**3GPP TSG-RAN WG4 Meeting # 111 R4-2408023**

**Fukuoka City, Fukuoka , Japan, 20th – 24th May, 2024**

**Agenda item:** 7.24.1 and 7.24.2

**Source:** Moderator (Huawei)

**Title:** Ad-hoc minutes for [111][226] Netw\_Energy\_NR

**Document for:** Information

# Introduction

This topic summary includes RRM core/perf requirements for Rel-18 network energy saving (7.24.1 and 7.24.2).

**Recommended Topics to be treated online (in order of decreasing priority):**

**Issue 1-1-1: Power difference conditions**

**Issue 2-1-1: Test configurations for SSB-less - EPRE**

**Issue 1-1-3: Multiple SSB-less SCells activation**

**Issue 1-1-6: Intra-band non-contiguous CA**

**Issue 2-1-3: Test configurations for SSB-less – Reference Cell determination**

**Issue 1-1-2: Requirements applicability when multiple P-TRS are configured.**

**CR handling:**

**The endorsed Big CRs in RAN4#110bis and CR/draftCR in RAN4#111 will be captured in formal CR in post-meeting.**

# Topic #1: Core requirements maintenance

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407197.zip) | MediaTek inc. | **Proposal 1: No need to further clarify EPRE comparison whether it is performed after AGC. No need to capture in spec. (Option 2 in [1]).** |
| [**R4-2407309**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407309.zip) | Apple | **Proposal 1: For power difference conditions in SSB-less SCell activation requirement, RAN4 to keep “EPRE after pre-compensation” in the spec text, and if needed we can also clarify the pre-compensation is based on CC BW size, SCS, and pathloss difference based on normalized pathloss equation with implementation margins.****Proposal 2: For P-TRS based SSB-less SCell activation, either of following alternative can be adopted:****Alt1: UE to assume: the TRS used for activation shall be the one QCLed typeC with the SSB indirectly associated with the active TCI for PDCCH/PDSCH reception at reference cell.****Alt2: inter-band FR1 SSB-less SCell activation requirement only applies if network configures only one TRS of the SSB-less SCell before SCell activation.****Proposal 3: for intra-band FR1 NCCA case, the side condition of RTD for SSB-less SCell activation shall be defined as:*** **The RTD between the target SSB-less intra-band NCCA SCell and the collocated reference serving cell is within CP where CP is corresponding to the max SCS between reference cell and target SCell.**

**Proposal 4: for intra-band FR1 NCCA case, the side condition of power imbalance for SSB-less SCell activation shall be defined as:*** **The [EPRE] difference at the UE is smaller than or equal to [6] dB, where, [EPRE] difference is the power difference between TRS/A-TRS symbol on the SSB-less SCell and SSB symbol on the reference serving cell [after the compensation for AGC].**

**Proposal 5: if neighbor cells on carrier of SSB-less SCell have SSB transmission, the measurement for those neighbor cells shall be treated as inter-frequency measurement without MG as long as the SSBs from those neighbor cells can be contained in the active BWP of SSB-less SCell.** **Proposal 6: for multiple SSB-less SCell activation, if the being-activated SSB-less SCells are on intra-band contiguous CCs, to prioritize the SCell with the smallest TRS periodicity for activation, and then treat the other SCell(s) activation by reusing all the AGC and T/F information (no additional time is needed for activation), and the total delay for multiple SCell activation would still be: Tfirst\_TRS + TTRS +[5]ms.** |
| [**R4-2407740**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407740.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: The requirements for inter-band SSB-less operation apply provided that [EPRE] difference at UE side is less than [12]dB after pre-compensation for AGC.****Observation #1: There may be ambiguity on which TRS to be used for SSB-less SCell activation in case of multiple TRSs in the SSB-less SCell.****Proposal 2: For P-TRS based SSB-less SCell activation, RAN4 to discuss if SCell activation delay shall be defined when multiple TRSs are QCL-typeC with the SSBs in the reference cell.****Observation #2: 260ns TAE is assumed only for intra-band contiguous CA.** **Observation #3: For FR1 intra-band non-contiguous CA, UE shall be able to handle up to 3us receive timing difference which is derived from 3us TAE.****Proposal 3: For FR1 intra-band non-contiguous CA, reuse the SSB-less SCell activation delay requirement defined for FR1 co-located inter-band CA with the same RTD side condition i.e. RTD within CP.****Observation #4: SMTC configuration is per carrier and UE is not expected to measure the cells on this carrier.** **Proposal 4: Do not discuss the neighbor cell measurement on the carrier of SSB-less SCell.****Observation #5: The CSI-RS for L1-RSRP reporting is to be transmitted during non-active periods of Cell DTX based on RAN1.** **Observation #6: RAN1 also agreed that “Periodic/Semi-persistent CSI report” is not to be transmitted during non-active periods of Cell DRX but does not elaborate if all the CSI reporting types are included.** **Observation #7: The delay of the L1-RSRP report due to Cell DRX will cause unnecessary beam failures and degrade the system performance.****Proposal 5: The CSI report for L1-RSRP shall be allowed during non-active periods of Cell DRX.****Proposal 6: Send LS to RAN1 clarifying that the CSI report for L1-RSRP shall be allowed during non-active periods of Cell DRX.****Observation #8: Existing NES-based condition handover delay assumes that the CHO condition remains fulfilled/met from the end of Tevent\_DU until UE successfully decodes DCI 2-X command.****Observation #9: For the case DCI 2-X command comes after TEvent\_DU + Tidentify\_intra\_with\_index, the NES-based CHO condition may or may not be met when receiving the DCI 2-X command.****Proposal 7: The NES-based conditional handover delay shall be defined considering the possible channel variation when DCI 2-X command comes after TEvent\_DU + Tidentify\_intra\_with\_index.****Proposal 8: The NES-based CHO shall be executed only if the condition of NES-based CHO is met when receiving the DCI 2-X command after TEvent\_DU + Tidentify\_intra\_with\_index.** **Proposal 9: If the condition of NES-based CHO is not met when receiving the DCI 2-X command after TEvent\_DU + Tidentify\_intra\_with\_index.,*** **Tevent\_DU is defined as the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until “a condition exists at the measurement reference point after receiving DCI 2-9 which will trigger the NES-based conditional handover”, and**
* **Tmeasure equals to TSSB\_measurement\_period\_intra or TSSB\_measurement\_period\_inter.**
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| [**R4-2407741**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407741.zip) | Nokia, Nokia Shanghai Bell | **38133CR on handover delay for NES-based handover** |
| [**R4-2407871**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407871.zip) | OPPO | 1. Not consider SSB-less SCell operation for intra-band NCCA in R18.
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| [**R4-2407934**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407934.zip) | CMCC | **Observation 1: In multiple P-TRSs configured scenario, the current requirement without further clarification is workable.****Proposal 1: In multiple P-TRSs configured scenario, the activation delay can be further improved to Tactivation\_time = min(Tfirst\_TRS\_1 + TTRS\_1, ... , Tfirst\_TRS\_n + TTRS\_n) +5 ms, which Tfirst\_TRS\_n is the time to the end of each first complete nth periodic CSI-RS burst for SCell activation after slot n +** $\frac{T\_{HARQ}+3ms}{NR slot length}$**. TTRS\_n is the periodicity of the nth periodic CSI-RS burst for SCell activation. If such improvement is not pursued, then current requirement without further clarification is also workable.** **Proposal 2: Two ways to define the requirement:*** **Alt 1: Define two sets of requirement and side conditions, reuse the intra-band contiguous CA case (for single RF chain) and inter-band CA case (for separate RF chain) respectively.**
* **Alt 2: Define one set of requirement which reusing the SSB-less activation delay requirement of inter-band CA, and two sets of side conditions as follows:**
	+ **Set 1 (for single RF chain):**
		- **EPRE difference at UE side shall be NOT larger than 6dB**
		- **RTD between the target SCell and the intra-band NCCA collocated reference serving cell can be within CP**
	+ **Set 2 (for separate RF chain): Reusing the side condition of inter-band CA case.**

