**3GPP TSG-RAN WG4 Meeting #110bis R4-2406291**

**Changsha, China, April 15 – 19, 2024**

**Agenda item:** 6.14.3

**Source:** Apple

**Title:** Ad-hoc minutes #2 on RRM requirements for NR\_Mob\_enh2

**Document for:** Information

# Topic #1: LTM

## Open issues summary

(Online) Issue 4-4-2: Interruption when PRACH is not fully contained in any of UE’s configured UL BWP(s) of active serving cells

*In moderator’s view, more explanation on the impact of SRS carrier switch on PDCCH-order RACH is necessary. According to 38.133 cl. 8.2.2.2.9. SRS carrier switching will not be performed if colliding with PDCCH-order RACH.*

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| When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:  - switching is from a configured carrier to another activated carrier;  - the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;  - the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];  - the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].  - the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD. |

* Proposals
  + Option 1 (Ericsson, QC):
    - Interruption to both DL and UL duration before/after PDCCH-order LTM PRACH is extended by 1ms for the following case:
      * The PDCCH-order PRACH is not fully contained in any of UE’s configured UL BWP(s) of active serving cells, and
      * the number of RRC-configured LTM cells whose PRACH resources are not fully overlapping in the frequency domain [with active BWP] of any serivng cell is more than 2, and
      * UE is configured with SRS carrier switching.
* Recommended WF
  + Need more discussion.

Further check the following:

* + Interruption to both DL and UL duration before/after PDCCH-order LTM PRACH is extended by 1ms for the following case:
    - The PDCCH-order PRACH is not fully contained in any of UE’s configured UL BWP(s) of active serving cells, and
    - the number of RRC-configured LTM cells whose PRACH resources are not fully overlapping in the frequency domain [with active BWP] of any serivng cell is more than 2, and
    - UE is configured with SRS carrier switching.

(Online) Issue 5-4-1: Whether to have test with two neighbor cells in FR2 for intra-frequency L1-RSRP measurement

* Proposals
  + Proposal 1 (CATT):
    - For intra-frequency L1-RSRP measurement in FR2, it is reasonable to configure two neighbor cells for test cases with TCI state activation even though it will cause long measurement delay compared with one neighbor cell.
  + Proposal 2 (MTK, CATT): For intra-frequency L1-RSRP measurement in FR2, define the following two test cases:
    - with one neighbor cell and no early TCI state activation
    - with two neighbor cells and TCI state of one of the neighbor cells is activated
* Recommended WF
  + Need more discussion

MTK: this is only for UE which can support more than 1 candidate cells. UE supporting more than 1 cell, UE needs to pass both test with 1 and 2 neighbor cells.

FFS:

* introduce test with two neighbor cells in FR2 for intra-frequency L1-RSRP measurement.
  + [2 AoAs] in the test.
  + Only applies for UE which supports more than 1 candidate cell.

**(Online) Issue 4-3-4: The meaning if UE does not report the capabilities for Number of cells/resources/frequency layers**

* Proposals
  + Option 1 (vivo): For 39-3-2/3/[4]/5/6, the minimum number is set as the default value if UE does not report support this capability.
* Recommended WF
  + Need more discussion.

MTK/QC: option 1 is making this capability mandotry. Some UE may not need this capability.

**(Online) Issue 4-4-1: Interruption on DL slots due to PDCCH-ordered RACH**

* Proposals
  + Option 1 (vivo):
    - For 39-4, change the description that interruption on DL is always assumed if UE does not report this capability, and if UE report the capability, there is no interruption.
* Recommended WF
  + Need more discussion.

**Issue 2-2-2: Measurement period of serving cell L1-RSRP measurement**

* Proposals
  + Option 1 (Apple):
    - introduce NLayer in serving cell L1 RSRP measurement requirement and clarify that it is for UE capable of RTD>CP configured with L1 RSRP measurement on neighbour cell.

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* Recommended WF
  + Need more discussion.

