3GPP TSG-RAN WG4 Meeting #107 R4-230xxxx

Incheon, KR, May 22 – May 26, 2023

**Agenda item:** 8.9.4

**Source:** Moderator (Apple)

**Title:** Topic summary for [107][209] NR\_RRM\_enh3\_part1

**Document for:** Information

# Introduction

This topic summary includes general and work plan (8.9.1), L3 part enhancement for FR2 SCell activation (8.9.2/8.9.2.1), L1 part enhancement for FR2 SCell activation (8.9.2.2) and Other potential enhancement for FR2 SCell activation (8.9.2.3).

*List of candidate target of discussions for this topic.*

* 1st round: mainly discuss on
	+ Issues in topic #1, #2, #0 and #3.
* 2nd round: all issues are discussed based on the conclusions from 1st round issues

# Topic #0: General and work plan (8.9.1)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2308316**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308316.zip) | Huawei, HiSilicon | Observation 1: The FR2 enhancement under discussion are common for different SCell activation procedure containing Tactivation\_time.Observation 2: In current multiple SCell activation requirements, Cell search is not needed for FR2 to-be-activated SCell.Proposal 1: The enhancement under discussion can also apply to other single Cell activation including direct SCell activation and PUCCH SCell activation.Proposal 2: RAN4 to discuss whether to define requirements for multiple SCell activation involving unknown FR2 to-be-activated SCell without active serving cell or known to-be-activated SCell in the same band. If RAN4 decide to define requirements, it should be discussed after the requirements for single SCell activation is completed. Proposal 3: RAN4 to clarify whether SCell activation requirements for FR2-2 are included or not.  |
| [**R4-2308214**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308214.zip) | vivo | Observation 1 No baseline RRM requirement has been specified for the activation of multiple unknown FR2 SCells who have no active serving cell(s) or known to-be-activated SCell(s) on the same band.Proposal 1 RAN4 further discuss whether RRM requirements for multiple SCell activation need to be introduced/enhanced based on the new measurement reporting mechanism inferred from RAN4 LS R4-2306321.Proposal 2 RAN4 inform RAN2 about RAN4’s decision regarding multiple SCell activation, especially on the issues that may have RAN2 signalling impact. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 0-1

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 0-1: Whether FR2 SCell activation enhancement in topic #1/2/3 is appliable for direct SCell activation and PUCCH SCell activation**

* Proposals (Huawei): The enhancement under discussion can also apply to other single Cell activation including direct SCell activation and PUCCH SCell activation.
* Recommended WF
	+ To conclude on the proposal in this meeting

**Issue 0-2: Enhancement for multiple FR2 unknown SCells’ activation**

* Proposals (Huawei, vivo): RAN4 to discuss whether to define requirements for multiple SCell activation involving unknown FR2 to-be-activated SCell without active serving cell or known to-be-activated SCell in the same band.
	+ If RAN4 decide to define requirements, it should be discussed after the requirements for single SCell activation is completed. (Huawei)
	+ RAN4 inform RAN2 about RAN4’s decision regarding multiple SCell activation, especially on the issues that may have RAN2 signalling impact. (vivo)
* Recommended WF
	+ To conclude on the proposal in this meeting, and if RAN4 made conclusion, it’s necessary to inform RAN2 ASAP.

**Issue 0-3: whether to consider SCell activation requirements for FR2-2**

* Proposals (Huawei): RAN4 to clarify whether SCell activation requirements for FR2-2 are included or not.
* Recommended WF
	+ To conclude on the proposal in this meeting
	+ [Moderator]: the discussion so far is only for FR2-1. FR2-2 can be discussed in future release if needed (FR2-2 even has LBT and larger Rx beam sweeping factor), and please companies double confirm.

# Topic #1: L3 part enhancement for FR2 SCell activation (8.9.2.1)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2307320 | Apple | Proposal 1: RAN4 to not consider additional solution for report L3 measurement results for unknown FR2 SCell activation enhancement in R18. Whether and how to extend the solution from R18 further mobility enhancement WI to SCell activation can be discussed in future release. Proposal 2: No need to define criteria to determine the L3 measurement result is available or not for FR2 unknown SCell activation enhancement, and the reported results must meet the existing measurement accuracy requirement.Proposal 3: No need to report L3 measurement reporting after receiving SCell activation command if UE has no valid measurement results.Proposal 4: after receiving SCell activation command, if UE reports valid L3 measurement result, * L3 and L1 parts can be skipped in the activation delay requirement design, i.e., network can perform TCI activation after valid L3 measurement results are reported.
* the uncertainty for TCI can be defined as the time period between TCI configuration/activation relative to the first valid L1-RSRP reporting and the new triggered L3 measurement report which occurs earlier.

Proposal 5: Beam sweeping factor capability of X1 of {2,4,6} for cell detection part (X1\*Trs) of L3 and beam sweeping factor capability of X2 of {2,4,6} for SSB based L1-RSRP measurement. If X1/X2 is absent in capability indication, legacy beam sweeping factor (i.e., 8) shall be assumed for X1/X2.Proposal 6: X1 cannot be 0.Proposal 7: For enhanced unknown FR2 SCell activation requirement, * RAN4 to use SSB periodicity instead of SMTC periodicity.
* The window of the cell detection can be same as SMTC duration from UE implementation perspective but it’s no need to be reflected in the requirement.
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| [**R4-2307356**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307356.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: The report of L3 measurement result after SCell activation command needs to be valid. Proposal 2: The report of L3 measurement result is considered as valid only if it fulfils the measurement requirement for a deactivated SCell as specified in TS38.133 Table 9.2.5.2-3 (for FR1) and Table 9.2.5.2-4 (for FR2).Proposal 3: The UE is allowed to continue the measurement and report a valid L3 measurement result when it is ready, if there is no valid L3 measurement result at the time of SCell activation. Observation #1: If the UE sends a valid L3 measurement report after SCell activation command, AGC, cell search and L1-RSRP measurement are not needed.Proposal 4: The unknown SCell shall be activated as if it is known and existing SCell activation delay requirement applies, if the UE sends a valid L3 measurement report after SCell activation command. Proposal 5: The TCI and SP/P-CSI-RS activation commands are based on the valid L3 measurement report after SCell activation command, if the report is sent after SCell activation command.Proposal 6: A-TRS for fast SCell activation can be triggered based on the valid L3 measurement report after SCell activation command. Proposal 7: X1 can be zero to allow for different UE implementation.Proposal 8: To use SSB periodicity instead of SMTC periodicity for FR2 unknown SCell activation. |
| [**R4-2307464**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307464.zip) | NTT DOCOMO, INC. | Observation 1: If the availability of L3 measurements is not explicitly defined, the effect of L3 measurements may be "depending on the UE implementation" or "ambiguity in activation reduction effect".Proposal 1: The L3 measurement report is considered as valid only if it fulfils the measurement requirement for a deactivated Scell as specified in TS38.133 Table 9.2.5.2-3 (for FR1) and Table 9.2.5.2-4 (for FR2).Proposal 2: The UE may continue the measurement and report a valid L3 measurement result when it is ready, if there is no valid L3 measurement result at the time of Scell activation. |
| [**R4-2307560**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307560.zip) | CMCC | Proposal 1: no need to define criteria to determine the L3 measurement result is available or not for FR2 unknown SCell activation enhancement. But the reporting shall meet the existing measurement accuracy requirements.Proposal 2: If valid L3 measurement results with SSB index are reported, L3 measurement and L1 measurement can be skipped.Proposal 3: it is proposed that X1(Beam sweeping factor enhancement in L3 part of FR2 unknown SCell activation) can be zero.Proposal 4: for the value of X1, it is proposed to select from {0, 1, 2, 4, 6}, whether to support some of the values or to support all the values can be further discussed. |
| [**R4-2307809**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307809.zip) | LG Electronics Inc. | L3 reporting during SCell activation* *Proposal 1*: The valid measurement reporting after the SCell activation command needs to meet the existing measurement accuracy requirements, and additionally time window [W] could be considered as an additional condition.
* *Proposal 2*: If a UE has no valid measurement results, UE needs to report even the lowest RSRP reported value to notice whether a UE has valid measurement results to the network.