**Proposal 3: Define two UE capabilities for intra-band NCCA scenario, which corresponding to different UE implementation of single and separate RF chain, the granularity could be per FS indication.****Proposal 4: For the case of the neighbour cell(s) is on the carrier of SSB-less SCell and the SSB from neighbour cell(s) can be contained in the active BWP of SSB-less SCell, the measurement for such neighbour cell(s) can be treated as intra-frequency measurement.****Proposal 5: The multiple SSB-less SCells operated in intra-band contiguous CCs shall be studied and specified. The side condition from single SSB-less SCell case can be reused, the requirement could be defined as:** **Tactivation\_time = min(Tactivation\_time\_SCell1, ... , Tactivation\_time\_SCelln), n = 1, .. , the number of to-be-activated SSB-less SCells*** **Tactivation\_time\_SCelln = Tfirst\_TRS\_Scelln + TTRS\_Scelln + 5ms. [if aperiodic CSI-RS resources are not configured for SCell activation for the nth SSB-less SCells or UE do not support [ATRS based SSB-less operation]]**
* **Tactivation\_time\_SCelln =Tfirst\_ATRS\_Scelln + Tgap\_Scelln + TATRS\_Scelln + 5ms. [if aperiodic CSI-RS resources are configured for Scell activation for the nth SSB-less SCells and UE supporting [ATRS based SSB-less operation]]**
	+ **Tfirst\_TRS\_Scelln is the time to the end of the first complete periodic CSI-RS burst for the nth SCell activation after slot n +** $\frac{T\_{HARQ}+3ms}{NR slot length}$**.**
	+ **TTRS\_Scelln is the periodicity of the periodic CSI-RS burst for the nth SCell activation.**
	+ **Tfirst\_ATRS\_Scelln is the time to the end of the first complete CSI-RS burst for the nth SCell activation after slot n +** $\frac{T\_{HARQ}+3ms}{NR slot length}$ **where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots.**
	+ **TATRS\_Scelln is the CSI-RS burst for the nth SCell activation where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots.**
	+ **Tgap\_Scelln is the gap length between two aperiodic CSI-RS bursts for the nth SSB-less SCell.**

**Proposal 6: A candidate solution to refine the NES CHO requirement is** **DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution****TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until the earliest time of** * **a condition exists at the measurement reference point which not earlier than Tidentify before UE successfully decodes DCI 2-9 with NES-mode indication, and keeps existing before UE successfully decodes DCI 2-9 with NES-mode indication which will trigger the NES-based conditional handover**
* **a condition exists at the measurement reference point after UE successfully decodes DCI 2-9 command with NES-mode indication which will trigger the NES-based conditional handover**

**For NES-based conditional intra-frequency handover:*** **the measurement time delay equal to Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index**

**For NES-based conditional inter-frequency handover:*** **the measurement time delay equal to Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index**
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| [**R4-2408078**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408078.zip) | SAMSUNG R&D INSTITUTE JAPAN | * **Observation 1: At least partial RF components can be shared across CCs i.e., antenna, LNA for Intra-band NC CA.**
* **Observation 2: For power difference side condition: 6dB can be assumed for intra-band NC CA.**
* **Observation 3: It’s not precluded single Rx chain (RF and baseband) can be implemented to support intra-band NC CA which pending on frequency separation distance and pass-band bandwidth on operating bands.**
* **Observation 4: The side condition of RTD can be different pending on UE architecture and frequency separation range across CCs.**
* **Observation 5: In order to optimize performance under intra-band NC CA scenario, multiple sets of requirements maybe required pending on UE capability and operating bands.**
* **Observation 6: It’s hard to conclude in Rel-18 during maintenance phase for intra-band NC CA scenario supporting.**

**Proposal: Further discuss the supporting of SSB-less operation feature with intra-band NC CA scenario in Rel-19 e.g., under Rel-19 Fragmented Carriers SI or Rel-19 NES WI.**  |
| [**R4-2408248**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408248.zip) | ZTE Corporation | **Proposal 1: To keep the “EPRE after pre-compensation” in the spec.****Proposal 2: If the SSB of neighbour cell is fully contained by the active BWP of the SSB-less SCell, the SSB based neighbour cell measurment is defined as intra-frequency measurement, and no gap is needed. Otherwise, the SSB based neighbour cell measurement is defined as inter-frequency measurement and gap is needed.****Proposal 3: Configuring multiple periodic TRS resource in SSB-less SCell is typical, we prefer to define activation delay requirements for this case instead of simply saying no requirements.****Proposal 4: Multiple Candidates are suggested as below, open to apply any of them.*** **Candidate 1: When NW indicates the SSB-less SCell activation command, NW indicates the periodic TRS resource index explicitly, so that UE use the indicated TRS resource to perform SSB-less SCell activation. The Tfirst\_TRS and TTRS in the requirements fomular means the indicated periodic TRS.**
* **Candidate 2: Without any explicit NW indication, UE determine which periodic TRS resource to use based on the active TCI state used in the reference cell. All periodic TRS resource are QCLed-Type C with the SSB transmitted in the reference cell one-to-one, the active TCI state is also associated one of the SSB transmitted in the reference cell, so the SSB associated with the active TCI state used in the reference cell can guarantee the ceverage of the UE, the corresponding periodic TRS resource is suitable for the AGC and T/F sync of the SSB-less activation.**
* **Candidate 3: Depend on UE decision, UE can pick any periodic TRS resource to perform SSB-less SCell activation. When determine the activation delay, use the maximum period of multiple TRS resources.**