**(Online) Issue 5-2-1: Procedures and configurations of test cases on cell switch delay**

* Proposals
  + Proposal 1 (CATT):
    - Test preparation:
      * Configuration of Candidate cell, L3 measurement and L1 measurement are configured.
      * UE has performed L3 measurement and L1 measurement on the target cell.
      * TE has received valid L1 measurement report on the target cell.
    - For T1,
      * T1 starts from a valid L1 report on target cell.
      * TE then activates TCI state of target cell if UE supports pre TCI state activation on candidate cell(s), otherwise, TE does not activate TCI state.
    - T2 starts from the time that UE receives cell switch command. The duration of T2 covers the whole cell switch delay.
      * The time gap between cell switch command and TCI sate activation command is longer than the time duration to be discussed in core part.
  + Proposal 2 (Nokia):
    - T1:
      * UE is connected to cell 1 (PCell) and has no timing information of cell 2 (neighbor cell).
    - T2:
      * UE is configured with L3 and L1 measurement for cell 2. UE is given time to perform L3 and L1 measurement and report (at least) L1 measurement for cell 2.
      * In test cases with early TCI state activation, after network receives L1 report, TE sends TCI state activation command
    - T3:
      * T3 starts after L1 report for test cases without early TCI state activation and after TCI state activation delay for test cases with early TCI state activation.
      * TE sends cell switch command to cell 2.
      * UE shall complete cell switch within the delay and interruption specific for the test case (send PRACH or first UL transmission to cell 2).
  + Proposal 3 (ZTE):
    - For cell switch without early TCI state activation, the procedure of test case can refer to L3 HO and consist of two consecutive periods.
      * T1: UE connected to cell 1 (PCell) and configured to measure cell 2 (LTM candidate cell).
      * T2: Cell switch command to cell 2 (without TA). UE to complete the cell switch within the delay defined for RACH-based cell switch.
    - For RACH-based cell switch with early TCI state activation, the procedure of test case consist of three consecutive periods.
      * T1: UE connected to cell 1 (PCell) and configured to measure cell 2 (LTM candidate cell).
      * T2: At the beginning of T2, UE receives TCI state activation command for cell 2 with TCI state 1.
      * T3: UE receives cell switch command to cell 2, TCI state 1 (without TA). UE to complete the cell switch within the delay defined for RACH-based cell switch and with Tfirst-RS = 0 and TRS-proc = 0.
  + Proposal 4 (Huawei): Test case for RACH based intra-frequency Cell switch from FR2 to FR2 without early TCI state activation:
    - Two cells: one serving cell, one candidate neighbor cell on the same frequency
    - One time period T1: Starting T1, UE receives a MAC CE LTM cell switch command from the network
    - Before T1: UE has reported L3 measurement with SSB index and valid L1 measurement report on cell2.
  + Proposal 5 (vivo):
    - For R18 LTM cell switch test cases, gNB configures A3-event triggered reporting on the target cell, and L1 measurement and reporting is configured/activated only after gNB receives the corresponding L3 reporting.
    - In cell switch test cases, the A3-events are configured in the measConfig of LTM candidate cell config, i.e. decoded and applied during cell switch.
    - To enable repeated test in the cell switch testing, both directions, i.e. cell1 -> cell2 and cell2 -> cell1, are tested.
* Recommended WF
  + Based on the proposals and proposed CRs, Moderator recommends discuss the following divergence parts:
    - Issue A: Whether some procedures as part of test or as preparation before the test
      * Option A1:
        + T1: UE is connected to cell 1 (PCell) and has no timing information of cell 2 (neighbor cell).
        + T2: UE is configured with L3 and L1 measurement for cell 2. UE is given time to perform L3 and L1 measurement and report (at least) L1 measurement for cell 2.
      * Option A2:
        + Test preparation

UE is connected to cell 1 (PCell)

Before T1: UE has reported L3 measurement and valid L1 measurement report on cell2.

* + - Issue B: For cell switch test cases without early TCI state activation, whether one time period is enough
      * One time period T1: Starting T1, UE receives a MAC CE LTM cell switch command from the network
    - Issue C: whether to enable repeated test in the cell switch testing, both directions, i.e., cell1 -> cell2 and cell2 -> cell1

Agreements:

For test case for cell switch in the following table, introduce T1~T5:

* + T1: at starting point of T1, UE has no timing info of target cell. UE is configured with L3 and L1 measurement for cell 2. UE is given time to perform L3 for cell 2. T1 ends when TE receives L3 measurement report.
  + T2: TE provides LTM configuration. Ends when TE recevies L1 RSRP report.
  + T3: TE triggers TCI activation (only for UE supporting early TCI activation)
  + T4: TE triggers RACH. (only for RACH-less cell switch and for UE supporting early timing acquisition)
  + T5: TE triggers cell switch. Verify cell switch requirements during T5.

