**3GPP TSG RAN WG1 #118bis**  **R1-240xxxxx**

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

**Source: Moderator (Fujitsu)**

**Title: FL summary 1 of Maintenance on Further NR Mobility Enhancements**

**Agenda Item: 8.1**

**Document for: Information**

# Introduction

This contribution is a Feature Lead (FL) summary for the CRs for mobility enhancements under A.I. 8.1.

# Plan for GTW/Online discussion

##### [Tuesday session]

# List of Contributions

### Mobility Enhancement

R1-2407783 Discussion on the maximum number of PL RS maintained simultaneously for candidate cells ZTE Corporation, Sanechips

R1-2407784 Draft CR on the maximum number of PL RS maintained simultaneously for candidate cells in TS 38.213 ZTE Corporation, Sanechips

R1-2408604 Draft CR for 38.212 on names of LTM parameters Ericsson

R1-2408611 Draft CR for 38.213 on UE-based TA measurement Ericsson

R1-2408625 Draft CR on TCI state application for the candidate cell Samsung

R1-2408744 Correction on SSB-RO mapping for LTM Google

R1-2408745 Correction on early UL synchronization for LTM Google

R1-2408888 Draft CR on LTM PRACH and serving UL transmition in the same band MediaTek Inc.

R1-2408889 Draft CR on LTM TA command application time MediaTek Inc.

R1-2408969 Corrections to the Pathloss RS in LTM TCI state in TS38.213 Huawei, HiSilicon

# void

# Issues in RAN1#118bis

## [High] Issue 1-1: Pathloss maintenance for candidate cells

### Summary of Proposal

R1-2407783 Discussion on the maximum number of PL RS maintained simultaneously for candidate cells ZTE Corporation, Sanechips
R1-2407784 Draft CR on the maximum number of PL RS maintained simultaneously for candidate cells in TS 38.213 ZTE Corporation, Sanechips
R1-2408969 Corrections to the Pathloss RS in LTM TCI state in TS38.213 Huawei, HiSilicon

* This is to specify how many pathloss RSs needs to be maintained. The differences of the 2 companies’ proposals are:
* The number of pathloss RSs UE maintains ([4] or 8)

**TP by ZTE for 38.213**

**21 L1/L2-triggered mobility procedures**

A UE can be indicated, by *LTM-Config*, candidate cells and SS/PBCH blocks per candidate cell for the UE to obtain synchronization and measure corresponding L1-RSRPs [10, TS 38.133]. A Candidate Cell TCI States Activation/Deactivation MAC CE can activate TCI states, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*, associated with SS/PBCH blocks or TRS of corresponding candidate cells [11, TS 38.321]. The RS index for obtaining the candidate cell downlink pathloss estimate is provided by pathlossReferenceRS-Id in the *CandidateTCI-State* or *CandidateTCI-UL-State.* A UE does not expect to simultaneously maintain more than eight PL RSs associated with activated TCI states for all candidate cells before reception of the LTM Cell Switch Command MAC CE.If the Candidate Cell TCI States Activation/Deactivation MAC CE activates TCI states, an LTM Cell Switch Command MAC CE can indicate a TCI state from the activated TCI states; otherwise, the LTM Cell Switch Command MAC CE can activate and indicate a TCI state, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*. After reception of the LTM Cell Switch Command MAC CE, activated TCI states that are not indicated by the MAC CE are deactivated and a UE does not expect to maintain PL RS(s) that are not provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State* indicated in LTM Cell Switch Command MAC CE. The UE is provided configurations by *ltm-CSI-ReportConfigToAddModList* for reporting L1-RSRP measurements [6, TS 38.214] that include a number of candidate cells and a number of SS/PBCH blocks per candidate cell from the number of candidate cells.