**Proposal 5: To move forward, we prefer to specify two sets of requirements respectively assuming single and separate chains, where the requirements of inter-band case are largely reused for the separate chains assumption, and the requriements of intra-band contiguous case are largely reused for the single chain assumtpion. Two optional UE capabilities refers to the two cases. If neither of them supported by the UE, then UE does not support the SSB-less SCell activation for intra-band non-contiguous CA.** |
| [**R4-2408252**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408252.zip) | ZTE Corporation, Sanechips | **[Netw\_Energy\_NR-Core] Draft CR for SSB-less SCell activation of R18 NES** |
| [**R4-2408313**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408313.zip) | China Telecom | **Observation 1: Regarding FR1 Intra-band non-contiguous CA with SSB-less operation, it was agreed in previous meeting that further study whether we can reuse or not the SSB-less activation delay requirement specified for FR1 inter-band CA, and the study does not impact the completion timeline of the WI.****Observation 2: UE implementation in FR1 Intra-band non-contiguous CA can be based on single RF chain or separate RF chains, which is different from UE implementation in FR1 inter-band CA based on separate RF chains.****Proposal 1: The SSB-less activation delay requirement specified for FR1 inter-band CA cannot be directly reused for FR1 Intra-band non-contiguous CA with SSB-less operation.** |
| [**R4-2408437**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408437.zip) | Qualcomm Incorporated | **Proposal: Do not to discuss the neighbor cell measurement on the carrier of SSBless SCell.** **Observation: Feasible scenario for multiple SCell activation is all to-be-activated SCells are contiguous and all SCells are SSBless. UE can activate SCells simultaneously based on largest periodicity of P-TRS among to-be-activated SCells.** **Observation: In R17, there is no requirement for A-TRS based multiple SCell activation. Therefore, there is no baseline requirement to apply. Since not all SSBless SCell may not transmit A-TRS, more discussion is needed for feasible scenario. RAN4 will not define A-TRS based multiple SSBless SCell activation due to limited time in maintenance phase.** **Proposal: RAN4 will not define requirements for A-TRS based multiple SSBless SCell activation.****Proposal: Multiple SSBless SCells activation requirement is applicable when following conditions are met:*** + **All to-be-activated SCells are SSBless on the same band and SCells are contiguous, and**
	+ **All to-be-activated SCells have same QCL source cell for P-TRS in each SSBless SCell.**
* **Otherwise, there is no requirement.**

**Proposal: Multiple SSBless SCells activation requirement is defined based on the largest periodicity of TRS among multiple SSBless SCells. Activation requirement: Tfirst\_TRS\_MAX\_multiple\_scells + TTRS\_MAX\_multiple\_scells +5 ms.****Proposal: RAN4 will not define requirements for SSBless SCell for intra-band non-contiguous CA in R18. RAN4 shall focus on closing other open issues.**  |
| [**R4-2408482**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408482.zip) | Intel Corporation | **Proposal 1: Adopt WF Alternative 1:** * **Specify only assuming separate chains and reuse largely the requirements specified for inter-band cases;**
* **Specify UE optional capability signalling for intra-band NCCA SSB-less SCell operations in a similar way as for inter-band cases;**
* **UE with single chain implementation does not indicate support for intra-band NCCA SSB-less SCell operations and does not need to meet the requirements.**

**Proposal 2: Introduce the optional with capability signalling with per FS granularity for UE supporting intra-band NCCA SSB-less SCell operation in Rel-18.**  |
| [**R4-2408483**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408483.zip) | Intel Corporation | **DraftCR on intra-band NCCA SSB-less Scell activation** |
| [**R4-2408594**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408594.zip) | Huawei, HiSilicon | **Proposal 1: The compensation for AGC is 20log10(X) with 4dB implementation margin, where X is the ratio of center frequency of the SSB-less operation band pair.****Proposal 2: If neighbor cells on carrier of SSB-less SCell have SSB transmission, the measurement for those neighbor cells shall be treated as inter-frequency measurement without MG as long as the SSBs from those neighbor cells can be contained in the active BWP of SSB-less SCell.****Proposal 3: No need to further clarifiy on neighbor cell measurement on carrier of SSB-less SCell in R18 inter-band SSB less operation.****Proposal 4: For FR1 intra-band NCCA with SSB-less operation, EPRE difference at UE side shall be NOT larger than 6dB.****Proposal 5: For FR1 intra-band NCCA with SSB-less operation, RTD between the target SCell and the intra-band NCCA collocated reference serving cell can be within CP.****Proposal 6: When to-be-activated SSB-less SCells are in same band, existing single CC requirement can apply to each to-be-activated SSB-less SCells respectively.****Observation 1: The NES-based CHO is triggered when following conditions are met:****Condition 1: NES mode indication has been received.****Condition 2: The entry condition is now fulfilled.** **Observation 2: If we want to model the procedure clearly, it could be divided into following two cases:*** **NES based CHO is triggered when DCI 2-9 with NES-mode indication is decoded when condition keeps existing within Tidentifybefore UE successfully decodes DCI 2-9 with NES-mode indication**

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| **TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until** **- a condition exists at the measurement reference point which will trigger the conditional handover, or** **- UE successfully decodes DCI 2-9 with NES-mode indication.****<<unchanged part>>****6.1.4.2.2 Measurement time****The measurement time delay is defined from the end of TEvent\_DU until UE executes a handover to a target cell and interruption time starts.****For conditional intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra with index or Tidentify\_intra\_without\_index defined in clause 9.2.5.1 or clause 9.2.6.2.** **For conditional inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index defined in clause 9.3.4.****For NES-based conditional intra-frequency handover:****- If a condition exists at the measurement reference point which fulfills the conditions for NES-based conditional handover, and it keeps existing for Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index before UE successfully decodes the DCI 2-9 with NES-mode indication, Tmeasure = 0.****- Otherwise, Tmeasure equal to the time span from the end of TEvent\_DU until a condition keeps existing for Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index. which can fulfill the NES-based conditional handover.** |

* **Otherwise, NES based CHO is triggered until condition keeps existing for Tidentifyafter DCI 2-9 with NES-mode indication is decoded.**

**Observation 3: It is very difficult to define Tevent\_DU based on current framework which ignores the receiving of DCI 2-9.****Proposal 7: Modify the requirements for NES-based CHO as follows:** |
| [**R4-2408595**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408595.zip) | Huawei, HiSilicon | **Update on SSB-less based SCell activation** |
| [**R4-2408866**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408866.zip) | vivo | **Proposal 1: At least if UE have one intra-band contiguous active serving cell, the UE shall ignore the inter-band R18 reference configuration for SSB-less SCell, i.e. UE only use the intra-band contiguous active serving cell as the reference for the SSB-less SCell.****Proposal 2: Intra-band SSB-less operation considering intra-band non-contiguous and co-located CA is not supported in R18.****Proposal 3: The ‘[after the compensation for AGC]’ is removed from RRM requirements.****Proposal 4: For the delay requirement on NES-based CHO, RAN4 to revise the definition of TEvent\_DU as follows:****TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until*** **a condition exists within 2\*Tidentify\_intra\_with\_index or 2\*Tidentify\_intra\_without\_index before UE successfully decodes DCI 2-9, ~~at the measurement reference point~~ which will trigger the NES-based conditional handover**