Power level of target cell remains the same starting from T1.

Timeline can be revisited based on conclusion of other open issues.

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| **Core requirements defined** | **Detail** | **Company** | **Ad-hoc agreement** |
| PCell Cell switch requirements | A.6.3.x.1   * RACH based Cell switch from FR1 to FR1   + Intra-frequency cell switch   + Without early TCI state activation | CATT | Merge A.6.3.x.1 and A.6.3.x.2 without T4. |
| A.6.3.x.2   * RACH based Cell switch from FR1 to FR1   + Intra-frequency cell switch   + With early TCI state activation | MTK, Ericsson |
| A.6.3.x.3   * RACH-less Cell switch from FR1 to FR1   + Intra-frequency cell switch   + Without early TCI state activation | ZTE | Merge A.6.3.x.3 and A.6.3.x.4 |
| A.6.3.x.4   * RACH-less Cell switch from FR1 to FR1   + Intra-frequency cell switch   + With early TCI state activation | vivo |
| A.6.3.x.5   * RACH based Cell switch from FR1 to FR1   + Inter-frequency cell switch   + Without early TCI state activation | vivo | Merge A.6.3.x.5 and A.6.3.x.6 without T4 |
| A.6.3.x.6   * RACH based Cell switch from FR1 to FR1   + Inter-frequency cell switch   + With early TCI state activation | Nokia |
| A.7.3.x.1   * RACH based Cell switch from FR2 to FR2   + Intra-frequency cell switch | Huawei |  |
| A.7.3.x.2   * RACH-less Cell switch from FR2 to FR2   + Intra-frequency cell switch | QC |  |
| A.7.3.x.3   * RACH based Cell switch from FR2 to FR2   + Inter-frequency cell switch | Nokia |  |
| PSCell cell switch | A.6.3.y.1   * RACH based Cell switch from FR1 to FR1   + Intra-frequency cell switch   + Without early TCI state activation | CATT | Merge A.6.3.y.1 and A.6.3.y.2 without T4 |
| A.6.3.y.2   * RACH based Cell switch from FR1 to FR1   + Intra-frequency cell switch   + With early TCI state activation | Nokia |
| A.7.3.y.1   * RACH based Cell switch from FR2 to FR2   + Intra-frequency cell switch | OPPO |  |

**~~(Online) Issue 5-2-3: Whether and how to define a value for T~~~~LTM\_IU~~ ~~in the RACH-less LTM cell switch delay test cases~~**

*~~As configured grant PUSCH is optional UE capability, moderator suggests to use dynamic grant. In moderator’s understanding, in the test, we need to constraint TE sends PDCCH on target cell after T~~~~cmd~~ ~~+ T~~~~LTM-RRC-processing~~ ~~+ T~~~~LTM-processing~~ ~~+ T~~~~first-RS~~ ~~+ T~~~~RS-proc~~*

* ~~Proposals~~
  + ~~Proposal 1 (Nokia):~~ 
    - ~~RAN4 to discuss whether to define a value for T~~~~LTM\_IU~~ ~~in the RACH-less LTM cell switch delay test cases or to leave the value open.~~
  + ~~Proposal 2 (MTK):~~
    - ~~In the test cases for RACH-less cell switch, dynamic grant should be used to schedule the first UL.~~
* ~~Recommended WF~~
  + ~~Recommend agree on~~
    - ~~In the test cases for RACH-less cell switch, dynamic grant should be used to schedule the first UL.~~
    - ~~FFS: define a value for T~~~~LTM\_IU~~ ~~in the RACH-less LTM cell switch delay test cases or to leave the value open.~~

**~~(Online) Issue 5-5-2: Whether define test cases for UL transmit timing requirements~~**

* ~~Proposals~~
  + ~~Proposal 1 (Nokia): Verify UL transmit timing requirements in some test case (cell switch or separately).~~
* ~~Recommended WF~~
  + ~~Need more discussion~~

**~~Issue 5-2-4: Test coverage on cell switch delay~~**

*~~Proposal 1:~~*

*~~As joint DL/UL TCI states~~**~~and separate DL/UL TCI states are separate optional UE capabilities, it is reasonable to cover both capabilities. One test case with two configurations is workable. Some test cases are already including two settings, one for UE only supporting separate DL/UL TCI states, another for UE supporting joint DL/UL TCI states.~~*

*~~Proposal 2:~~*

*~~Moderator thinks it is not necessary to test the case that UE does not support early TCI state activation and the measurement period of L1-RSRP is longer than 160ms, as UE definitely needs to perform T/F tracking during cell switch delay no matter L1 measurement period >160ms or not.~~*

* ~~Proposals~~
  + ~~Proposal 1 (Nokia):~~ 
    - ~~RAN4 to define cell switch delay test cases to support both joint DL/UL TCI states and separate DL/UL TCI states.~~
  + ~~Proposal 2 (CTC):~~
    - ~~Whether specify the case where UE does not support early TCI state activation and the measurement period of L1-RSRP is longer than 160ms separately.~~
* ~~Recommended WF~~
  + ~~Recommend agree on~~
    - ~~The test cases should cover UE supporting joint DL/UL TCI states and UE supporting DL/UL TCI states with two configurations in one test.~~
    - ~~Not to define separate test cases for the case where UE does not support early TCI state activation and the measurement period of L1-RSRP is longer than 160ms.~~

**~~Issue 5-2-5: Requirements to verify in test cases for cell switch~~**

* ~~Proposals~~
  + ~~Proposal 1 (Nokia):~~ 
    - ~~The cell switch delay requirement to be verified in the test cases depends on UE support of capability of faster UE processing and early ASN.1 decoding and validity check.~~
* ~~Recommended WF~~
  + ~~Recommend agree on Proposal 1 and discuss in the corresponding CR directly.~~

**~~(Online) Issue 5-5-5: Applicability rule~~**

*~~Proposal 1 is aligned with the agreement in RAN4#110~~*

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| ~~Agreement in RAN4#110~~   * + ~~For FR1 cell switch delay, define test cases for both with and without TCI state activation. For UE supporting TCI state activation, not perform the test without TCI state activation.~~ |

*~~For cell switch delay in FR2 and PDCCH order RACH, there are no separate test cases with early TCI state activation.~~*

*~~Therefore, moderator thinks there is no need to discuss proposal 1.~~*

* ~~Proposals~~
  + ~~Proposal 1 (QC): For a UE capable of early TCI state activation, test cases without early TCI state activation before PDCCH-order PRACH and LTM cell switch are skipped.~~
  + ~~Proposal 2 (QC): For a UE capable of early PRACH transmission, test cases for PRACH-based LTM cell switch are skipped.~~
* ~~Recommended WF~~
  + ~~Need more discussion.~~

**~~(Online) Issue 3-2-1-1: Time gap between early TCI state activation command and cell switch command~~**

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* ~~Proposals~~
  + ~~Option 1 (MTK)~~
    - ~~After receiving activation command of a known TCI state, UE performs one shot SSB based T/F tracking on candidate cell(s) immediately after TCI state activation command.~~
    - ~~Only consider the case that UE can finish T/F tracking in only one SSB period, i.e., NW activates TCI state(s) of cells on a single frequency layer in FR1 and NW activates TCI state(s) of one more cell in FR2 at a certain time.~~
    - ~~Only consider known TCI state case for early TCI state activation in FR2.~~
    - ~~Consider unknown TCI state case for early TCI state activation in FR1 if the following conditions can be met:~~
      * ~~UE has reported beam-level L3 measurement result of the associated SSB of the TCI state within 1280ms~~
      * ~~SNR of the associated SSB is above -3dB.~~
  + ~~Option 2 (vivo):~~ 
    - ~~The time gap for TCI activation before cell switch shall also consider UL part of TCI activation, i.e. the time gap equals to~~ ~~T~~~~HARQ~~ ~~+ +~~ ~~max(TOk\*(T~~~~first-SSB~~ ~~+ T~~~~SSB-proc~~~~), NM~~*~~\*~~* ~~(T~~~~first\_target-PL-RS~~ ~~+ 4\*T~~~~target\_PL-RS~~ ~~+ 2ms))~~~~/ NR slot length~~
    - ~~For UE supporting 45-3a/45-4a, UL TCI activated before cell switch is not used for PDCCH-ordered RACH. The time gap for TCI activation before PDCCH-ordered RACH only counts DL part of TCI activation.~~
    - ~~Considering no legacy RRM requirements are applicable if PL-RS is configured as SSB in FR2, RAN4 not to define RRM requirements in R18 for the case TCI activation before cell switch is indicated on an candidate cell with SSBs and PL-RSs outside active BWP, at least for FR2.~~
    - ~~No RRM requirement is applicable for a R18 UE if TCI activation of two candidate cells happens at the same time in FR2, e.g. received in one MAC PDU with two MAC CEs.~~
  + ~~Option 3 (Nokia):~~ 
    - ~~UE can perform PL-RS estimation based on the same SSB (T~~~~first-SSB~~~~/T~~~~first-RS~~~~) as is used for T/F tracking at TCI state activation.~~
    - ~~If TCI state is activated before cell switch, the UE shall do PL-RS estimation during the early TCI state activation. After TCI state activation, UE shall maintain the PL-RS for the active TCI state(s).~~
    - ~~Early TCI state activation requirements apply for both known and unknown TCI states. Legacy known TCI state condition and unknown TCI state switch delay can be reused.~~
    - ~~Extend the agreement “~~*~~When the target cell is a current serving cell (role switch) and the target TCI state in LTM cell switch command or SSB index indicated in PDCCH order is already on the active TCI state list for that serving cell or on the LTM candidate cell active TCI state list, consider the target TCI state activated.”~~* ~~to cover also the time gap between TCI state activation MAC-CE and LTM cell switch command.~~
  + ~~Option 4 (Ericsson, QC)~~
    - ~~TCI state activation requirements to be defined for known and unknown LTM candidate TCI states in the list of LTM TCI state activation.~~
    - ~~RAN4 to agree the following as requirements for LTM candidate TCI state activation delay before receiving the cell switch command.~~ 
      * ~~If all the target LTM TCI states in the active TCI state list are known, if the UE receives TCI state activation command at slot n, UE shall have completed the LTM TCI state list update in slot n + T~~~~HARQ~~ ~~+ + TO~~~~k~~~~\*(T~~~~first-SSB\_List~~ ~~+ T~~~~SSB-proc~~~~) /~~ *~~NR slot length~~*~~.~~
      * ~~If any of the target TCI states in the active TCI state list are unknown, if the UE receives TCI state activation command at slot n, UE shall have completed the LTM TCI state list update in slot n+ T~~~~HARQ~~ ~~+ + (T~~~~L1-RSRP\_list~~ ~~+TO~~~~uk~~~~\*(T~~~~first-SSB\_List~~~~+ T~~~~SSB-proc~~~~)) /~~ *~~NR slot length~~*~~.~~
      * ~~In the TCI state activation requirements for LTM candidate cells, T~~~~first-SSB\_List~~ ~~is given by~~
      * ~~For FR2,~~
        + ~~T~~~~first-SSB\_List~~ ~~= T~~~~first-SSB\_LTM1~~ ~~+ T~~~~first-SSB\_LTM2 + ... +~~~~T~~~~first-SSB\_LTMn~~~~, if the time to first SSB associated to LTM candidate TCI states are overlapped in FR2.~~
        + ~~T~~~~first-SSB\_List~~ ~~= max (T~~~~first-SSB\_LTM1~~~~, T~~~~first-SSB\_LTM2, .. ,~~ ~~T~~~~first-SSB\_LTMn~~~~.) if the time to first SSB associated to LTM candidate TCI states are not overlapped.~~
      * ~~For FR1, T~~~~first-SSB\_List~~ ~~= max (T~~~~first-SSB\_LTM1~~~~, T~~~~first-SSB\_LTM2, .. ,~~ ~~T~~~~first-SSB\_LTMn~~~~).~~ 
        + ~~Where, the T~~~~first-SSB\_LTMn~~ ~~is the SSB periodicity of LTM candidate cell n.~~
* ~~Recommended WF~~

*~~Consider the common parts the proposals, and divergence among the proposals~~*

* + ~~Recommend agree on~~
    - ~~After receiving activation command of a known TCI state, UE performs one shot SSB based T/F tracking on candidate cell(s) immediately after TCI state activation command~~
    - ~~Reuse legacy known TCI state condition in legacy TCI state switching requirements~~
    - ~~Support both known and unknown TCI state in FR1~~
      * ~~FFS: Discuss the conditions to support unknown TCI state in FR1~~
    - ~~FFS: Discuss whether to consider the case that candidate cell’s SSB or PL-RS is outside active BWP in FR2~~
    - ~~FFS: Discuss whether and how to consider the case that UE cannot finish T/F tracking in one SSB/gap period, i.e.,~~ 
      * ~~Multiple frequency layers in FR1~~
      * ~~Multiple cells in FR2~~
    - ~~FFS: Discuss whether and how to consider unknown TCI state in FR2~~
    - ~~FFS: whether to consider addition time for PL-RS measurement~~

**~~Issue 5-5-3: Whether to define test cases for unknown TCI state activation or the test cases involving early TCI state activation~~**

* ~~Proposals~~
  + ~~Proposal 1 (Ericsson): RAN4 should define test cases for unknown TCI state activation for the test cases involving early TCI state activation.~~
* ~~Recommended WF~~
  + ~~Need more discussion.~~
  + ~~Pending on issue 3-2-1-1.~~

**~~(Online) Issue 3-2-1-2: Alternative conditions for T~~~~first-RS~~ ~~=0~~**

*~~From the proponents’ contribution:~~*

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* ~~Proposals~~
  + ~~Option 1 (Ericsson, QC):~~ 
    - ~~The target TCI state in cell switch command is activated not more than 160ms ago from the reception of the cell switch command; or~~
    - ~~The target TCI state in cell switch command is activated before receiving the cell switch command and the SSB associated to target TCI state is available at least once every 160 ms after the TCI state activation command is received~~
    - ~~Replace current wording of L1-RSRP measurement period is not larger than 160 ms in LTM cell switch requirements with “L1-RSRP measurement period is not larger than 160 ms with the assumption of M=1 and T~~~~Report~~ ~~=0 in the L1-RSRP measurement period specified in the 9.14 and 9.15.~~
* ~~Recommended WF~~
  + ~~Need more discussion.~~

**~~(Online) Issue 3-2-3-1: T~~~~interruption~~****~~of PSCell switch~~**

*~~Interruption on MCG is caused by RF retuning. The interruption on MCG due to PSCell addition is also caused by RF retuning. So the interruption length of PSCell addition can be reused.~~*

* ~~Proposals~~
  + ~~Option 1 (CTC, MTK):~~ 
    - ~~The interruption on MCG due to PSCell change is the same as PSCell addition.~~
  + ~~Option 2 (Nokia):~~ 
    - ~~RAN4 to discuss why and how long interruption would be needed due to LTM PSCell switch on serving cells in MCG.~~
* ~~Recommended WF~~
  + ~~Need more discussion.~~

**~~(Online) Issue 3-2-2-1: Extra time for PL-RS measurement~~**

* ~~Proposals~~
  + ~~Option 1 (MTK):~~ 
    - ~~For CBRA cell switch, no additional PL-RS measurement time is needed.~~
    - ~~For CFRA and RACH-less cell switch, both in FR1 and FR2, the cell switch requirements are only applicable to the case when target PL-RS is maintained, and UE does not need extra time to measure the PL-RS.~~
    - ~~During cell switch, PL-RS is maintained provided:~~

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| ~~- the target PL-RS is associated with or included in the UL or joint TCI states in the active TCI list for PUSCH/PUCCH/SRS transmissions~~  ~~- Number of active UL TCI states (UL or joint TCI state) for PUSCH/PUCCH/SRS transmissions does not exceed UE capability ltm-MAC-CE-JointTCI-r18 or ltm-MAC-CE-SeparateTCI-r18~~  ~~- The target pathloss reference signal remains detectable during cell switch delay~~  ~~- SNR of the target pathloss reference signal≥-3dB~~  ~~- The associated SSBs with the target pathloss reference signal remain detectable during cell switch delay~~  ~~- SNR of the associated SSB ≥-3dB~~ |