**TP by Huawei for 38.213**

**21 L1/L2-triggered mobility procedures**

< Unchanged parts are omitted >

A UE can be indicated, by *LTM-Config*, candidate cells and SS/PBCH blocks per candidate cell for the UE to obtain synchronization and measure corresponding L1-RSRPs [10, TS 38.133]. A Candidate Cell TCI States Activation/Deactivation MAC CE can activate TCI states, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*, associated with SS/PBCH blocks or TRS of corresponding candidate cells [11, TS 38.321]. The RS index for obtaining the candidate cell downlink pathloss estimate is provided by *pathlossReferenceRS-Id* in the *CandidateTCI-State* or *CandidateTCI-UL-State.* A UE does not expect to simultaneously maintain more than [four] pathloss estimates across all candidate cells, associated with the activated TCI states, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State,* before LTM cell switch.If the Candidate Cell TCI States Activation/Deactivation MAC CE activates TCI states, an LTM Cell Switch Command MAC CE can indicate a TCI state from the activated TCI states; otherwise, the LTM Cell Switch Command MAC CE can activate and indicate a TCI state, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*. After reception of the LTM Cell Switch Command MAC CE, activated TCI states that are not indicated by the MAC CE are deactivated. The UE is provided configurations by *ltm-CSI-ReportConfigToAddModList* for reporting L1-RSRP measurements [6, TS 38.214] that include a number of candidate cells and a number of SS/PBCH blocks per candidate cell from the number of candidate cells.

### Companies’ views

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| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | Need clarification first | FL’s understanding after the previous meeting is that:* the necessity of this CR depends on RAN4
	+ if RAN4 defines only relaxed requirement considering non-maintained pathloss, pathloss maintenance for candidate cells is not necessary to be specified in RAN1
	+ Otherwise, RAN1 can specify pathloss maintenance

OK to approve either CR if the RAN4 situation met this condition.  |
| Ericsson | No |  |
| Samsung | No |  |
| Lenovo | No |  |
| NOKIA | See Comment | RAN4 has made the following agreement. Based on this, it seems there is no requirement for PL-RS maintenance. We’re open to discuss and clarify. **Issue 1-4-2-1: Conditions of no extra time for PL-RS measurement in cell switch delay****<Agreement>:*** No additional PL-RS measurement time is needed, provided L3-RSRP or L1-RSRP on the SSB associated with PL-RS has been measured/reported.
	+ PL-RS is associated with TCI state indicated by LTM cell switch command in terms of QCL chain.
 |
| ZTE |  | According to the following agreement made in RAN4#112, RAN4 thinks that it does not need to introduce additional PL-RS measurement, which implies the mechanism of legacy PL-RS measurement and maintenance is sufficient for LTM. That is to say, from a cell perspective, UE still needs to measure/maintain up to 4 PL-RSs. If this rule is extended to LTM, at least we should clarify these 4 PL-RS per candidate cell or across candidate cells.

|  |
| --- |
| **<Agreement>:*** + No additional PL-RS measurement time is needed, provided L3-RSRP or L1-RSRP on the SSB associated with PL-RS has been measured/reported.
		- PL-RS is associated with TCI state indicated by LTM cell switch command in terms of QCL chain.
	+ Further discuss the wording in the CR next meeting.
 |

 |
| vivo |  | We are open for discussion |
| Huawei, HiSilicon | Yes. | As for the RAN4 agreement quoted by Nokia, it is in the cell switch delay. However, the CR is trying to resolve the PL RS before CSC. so we think the RAN4 agreement do not cover the cases of CR. In addition, the RAN4 agreement is just saying additional/extra time. Our interpretation of “additional/extra” no additional time on top of existing time in serving cell.  |
| CATT |  | A clarification of the number of PL-RSs seems needed. |
| NTT DOCOMO | No |  |

### FL proposal 1-v1

* Send RAN4 an LS to ask the following question:
	+ R1-2407784, R1-2408969 are proposed in RAN1#118b to discuss the necessity to specify pathloss maintenance before cell switch command for candidate cells.
	+ RAN1 noticed that RAN4 has made the following agreement, but RAN1 is not clear how to understand the implication of “No additional PL-RS measurement time is needed”
		- *Issue 1-4-2-1: Conditions of no extra time for PL-RS measurement in cell switch delay*
			* *<Agreement>:*
				+ *No additional PL-RS measurement time is needed, provided L3-RSRP or L1-RSRP on the SSB associated with PL-RS has been measured/reported.*
				+ *PL-RS is associated with TCI state indicated by LTM cell switch command in terms of QCL chain.*
	+ Interpretation 1: RAN4 assumes that the pathloss measurement has been maintained by the UE, and hence the UE cannot perform the additional pathloss measurement after the reception of cell switch command.
	+ Interpretation 2: RAN4 assumes that pathloss measurement time has already been included in the cell switch delay, which means that UE can perform the pathloss measurement after the reception of cell switch command.
	+ RAN1 respectfully asks RAN4 to provide their understanding.