**Proposal 5: RAN4 to revise the starting point of TCHO\_execution as follows:****TCHO\_execution is the UE execution preparation time for conditional handover.** * **For NES-based conditional handover, it starts after UE successfully decodes DCI 2-9.**
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| [**R4-2408871**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408871.zip) | vivo | **Draft CR for conditional handover requirements on network energy saving** |
| [**R4-2409723**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409723.zip) | Ericsson | 1. **RAN4 to agree that the EPRE should be defined as the power per RE at the antenna connector as averaged over the respective SSB and TRS bandwidth and then normalized to the SCS.**
2. **RAN4 to agree that EPRE side condition for reference cell and SSB-less SCell as 12 dB.**
3. **For intra-band NCCA, RAN4 to agree on following**
	* **Specify only assuming separate RF chains and reuse largely the requirements specified for inter-band cases;**
	* **Specify UE optional capability signalling for intra-band NCCA SSB-less SCell operations in a similar way as for inter-band cases.**
	* **UE with single RF chain implementation does not indicate support for intra-band NCCA SSB-less SCell operations and does not need to meet the requirements.**
4. **Do not discuss the neighbor cell measurement on the carrier of SSB-less SCell.**
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| [**R4-2409724**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409724.zip) | Ericsson | **Draft CR to 38.133 on SSB less Scell activation** |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1 SSB-less related

**Issue 1-1-1: Power difference conditions**

*Background*

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| ***RAN4#109 R4-2321562*****Online session (Thursday Nov 16, 2023)**Agreement:* + The requirements apply provided that [EPRE] difference at UE side is less than [9] dB.
		- EPRE difference is based on power difference between TRS symbol on SSB-less SCell and SSB symbol on reference cell
		- Capture in the WF that RAN4 assumes that UE carries out pre-compensation for AGC considering [BW difference and carrier frequency difference].

Further discuss whether/how to capture the EPRE after pre-compensation in the spec.***RAN4#110 R4-2403526*****Issue 1-1-1: Power difference conditions** * Proposals
	+ Option 1: keep “EPRE after pre-compensation for AGC” in the spec text. (Apple, Ericsson, Huawei, Nokia, Vivo, ZTE)
		- Option 1a: RAN4 to agree that EPRE side condition for reference cell and SSB less SCell as [12] dB. (Ericsson, Nokia)
		- Option 1b: RAN4 to agree that the EPRE should be defined as the power per RE at the antenna connector as averaged over the respective SSB and TRS bandwidth and then normalized to the SCS. (Ericsson)
		- Option 1c: The EPRE difference at UE side is smaller than or equal to [9] dB, where, EPRE difference is the power difference between TRS/A-TRS symbol on the SSB-less SCell and SSB symbol on the reference serving cell*, which excludes the uncertainty of power difference that caused by non-ideal UE compensation for AGC considering BW difference and carrier frequency difference between SSB-less SCell and the reference serving cell*. (Vivo)
		- Option 1d: The side condition of power difference can be captured as “post-power difference”, which is interpreted as the power difference between TRS/A-TRS symbol on the SSB-less SCell and SSB symbol on the reference serving cell after the compensation for AGC. (ZTE)
	+ Option 2: No need to further clarify EPRE comparison whether it is performed after AGC. No need to capture in spec. (QC)
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* Proposals
	+ Option 1: keep “EPRE after pre-compensation for AGC” in the spec text. (Apple, Nokia, ZTE, Huawei, Ericsson)
		- Option 1a: clarify the pre-compensation is based on CC BW size, SCS, and pathloss difference based on normalized pathloss equation with implementation margins. (Apple)
		- Option 1b: The compensation for AGC is 20log10(X) with 4dB implementation margin, where X is the ratio of center frequency of the SSB-less operation band pair. (Huawei)
		- Option 1c: RAN4 to agree that EPRE side condition for reference cell and SSB less SCell as [12] dB. (Nokia, Ericsson)
		- Option 1d: RAN4 to agree that the EPRE should be defined as the power per RE at the antenna connector as averaged over the respective SSB and TRS bandwidth and then normalized to the SCS. (Ericsson)
	+ Option 2: Remove “after pre-compensation for AGC. (MTK, Vivo)
* Moderator: Majority (5/7) supports keep the EPRE after per-compensation with different proposals on how to descript the pre-compensation. To move forward, companies are encouraged to check following alternatives summarized by moderators. Regarding the relation to BW and SCS, per RAN1 definition TS 38.213 as cited below, it is already “per RE” energy. Thus, no need for further normalization w.r.t BW.
	+ “EPRE Energy per resource element”
* Recommended WF:

Agree on following clarification:

* + The EPRE in the spec is the normalized EPRE by SCS.

Considering following two alternatives in this meeting.

* + Alt 1: keep the “EPRE after pre-compensation for AGC” and clarify that pre-compensation is based on [CC BW size, SCS], and pathloss difference based on normalized pathloss equation with implementation margins as follows:
		- 20log10(X) with [4]dB implementation margin, where X is the ratio of center frequency of the SSB-less operation band pair.
	+ Alt 2: No clarification on “EPRE after pre-compensation for AGC” but increase change [9] dB to [12] dB

**Issue 1-1-2: Requirements applicability when multiple P-TRS are configured.**

* Proposals
	+ Option 1: Define requirements when multiple P-TRS are configured: (Apple, Nokia, CMCC, ZTE)
		- Option 1a: The TRS used for activation shall be the one QCLed typeC with the SSB indirectly associated with the active TCI for PDCCH/PDSCH reception at reference cell. (Apple, ZTE)
		- Option 1b: In multiple P-TRSs configured scenario, the activation delay can be further improved to Tactivation\_time = min(Tfirst\_TRS\_1 + TTRS\_1, ... , Tfirst\_TRS\_n + TTRS\_n) +5 ms, which Tfirst\_TRS\_n is the time to the end of each first complete nth periodic CSI-RS burst for SCell activation after slot n + (T\_HARQ+3ms)/(NR slot length). TTRS\_n is the periodicity of the nth periodic CSI-RS burst for SCell activation. If such improvement is not pursued, then current requirement without further clarification is also workable. (CMCC)
		- Option 1c: NW indicates the periodic TRS resource index explicitly. (ZTE)
		- Option 1d: UE can pick any periodic TRS resource to perform SSB-less SCell activation. When determine the activation delay, use the maximum period of multiple TRS resources. (ZTE)
	+ Option 2: Inter-band FR1 SSB-less SCell activation requirement only applies if network configures only one TRS of the SSB-less SCell before SCell activation. (Apple)
	+ Option 3: RAN4 to discuss if SCell activation delay shall be defined when multiple TRSs are QCL-typeC with the SSBs in the reference cell. (Nokia)
* Recommended WF:
	+ Check whether option 1a can be agreed.