Beam related enhancement for L3 part* *Proposal 3*: Consider X1={2,4,6} and X2={0,2,4,6} for beam sweeping factor capability, and it means 8 if absent.
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| [**R4-2307944**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307944.zip) | Xiaomi | Proposal 1: RAN4 not to define additional criteria to determine whether the valid L3 measurement result is available or not as long as the reported L3 measurement result fulfills the existing accuracy requirement.Proposal 2: If the UE has no valid L3 measurement result to be reported, no need to report L3 measurement reporting after receiving SCell activation command, and the UE needs to perform L3 measurement and L1 measurement with/without enhanced requirement according to UE capability.Proposal 3: When the valid L3 measurement result with SSB index is reported after SCell activation command, L3 and L1 parts are skipped, i.e., network can perform TCI activation after valid L3 measurement results are reported.Proposal 4: For unknown FR2 SCell activation enhancement, introduce the UE capability to support the Rx beam sweeping factor is {6, 4} for cell detection part of L3 and SSB based L1-RSRP measurement, respectively.Proposal 5: The value of X1 (Beam sweeping factor enhancement in L3 part of FR2 unknown SCell activation) shall be larger than zero. |
| [**R4-2308016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308016.zip) | China Telecom | Proposal 1: The valid reporting must meet the existing measurement delay/accuracy requirement.Proposal 2: It’s not necessary to report L3 measurement reporting after receiving SCell activation command if UE has no valid measurement results.Proposal 3: When the valid L3-RSRP measurement results are reported, L3 and L1 parts can be skipped.Proposal 4: UE needs to report valid L3 measurement result within a time threshold after SCell activation command.Proposal 5: For the value of X1 and X2, lower Rx beam sweeping factor for Positioning can be the baseline, e.g., X1 and X2 can be {1,2,4,6}.Proposal 6: Follow the previous agreement to keep “X1\*Trs” part of current delay requirement and to reduce Rx beam sweeping factor for cell detection stage in L3 part based on UE capability. |
| [**R4-2308212**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308212.zip) | vivo | Observation 1 Although the measurement results reported by UE for reducing unknown SCell activation delay, is called as ‘L3 measurement results’, actually they are triggered and used by MAC sub-layer of the gNB, similar to R18 LTM discussed in feMob WI.Observation 2 The term ‘L3 measurement results’ can be further revised in RAN4 specs if RAN1/2 agrees to introduce the new measurement, calculation and reporting mechanisms.Proposal 1 RAN4 may further discuss and clarify whether to re-use any newly introduced measurement and reporting mechanism, if agreed in other WIs based on RAN1/2 discussion, for unknown FR2 SCell activation delay reduction.Proposal 2 To check the freshness of the to-be-reported measurement results of the SCell, the same time windows as those in current known SCell condition can be reused, i.e. 4s for PC1/PC5, and 3s for PC2/PC3/PC4.Proposal 3 The measurement results are considered as available only if it fulfils the measurement requirement for a deactivated Scell as specified in TS38.133 Table 9.2.5.2-3 (for FR1) and Table 9.2.5.2-4 (for FR2), which implies that the reported SS-RSRP, SS-RSRQ, and SS-SINR measurements need to meet the accuracy requirements specified in Clause 10.Proposal 4 RAN4 inform RAN2 about a potential scenario that the reporting is triggered by SCell activation, but there is no available result at the UE side. Whether and how to send the corresponding reporting conveying the information of un-detected SCell can be decided by RAN2.Proposal 5 If the new triggered measurement reporting is reported after SCell activation, the SCell activation can be considered as unknown case where the uncertainty for TCI can be defined as the time period between TCI configuration/activation relative to the first valid L1-RSRP reporting and the new triggered L3 measurement report which occurs earlier.Proposal 6 For the X1 in the capability reporting, the entries of the set can be [8, 4, 2, 0]. For the X2 in the capability reporting, the entries of the set can be [6, 4, 2, 0].Proposal 7 Do not change the definition/usage of SMTC periodicity for FR2 unknown Scell activation requirements. |
| [**R4-2308317**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308317.zip) | Huawei, HiSilicon | Proposal 1: RAN4 to wait for RAN2 conclusion on triggering/configuration/reporting, and there is no need to have further discussion in RAN4.Observation 1: The accuracy/delay requirements for measurement reporting after Scell activation command is not clear.Proposal 2: No need to define criteria to determine the L3 measurement result is available/valid or not for FR2 unknown SCell activation enhancement.Proposal 3: No need to report L3 measurement reporting after receiving SCell activation command if UE has no valid measurement results.Observation 2: When the time instance when the measurement is performed is far away from Scell activation command (e.g. large measCycle with multiple carriers to be measured), whether UE can skip L3 and L1 parts is questionable. Observation 3: It is hard to determine when the result is obtained by the UE since it is up to UE implementation.Proposal 4: RAN4 to discuss applicability conditions for requirements based on L3 reporting after SCell activation that the measurement period of the SCell being activated is equal to or smaller than X ms.Proposal 5: It is up to NW implementation to choose whether to configure TCI based on L3 report after SCell activation command or based on L1-RSRP as legacy cases.Proposal 6: When the NW triggered measurement reporting is reported after SCell activation, it can be considered as unknown case where the uncertainty for TCI can be defined as the time period between TCI configuration/activation relative the first valid L1-RSRP reporting and the NW triggered L3 measurement report which occurs earlier.Proposal 7: The candidate value for X1 and X2 are (4,6) and (2,3,4,5,6,7) respectively.Proposal 8: For enhanced unknown FR2 Scell activation requirement, RAN4 to use SSB periodicity instead of SMTC periodicity when the SMTC is only configured in MO.  |
| [**R4-2308480**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308480.zip) | OPPO | Proposal 1: RAN4 wait for RAN2’s reply on signalling design, including potential additional events for report triggering.Proposal 2: No need to define criteria to determine the L3 measurement result is available or not for FR2 unknown SCell activation enhancement.Proposal 3: No need to report L3 measurement reporting after receiving SCell activation command if UE has no valid measurement resultsProposal 4: If UE reports valid L3 measurement result, L3 and L1 parts can be skipped, i.e., network can perform TCI activation after valid L3 measurement results are reported;Proposal 5: X1 cannot be zero as cell detection part of L3 cannot be skipped. |
| [**R4-2308719**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308719.zip) | ZTE Corporation | Observation 1: Regarding to whether the report is fresh enough or not, NW can not recognize, in fact the legacy L3 report is also in the same situation. So it is not a new issue. Proposal 1: No need to define any condition related to the validity of the L3 measurement result from the perspective of when UE performs the measurements.Observation 2: If a poor measurement result is fed back to the NW, the NW can not obtain useful RSRP and SSB index info from such quick report.Proposal 2: Whether the quality of measurement results in the report is good enough, which should be deem as one of the validity condition.Proposal 3: Both the legacy measurement period specified in TS38.133 Table 9.2.5.2-3 (for FR1), Table 9.2.5.2-4 (for FR2) and SS-RSRP/SS-RSRQ/SS-SINR accuracy requirements specified in Clause 10 should be also considered as the validity condition.Proposal 4: No need to report L3 measurement reporting after receiving SCell activation command if UE has no valid measurement results. The UE only needs to report valid report if it has.Proposal 5: After valid L3 measurement results reported, NW acquires the beam information of the to-be-activated SCell similar as the known case, so the L3 and L1 parts can be skipped.Proposal 6: For enhanced unknown FR2 SCell activation requirement, RAN4 to use SSB periodicity instead of SMTC periodicity. |
| R4-2309430 | Qualcomm Incorporated | Proposal1: No need to define criteria to determine the L3 measurement results is available. Existing measurement delay/accuracy requirements are reused. Proposal 2 : RAN4 shall define reporting delay requirements from receiving/decoding MAC-CE for SCell activation command to L3 measurement reporting. * UE shall report L3 measurement report within [X] ms from receiving [L3 report triggering command] if measurement result is available.
* UE does not report L3 measurement report after exceeding reporting delay requirements.