* + ~~Option 2 (vivo): The UL TCI activation delay is added into cell switch delay as follows.~~
    - ~~T~~~~LTM-interrupt~~ ~~= T~~~~LTM-RRC-processing~~ ~~+ T~~~~LTM-processing~~~~+ max(T~~~~first-RS~~ ~~+ T~~~~RS-proc~~~~, T~~~~first\_target-PL-RS~~ ~~+ [2]\*T~~~~target\_PL-RS~~ ~~+ 2ms)~~~~+ T~~~~LTM-IU~~
  + ~~Option 4 (Huawei, ZTE, Nokia): No additional delay or conditions are needed for PL-RS measurement.~~
    - ~~Option 4a (Nokia): The number of PL-RS the UE shall be able to maintain for LTM candidate cells should be added on top of the number of the 4 PL-RS the UE is expected to be able to keep track of for serving cells. RAN4 to discuss the exact number of LTM candidate cell PL-RS that the UE shall be able to maintain.~~
  + ~~Option 5 (Ericsson, QC): For the cell switch delay, no additional delay or conditions are needed for PL-RS measurement provided that the following condition are fulfilled:~~
    - ~~UE has reported L3-RSRP on the SSB associated with PL-RS before reception of LTM configuration and UE is configured to perform L3 or L1 measurements after LTM configuration.~~
* ~~Recommended WF~~
  + ~~Recommend agree on~~
    - ~~For CBRA cell switch, no additional PL-RS measurement time is needed, with no conditions~~
    - ~~For CFRA cell switch and RACH-less cell switch, no additional PL-RS measurement time is needed~~
      * ~~Further discuss the conditions.~~

**~~Issue 3-3-1: known conditions~~**

* ~~Proposals~~
  + ~~Proposal 1 (Nokia): Because based on earlier Rel-18 agreements cell switch delay requirements only apply if target TCI state is known, the UE has to report L1 measurements for the target cell before the cell switch command. Unless RAN4 decides to change the known TCI state condition, there is no need to consider cell switch without L1 report in Rel-18 requirements.~~
  + ~~Proposal 2 (Ericsson): update the known TCI state conditions for LTM cell switch:~~

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| --- |
| ~~The target joint DL/UL TCI state or separate DL and UL TCI states in the LTM cell switch command are known if the following conditions are met:~~  ~~- The target TCI state in cell switch command is activated not more than 160ms ago from the reception of the cell switch command and SNR of the SSB associated to TCI state ≥ -3dB; or~~  ~~- The target TCI state in cell switch command is activated and provided with SSB at least every 160 ms after the TCI state activation command is received and SNR of the SSB associated to TCI state ≥ -3dB; or~~  ~~- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target DL/UL TCI state to the completion of LTM cell switch, where the RS resource for L1-RSRP measurement is the RS in target DL/UL TCI state or QCLed to the target DL/UL TCI state~~  ~~- LTM cell switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement~~  ~~- The UE has sent at least 1 L1-RSRP report for the target DL/UL TCI state before the LTM cell switch command~~  ~~- The target DL/UL TCI state remains detectable during the LTM cell switching period~~  ~~- The SSB associated with the target DL/UL TCI state remain detectable during the cell switching period~~  ~~- SNR of the TCI state ≥ -3dB~~  ~~Otherwise, the target joint DL/UL TCI state or separate DL and UL TCI state is unknown.~~ |

* ~~Recommended WF~~
  + ~~Need more discussion~~

**~~(Online) Issue 3-2-4-1: Which cell(s) T~~~~LTM-RRC-processing~~ ~~= 0 apply to when candidate cells configured are more than UE capability?~~**

*~~For information:~~*

|  |
| --- |
| ~~38.321~~    ~~Figure 6.1.3.76-1: Candidate Cell TCI state activation/deactivation MAC CE~~ |