**AH discussion in Wed:**

ZTE: Multi P-TRS is typical. We need to define requirements for this case.

Ericsson: Not typical case.

Nokia: Fine with option 1a. TRS beam could be narrow. It is risky to assume only one TRS.

HW: Fine option 1a.

QC: Nor clear about indirectly in 1a.

Apple to QC: PDCCH TCI can not directly QCL to SSB.

Tentative agreements:

The TRS used for activation shall be the one QCLed typeC with the SSB indirectly associated with the active TCI for PDCCH/PDSCH DMRS at reference cell

Note: The wording can be further improved and identify the potential spec impact if needed.

**Issue** **1-1-3: Multiple SSB-less SCells activation**

*Background:*

|  |
| --- |
| **RAN4#110bis R4-2406301****Issue 1-1-7: Multiple SSB-less SCells activation**Agreement:* When to-be-activated SSB-less SCells are in different bands
	+ Existing single CC requirement can apply to each to-be-activated SSB-less SCells respectively.
	+ The reference cell to the multiple SSB-less Scells in difference bands may or may not be different.
 |

* Proposals
	+ Option 1: If the being-activated SSB-less SCells are on intra-band contiguous CCs, the activation delay is based on the shortest Tactivation\_time among all being-activated SSB-less SCell. (CMCC, Apple)
	+ Option 2: When following conditions are met, Multiple SSBless SCells activation requirement is defined based on the largest periodicity of TRS among multiple SSBless SCells. Activation requirement: Tfirst\_TRS\_MAX\_multiple\_scells + TTRS\_MAX\_multiple\_scells +5 ms. (QC)
		- All to-be-activated SCells are SSBless on the same band and SCells are contiguous, and
		- All to-be-activated SCells have same QCL source cell for P-TRS in each SSBless SCell.
	+ Option 3: Not define requirements for A-TRS based multiple SSBless SCell activation. (QC)
	+ Option 4: When to-be-activated SSB-less SCells are in same band, existing single CC requirement can apply to each to-be-activated SSB-less SCells respectively. (Huawei)
* Recommended WF:
	+ Discuss above options in this meeting.

**Ad hoc discussion (Wed):**

* Recommended WF:
	+ In addition to the agreed scenario in RAN4#110bis. Discuss whether/how to define requirements for following scenario:
		- When all to-be-activated SCells are SSBless on the same band and SCells are contiguous.
		- All to-be-activated SCells have same QCL source cell.
			* FFS requirements apply to both P-TRS and A-TRS
			* FFS
				+ Option 1: single CC requirement can apply respectively.
				+ Option 2: shortest ~~T~~~~activation\_time~~ P-TRS periodicity among all being-activated SSB-less SCell apply
				+ Option 3: longest Tactivation\_time among all being-activated SSB-less SCell apply

QC: No multiple CC requirements for R17 A-TRS. Prefer not to define multi-CC based on A-TRS. Easier to define requirements based on P-TRS. Technically option 2 and 3 are OK, FFS on spec impact.

Apple: Same views as QC wrt A-TRS and P-TRS. Use one Cell to do activation first, then the total delay can rely on the first Cell.

Nokia: Prefer option 2 for P-TRS. For A-TRS, why cannot apply the same principle?

HW: Ok with option 1 and option 2 (use shortest periodicity)

Ericsson:

Apple: Option 2 don't need to wait other Cells. Total delay can be reduced.

MTK: Think about option 2.

QC: Option 2 is kind of enhancement. Prefer option 3 based on current multiple SCell activation.

Nokia: same views as HW about option 3.

Ericsson: One Cell is configured with A-TRS and other Cells configured with P-TRS. The total delay can rely on A-TRS.

Agreements:

* + Also define requirements for following scenario:
		- When all to-be-activated SCells are SSBless on the same band and SCells are contiguous.
		- All to-be-activated SCells have same QCL source cell.
		- P-TRS is used.
			* Option 1: The multiple SCell activation delay requirements are based on TRS with the shortest periodicity. The detailed requirements can be discussed in the CR.
			* Option 2: UE activate each to-be-activated SCell based on the TRS on the SCell, and the requirements to be defined accordingly (i.e. single CC delay)
		- FFS A-TRS based requirements.

**Issue 1-1-4: Neighbour cells on carrier of SSB-less SCell**

* Proposals
	+ Option 1: if neighbor cells on carrier of SSB-less SCell have SSB transmission, the measurement for those neighbor cells shall be treated as inter-frequency measurement without MG as long as the SSBs from those neighbor cells can be contained in the active BWP of SSB-less SCell (Apple, Huawei)
	+ Option 2: For the case of the neighbour cell(s) is on the carrier of SSB-less SCell and the SSB from neighbour cell(s) can be contained in the active BWP of SSB-less SCell, the measurement for such neighbour cell(s) can be treated as intra-frequency measurement (CMCC)
	+ Option 3: If the SSB of neighbour cell is fully contained by the active BWP of the SSB-less SCell, the SSB based neighbour cell measurment is defined as intra-frequency measurement, and no gap is needed. Otherwise, the SSB based neighbour cell measurement is defined as inter-frequency measurement and gap is needed. (ZTE)
	+ Option 3: Do not discuss the neighbor cell measurement on the carrier of SSB-less SCell. (Nokia, QC, Huawei, Ericsson)
* Recommended WF:
	+ Companies are encouraged to discuss the issue considering legacy SSB-less and R18 inter-band SSB-less jointly in unified manner. And no further discussion in R18 NES.

**Issue 1-1-5: Relation to R15 intra-band SSB-less**

* Proposals
	+ Option 1: At least if UE have one intra-band contiguous active serving cell, the UE shall ignore the inter-band R18 reference configuration for SSB-less SCell, i.e. UE only use the intra-band contiguous active serving cell as the reference for the SSB-less SCell. (Vivo)
* Recommended WF:
	+ Discuss above issue.

**Ad hoc discussion (Wed):**

Moderator: The relevant scenario is: UE supports both R18 inter-band SSB-less and R15 intra-band SSB-less AND there is active intra-band contiguous Cell with SSB.

Suggest to discuss the issue based on following options summarized by moderator:

* When R18 reference cell indication is provided:
	+ Option 1: R15 intra-band SSB-less requirements apply (i.e., ignore R18 reference cell configuration)
	+ Option 2: R18 inter-band SSB-less requirements apply.
* When R18 reference cell indication is NOT provided:
	+ Option 1: If the QCL source SSB is on inter-band, then R18 inter-band SSB-less requirements apply; If the QCL source SSB is on the intra-band contiguous Cell, then R15 intra-band SSB-less requirements apply;

Ericsson: Wait for RAN2.