Note: [L3 report trigger command] can be included at Scell activation command per RAN4 #106bis-e agreement. Proposal 3: UE expect to receive TCI activation command after reporting L3 measurement report with SSB index. * If UE does not receive TCI activation command within certain time period after reporting L3 measurement, UE can perform either legacy SCell activation process or enhanced Scell activation.

Proposal 4: min(SSB periodicity, SMTC periodicity) is used for enhanced FR2 SCell activation delay requirements. |
| [**R4-2309555**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309555.zip) | MediaTek inc. | Proposal 1: UE should send L3-RSRP report with SSB index after THARQ + MAC CE processing time and within a margin [M] ms.Proposal 2: If NW cannot grant the UE with an UL resource within [M] margin, NW should not trigger the UE to send the report.Proposal 3: The L3 measurement report for unknown FR2 Scell activation is triggered when* Scell activation command is received, and
* When the existing conditions in 38.133 for considering target FR2 SCell as unknown are met.

Proposal 4: For L3 measurements validity: measurement should satisfy the requirement for a deactivated Scell as specified in TS38.133.Proposal 5: For L3 measurements availability: a time duration [W]s is required to determine whether a valid L3 measurement is fresh or old.Proposal 6: If NW triggers the UE to send L3 report, and if UE does not have valid L3 measurement results, UE still need to indicate something to the NW. If NW does not receive anything, NW may assume there was a failure in the report transmission and could request the UE to do re-transmission.Proposal 7: if UE reports valid L3 measurement result, L3 and L1 parts can be skipped, i.e., network can perform TCI activation after valid L3 measurement results are reported.Proposal 8: The values of X1 and X2 can be defined following the same principle of reduced beam sweeping factor for Positioning (i.e., X1 and X2 can be {1,2,4,6}).Proposal 9: X1 cannot be zero; otherwise RAN4 previous agreement will be broken. |
| R4-2309587 | Ericsson | Proposal 1: Measurement report can be considered valid if it meets existing measurement period reporting requirements.Proposal 2: UE to send measurement report if UE obtain the measurement report before certain thresholdProposal 3: UE do not report L3 measurement report if UE do not have valid measurement report before certain threshold.Proposal 4: RAN4 to agree that L3 part can be skipped and whether L1 part can be skipped or not depends on whether NW sends TCI command or not.Proposal 5: RAN4 to agree that X1 can be {0, 1, 4} and X2 can be {2, 4, 6}.Proposal 6: RAN4 to use the SSB periodicity instead of SMTC\_MAX for coarse and fine AGC measurement for unknown SCell activation. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1 L3 reporting during SCell activation

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 1-1-1: Additional solutions of report L3 measurement results for unknown FR2 SCell activation enhancement (previous issue 1-1-1 in R4-2306315)**

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| --- |
| *Last meeting agreement in R4-2306315:** *Agreements (GTW, Monday Apr 17, 2023)*
	+ *UE needs to report the L3 measurement result after SCell activation command*
	+ *FFS if additional solutions should be considered. Decision on additional solutions need to be made no later that in RAN4 #107.*
 |

* Option 1 (Apple):
	+ RAN4 to not consider additional solution for report L3 measurement results for unknown FR2 SCell activation enhancement in R18.
	+ Whether and how to extend the solution from R18 further mobility enhancement WI to SCell activation can be discussed in future release.
* Option 2 (vivo):
	+ RAN4 may further discuss and clarify whether to re-use any newly introduced measurement and reporting mechanism, if agreed in other WIs based on RAN1/2 discussion, for unknown FR2 SCell activation delay reduction.
* Recommended WF
	+ [Moderator]: due to the limited time for this WI, could we consider the following compromise:
		- Option 3 for compromise:
			* RAN4 to not consider additional solution for report L3 measurement results for unknown FR2 SCell activation enhancement in R18.
			* In future release, RAN4 can further discuss and clarify whether to re-use any newly introduced measurement and reporting mechanism, if agreed in other WIs based on RAN1/2 discussion, for unknown FR2 SCell activation delay reduction.

**Issue 1-1-2: waiting RAN2 conclusions for when/how/what to report L3 measurement results for unknown FR2 SCell activation enhancement (previous issue 1-1-1, 1-1-2, 1-1-3, 1-1-4, 1-1-5 in R4-2306315), except the FFS for additional solution in issue 1-1-1**

* Option 1 (Huawei, OPPO):
	+ RAN4 to wait for RAN2 conclusion on triggering/configuration/reporting, and there is no need to have further discussion in RAN4.
* Option 2 (MediaTek):
	+ Regarding when to report L3 measurement results in previous issue 1-1-1 in R4-2306315:
		- UE should send L3-RSRP report with SSB index after THARQ + MAC CE processing time and within a margin [M] ms.
		- If NW cannot grant the UE with an UL resource within [M] margin, NW should not trigger the UE to send the report.
	+ Regarding how to trigger L3 report in previous issue 1-1-2 in R4-2306315:
		- The L3 measurement report for unknown FR2 Scell activation is triggered when
			* Scell activation command is received, and
			* When the existing conditions in 38.133 for considering target FR2 SCell as unknown are met.
* Recommended WF
	+ [Moderator]: companies to check if option 1 is acceptable. For when to report in option 2, it could be further discussed in issue 1-1-5. For how to trigger L3 report in option 2, this enhancement is for unknown SCell activation already, not sure if we still need proposed clarification, and please companies share your views on it.

**Issue 1-1-3: If measurement results are available, the UE will report them to the NW. How to determine the measurement result is available?**

* Proposals:
	+ Option 1 (Apple, CMCC, Xiaomi, CTC, Huawei, OPPO, ZTE, Qualcomm, Ericsson):
		- No need to define criteria to determine the L3 measurement result is available or not for FR2 unknown SCell activation enhancement.
		- Option 1a (Apple, CMCC, Xiaomi)
			* The reported results must meet the existing measurement accuracy requirement.
		- Option 1b (CTC, Qualcomm, ZTE):
			* The valid reporting must meet the existing measurement delay/accuracy requirement.
		- Option 1c (Ericsson):
			* Measurement report can be considered valid if it meets existing measurement period reporting requirements.
	+ Option 2 (LGE, vivo, MediaTek):
		- A time window could be considered as a condition to determine if the result to be reported is fresh.
		- Option 2a (LGE):
			* The valid measurement reporting after the SCell activation command needs to meet the existing measurement accuracy requirements, and additionally time window [W] could be considered as an additional condition.
		- Option 2b (vivo):
			* To check the freshness of the to-be-reported measurement results of the SCell, the same time windows as those in current known SCell condition can be reused, i.e. 4s for PC1/PC5, and 3s for PC2/PC3/PC4.
			* The measurement results are considered as available only if it fulfils the measurement requirement for a deactivated Scell as specified in TS38.133 Table 9.2.5.2-3 (for FR1) and Table 9.2.5.2-4 (for FR2), which implies that the reported SS-RSRP, SS-RSRQ, and SS-SINR measurements need to meet the accuracy requirements specified in Clause 10.
		- Option 2c (MediaTek):
			* For L3 measurements validity: measurement should satisfy the requirement for a deactivated Scell as specified in TS38.133.
			* For L3 measurements availability: a time duration [W]s is required to determine whether a valid L3 measurement is fresh or old.
	+ Option 3 (Nokia, NTT DCM):
		- The report of L3 measurement result after SCell activation command needs to be valid.
		- The report of L3 measurement result is considered as valid only if it fulfils the measurement requirement for a deactivated SCell as specified in TS38.133 Table 9.2.5.2-3 (for FR1) and Table 9.2.5.2-4 (for FR2).
* Recommended WF
	+ [Moderator]: The discrepancy among different sub-options are highlighted in RED. Please companies discuss:
		- In requirement design, whether or not need a time window to determine freshness of L3 measurement result? If yes, what’s the window?
		- In requirement design, which requirement shall the L3 measurement results reporting meet?
			* Accuracy requirement? Measurement delay requirement? Or both?

**Issue 1-1-4: FFS on necessity of L3 measurement reporting if UE has no valid measurement results?**

* Proposals:
	+ Option 1 (Apple, Xiaomi, CTC, Huawei, OPPO, ZTE): No need to report L3 measurement reporting after receiving SCell activation command if UE has no valid measurement results.
		- Option 1a (Xiaomi): If the UE has no valid L3 measurement result to be reported, no need to report L3 measurement reporting after receiving SCell activation command, and the UE needs to perform L3 measurement and L1 measurement with/without enhanced requirement according to UE capability.
	+ Option 2 (Nokia, NTT DCM): The UE is allowed to continue the measurement and report a valid L3 measurement result when it is ready, if there is no valid L3 measurement result at the time of SCell activation.
	+ Option 3 (LGE, MediaTek): If NW triggers the UE to send L3 report, and if UE does not have valid L3 measurement results, UE still need to indicate something to the NW.
		- Option 3a (LGE): If a UE has no valid measurement results, UE needs to report even the lowest RSRP reported value to notice whether a UE has valid measurement results to the network.
		- Option 3b (MediaTek): If NW does not receive anything, NW may assume there was a failure in the report transmission and could request the UE to do re-transmission.
	+ Option 4 (vivo): RAN4 inform RAN2 about a potential scenario that the reporting is triggered by SCell activation, but there is no available result at the UE side. Whether and how to send the corresponding reporting conveying the information of un-detected SCell can be decided by RAN2.
	+ Option 5 (Ericsson): UE to send measurement report if UE obtain the measurement report before certain threshold. UE do not report L3 measurement report if UE do not have valid measurement report before certain threshold.
* Recommended WF
	+ [Moderator]: please companies to discuss:
		- Whether or not UE needs to report anything immediately after decoding the SCell activation command if UE has no valid measurement results at that time point?
			* If yes, what to report? E.g., option 3a?
			* If no, shall UE continue measurement and report a valid L3 measurement result when it is ready? E.g., option 1 or option 2?
			* Or send LS to RAN2 for their decision? Option 3?
			* Or other solution, like option 5?

**Issue 1-1-5: delay requirement for “L3 measurement reporting after SCell activation command”?**

* Proposals:
	+ Option 1 (Qualcomm):
		- RAN4 shall define reporting delay requirements from receiving/decoding MAC-CE for SCell activation command to L3 measurement reporting.
			* UE shall report L3 measurement report within [X] ms from receiving [L3 report triggering command] if measurement result is available.
			* UE does not report L3 measurement report after exceeding reporting delay requirements.
		- Note: L3 report trigger command can be included at Scell activation command per RAN4 #106bis-e agreement.
	+ Option 2 (MediaTek):
		- UE should send L3-RSRP report with SSB index after THARQ + MAC CE processing time and within a margin [M] ms.
		- If NW cannot grant the UE with an UL resource within [M] margin, NW should not trigger the UE to send the report.
	+ Option 3 (CTC):
		- UE needs to report valid L3 measurement result within a time threshold after SCell activation command.
* Recommended WF
	+ [Moderator]: the option 1/2/3 are quite similar, during the discussion please proponents confirm if they can be merged.