* ~~Proposals~~
  + ~~Option 1 (MTK):~~ 
    - ~~T~~~~LTM\_RRC-processing~~ ~~in TS38.133 is zero only applicable to the cells whose TCI state(s) are activated, if early TCI state activation on any candidate cell is triggered.~~
    - ~~T~~~~LTM\_RRC-processing~~ ~~in TS38.133 is zero only applicable to the latest cell on which PDCCH-order RACH is triggered if NW doesn’t active TCI state of any candidate cell~~
  + ~~Option 2 (Ericsson, QC)~~
    - ~~The ltm-CandidateConfig IEs associated with at least one active TCI state~~
    - ~~The ltm-CandidateConfig IEs associated with previously performed PDCCH-order PRACH.~~
    - ~~If the number of the ltm-CandidateConfig IEs associated with active TCI state and PDCCH-order PRACH transmission is larger than maxLTMCandidateConfig, the ltm-CandidateConfig IEs for fast RRC processing are chosen in reverse chronological order of Candidate Cell TCI States Activation MAC CE and PDCCH-order PRACH, i.e. maxLTMCandidateConfig ltm-CandidateConfig IEs with the most recently activated TCI states and PDCCH-order PRACH transmission.~~
    - ~~The current serving cells and the cells inside the ltm-CandidateConfig, chosen by the above condition, across cell groups (i.e. MCG and SCG) is not larger than maxServingAndCandidteCells~~
  + ~~Option 3 (vivo):~~
    - ~~In R18, T~~~~LTM\_RRC-processing~~ ~~in TS38.133 is zero only if number of configured candidate cells across all frequency layers (i.e. including both candidate SpCells and SCell) is no more than number of cells UE supports early ASN.1 decoding and validity/compliance check.~~

*~~Moderator: Last meeting, RAN4 agreed to consider other cases too. Suggest not to revise previous agreement unless issues are found and all the companies agree to revise.~~*

* + ~~Option 4 (Nokia)~~
    - ~~For the conditions of early ASN.1 decoding capability, RAN4 to clarify the UE behaviour in case TCI activation command or PDCCH order is sent for more cells than UE capability to decode candidate cell configurations.~~
* ~~Recommended WF~~
  + ~~Recommend agree on~~
    - ~~when candidate cells configured are more than UE capability [39-6], T~~~~LTM\_RRC-processing~~ ~~= zero applies to the following cells~~
      * ~~The target cell’s TCI state has been activated or the target cell which UE has received PDCCH-order to trigger PRACH transmission.~~
        + ~~Conditions on time gap between TCI state activation/PDCCH-order and cell switch command are discussed in issue 3-2-4-2 and 3-2-4-3.~~
      * ~~The total number of Cells [and cell groups] choose for early RRC processing is not larger than [39-6]~~
      * ~~FFS: how to choose the cells or cell groups for early RRC processing~~
        + ~~Option 1:~~

~~the cells whose TCI state(s) are activated, if early TCI state activation on any candidate cell is triggered.~~

~~the latest cell on which PDCCH-order RACH is triggered if NW doesn’t active TCI state of any candidate cell~~

* + - * + ~~Option 2:~~

~~the most recently activated TCI states and PDCCH-order PRACH transmission.~~

**~~(Online) Issue 3-2-4-3: Condition on time gap between PDCCH-order and cell switch command for T~~~~LTM\_RRC-processing~~ ~~=0~~**

* ~~Proposals~~
  + ~~Option 1 (MTK, Nokia):~~ 
    - ~~T~~~~LTM-RRC-processing~~ ~~= 0, if UE supports [Early processing of an LTM candidate cell RRC configuration] and has received PDCCH order for the target cell at least 10 ms before the LTM cell switch command.~~
  + ~~Option 2 (Ericsson, QC)~~
    - ~~The time gap from the slot where the UE received the PDCCH triggering the PDCCH-order PRACH transmission to the slot where the UE received the LTM cell switch MAC CE is larger than N~~~~T,2~~~~+10ms, if the condition of ‘fast RRC processing’ is met by the PDCCH-order PRACH transmission.~~

*~~Moderator: N~~~~T,2~~ ~~is the time given for PDCCH-order decoding in moderator’s understanding~~*

* ~~Recommended WF~~
  + ~~Recommend agree on Option 2.~~