Nokia: It depends on the BCs.

Apple: When the indication is given. Just follow the indication. If the indication is not provided, follow the QCL. No case when QCL to both intra-band and inter-band. No requirements for this case.

Xiaomi: If the intra-band Cell can be indicated R18 indication. If the indication is not provided, if there are both intra-band and inter-band QCL source, how to handle.

QC: First case, follow indication. Second case, if both QCL are provided, intra-band Cell shall be prioritized.

Vivo: In R18, only co-collocated CA. Thus, no big difference. No impact to spec.

Fujisu: If there is no indication, what is the UE behaviour. NW can provide information.

HW: Do not consider QCL both to intra-band and inter-band.

Nokia: It is unreasonable to set QCL source to both intra band inter band. OK no requirements for this case.

Xiaomi: Whether indication can indicate intra-band Cell.

Ericsson: Cannot agree on anything in this meeting. There is discussion in RAN2.

Oppo: Why NW configure both QCL for both intra-band and inter-band?

QC: Reply on QCL configuration. QCL relation should be very clear.

QC(RAN2): RAN 2 has CB in tomorrow afternoon.

Check following option in AH return to:

Option 1: From RAN4 understanding, for UE supports both R18 inter-band SSB-less and R15 intra-band contiguous SSB-less, it is not expected that the to-be-activated SCell is configured with QCL source to both intra-band contiguous and inter-band Cells.

**Issue 1-1-6: Intra-band non-contiguous CA**

*Background*

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| ***RAN4#110 R4-2403526*****Issue 1-3-1: Intra-band NCCA**Agreement:Regarding FR1 intra-band NCCA with SSB-less operation, further study whether we can reuse or not the SSB-less activation delay requirement specified for FR1 inter-band CA.The study does not impact the completion timeline of the WI.  |

* Proposals
	+ Option 1 For FR1 intra-band non-contiguous CA, reuse the SSB-less SCell activation delay requirement defined for FR1 collocated inter-band CA with the same RTD side condition i.e. RTD within CP (Nokia, Intel, Ericsson)
		- Option 1a: (Intel, Ericsson)
			* Specify only assuming separate chains and reuse largely the requirements specified for inter-band cases;
			* Specify UE optional capability signalling for intra-band NCCA SSB-less SCell operations in a similar way as for inter-band cases;
			* UE with single chain implementation does not indicate support for intra-band NCCA SSB-less SCell operations and does not need to meet the requirements.
			* Introduce the optional with capability signalling with per FS granularity for UE supporting intra-band NCCA SSB-less SCell operation in Rel-18.
	+ Option 2: The SSB-less activation delay requirement specified for FR1 inter-band CA cannot be directly reused for FR1 Intra-band non-contiguous CA with SSB-less operation. (CTC)
	+ Option 3: RAN4 will not consider SSBless SCell operation for intra-band NCCA in R18. (OPPO, Samsung, QC, Vivo)
		- Option 3a: Further discuss the supporting of SSB-less operation feature with intra-band NC CA scenario in Rel-19 e.g., under Rel-19 Fragmented Carriers SI or Rel-19 NES WI.(Samsung)
	+ Option 4: (Apple, Huawei)
		- For FR1 intra-band NCCA with SSB-less operation, EPRE difference at UE side shall be NOT larger than 6dB
		- For FR1 intra-band NCCA with SSB-less operation, The RTD between the target SSB-less intra-band NCCA SCell and the collocated reference serving cell is within CP where CP is corresponding to the max SCS between reference cell and target SCell.
	+ Option 5: Two sets of requirements and/or conditions (CMCC, ZTE)
		- Option 5a: Specify two sets of requirements respectively assuming single and separate chains, where the requirements of inter-band case are largely reused for the separate chains assumption, and the requriements of intra-band contiguous case are largely reused for the single chain assumtpion. Two optional UE capabilities refers to the two cases. If neither of them supported by the UE, then UE does not support the SSB-less SCell activation for intra-band non-contiguous CA. (ZTE)
		- Option 5b: (CMCC)
* Alt 1: Define two sets of requirement and side conditions, reuse the intra-band contiguous CA case (for single RF chain) and inter-band CA case (for separate RF chain) respectively.
* Alt 2: Define one set of requirement which reusing the SSB-less activation delay requirement of inter-band CA, and two sets of side conditions as follows:
	+ Set 1 (for single RF chain):
		- EPRE difference at UE side shall be NOT larger than 6dB
		- RTD between the target SCell and the intra-band NCCA collocated reference serving cell can be within CP
	+ Set 2 (for separate RF chain): Reusing the side condition of inter-band CA case.

Define two UE capabilities for intra-band NCCA scenario, which corresponding to different UE implementation of single and separate RF chain, the granularity could be per FS indication.

* Moderator:
	+ 3 companies support to reuse inter-band conditions and requirements.
	+ 4 companies support not to discuss this scenario in R18
	+ 2 companies support to assume “single RF chain” (e.g., CP and 6dB)
	+ 2 companies support to consider two separate conditions and/or requirements and two optional UE capabilities.
* Recommended WF:
	+ Discuss above issue in this meeting.

**Ad hoc discussion (Wed):**

Apple: Similar views as last meeting (single RF chain). No OK to indicate the implementation about RF chain.

Intel: Technically, Apple and HW proposal is OK.

Vivo: Late for this scenario. It will impact RAN2 design. Discuss the scenario to later release.

Ericsson: Assume two RF chain since it is optional UE capability.

Nokia: Same views as Ericsson.

### Sub-topic 1-2 NES-based CHO related

**Issue 1-2-1: When CHO condition is not met anymore**

* Proposals
	+ Option 1: CMCC

|  |
| --- |
| ***A candidate solution to refine the NES CHO requirement is*** ***DCHO = TRRC + TEvent\_DU + Tmeasure + Tinterrupt + TCHO\_execution******TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until the earliest time of*** * ***a condition exists at the measurement reference point which not earlier than Tidentify before UE successfully decodes DCI 2-9 with NES-mode indication, and keeps existing before UE successfully decodes DCI 2-9 with NES-mode indication which will trigger the NES-based conditional handover***
* ***a condition exists at the measurement reference point after UE successfully decodes DCI 2-9 command with NES-mode indication which will trigger the NES-based conditional handover***

***For NES-based conditional intra-frequency handover:**** ***the measurement time delay equal to Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index***

***For NES-based conditional inter-frequency handover:**** ***the measurement time delay equal to Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index***
 |