## [High] Issue 1-2: UE-based TA measurement

### Summary of Proposal

R1-2408611 Draft CR for 38.213 on UE-based TA measurement Ericsson

🡪 Clarify in 38.213 that the UE only calculates a TA value if the TA command in the cell switch command is FFF, which is captured in RAN2 MAC specification.

TP to 38.213

**21 L1/L2-triggered mobility procedures**

A UE can be indicated, by *LTM-Config*, candidate cells and SS/PBCH blocks per candidate cell for the UE to obtain synchronization and measure corresponding L1-RSRPs [10, TS 38.133]. A Candidate Cell TCI States Activation/Deactivation MAC CE can activate TCI states, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*, associated with SS/PBCH blocks or TRS of corresponding candidate cells [11, TS 38.321]. The RS index for obtaining the candidate cell downlink pathloss estimate is provided by *pathlossReferenceRS-Id* in the *CandidateTCI-State* or *CandidateTCI-UL-State.* If the Candidate Cell TCI States Activation/Deactivation MAC CE activates TCI states, an LTM Cell Switch Command MAC CE can indicate a TCI state from the activated TCI states; otherwise, the LTM Cell Switch Command MAC CE can activate and indicate a TCI state, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*. After reception of the LTM Cell Switch Command MAC CE, activated TCI states that are not indicated by the MAC CE are deactivated. The UE is provided configurations by *ltm-CSI-ReportConfigToAddModList* for reporting L1-RSRP measurements [6, TS 38.214] that include a number of candidate cells and a number of SS/PBCH blocks per candidate cell from the number of candidate cells.

If *ltm-UE-MeasuredTA-ID* of a candidate cell and *ltm-ServingCellUE-MeasuredTA-ID* of the serving cell are provided to a UE and have same value, and if the Timing Advance Command field in the LTM Cell Switch Command MAC CE is not FFF, the UE estimates based on the UE implementation a timing advance to apply from a first transmission on the candidate cell that is after the reception of a cell switch command for the candidate cell when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied.

<Unchanged text omitted>

### Companies’ views

|  |  |  |
| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | No | The last part of this sentence “when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied.” is captured for the same intention avoiding capturing the same/duplicated description in RAN2 specifications.  |
| Ericsson | Yes? | Note that 5.18.35 contains many conditions:5.18.35 LTM Cell Switch CommandThe network may instruct the UE to perform LTM cell switch procedure by sending the LTM Cell Switch Command MAC CE described in clause 6.1.3.75.The MAC entity shall:1> if the MAC entity receives an LTM Cell Switch Command MAC CE on a Serving Cell:2> indicate to upper layers that the LTM cell switch procedure is triggered and the Target Configuration ID included in the LTM Cell Switch Command MAC CE;2> if the MAC reset operation as specified in clause 5.12 is performed, as requested by upper layers:3> if Timing Advance Command value (hexa-decimal) is not set as FFF:4> process the received Timing Advance Command (see clause 5.2);4> consider the RACH-less LTM cell switch to be ongoing;4> if the MAC entity is associated with SCG:5> indicate to upper layers to skip the Random Access procedure for this LTM cell switch.3> else if the UE is configured with UE-based Timing Advance measurement as specified in TS 38.331 [5] and the UE has successfully measured the Timing Advance for the SpCell of the indicated LTM target configuration:4> process the measured Timing Advance (see clause 5.2);4> consider the RACH-less LTM cell switch to be ongoing.4> if the MAC entity is associated with SCG:5> indicate to upper layers to skip the Random Access procedure for this LTM cell switch.3> consider the SSB associated to the TCI state indicated by TCI state ID field as the one used for configured uplink grant selection for the initial uplink transmission towards the candidate cell for RACH-less LTM cell switch (as in clause 5.8.2);3> indicate to lower layers the information regarding the TCI state information included in the LTM Cell Switch Command MAC CE.Which condition is applicable here? |
| Samsung | No | It is better to avoid duplicating descriptions in multiple specifications. |
| Lenovo | No | Agree with FL and Samsung. |
| NOKIA | Maybe | Note that the time when the UE estimates TA is left to UE implementation (e.g., before or during cell switch). Based on the proposed change it may be interpreted that the UE will estimate the UE only after receiving the cell switch command. If we want to reflect the proposed condition, maybe the part “when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied” can be replaced with what is proposed by Ericsson.  |
| ZTE | No | Agree with FL’s assessment. |
| vivo |  | We are open for discussion |
| Huawei, HiSilicon | No | The RAN2 spec reflect when UE applies the TA. When UE measures TA is up to UE implementation.  |
| CATT |  | We are open for discussion |
| NTT DOCOMO | No |  |

