  | Huawei |  |
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**Existing tdocs**

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| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| [R4-2215592](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215592.zip) |  | CR for unified TCI | Apple | Revised | some parts depend on open issue 1-1-1, 1-2-1.  |
| [R4-2216281](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216281.zip) |  | CR on maintaining TCI state switching requirements for R17 unified TCI | Huawei, HiSilicon | Return to | depend on open issue 1-2-2 |
| [R4-2216361](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216361.zip) |  | CR on unified TCI in R17 feMIMO | vivo | Return to | depend on open issue 1-1-1, 1-2-1, 1-4-1 |
| [R4-2216818](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216818.zip) |  | CR on maintenance of unified TCI state switching requirements | Ericsson | Return to | depend on open issue 1-1-1, 1-2-1, 1-4-1modification in 8.15.1 is merged to R4-2215592. |
| [R4-2215594](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215594.zip) |  | CR for inter-cell beam management | Apple | Revised | some parts depend on open issue 2-1-1modification in 9.13.3 is merged to R4-2216820 |
| [R4-2215767](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215767.zip) |  | CR on applicability of R17 inter cell beam management for FR2-2 | MediaTek Inc. | Agreeable |  |
| [R4-2216283](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216283.zip) |  | CR on maintaining L1-RSRP measurement requirements for R17 inter-cell BM | Huawei, HiSilicon | Return to | some parts depend on open issue 2-1-1, 2-5-1 |
| [R4-2216363](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216363.zip) |  | CR on inter-cell beam managements in R17 feMIMO | vivo | Return to | some parts depend on open issue 2-1-1, 2-2-1, 2-3-1 |
| [R4-2216820](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216820.zip) |  | Maintenance CR on inter-cell BM | Ericsson | Revised |  |
| [R4-2215747](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215747.zip) |  | Correction on requirements for TRP specific link recovery procedures | Samsung | Agreeable |  |
| [R4-2216487](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216487.zip) |  | CR on SFN based RLM and LRP | ZTE Corporation | Return to | discuss in 2nd round whether modification is needed |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents