**3GPP TSG-RAN WG4 Meeting #112bis R4-2416854**

**Hefei, Anhui, China, 14th – 18th October, 2024**

**Agenda item:** 6.15.4

**Source:** CATT

**Title:** WF on RRM requirements for NR\_RRM\_Ph5\_Part2

**Document for:** Approval

# Introduction

This WF includes the agreements and open issues discussed in topic summary for [112bis][210] NR\_RRM\_Ph5\_Part2.

# Topic #1: Fast SCell activation for UE supporting Rel-18 EMR

## Sub-topic 1-1 General

#### Issue 1-1-1: Applicability of fast SCell activation delay requirements

Proposals:

* Option 1: (vivo, CATT, CMCC, LGE, Apple, ZTE, MTK)
  + RAN4 not to define the fast SCell activation delay requirements for the case **when the durations for validity check (i.e., *measIdleValidityDuration-r18* and/or *measReselectionValidityDuration-r18*) are not configured**.
* Option 2: (OPPO, Nokia, Samsung)
  + RAN4 to include the case when measIdleValidityDuration-r18 and/or measReselectionValidityDuration-r18 are not configured and define requirements of fast SCell activation with EMR.
* Option 2a: (OPPO)
  + Consider the following two approaches to support the case:
    - 1) a new indication of valid measurement results of idle/inactive mode can be introduced, or
    - 2) reusing the R18 validity check rule with fulfilling a default value of ValidityDuration.
* Option 2b: (Samsung)
  + - RAN4 not to include the case when *measIdleValidityDuration-r18* is not configured
    - RAN4 to include the case when measReselectionValidityDuration-r18 is not configured

#### Issue 1-1-2: Scope of fast SCell activation for UE supporting Rel-18 eEMR

Proposals

* Option 1: (vivo)
  + RAN4 to start from the case of Direct SCell Activation at SCell addition for fast SCell activation for UE supporting Rel-18 EMR. *(agreed in last meeting)*
* Option 1a: (Qualcomm)
  + RAN4 to consider RRC-based direct SCell activation with a TCI state indication in the RRC based on Rel-18 Beam-level eEMR, i.e.
    - SCellConfig includes *sCellState-r16* and *tci-ActivatedConfig-r17* based on Rel-18 beam-level eEMR.
  + RAN4 to not consider SCG addition/activation
  + RAN4 to not consider MAC CE based SCell activation
  + RAN to consider non-PUCCH SCells and PUCCH SCells where the SCells belonging to PTAG and STAG
* Option 2: (CATT, Apple, CTC, Ericsson, Nokia, ZTE)
  + On top of Direct SCell Activation at SCell addition, Single MAC CE based DL SCell Activation is also supported.
* Option 3: (Nokia)
  + On top of Direct SCell Activation at SCell addition, Single MAC CE based PUCCH SCell Activation is also supported.

#### Issue 1-1-3: Target scenarios of fast SCell activation

Proposals

* Proposal 1: (CMCC, CTC)
  + it is proposed to reduce SCell activation delay for unknown case in FR1 and FR2-1.
* Proposal 2: (Nokia, Ericsson)
  + RAN4 to study both known and unknown conditions for fast SCell activation with Rel-18 EMR.
* Proposal 3: (Qualcomm, Samsung)
  + RAN4 to not consider the following SCells for the eEMR based fast SCell activation requirements:
    - SCell being contiguous to PCell in FR1 (i.e. intra-band contiguous CA)
    - SCell being in the same band as PCell in FR2 (i.e. intra-band CA)
* Proposal 4: (Nokia)
  + RAN4 to consider all possible FR1 and FR2 scenarios for SCell activation, and the work can be initiated for FR1 Pcell + FR2 Pscell/SCell.
* Proposal 5: (Nokia)
  + RAN4 should specify scenarios where the delay is less than 100 ms, even close to 20 ms (RRC setup/resume delay).
* Proposal 6: (Samsung)
  + RAN4 to consider the following scenarios as the starting point: The SCell being activated belongs to FR2 and there is no active serving cell on that FR2 band provided that PCell or PSCell is in FR1

## Sub-topic 1-2 SCell activation delay requirements

#### Issue 1-2-1a: How to update the known condition with consideration of valid eEMR reporting

*Agreement:*

* RAN4 to update known condition that the UE has sent a R18 EMR report according to the reporting requirements in 4.7.3 or 5.8.3 and the R18 EMR report is sent within [Y] seconds before SCell activation command reception.
  + For FR1,
    - [Y] equals to [5s] for direct SCell activation
    - FFS: Y for other SCell activation case.
  + For FR2,
    - Reuse the existing value of Y in direct SCell activation
    - FFS: Y for other SCell activation case.

*Agreement:*

* the SSB detectability applies from the earliest possible eEMR measurement (e.g., the configured *measIdleValidityDuration* or *measReselectionValidityDuration* before Msg1 transmission) to the end of the defined SCell activation latency (i.e. a valid CQI reporting).
  + the SSB measured remains detectable according to the IDLE/Inactive mode measurement conditions specified in 4.2 or the CA/DC measurement conditions specified in 4.4 when UE is in IDLE/INACTIVE state and
  + the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2 and 9.3 when UE is in CONNECTED mode.

Candidate options for proposal 5: The fast SCell activation delay requirements with Rel-18 valid eEMR reporting apply provided *measIdleValidityDuration-r18*/*measReselectionValidityDuration-r18* is configured with smaller than [X].

* Option 1(OPPO(for X<=5s),Apple, MTK,vivo, HW):
  + The fast SCell activation delay requirements with Rel-18 valid eEMR reporting apply provided that *measIdleValidityDuration-r18*/*measReselectionValidityDuration-r18* is configured smaller than [X]
  + Discuss the value of [X].
    - FFS whether X is a constant value defined in spec or up to UE capability.
* Option 2 (Ericsson, CMCC, Nokia): No need to have such side condition in option 1. Need more discussion.
* Option 3 (OPPO, Apple, Samsung, QC, ZTE, CATT): use existing SSB based known SCell activation delay requirement with 2 SSB samples and don’t need side condition in option 1

Offline discussion for proposal 5:

FR1:

Option1 delay components: 1or 2 SSB sample(s) as legacy known case (Apple, OPPO, MTK, HW)

Option 2: (Ericsson, Nokia)

Option 3 delay components: 2 SSB samples (Apple, QC, OPPO, ZTE, CATT，Samsung)

FR2:

Option1 delay components: 1 SSB sample as legacy known case (Apple with short window, OPPO with X=5, MTK, HW)

Option 2: (Ericsson, Nokia)

Option 3 delay components : [2] SSB samples \* beam sweeping +1 SSB sample (QC, Apple, OPPO, ZTE, Samsung, VIVO, MTK when the validityduration is configured)

Option x (combine option 1 and option 2) delay components:[ K] SSB samples \* beam sweeping +1 SSB sample (QC, ZTE, Nokia, HW, CATT, Samsung)

* + K = 0 or 1 if  when the “validityduration” is applied with smaller than X
  + K = 1 or 2 otherwise

Other proposals:

* Proposal 6: For a UE supporting *measValidationReportEMR* or *measValidationReportReselectionMeasurements*, the legacy known conditions with deactivated SCell L3 measurement still apply.
* Proposal 7:
  + In case the SCell has more than one actually transmitted SSB, the report should be based on beam level measurement result, i.e. MeasIdleConfig > MeasIdleCarrierNR > BeamMeasConfigIdle-NR > includeBeamMeasurements = true.
* Proposal 8: It is feasible to introduce a new dedicated eEMR based fast SCell activation indication
  + The corresponding MAC-CE command could be provided together with MAC-CE for SCell activation
    - [Rel-18 EMR based SCell fast activation command] is received [after L3-RSRP reporting via Rel-18 EMR] and no later than the time when UE receives MAC-CE command for TCI activation
* Proposal 9: The fast SCell activation delay requirements with Rel-18 valid eEMR reporting apply provided that measIdleValidityDuration-r18/measReselectionValidityDuration-r18 is configured
  + 1 SSB sample as legacy known case when the validityduration is applied with smaller than [X]
    - FFS whether X is a constant value defined in spec or up to UE capability

#### Issue 1-2-2: Consideration on SINR condition during the whole procedure for known SCell activation

*Tentative agreement:*

* Not to update the SINR condition (i.e., Ês/Iot≥ -2dB) for SCell activation delay requirements.

#### Issue 1-2-3: Consideration on measurement period condition of FR1 known SCell activation

Proposals

* Option 1: (CATT)
  + No need to update the measurement period condition for FR1 known SCell activation.
* Option 2a: (Apple)
  + For fast SCell activation based on eEMR, time for AGC is always needed since measurement period in IDLE/INACTIVE mode is longer than 2400ms in most cases.
* Option 2b: (Qualcomm, Nokia)
  + In any case, the SCell activation requirement should allow UE to receive at least one SSB sample based on [SSB period] or [configured SMTC periodicity].
* Option 3: (Samsung)
  + If the SCell is known based on the eEMR based known condition and belongs to FR1, 2400 ms can be modified to Y ms
    - The basic components to define Y and the subsequent impact on AGC training gate for activation shall be discussed.

#### Issue 1-2-4: Whether the indication to network is needed

Proposals

* Option 1: (CATT, Apple, Samsung)
  + Valid eEMR report in R18 is enough. No need to introduce additional indication to the network for fast or slow SCell activation.
* Option 2: (Ericsson, Nokia)
  + RAN4 to introduce a UE indication to the network. The fast or not definition can refer to the known/unknown condition that will be defined for fast Scell activation via EMR.

# Reference

1. R4-2415657 Topic summary for [112bis][210] NR\_RRM\_Ph5\_Part2, CATT, RAN4#112bis