### FL proposal 2-v1

Alt 1: modify the existing sentence in section 21 of TS38.213 to cover multiple conditions while avoiding the duplication in RAN2 spec

**21 L1/L2-triggered mobility procedures**

<Unchanged text omitted>

If *ltm-UE-MeasuredTA-ID* of a candidate cell and *ltm-ServingCellUE-MeasuredTA-ID* of the serving cell are provided to a UE and have same value, the UE estimates based on the UE implementation a timing advance to apply from a first transmission on the candidate cell that is after the reception of a cell switch command for the candidate cell when the Timing Advance Command field in the LTM Cell Switch Command MAC CE is not FFF, ~~when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied.~~

<Unchanged text omitted>

Alt 2: Capture the condition in RAN2 spec

**21 L1/L2-triggered mobility procedures**

<Unchanged text omitted>

If *ltm-UE-MeasuredTA-ID* of a candidate cell and *ltm-ServingCellUE-MeasuredTA-ID* of the serving cell are provided to a UE and have same value the UE estimates based on the UE implementation a timing advance to apply from a first transmission on the candidate cell that is after the reception of a cell switch command for the candidate cell ~~when the conditions~~ based on the procedures defined in clause 5.18.35 of [11, TS 38.321] ~~is satisfied~~.

<Unchanged text omitted>

Alt 3: No spec change

## [High] Issue 1-3: Timeline for TCI state application

### Summary of Proposal

R1-2408625 Draft CR on TCI state application for the candidate cell Samsung

🡪 for Candidate cell PRACH, the two missing RRC parameters are pointed out

|  |
| --- |
| 21 L1/L2-triggered mobility procedures< Unchanged parts are omitted >A UE can be provided by a LTM Cell Switch Command MAC CE in a PDSCH reception on the serving cell [11, TS 38.321] a TCI state ID and/or an UL TCI state ID indicating a *CandidateTCI-State* and/or *CandidateTCI-UL-State* from *ltm-DL-OrJointTCI-StateToAddModList* and/or *ltm-UL-TCI-StateToAddModList* [6, TS 38.214] for applicable receptions or transmissions on a candidate cell from the number of candidate cells. The UE may assume that DM-RS antenna ports for PDCCH receptions and for PDSCH receptions are quasi co-located with the SS/PBCH block or the TRS in the TCI state with respect to quasi co-location 'typeA' and 'typeD' properties, when applicable. The UE does not expect to be indicated quasi co-location 'typeA' properties when a SS/PBCH block is configured as a source RS of the TCI state. The UE applies the *CandidateTCI-State* and/or *CandidateTCI-UL-State,* if indicated by the MAC CE, no later than after the last symbol of a PUCCH or PUSCH with HARQ-ACK information for the PDSCH providing the MAC CE, where , , and are defined in [10, TS 38.133]*.* For RACH-based LTM cell switch [19, TS 38.300], the UE applies the *CandidateTCI-State* for receptions on the candidate cell, and applies a spatial domain filter corresponding to the *CandidateTCI-State* or the *CandidateTCI-UL-State* for transmissions on the candidate cell, that are after the completion of the random access procedure associated with the PRACH transmission on the candidate cell and before a new indicated TCI state is applied for the candidate cell. For RACH-less LTM cell switch [19, TS 38.300], the UE applies the *CandidateTCI-State* for receptions on the candidate cell and applies a spatial domain filter corresponding to the *CandidateTCI-State* or the *CandidateTCI-UL-State* for transmissions on the candidate cell before a new indicated TCI state is applied for the candidate cell.< Unchanged parts are omitted > |