* + Option 2: (Huawei)

|  |
| --- |
| TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until - a condition exists at the measurement reference point which will trigger the conditional handover, or - UE successfully decodes DCI 2-9 with NES-mode indication.<<unchanged part>>6.1.4.2.2 Measurement timeThe measurement time delay is defined from the end of TEvent\_DU until UE executes a handover to a target cell and interruption time starts.For conditional intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra with index or Tidentify\_intra\_without\_index defined in clause 9.2.5.1 or clause 9.2.6.2. For conditional inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify\_inter\_with\_index or Tidentify\_inter\_without\_index defined in clause 9.3.4.For NES-based conditional intra-frequency handover:- If a condition exists at the measurement reference point which fulfills the conditions for NES-based conditional handover, and it keeps existing for Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index before UE successfully decodes the DCI 2-9 with NES-mode indication, Tmeasure = 0.- Otherwise, Tmeasure equal to the time span from the end of TEvent\_DU until a condition keeps existing for Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index. which can fulfill the NES-based conditional handover. |

* + Option 3: Vivo

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| --- |
| *TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until** *a condition exists within 2\*Tidentify\_intra\_with\_index or 2\*Tidentify\_intra\_without\_index before UE successfully decodes DCI 2-9, ~~at the measurement reference point~~ which will trigger the NES-based conditional handover*

*TCHO\_execution is the UE execution preparation time for conditional handover.* * *For NES-based conditional handover, it starts after UE successfully decodes DCI 2-9.*
 |

* + Option 4: Nokia

|  |
| --- |
| TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until - a condition exists at the measurement reference point which will trigger the conditional handover, or - a condition exists after receiving DCI 2-9 command which will trigger the NES-based conditional handover, provided DCI 2-9 command comes after TEvent\_DU + Tidentify\_intra\_with\_index and the condition of NES-based CHO is met when receiving the DCI 2-9 command, or- a condition exists at the measurement reference point which will trigger the NES-based conditional handover, otherwise. For NES-based conditional intra-frequency handover:- If UE successfully decodes DCI 2-9 command earlier than the time at the end of TEvent\_DU + Tidentify\_intra\_with\_index or TEvent\_DU + Tidentify\_intra\_without\_index, then the measurement time delay equal to Tidentify\_intra\_with\_index or Tidentify\_intra\_without\_index- If UE successfully decodes DCI 2-9 command later than the time at the end of TEvent\_DU + Tidentify\_intra\_with\_index or TEvent\_DU + Tidentify\_intra\_without\_index, and the condition of NES-based CHO is met when receiving the DCI 2-9 command, then the measurement time delay equals to the time from the end of Tevent\_DU until UE successfully decodes DCI 2-9 command.- If UE successfully decodes DCI 2-9 command later than the time at the end of TEvent\_DU + Tidentify\_intra\_with\_index or TEvent\_DU + Tidentify\_intra\_without\_index, and the condition of NES-based CHO is not met when receiving the DCI 2-9 command, then the measurement time delay equals to TSSB\_measurement\_period\_intra. |

* Recommended WF:
	+ Discuss above issue in this meeting.

### Sub-topic 1-3 Cell DTX/DRX related

**Issue 1-3-1: Impact on L1-RSRP reporting delay**

* Proposals
	+ Option 1: Nokia
		- The CSI report for L1-RSRP shall be allowed during non-active periods of Cell DRX. The L1-RSRP report delay requirement is not impacted due to Cell DRX.
		- Send LS to RAN1 clarifying that the CSI report for L1-RSRP shall be allowed during non-active periods of Cell DRX.

### CR handling

Discuss following CR during the meeting.

**CR for SSB-less operation**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc** | **Source** | **Changes** | **Recommendation** |
| R4-2408252 |  ZTE | Correct UE features name and remove brackets | To be checked during the meeting. |
| R4-2408483 | Intel | Requirements updating for intra-band NCCA  | Pending on Issue 1-1-6. |
| R4-2408595 | Huawei | Change#1: Clarification on AGC compensationChange#2 requirements for multiple SSB-less SCell | Change#1 Pending on issue 1-1-1Change#2 is based on last meeting agreement. Output of Issue 1-1-3 can be captured in the CR.  |
| R4-2409724 | Ericsson | Clarification on AGC compensation | Pending on issue 1-1-1. Suggested to be merged to CR R4-2408595 |

**CR for NES-based CHO**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc** | **Source** | **Changes** | **Recommendation** |
| R4-2407741 | Nokia | Changes are pending on issue 1-2-1 | To be checked during the meeting. |
| R4-2408871 | Vivo  | Change#1 is pending on issue 1-2-1. Change#2 about TCHO\_execution to be discussed in the meeting.  | Change#1 is recommended to be merged to R4-2407741.Change#2 to be checked during the meeting. |

# Topic #2: Perf: Performance part for NES – SSB-less

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407198**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407198.zip) | MediaTek inc. | **Proposal 1: Configure Pcell with higher EPRE than the SSB-less Scell.** |
| [**R4-2407310**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407310.zip) | Apple | **Proposal 1: RAN4 to set EPRE difference as [9 dB] + [ΔPL] in the test cases for reference cell and SSB-less SCell, and ΔPL is decided only the CC BW difference between reference cell and target SCell.****Proposal 2: for the inter-band SSB-less SCell activation test case,** * **reference cell is set as 10MHz CC BW with 15kHz SCS**
* **SSB-less SCell is set as 40MHz CC BW with 15kHz SCS.**
* **ΔPL = 15dB**
 |
| [**R4-2407742**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407742.zip) | Nokia, Nokia Shanghai Bell | **Observation#1: The A-TRS index is indicated in SCell activation command based on R17 fast SCell activation.** **Observation #2: The A-TRS in TCs is configured with QCL-typeC with one source cell and this QCL source cell shall be taken as the default reference cell.****Proposal 1: For A-TRS based SCell activation TCs, explicit indication of reference cell is not needed.** **Proposal 2: To define a P-TRS based SCell activation TC with multiple QCL source cells to verify the explicit signalling of reference cell.**  |
| [**R4-2407744**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407744.zip) | Nokia, Nokia Shanghai Bell | **correction CR on SSB-less SCell activation TCs** |
| [**R4-2407935**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407935.zip) | CMCC | **Proposal 1: Set EPRE difference as [9 dB] + ΔPL. ΔPL is the pathloss difference caused by frequency difference between two Cells, which can be set as 20 log(fc1/fc2) in the test case.** |
| [**R4-2408246**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408246.zip) | ZTE Corporation, Sanechips | **Proposal 1: In the test setup, the receiving power difference between reference cell and the inter-band SSB-less SCell is equal to [9 dB]+ΔPL, where ΔPL = 20\*log(f1/f2).** |
| [**R4-2408253**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408253.zip) | ZTE Corporation, Sanechips | **[Netw\_Energy\_NR-Perf] Draft CR for TC of TRS, A-TRS based SSB-less SCell activation** |
| [**R4-2408314**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408314.zip) | China Telecom | **Proposal 1: Support the description that ΔEPRE is equal to 20\*log(f1/f2), where f1 and f2 are the frequency radio channel 1 and radio channel 2, and the bracket of this description in the test case can be removed.** |
| [**R4-2408438**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408438.zip) | Qualcomm Incorporated | **Proposal : RAN4 do not introduce pathloss margin [ΔPL].****Proposal: Prefer to configure higher transmit power for TRS of the SSBless Scell than SSB transmit power of the reference cell** |
| [**R4-2408572**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408572.zip) | Huawei, HiSilicon | **Draft CR on TC maintenance for R18 NES SSB-less** |
| [**R4-2409725**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409725.zip) | Ericsson | 1. **RAN4 to set EPRE difference as [9 dB] + [ΔPL] in the test cases**
2. **RAN4 to use free space propagation delay difference to compute the ΔPL based on the carrier frequency difference and BW difference.**
 |
| [**R4-2409726**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409726.zip) | Ericsson | **Draft CR to 38.133 TC for EN-DC: A-TRS based inter-band SSB-less Scell activation delay** |
| [**R4-2407777**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407742.zip) | vivo | **Proposal 1 ΔPL is 0dB in SSB-less operation test cases.****Proposal 2 It is preferred that only test the case that Pcell is lower than SCell if non-zero power difference between ref and SSB-less bands need to be tested.** |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1 Performance part related to SSB-less