**Issue 1-1-6: FFS: When the valid L3 measurement result with SSB index is reported after SCell activation command, L3 and L1 parts can be skipped, i.e., network can perform TCI activation after valid L3 measurement results are reported.**

* Proposals: When the valid L3 measurement result with SSB index is reported after SCell activation command,
	+ Option 1 (Apple, Nokia, CMCC, Xiaomi, CTC, OPPO, ZTE, MediaTek):
		- L3 and L1 parts can be skipped in the activation delay requirement design, i.e., network can perform TCI activation after valid L3 measurement results are reported.
		- Option 1a (Apple):
			* the uncertainty for TCI can be defined as the time period between TCI configuration/activation relative to the first valid L1-RSRP reporting and the new triggered L3 measurement report which occurs earlier.
		- Proposal 1b (Nokia):
			* The TCI and SP/P-CSI-RS activation commands are based on the valid L3 measurement report after SCell activation command, if the report is sent after SCell activation command.
			* A-TRS for fast SCell activation can be triggered based on the valid L3 measurement report after SCell activation command.
	+ Option 2 (vivo, Huawei):
		- If the new triggered measurement reporting is reported after SCell activation, the SCell activation can be considered as unknown case where the uncertainty for TCI can be defined as the time period between TCI configuration/activation relative to the first valid L1-RSRP reporting and the new triggered L3 measurement report which occurs earlier.
		- Option 2a (Huawei):
			* RAN4 to discuss applicability conditions for requirements based on L3 reporting after SCell activation that the measurement period of the SCell being activated is equal to or smaller than X ms.
			* It is up to NW implementation to choose whether to configure TCI based on L3 report after SCell activation command or based on L1-RSRP as legacy cases.
	+ Option 3 (Qualcomm):
		- UE expect to receive TCI activation command after reporting L3 measurement report with SSB index.
			* If UE does not receive TCI activation command within certain time period after reporting L3 measurement, UE can perform either legacy SCell activation process or enhanced Scell activation.
	+ Option 4 (Ericsson):
		- RAN4 to agree that L3 part can be skipped and whether L1 part can be skipped or not depends on whether NW sends TCI command or not.
* Recommended WF
	+ [Moderator]: based on the majority views, please companies consider if we can combine option 1 and 2 as compromise? And also please check the additional conditions proposed in option 3 and 4.

### Sub-topic 1-2 Beam related enhancement for L3 part

*Sub-topic description*

***Agreement in last meeting R4-2306315***

|  |
| --- |
| Agreement:* For unknown FR2 SCell activation enhancement, introduce the UE capability to support Rx beam sweeping factor less than 8 for cell detection part and SSB based L1-RSRP measurement.
	+ if UE has full set (N=8) of beam sweeping during AGC settling part during FR2 unknown SCell activation procedure.
		- Introduce beam sweeping factor capability of X1 for cell detection part (X1\*Trs) and beam sweeping factor capability of X2 for SSB based L1-RSRP measurement
		- Beam sweeping factor capability X1/X2 are two independent capabilities
* Note: above enhancement only applies for FR2 unknown SCell activation enhancement
* Note: How to capture in spec can be discussed in CR stage
* The candidate values for X1/X2 are FFS
 |

*Open issues and candidate options before f2f meeting:*

**Issue 1-2-1: can X1(Beam sweeping factor enhancement in L3 part of FR2 unknown SCell activation) be zero? (not related with WI of FR2 multi-Rx chain DL reception)**

***Agreement in RAN4#106 meeting R4-2303228***

|  |
| --- |
| Agreement:* To keep “X1\*Trs” part of current FR2 unknown SCell activation delay in the delay requirement for FR2 SCell activation enhancment.
	+ X1 can be less than 8 in the beam sweeping factor reduction discussion for cell detection stage in L3 part based on UE capability.
 |

* Option 1 (Apple, Xiaomi, CTC, LGE, OPPO, MediaTek, Huawei): No.
* Option 2 (Nokia, CMCC, Ericsson): Yes
* Recommended WF
	+ [Moderator]: Please companies double check the previous agreement in RAN4#106 meeting for reference.

**Issue 1-2-2: Beam sweeping factor enhancement in L3 and L1 part of FR2 unknown SCell activation (not related with WI of FR2 multi-Rx chain DL reception)**

* Option 1 (Apple):
	+ X1 = {2,4,6} and X2 = {2,4,6}.
	+ If X1 is absent in capability indication, it means 8 for beam sweeping factor;
	+ If X2 is absent in capability indication, it means 8 for beam sweeping factor;
* Option 2 (CMCC):
	+ X1 to select from {0, 1, 2, 4, 6}; X2 to select from {1,2,4,6}
* Option 3 (LGE):
	+ X1={2,4,6} and X2={0,2,4,6}
	+ If X1 is absent in capability indication, it means X1=8 for beam sweeping factor;
	+ If X2 is absent in capability indication, it means X2=8 for beam sweeping factor;
* Option 4 (Xiaomi):
	+ X1 = {4,6} and X2 = {4,6}.
* Option 5 (CTC, MediaTek):
	+ X1 = {1,2,4,6} and X2 = {1,2,4,6}.
* Option 6 (vivo):
	+ X1 = {0,2,4,8} and X2 = {0,2,4,6}.
* Option 7 (Huawei):
	+ X1 = {4,6} and X2 = {2,3,4,5,6,7}.
* Option 8 (Ericsson):
	+ X1 = {0,1,4} and X2 = {2,4,6}.
* Option 9 (Qualcomm):
	+ X2 can be either zero or non-zero when X1 =8. X2 cannot be zero when X1 is less than 8.
* Recommended WF
	+ [Moderator]: summarize all the candidate values for discussion:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Company | X1 | X2 | If X1 is absent, beam sweeping factor for cell detection part is | If X2 is absent, beam sweeping factor for SSB-based L1 measurement is |
| Apple | 2,4,6 | 2,4,6 | 8 | 8 |
| CMCC | 0, 1, 2, 4, 6 | 1,2,4,6 |  |  |
| LGE | 2,4,6 | 0,2,4,6 | 8 | 8 |
| Xiaomi | 4,6 | 4,6 |  |  |
| CTC | 1,2,4,6 | 1,2,4,6 |  |  |
| MediaTek | 1,2,4,6 | 1,2,4,6 |  |  |
| vivo | 0,2,4,8 | 0,2,4,6 |  |  |
| Huawei | 4,6 | 2,3,4,5,6,7 |  |  |
| Ericsson | 0,1,4 | 2,4,6 |  |  |
| **Summary** | 4 (9 companies support);6 (7 companies support);2 (6 companies support)1 (4 companies support) | 4 (9 companies support);6 (8 companies support);2 (8 companies support)1 (3 companies support)0 (2 companies support) |  |  |
| **Proposal for compromise (>50% supporting)** | **{2,4,6}** | **{2,4,6}; and 0 is up to the conclusion of issue 2-1-1** | **8** | **8** |

