**3GPP TSG-RAN WG4 Meeting #111 *R4-2410308***

**Fukuoka, Japan, May 20-24, 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Draft CR for LTM cell switch, PDCCH ordered RACH and TCI state activation |
|  |  |
| ***Source to WG:*** | R4 |
| ***Source to TSG:*** | Nokia |
|  |  |
| ***Work item code:*** | NR\_Mob\_Enh2-Core |  | ***Date:*** | 24 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | LTM cell switch delay and TCI state activation requirements are not complete. |
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| ***Summary of change:*** |  The following agreements are captured:**Issue 3-1-4-2: Condition on time gap between PDCCH-order and cell switch command for TLTM\_RRC-processing =0**< **Agreement**>: * + 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 NT,2+10ms, if the condition of ‘fast RRC processing’ is met by the PDCCH-order PRACH transmission.

**Issue 1-3-6: cell switch delay and PDCCH order RACH delay requirements without L1 measurement***Ad hoc agreement*< **Agreement**>: * In cell switch delay requirement:
	+ In FR1, for UE not supporting/configured with L1 measurement, one SSB occasion is needed from RAN4 requirement point of view for T/F fine tracking, if
		- the time gap between completion of TCI activation and cell switch command is larger than [160ms], or
		- the time gap between early RACH transmission and cell switch command is larger than [160ms].
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| ***Consequences if not approved:*** | Incomplete requirements |
|  |  |
| ***Clauses affected:*** | 6.3, 8.20 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | R4-2408685 |

Start of Change 4

## 6.3 L1/L2-Triggered Mobility

### 6.3.1 LTM PCell Cell Switch

#### 6.3.1.1 Introduction

The purpose of LTM cell switch is to switch the PCell or PSCell to a target cell indicated in LTM cell switch command. The requirements in this section are applicable to LTM PCell switch.

The requirements in this clause are applicable to SA and NR-DC, and to both intra-frequency and inter-frequency LTM cell switch.

The requirements for inter-frequency cell switch to an FR2 target cell in this clause are only applicable, when

- network has configured UE to perform L3 measurement with SSB index or L1 measurement for the target cell before the cell switch command, or

- the SFN of the serving cell from which cell switch command is received and the SFN of the target cell are the same.

The requirements in this clause are applicable to SA for the following scenarios:

PCell switch to a neighboring LTM candidate cell

- FR1 cell to FR1 cell

- FR1 cell to FR2 cell

- FR2 cell to FR2 cell

- FR2 cell to FR1 cell

PCell switch to an LTM candidate cell that is a serving SCell in MCG

- FR1 cell to FR1 cell

- FR2 cell to FR2 cell

The requirements in this clause are applicable to NR-DC for the following scenarios:

PCell switch to a neighboring LTM candidate cell

- FR1 cell to FR1 cell

PCell switch to an LTM candidate cell that is a serving SCell in MCG

- FR1 cell to FR1 cell

#### 6.3.1.2 LTM Cell Switch delay

LTM cell switch delay DLTM is the delay from the end of the last TTI containing the MAC-CE command for cell switch until the time the UE transmits the first UL message on the target cell.

When the target cell and the target joint UL/DL TCI state or separate UL and DL TCI states in the MAC-CE LTM cell switch command are known, the LTM cell switch delay is defined as:

 DLTM = Tcmd + TLTM-interrupt

Where:

Tcmd equals to THARQ + 3ms, where THARQ is the timing between cell switch command and acknowledgement as specified in TS 38.213.

TLTM-interrupt is as stated in section 6.3.1.3.

The target cell in the LTM cell switch command is known if the following conditions are met:

- During the last 5 seconds before the reception of the cell switch command:

- The UE has sent a valid L1 or L3 measurement report for the target cell, and

- One of the SSBs measured from the NR target cell configured for measurement remains detectable according to the cell identification conditions specified in clause 9.2 for intra-frequency cell and in clause 9.3 for inter-frequency cell,

- One of the SSBs measured from the NR target cell configured for measurement remains detectable according to the cell identification conditions specified in clause 9.2 for intra-frequency cell and in clause 9.3 for inter-frequency cell,

Otherwise, the cell is unknown.

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 the cell switch command is activated not more than TBD ms before 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 before receiving the cell switch command and the SSB associated to target TCI state is available at least once every TBD 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.

#### 6.3.1.3 Interruption time

The interruption time TLTM-interrupt is the time between the end of the last TTI containing the MAC-CE command for LTM cell switch until the time the UE transmits the first UL message on the target cell, excluding Tcmd stated in section 6.3.1.2.

 TLTM-interrupt = TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU ms,

Where:

TLTM-RRC-processing is the time for ASN.1 decoding and validity/compliance check for the RRC configuration of the LTM target cell indicated in the LTM cell switch command.