### Companies’ views

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| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | Need discussion (but tend to No) | FL wonders whether the UE can receive/transmit signals using *CandidateTCI-State/CandidateTCI-UL-State* after the reception of new TCI state because UE is in the transition phase. Even without this CR, the system wouldn’t be broken.  |
| Ericsson | Maybe | Changing “indicated” to “applied” seems like a reasonable clarification, note that we have a statement in 38.214 that does not use the term “indicated” for TCI states:If a UE receives a higher layer configuration of *dl-OrJointTCI-StateList* where only one TCI-State can be used as an indicated TCI state, the UE obtains the QCL assumptions from that TCI state for DM-RS of PDSCH and DM-RS of PDCCH, and the CSI -RS applying the indicated TCI state. Here “applies” is more adequate than “indicated” |
| Samsung | Yes | The candidate TCI state is used until the indicated TCI state of new serving cell is applied or become applicable. |
| Lenovo | Yes | Agree with Ericsson and Samsung. “applies” is more adequate than “indicated” because there is a beam application time after indicating a new TCI state. |
| NOKIA | Maybe | Agree with Ericsson that, “indicated” can simply be replaced with “applied” this is because an activated TCI state can also be applied in the target cell as per the following specification in 38.214 and 38.213.Note that in 38.214, an LTM TCI is used until an activated TCI state is applied:…If *tci-PresentInDCI* is set to 'enabled' or *tci-PresentDCI-1-2* is configured for the CORESET scheduling the PDSCH, and the time offset between the reception of the DL DCI and the corresponding PDSCH is equal to or greater than *timeDurationForQCL* if applicable, after a UE receives an initial higher layer configuration of TCI states and before reception of the activation command, - the UE assumes that DM-RS of ports of PDSCH of a serving cell are quasi co-located with the reference signal(s) in the *CandidateTCI-State* indicated in the LTM Cell Switch Command MAC CE [10, 38.321], except during RACH procedure for RACH-based LTM, if applicable, otherwiseAlso in 38.213, For a CORESET other than a CORESET with index 0, * if a UE has not been provided a configuration of TCI state(s) by *tci-StatesPDCCH-ToAddList* and *tci-StatesPDCCH-ToReleaseList* for the CORESET, or has been provided initial configuration of more than one TCI states for the CORESET by *tci-StatesPDCCH-ToAddList* and *tci-StatesPDCCH-ToReleaseList* and has not received a MAC CE activation command for one of the TCI states as described in [11, TS 38.321], the UE assumes that the DM-RS antenna port associated with PDCCH receptions is quasi co-located with
* the one or more DL RS configured by a TCI state provided by *CandidateTCI-State*, where the TCI state is indicated by an LTM Cell Switch Command MAC CE except during RACH procedure for the RACH-based LTM if applicable, otherwise,
 |
| ZTE | Yes | It makes sense to clarify the behavior after a TCI state is indicated and before the TCI state takes effect. |
| vivo | No | This is related to beam application time discussion in past. |
| Huawei, HiSilicon | Yes | Fine with the CR |
| CATT | Yes |  |
| NTT DOCOMO | Yes | Agree with proponent |

### FL proposal 3-v1

The following TP to section 21 of TS38.213 is agreed in principle.