*Sub-topic description*

*Open issues and candidate options before meeting:*

**Issue 2-1-1: Test configurations for SSB-less - EPRE**

* Which Cell has higher EPRE:
	+ Option 1: Pcell with higher EPRE than the SSB-less Scell (MTK)
	+ Option 2: configure higher transmit power for TRS of the SSBless Scell than SSB transmit power of the reference cell (QC, vivo)
* Configuration of EPRE:
	+ Option 1: RAN4 to set TE transmission power difference as [9 dB] + [ΔP] in the test cases for reference cell and SSB-less SCell, and ΔP is decided **only the CC BW difference** between reference cell and target SCell. ΔP = 6dB with the following setups (Apple)
		- reference cell is set as 10MHz CC BW with 15kHz SCS
		- SSB-less SCell is set as 40MHz CC BW with 15kHz SCS
	+ Option 2: Set EPRE difference = 9 dB + ΔEPRE, where ΔEPRE is equal to 20\*log(f1/f2), and f1 and f2 are the frequency radio channel 1 and radio channel 2 (CMCC, CTC, ZTE, Ericsson)
	+ Option 3: Do not introduce pathloss margin [ΔEPRE]. (QC, vivo)
* Recommended WF:
	+ Discuss this issue with core maintenance issue 1-1-1 in this meeting.

**Issue 2-1-2: Test configurations for SSB-less – BW and SCS**

* Proposals:
	+ Option 1: (Apple)
		- reference cell is set as 10MHz CC BW with 15kHz SCS
		- SSB-less SCell is set as 40MHz CC BW with 15kHz SCS
* Recommended WF:
	+ Moderator: Per following agreement in R4-2403526. The Limitation seems not needed:

|  |
| --- |
| * The legacy R15 test scenario configuration can be reused. For PCell and SCell, the combinations of any two configurations among 15kHz/≥10MHz FDD, 15kHz/≥10MHz TDD and 30kHz/≥40MHz TDD are supported
 |

**Issue 2-1-3: Test configurations for SSB-less – Reference Cell determination**

* Proposals:
	+ Option 1: For A-TRS based SCell activation TCs, explicit indication of reference cell is not needed. (Nokia)
	+ Option 2: To define a P-TRS based SCell activation TC with multiple QCL source cells to verify the explicit signalling of reference cell.
* Recommended WF:
	+ Check whether option 1 is agreeable.
	+ Moderator: For option 2, per following agreement in R4-2406301. Option 2 seems not needed:

|  |
| --- |
| * + Single P-TRS is configured in SSB-less SCell in the SSB-less SCell activation TCs
 |

### Sub-topic 2-2 CR handling

Discuss following CRs during the meeting.

|  |  |  |
| --- | --- | --- |
| **Tdoc** | **Source** | **Recommendation** |
| R4-2407744 |  Nokia | To be checked during the meeting. |
| R4-2408253 | ZTE | Overlapping changes with R4-2407744 to be merged to R4-2407744. Other changes to be checked during the meeting. |
| R4-2408572 | Huawei | To be checked during the meeting. |
| R4-2409724 | Ericsson | To be checked during the meeting. |

# Topic #3: Perf: Performance part for NES – Others

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407743**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407743.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: The test cases where DCI 2-9 command is decoded “after” the RSRP condition of CHO is met needs to be updated considering if CHO condition is met or not when receiving DCI 2-9 command.** |
| [**R4-2407745**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407745.zip) | Nokia, Nokia Shanghai Bell | **correction CR on NES based CHO HO delay TCs** |
| [**R4-2408484**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408484.zip) | Intel Corporation | **Test case requirements for NES triggering inter-frequency target CHO delay from FR2 to FR1** |
| [**R4-2408573**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408573.zip) | Huawei, HiSilicon | **Draft CR on TC maintenance for R18 NES CHO** |
| R4-2407777 | vivo | **Proposal 3 For cell DTX test case, the TAT is set to 1280ms, and the UE shall be scheduled with PUSCH at every cell DTX cycle.****Proposal 4 RAN4 confirms whether TE can allocate UL resources based UE’s PRACH or SR for uplink resources in cell DTX inactive time.** |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1 Performance part related to NES CHO

*Sub-topic description*

*Open issues and candidate options before meeting:*

**Issue 3-1-1: CHO condition**

* TRS
	+ Option 1: The test cases where DCI 2-9 command is decoded “after” the RSRP condition of CHO is met needs to be updated considering if CHO condition is met or not when receiving DCI 2-9 command. (Nokia):
* Recommended WF:
	+ Discuss in CR directly.

### Sub-topic 3-2 Performance part related to NES Cell DTX/DRX

*Sub-topic description*

*Open issues and candidate options before meeting:*

**Issue 3-1-1: Maintaining uplink timing during NES Cell DTX test case**

* Proposals:
	+ Option 1: For cell DTX test case, the TAT is set to 1280ms, and the UE shall be scheduled with PUSCH at every cell DTX cycle. (vivo)
* Recommended WF:
	+ Discuss above option.

**Issue 3-1-2: Testability for Cell DTX cycle = 640ms**

* Proposals:
	+ Option 1: RAN4 confirms whether TE can allocate UL resources based on UE’s PRACH or SR in cell DTX inactive time. (vivo)
* Recommended WF:
	+ Discuss above option.

### Sub-topic 3-3 CR handling

Discuss following CR during the meeting.

|  |  |  |
| --- | --- | --- |
| **Tdoc** | **Source** | **Recommendation** |
| R4-2407745 |  Nokia | To be checked during the meeting. |
| R4-2408484 | Intel | To be checked during the meeting. |
| R4-2408573 | Huawei | To be merged to R4-2408484 |