TLTM-RRC-processing = 0, if the UE supports [*earlyDecodingAndValidityCheck*] capability, and at least one of the following conditions is met:

- The number of candidate cells in the LTM candidate cell configuration does not exceed [*number of candidate cells for early ASN.1 decoding and validity check*],

- UE has received LTM candidate cell TCI state activation command for the target cell at least THARQ + 13 ms before the LTM cell switch command, and the number of candidate cells with TCI state(s) in LTM candidate cell active TCI state list does not exceed [*number of candidate cells for early ASN.1 decoding and validity check*],

- UE has received PDCCH order for early RACH for the target cell at least NT,2+10 ms before the LTM cell switch command, where NT,2 is defined in section 8.1 of TS 38.213 [3].

*- [FFS: SCell is not part of the cell switch.]*

Otherwise TLTM-RRC-processing = 10 ms.

TLTM-processing is the time for UE processing, consisting of applying the target cell parameters and L1/L2 change.

If the UE supports [*faster LTM processing*] capability, the value of TLTM-processing equals to

[*faster intra-FR processing delay (10 ms or 15 ms)*] for FR1 to FR1 and FR2 to FR2 LTM cell switch.

[*faster inter-FR processing delay (20 ms or 30 ms)*] for FR1 to FR2 and FR2 to FR1 LTM cell switch.

Otherwise, the value of TLTM-processing equals to

- 20 ms for FR1 to FR1 and FR2 to FR2 LTM cell switch.

- 40 ms for FR1 to FR2 and FR2 to FR1 LTM cell switch.

Editor’s note: FFS whether a smaller value can be considered in some scenarios or under certain conditions, when the UE does not support [*faster LTM processing*] capability.

Tfirst-RS is the time for fine time tracking and acquiring full timing information of the target cell.

TRS-proc is the time for SSB processing.

Tfirst-RS = 0 and TRS-proc= 0 under the following conditions:

- The target TCI state indicated in the LTM cell switch command is in the serving cell active TCI state list, or

- The UE is configured with LTM L1 intra- and/or inter-frequency measurements for the target cell, and

- The target TCI state in the cell switch command is in the LTM candidate cell active TCI state list, and

- the time gap between receiving the LTM candidate cell TCI state activation MAC-CE and the cell switch command is at least TCI state activation delay stated in section 8.x, and

- the time gap between receiving the LTM candidate cell TCI state activation MAC-CE and the cell switch command is not more than [160 ms], or

- the measurement period of the SSB associated to target TCI state is not larger than 160 ms after the LTM candidate cell TCI state activation MAC-CE is received, or

- The target cell is an FR1 cell, and the UE is not configured with LTM L1 intra- and/or inter-frequency measurements for the target cell, and

- The target TCI state in the cell switch command is in the LTM candidate cell active TCI state list, and

- the time gap between receiving the LTM candidate cell TCI state activation MAC-CE and the cell switch command is at least TCI state activation delay stated in section 8.x, and not more than TCI state activation delay stated in section 8.x + [160 ms], or

- The time gap between the latest PDCCH ordered RACH preamble transmission on the target cell and the cell switch command is not more than [160 ms].

Otherwise,

Tfirst-RS is the time to the first SSB transmission on the target cell [after Tcmd].

*Editor’s note: FFS whether TRS transmission is also considered.*

TRS-proc = 2 ms.

TLTM-IU is the interruption uncertainty during LTM cell switch.

ForRACH-based LTM cell switch, TLTM-IU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TLTM-IU can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

ForRACH-less LTM cell switch, TLTM-IU\_is the uncertainty on transmitting the first uplink transmission on the target cell.

End of Change 4

Start of Change 6

## 8.20 LTM PSCell Cell Switch

### 8.20.1 Introduction

The purpose of LTM cell switch is to switch the PCell or PSCell to another cell. The requirements in this section are applicable to LTM PSCell switch.

The requirements in this clause are applicable to both intra-frequency and inter-frequency LTM cell switch.

The requirements for inter-frequency cell switch to an FR2 target cell in this clause are only applicable, when

- network has configured UE to perform L3 measurement with SSB index or L1 measurement for the target cell before cell switch command, or

- the SFN of the serving cell from which cell switch command is received and the SFN of the target cell are the same.

The requirements in this clause are applicable to NR-DC for the following scenarios:

PSCell switch to a neighboring LTM candidate cell

- FR1 cell to FR1 cell

- FR1 cell to FR2 cell

- FR2 cell to FR2 cell

- FR2 cell to FR1 cell

PSCell switch to an LTM candidate cell that is a serving SCell in SCG

- FR1 cell to FR1 cell

- FR2 cell to FR2 cell

### 8.20.2 LTM Cell Switch delay

LTM cell switch delay DLTM is the delay from the end of the last TTI containing the MAC-CE command for cell switch until the time the UE transmits the first UL message on the target cell.

When the target cell and the target joint UL/DL TCI state or separate UL and DL TCI states in the MAC-CE LTM cell switch command are known, the LTM cell switch delay is defined as:

 DLTM = Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU ms

Where:

Tcmd, TLTM-RRC-processing, TLTM-processing, Tfirst-RS, TRS-proc and TLTM-IU are as stated in section 6.3.1.2.

The definition of known LTM target cell and the definition of known target joint DL/UL TCI state or separate DL and UL TCI states are as stated in section 6.3.1.2.

### 8.20.3 Void

End of Change 6