21 L1/L2-triggered mobility procedures

< Unchanged parts are omitted >

A UE can be provided by a LTM Cell Switch Command MAC CE in a PDSCH reception on the serving cell [11, TS 38.321] a TCI state ID and/or an UL TCI state ID indicating a *CandidateTCI-State* and/or *CandidateTCI-UL-State* from *ltm-DL-OrJointTCI-StateToAddModList* and/or *ltm-UL-TCI-StateToAddModList* [6, TS 38.214] for applicable receptions or transmissions on a candidate cell from the number of candidate cells. The UE may assume that DM-RS antenna ports for PDCCH receptions and for PDSCH receptions are quasi co-located with the SS/PBCH block or the TRS in the TCI state with respect to quasi co-location 'typeA' and 'typeD' properties, when applicable. The UE does not expect to be indicated quasi co-location 'typeA' properties when a SS/PBCH block is configured as a source RS of the TCI state. The UE applies the *CandidateTCI-State* and/or *CandidateTCI-UL-State,* if indicated by the MAC CE, no later than after the last symbol of a PUCCH or PUSCH with HARQ-ACK information for the PDSCH providing the MAC CE, where , , and are defined in [10, TS 38.133]*.* For RACH-based LTM cell switch [19, TS 38.300], the UE applies the *CandidateTCI-State* for receptions on the candidate cell, and applies a spatial domain filter corresponding to the *CandidateTCI-State* or the *CandidateTCI-UL-State* for transmissions on the candidate cell, that are after the completion of the random access procedure associated with the PRACH transmission on the candidate cell and before a new TCI state is applied for the candidate cell. For RACH-less LTM cell switch [19, TS 38.300], the UE applies the *CandidateTCI-State* for receptions on the candidate cell and applies a spatial domain filter corresponding to the *CandidateTCI-State* or the *CandidateTCI-UL-State* for transmissions on the candidate cell before a new TCI state is applied for the candidate cell.

< Unchanged parts are omitted >

## [High] Issue 1-4: SSB-RO mapping for LTM

### Summary of Proposal

R1-2408744 Correction on SSB-RO mapping for LTM Google

* It is clarified that *ssb-PositionsInBurst* is also provided in *LTM-SSB-Config* for LTM.

#### TP to 38.213

8.1 Random access preamble

< Unchanged parts are omitted >

SS/PBCH block indexes provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or in *SSB-MTC-AdditionalPCI* or in *LTM-SSB-Config* are mapped to valid PRACH occasions in the following order where the parameters are described in [4, TS 38.211].

- First, in increasing order of preamble indexes within a single PRACH occasion

- Second, in increasing order of frequency resource indexes for frequency multiplexed PRACH occasions

- Third, in increasing order of time resource indexes for time multiplexed PRACH occasions within a PRACH slot

- Fourth, in increasing order of indexes for PRACH slots

An association period, starting from frame 0, for mapping SS/PBCH block indexes to PRACH occasions is the smallest integer number in the set determined by the PRACH configuration period according Table 8.1-1 such that SS/PBCH block indexes are mapped at least once to the PRACH occasions within the association period, where a UE obtains from the value of *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or in *SSB-MTC-AdditionalPCI* or in *LTM-SSB-Config.* If after an integer number of SS/PBCH block indexes to PRACH occasions mapping cycles within the association period there is a set of PRACH occasions or PRACH preambles that are not mapped to SS/PBCH block indexes, no SS/PBCH block indexes are mapped to the set of PRACH occasions or PRACH preambles. An association pattern period includes one or more association periods and is determined so that a pattern between PRACH occasions and SS/PBCH block indexes repeats at most every 160 msec. PRACH occasions not associated with SS/PBCH block indexes after an integer number of association periods, if any, are not used for PRACH transmissions.

< Unchanged parts are omitted >

### Companies’ views

|  |  |  |
| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | Yes | Agree with the proponent |
| Ericsson | Yes |  |
| Samsung | Yes | OK with the changes |
| Lenovo | Yes |  |
| NOKIA | Yes |  |
| ZTE | Yes |  |
| vivo | Yes | Fine with the proposed change |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| NTT DOCOMO | Yes |  |
|  |  |  |

### FL proposal 4-v1

A CR to section 8.1 of TS38.213 in R1-2408744 is agreed in principle.