### Sub-topic 1-3 others for L3 part

*Sub-topic description*

*Open issues and candidate options before f2f meeting:*

**Issue 1-3-1: whether to use SSB periodicity instead of SMTC periodicity for FR2 unknown SCell activation**

* Proposals
	+ Option 1 (Apple, Nokia, ZTE):
		- RAN4 to use SSB periodicity instead of SMTC periodicity.
		- Option 1a (Apple):
			* The window of the cell detection can be same as SMTC duration from UE implementation perspective but it’s no need to be reflected in the requirement.
	+ Option 2 (vivo):
		- Do not change the definition/usage of SMTC periodicity for FR2 unknown SCell activation requirements.
	+ Option 3 (Huawei):
		- For enhanced unknown FR2 Scell activation requirement, RAN4 to use SSB periodicity instead of SMTC periodicity when the SMTC is only configured in MO.
	+ Option 4 (Qualcomm):
		- min(SSB periodicity, SMTC periodicity) is used for enhanced FR2 SCell activation delay requirements.
	+ Option 5 (Ericsson):
		- RAN4 to use the SSB periodicity instead of SMTC\_MAX for coarse and fine AGC measurement for unknown SCell activation.
* Recommended WF
	+ [Moderator]:
		- It was agreed in previous WF R4-2120241 that: It is an error case if the SSB transmission periodicity is greater than the configured SMTC for the same carrier. Then option 4 shall be same as option 1.
		- Option 1 and option 3 are also same from technical perspective, based on Huawei’s excerpt of smtc definition from RAN2 TS38.331 that,
			* Smtc: The SSB periodicity/offset/duration configuration of target cell for NR SCell addition. The network sets the *periodicityAndOffset* to indicate the same periodicity as ssb-*periodicityServingCell* in *sCellConfigCommon*.

# Topic #2: L1 part enhancement for FR2 SCell activation (8.9.2.2)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2307321 | Apple | Proposal 1: for unknown R18 FR2 SCell activation enhancement, following L1 part enhancement can be considered:* Alt 1: if L3 measurement is performed without beam sweeping factor reduction and if L3 and L1 measurement are using same RS or QCLed type D RSs, skip L1-RSRP measurement and use measurement result from L3 stage for L1-RSRP reporting.
* Alt 2(further compromise): if L3 measurement is performed without beam sweeping factor reduction and if L3 and L1 measurement are using same RS or QCLed type D RSs, the L1-RSRP measurement delay can be deducted from the total activation delay.

Proposal 2: for unknown R18 FR2 SCell activation enhancement, even though L1-RSRP measurement can be skipped in issue 2-1-1, L1-RSRP reporting cannot be skipped. It is needed to inform network the beam information of the SCell.Proposal 3: To follow the previous agreement, * the A-TRS as specified for fast SCell activation can be used also for fine time tracking after TCI activation command.
* A-TRS based fine timing tracking after TCI activation command should be NW configurable. That means SSB based and A-TRS based fine timing acquisition should be supported.
 |
| [**R4-2307357**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307357.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: The L1-RSRP measurement can be skipped at least for Case 1 and Case 2 if the reference signals configured for L1-RSRP report has been measured during L3 part, or is QCL-typeD with the SSB being measured during L3 part. * + Case 1: the UE does not indicate reduced beam sweeping factors in UE capability
	+ Case 2: the UE indicates the support of reduced beam sweeping factor X1/X2 and X2 is above zero.

Proposal 2: The L1-RSRP measurement is always skipped if the UE indicates a zero-value X2.Proposal 3: L1-RSRP reporting (or some other message alike) is needed to inform network the beam information of the SCell when L1-RSRP measurement is skipped.Proposal 4: The UE shall indicate the L1-RSRP reporting is derived by skipping L1-RSRP measurement. Proposal 5: The A-TRS as specified for fast SCell activation can be used also for fine time tracking.Proposal 6: Send LS to RAN1 informing A-TRS as specified for fast SCell activation can be used also for fine time tracking after TCI activation command. |
| [**R4-2307465**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307465.zip) | NTT DOCOMO, INC. | Observation 1: According to the RAN4 106-bis-e agreement, there may be no need to continue discussing the UE behaviour of skipping L1 RSRP measurement in L1 part.Proposal 1: Not to discuss the explicit UE behaviour on “skip L1-RSRP” or whether UE shall derive L1-RSRP based on L3 measurement, which can already be reflected by capability indication of X2 if X2 = 0 is introduced. |
| [**R4-2307561**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307561.zip) | CMCC | Proposal 1: the L1-RSRP measurement (TL1-RSRP, measure) could be skipped under some conditions (e.g. the RS configured for L1-RSRP measurement has been measured during L3 synchronization or is QCLed type D with the RS for L3 procedures).Proposal 2: for the value of X2 for L1-RSRP measurement, it is proposed to select from {1, 2, 4, 6}, whether to support some of the values or to support all the values can be further discussed. |
| [**R4-2307945**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307945.zip) | Xiaomi | Proposal 1: L1-RSRP measurement can be skipped provided that the UE has reported the valid L3 measurement results with SSB index during cell search procedure and the same RS which is QCL-ed type D used for L1-RSRP measurement. Proposal 2: If L1-RSRP measurement is skipped, the configuration of TCI state activation is based on L3 measurement report and the L1-RSRP reporting can be skipped.  |
| [**R4-2308017**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308017.zip) | China Telecom | Proposal 1: If L3 part is performed without any enhancement, i.e., L3 part is performed with full 8 Rx beam sweeping factor, and if L3 and L1 measurement use same RS or QCL Type D RS, L1-RSRP measurement can be skipped.Proposal 2: When L1-RSRP measurement can be skipped, L1-RSRP reporting or TCI indication cannot be skipped, and measurement result of L3 part can be used for L1-RSRP reporting. |
| [**R4-2308213**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308213.zip) | vivo | Proposal 1 If zero is one of the possible entry of UE capability for X2 in issue 1-2-1 and issue 1-2-2, the discussion of issue 2-1-1 of R4-2306315 can be merged into 1-2-1 and 1-2-2 of R4-2306315.Proposal 2 Send LS to RAN1 to inform them the agreements achieved in RAN4 104-bis-e, and the current understanding of the agreed AP-TRS in RAN4, asking them to provide clarification on the A-TRS specified in TS 38.214. |
| [**R4-2308318**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308318.zip) | Huawei, HiSilicon | Observation 1: L1-RSRP reporting based on L3 measurement may have following issues:* The Beam index obtained by L3 measurement may be different from that obtained from L1-RSRP measurement.
* The RSRP value obtained by L3 measurement may be different from that obtained from L1-RSRP measurement.
* NW may experience different L1-RSRP value reported by UE, when some of them are derived based L3 measurement and other are based on L1-RSRP measurement.