## [High] Issue 1-5: PRACH and serving UL transmition in the same band

### Summary of Proposal

R1-2408888 Draft CR on LTM PRACH and serving UL transmition in the same band MediaTek Inc.

🡪 This CR is to differentiate the scenarios of the timing condition for LTM simultaneous UL transmission.

**21 L1/L2-triggered mobility procedures**

A UE can be indicated, by *LTM-Config*, candidate cells and SS/PBCH blocks per candidate cell for the UE to obtain synchronization and measure corresponding L1-RSRPs [10, TS 38.133]. A Candidate Cell TCI States Activation/Deactivation MAC CE can activate TCI states, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*, associated with SS/PBCH blocks or TRS of corresponding candidate cells [11, TS 38.321]. The RS index for obtaining the candidate cell downlink pathloss estimate is provided by pathlossReferenceRS-Id in the *CandidateTCI-State* or *CandidateTCI-UL-State.* If the Candidate Cell TCI States Activation/Deactivation MAC CE activates TCI states, an LTM Cell Switch Command MAC CE can indicate a TCI state from the activated TCI states; otherwise, the LTM Cell Switch Command MAC CE can activate and indicate a TCI state, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*. After reception of the LTM Cell Switch Command MAC CE, activated TCI states that are not indicated by the MAC CE are deactivated. The UE is provided configurations by *ltm-CSI-ReportConfigToAddModList* for reporting L1-RSRP measurements [6, TS 38.214] that include a number of candidate cells and a number of SS/PBCH blocks per candidate cell from the number of candidate cells.

If *ltm-UE-MeasuredTA-ID* of a candidate cell and *ltm-ServingCellUE-MeasuredTA-ID* of the serving cell are provided to a UE and have same value, the UE estimates based on the UE implementation a timing advance to apply from a first transmission on the candidate cell that is after the reception of a cell switch command for the candidate cell when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied.

A UE can be provided configurations, by *EarlyUL-SyncConfig*, for PRACH transmission parameters for each of the candidate cells. The UE can be triggered a PRACH transmission on a candidate cell by a PDCCH order that the UE receives on a serving cell and includes an indication of the candidate cell for the PRACH transmission [4, TS 38.212]. If the serving cell and the candidate cell operate in a same frequency range in different band and the UE would have transmissions that overlap in time, or when a gap between a first or last symbol of a PRACH transmission to the candidate cell is less than 𝑁 symbols from a last or first symbol, respectively, of an UL transmission to the serving cell, where is defined in Clause 8.1, the UE

- drops the transmissions on the serving cell when the UE does not support transmissions that overlap in time or are separated by less than the gap on the serving cell and the candidate cell and the UL transmission to the serving cell is other than a RACH Msg 1, Msg A, or Msg 3 transmission.

- prioritizes power allocation to the PRACH transmission on the candidate cell in clause 7.5 when the UE supports transmissions that overlap in time or are separated by less than the gap, and a total UE transmit power in the frequency range would exceed .

If the serving cell and the candidate cell operate in a same frequency range in the same band and the UE would have PRACH transmission to a candidate cell and the UL transmission to the serving cell in the same slot, or when a gap between a first or last symbol of a PRACH transmission to the candidate cell is less than 𝑁 symbols from a last or first symbol, respectively, of an UL transmission to the serving cell, where is defined in Clause 8.1, the UE

- drops the transmissions on the serving cell when the UE does not support the PRACH transmission to a candidate cell and the UL transmission to the serving cell occurs in the same slot or is separated by less than the gap on the serving cell and the candidate cell and the UL transmission to the serving cell is other than a RACH Msg 1, Msg A, or Msg 3 transmission.

- prioritizes power allocation to the PRACH transmission on the candidate cell in clause 7.5 when the UE supports the PRACH transmission to a candidate cell and the UL transmission to the serving cell occurs in the same slot or is separated by less than the gap, and a total UE transmit power in the frequency range would exceed .