Observation 2: Early L1-RSRP reporting is already possible which is up to UE implementation. Proposal 2: If L3 measurement is performed without L3 part enhancement, whether UE can report L1-RSRP based on L3 measurement is up to UE implementation, when the performance requirements as specified in TS38.133 clause 10.1.20.1 shall be fulfilled. And there is no specification impact.Proposal 3: L1-RSRP report should not be skipped which should not be coupled with SCell activation procedure.Observation 3: For AP-RS not QCLed to a RS on inter-band serving cell, the delay reduction of using AP-RS for fine timing is neglectable, and it is not clear when gNB can trigger the AP-RS. |
| [**R4-2308481**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308481.zip) | OPPO | Observation 1: Assuming measurement results from L3 measurement can be used for L1-RSRP reporting, the Rx beam sweeping factor for L1-RSRP measurement can be reduced, or even L1-RSRP measurement can be skipped.Proposal 1: UE can skip L1-RSRP measurement by using measurement results from L3 stage for L1-RSRP reporting, if L3 measurement and L1 measurement are using same RS or QCLed type D RSs |
| [**R4-2308718**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308718.zip) | ZTE Corporation | Proposal 1: When the following conditions are satisfied, L1-RSRP measurement can be ignored:1. UE can identify Tx beam during L3 part -- L3 part includes all same RS or QCLed Type D RS used by L1 part.
2. UE can identify Rx beam during L3 part --UE has swept all Rx beam needed by L1 part during L3 part

Proposal 2: For the case of L1-RSRP measurement can be skipped while no valid L3 measurement result is reported after the SCell activation command, the L1-RSRP report or some other report is necessary. Proposal 3: TCI state indication can not be skipped given that the delay reduction is quite small compared with the price of uncertainty.Proposal 4: The fine time tracking can be ignored once the UE acquires enough accurate timing via L3/L1 parts or directly reusing the timing of an inter-band active serving cell given that the side condition are met.Proposal 5: Being consistent with the previous agreements, AP RS can be used for fine time tracking after TCI state indication. |
| R4-2309431 | Qualcomm Incorporated | Observation : Since the X1 and X2 are independent UE capabilities it is up to UE what value to choose for X1 and X2. RAN4 can define side condition to support X2 =0. But it is still up to UE whether to indicate X2=0 with X1 =8. Proposal: X2 can be either zero or non-zero when X1 =8. X2 cannot be zero when X1 is less than 8. |
| [**R4-2309556**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309556.zip) | MediaTek inc. | Proposal 1: Close Issue 2-1-1 and discuss it under Issue 1-2-1 based on the UE capability X2.Proposal 2: L1-RSRP reporting cannot be skipped. It is needed to inform network the beam information of the SCell. |
| R4-2309588 | Ericsson | Proposal 1: RAN4 to agree that X2 can be 2 or 4 or 6 based on UE capability.Proposal 2: If L3 and L1 measurement are using same RS or QCL’ed type D RSs, RAN4 to agree that UE can skip L1-RSRP measurement and use measurement result from L3 stage for L1-RSRP reporting.Proposal 3: UE skips L1-RSRP report if it receives TCI state based on L3 results reported after cell search.Proposal 4: A-TRS based fast timing based on L3 report should be NW configurable. That means SSB based and A-TRS based fine timing acquisition should be supported. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 2-1 Enhancement for L1-RSRP

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 2-1-1: Whether and how to skip L1-RSRP measurement of FR2 unknown SCell activation (for the case when no valid L3 measurement result is reported after SCell activation command)?**

* Proposals
	+ Option 1 (Apple, CMCC, Xiaomi, CTC, OPPO, ZTE, Ericsson):
		- if L3 measurement is performed without beam sweeping factor reduction and if L3 and L1 measurement are using same RS or QCLed type D RSs, skip L1-RSRP measurement and use measurement result from L3 stage for L1-RSRP reporting.
		- Option 1a (Apple):
			* if L3 measurement is performed without beam sweeping factor reduction and if L3 and L1 measurement are using same RS or QCLed type D RSs, the L1-RSRP measurement delay can be deducted from the total activation delay.
	+ Option 2 (Nokia):
		- The L1-RSRP measurement can be skipped at least for Case 1 and Case 2 if the reference signals configured for L1-RSRP report has been measured during L3 part, or is QCL-typeD with the SSB being measured during L3 part.
			* Case 1: the UE does not indicate reduced beam sweeping factors in UE capability
			* Case 2: the UE indicates the support of reduced beam sweeping factor X1/X2 and X2 is above zero.
		- The L1-RSRP measurement is always skipped if the UE indicates a zero-value X2.
	+ Option 3 (NTT DCM):
		- Not to discuss the explicit UE behaviour on “skip L1-RSRP” or whether UE shall derive L1-RSRP based on L3 measurement, which can already be reflected by capability indication of X2 if X2 = 0 is introduced.
	+ Option 4 (vivo):
		- If zero is one of the possible entry of UE capability for X2 in issue 1-2-1 and issue 1-2-2, the discussion of issue 2-1-1 of R4-2306315 can be merged into 1-2-1 and 1-2-2 of R4-2306315.
	+ Option 5 (Huawei):
		- If L3 measurement is performed without L3 part enhancement, whether UE can report L1-RSRP based on L3 measurement is up to UE implementation, when the performance requirements as specified in TS38.133 clause 10.1.20.1 shall be fulfilled. And there is no specification impact.
	+ Option 6 (Qualcomm):
		- X2 can be either zero or non-zero when X1 =8. X2 cannot be zero when X1 is less than 8.
	+ Option 7 (MediaTek):
		- Close Issue 2-1-1 and discuss it under Issue 1-2-1 based on the UE capability X2.
* Recommended WF
	+ [Moderator]: Based on previous agreement in R4-2306315, X2 is the capability to indicate beam sweeping factor **for SSB based L1-RSRP measurement**. To compromise (considering relation between X2 and L1 measurement skipping in option 1/2/3/4/6/7, and considering whether UE can report L1 based on L3 measurement is UE implementation in option 5), following option is proposed from moderator perspective, and wording can be further polished:
		- Option 8 (Moderator):
			* For unknown FR2 SCell activation enhancement when no valid L3 measurement result is reported after SCell activation command, if L3 measurement is performed without beam sweeping factor reduction (beam sweeping factor is 8):
				+ When SSB based L1-RSRP measurement is configured, if X2 = 0, UE can skip SSB based L1-RSRP measurement, i.e., X2 can be indicated as 0 only if beam sweeping factor is 8 for L3 measurement.
				+ When CSI-RS based L1-RSRP measurement is configured, if L3 and L1 measurement are using QCLed type D RSs, UE can skip CSI-RS based L1-RSRP measurement.

**Issue 2-1-2: if L1-RSRP measurement can be skipped in issue 2-1-1, whether to skip L1-RSRP reporting or TCI indication of FR2 unknown SCell activation (for the case when no valid L3 measurement result is reported after SCell activation command)?**

* Proposals
	+ Option 1 (Apple, Nokia, CTC, Huawei, ZTE, MediaTek):
		- L1-RSRP reporting cannot be skipped. It is needed to inform network the beam information of the SCell.
		- Option 1a (Nokia):
			* The UE shall indicate the L1-RSRP reporting is derived by skipping L1-RSRP measurement.
	+ Option 2 (Xiaomi, Ericsson): (Moderator: this option might not be in scope of this issue, since it’s based on L3 measurement report)
		- If L1-RSRP measurement is skipped, the configuration of TCI state activation is based on L3 measurement report and the L1-RSRP reporting can be skipped.
* Recommended WF
	+ [Moderator]: this issue is for the case when no valid L3 measurement result is reported after SCell activation command, please companies check if option 1 is acceptable as well as the option 1a.

### Sub-topic 2-2 TCI related enhancement for L1 part

*Sub-topic description*

*Open issues and candidate options before f2f meeting:*

**Issue 2-2-1: Fine timing tracking for SSB corresponding to the TCI state during FR2 unknown SCell activation**

* Proposals
	+ Option 1 (ZTE):
		- The fine time tracking can be ignored once the UE acquires enough accurate timing via L3/L1 parts or directly reusing the timing of an inter-band active serving cell given that the side condition are met.
* Recommended WF
	+ Moderator: no discussion on this issue, this enhancement was deprioritized in agreed WF (R4-2303228).

**Issue 2-2-2: TCI activation enhancement during FR2 unknown SCell activation**

* Proposals
	+ Option 1 (ZTE):
		- TCI state indication cannot be skipped given that the delay reduction is quite small compared with the price of uncertainty.
* Recommended WF
	+ Moderator: no discussion on this issue, this enhancement was deprioritized in agreed WF (R4-2303228).

### Sub-topic 2-3 Aperiodic RS related enhancement for L1 part

*Sub-topic description*

*Open issues and candidate options before f2f meeting:*

**Issue 2-3-1: Aperiodic RS for TFineTiming during FR2 unknown SCell activation (this AP-RS is not QCLed to a RS on inter-band serving cell)**

|  |
| --- |
| It was an agreement in RAN4 #104bis-e (R4-2217249):Issue 3-3-1: Aperiodic RS for TFineTiming during FR2 unknown SCell activationAgreement:* A-TRS can be configured for fine timing tracking after TCI state activation, and the A-TRS is QCL-ed with the selected SSB index.
 |

* Proposal:
	+ The A-TRS as specified for fast SCell activation can be used also for fine time tracking after TCI activation command. (Apple, Nokia, ZTE)
	+ A-TRS based fine timing tracking after TCI activation command should be NW configurable. That means SSB based and A-TRS based fine timing acquisition should be supported. (Apple, Ericsson)
	+ Send LS to RAN1 informing A-TRS as specified for fast SCell activation can be used also for fine time tracking after TCI activation command. (Nokia, vivo)
* Recommended WF
	+ [Moderator]: Please company check if the above three proposals are agreeable or not.

# Topic #3: Other enhancements for FR2 SCell activation (8.9.2.3)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2307322 | Apple | Proposal 1: The early scheduling is network implementation and it’s not precluded in existing SCell activation requirement. No enhancement is needed.Whether UE shall be scheduled by the network immediately after L3 or L1-RSRP reporting is up to network implementation. |
| [**R4-2307358**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2307358.zip) | Nokia, Nokia Shanghai Bell | Observation #1: In existing spec, the UE cannot report a valid CSI before SP/P-CSI-RS activation or configuration.Observation #2: The report of OoR prevents the UE from being scheduled before the end of SCell activation.Proposal 1: The potential to enable earlier data transmission within the activation period shall be studied.Proposal 2: The data transmission shall be allowed after the UE receives the TCI activation command.Proposal 3: Starting from receiving the TCI activation command, the UE shall report CSI, instead of OoR, if the UE has available uplink resources to report CQI for the SCell. |
| [**R4-2308214**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308214.zip) | vivo | Observation 1 No baseline RRM requirement has been specified for the activation of multiple unknown FR2 SCells who have no active serving cell(s) or known to-be-activated SCell(s) on the same band.Proposal 1 RAN4 further discuss whether RRM requirements for multiple SCell activation need to be introduced/enhanced based on the new measurement reporting mechanism inferred from RAN4 LS R4-2306321.Proposal 2 RAN4 inform RAN2 about RAN4’s decision regarding multiple SCell activation, especially on the issues that may have RAN2 signalling impact. |
| **[R4-2308319](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308319.zip)** | Huawei, HiSilicon | Observation 1: The existing requirements does not prohibit UE from reporting valid CQI before the delay requirements defined in the specification.Observation 2: UE will report valid CQI when capable which marks the completion of SCell activation.Proposal 1: The early scheduling (CQI reported before the delay requirements) is not prohibited in existing SCell activation requirement. No enhancement is needed. |
| [**R4-2308482**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308482.zip) | OPPO | Proposal 1: No scheduling enhancement is needed for FR2 unknown SCell activation, which is up to network implementation. |
| [**R4-2308717**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2308717.zip) | ZTE Corporation | Proposal 1: According to the specification, not any restriction to limit when to schedule the to-be-activated SCell. The early scheduling is network implementation and it’s not precluded in existing SCell activation requirement.Proposal 2: We are fine to discuss some clarification on the UE behavior after receiving such early scheduling from NW.Proposal 3: For FR2, the initial scheduling can be decided by the NW after receiving the beam info and signal quality info after L1-RSRP report. For FR1, once the signal quality info derived by NW, the initial scheduling is possible. |
| R4-2309432 | Qualcomm Incorporated | Proposal: No need to consider enhancement on earlier data transmission within the activation period for FR2 unknown Scell. |
| [**R4-2309557**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_107/Docs/R4-2309557.zip) | MediaTek inc. | Proposal 1: the early scheduling is network implementation and it’s not precluded in existing SCell activation requirement. No enhancement is needed. |
| R4-2309589 | Ericsson | Proposal 1: Scheduling enhancement for FR2 unknown SCell may be a NW controlled optional feature. That means, NW may indicate the starting point of the scheduling to UE. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 3-1

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 3-1-1: Scheduling enhancement for FR2 unknown SCell activation**

* Proposals
	+ Option 1 (Apple, Huawei, OPPO, ZTE, Qualcomm, MediaTek, Ericsson):
		- The early scheduling is network implementation and it’s not precluded in existing SCell activation requirement. No enhancement is needed.
		- Option 1a (Apple): Whether UE shall be scheduled by the network immediately after L3 or L1-RSRP reporting is up to network implementation.
		- Option 2a (ZTE):
			* We are fine to discuss some clarification on the UE behavior after receiving such early scheduling from NW.
			* For FR2, the initial scheduling can be decided by the NW after receiving the beam info and signal quality info after L1-RSRP report. For FR1, once the signal quality info derived by NW, the initial scheduling is possible.
	+ Option 2 (Nokia):
		- The potential to enable earlier data transmission within the activation period shall be studied.
		- The data transmission shall be allowed after the UE receives the TCI activation command.
		- Starting from receiving the TCI activation command, the UE shall report CSI, instead of OoR, if the UE has available uplink resources to report CQI for the SCell.
* Recommended WF
	+ [Moderator]: Can Nokia compromise to option 1?