The UE transmits the PRACH on the candidate cell as described in Clause 8.1 with a power determined as described in Clause 7.4.

\*\*\* Unchanged parts are omitted \*\*\*

### Companies’ view

|  |  |  |
| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | No | FL’s understanding is that the current spec works even though it is not optimal. It is also said in the coversheet that “the timing condition of LTM simultaneous UL transmission for intra-band case seems to be too stringent and should be relaxed to align with timing condition of simultaneous UL transmission in intra-band CA”  |
| Ericsson | No | Agree with the FL: the specification works. In addition, the optimization is only relevant for a quite special case.  |
| MediaTek | Yes | The intention of this CR is to preserve the legacy PRACH transmission rule for the intra-band case, when UE does not support FG 45-5a (simultaneous UL transmission on serving cell and PRACH on candidate cell). Some background: The legacy PRACH transmission rules in clause 8-1 of TS38.213 define the following:* + - “UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot with respect to the smallest SCS configuration between the SCS configuration for the UL BWP with the PRACH and the SCS configuration for the UL BWP with the PUSCH/PUCCH/SRS transmissions”
		- “UE does not transmit PRACH and PUSCH/PUCCH/SRS when a first or last symbol of a PRACH transmission in a first slot is separated by less than N symbols ….”

Based on above, one can see that the legacy PRACH transmission/dropping criteria is: 1) whether UL transmission and PRACH are in a same slot, AND 2) whether the gap is less that N symbols. However, the current spec describes the dropping conditions (for a UE that doesn’t support FG 45-5a) for both inter-band and intra-based cases as follows: 1) whether UL transmission and PRACH overlap in time, and 2) whether the gap is less than N symbols. To preserve the legacy PRACH transmission rules, our CR proposes to change the wording from “transmissions that overlap in time” to “transmissions in a same slot” for the following case only:* + - UE does not support FG 45-5a, while candidate cell and serving cell are in the same band

For clarity, this CR does NOT intend to change any behavior for the following cases:* + - UE supports FG 45-5a (either intra-band and/or inter-band cases)
		- UE does not support FG 45-5a, while candidate cell and serving cell are in different bands
 |
| Samsung | No | Agree with FL. This is an optimization to a special case. |
| Lenovo | No | Agree with FL.  |
| NOKIA | Open to discuss | Based on our understanding, the proposed changes are trying to add more restriction for intra-band case instead of any relaxation, i.e., by not allowing simultaneous transmission in the same slot even if they are separated by N symbols. We’re open to discuss.  |
| ZTE | No | Agree with FL’s explanation. |
| vivo | No | Agree with the FL comments |
| Huawei, HiSilicon | No | We did not see the difference of the new paragraph from the existing paragraph. The existing one already cover same or different band. |
| NTT DOCOMO | No |  |
| MediaTek |  | Clarification to Huawei: The current spec uses the wording “transmissions overlapping in time” while the proposed CR uses the wording “transmission in a same slot” for the intra-band case.Clarification to Nokia: Your understanding is correct. UE does not transmit PUSCH/PUCCH/SRS and PRACH in a same slot in the same frequency band, even if they are separated by N symbols. This is, in fact, the default requirement in NR. Please see the paragraph (captured below) from clause 8.1, TS38.213.Clarification on “special case”: In our view, this is not the special case, but the default NR behavior. The default behavior is that UE does not transmit PUSCH/PUCCH/SRS and PRACH on a same slot (for serving cell). This can be read in clause 8.1, TS38.213, as captured below:   |

### FL proposal 5-v1

**Conclusion:**

* No consensus to endorse R1-2408888 (Draft CR on LTM PRACH and serving UL transmition in the same band).

## [High] Issue 1-6: TA command application time

### Summary of Proposal

R1-2408889 Draft CR on LTM TA command application time MediaTek

* This CR provides the application time for a timing advance command provided in a cell switch command

**.** **4.2 Transmission timing adjustments**

\*\*\* Unchanged parts are omitted \*\*\*

For a timing advance command in the case of random access response or in an absolute timing advance command MAC CE received on uplink slot and for a transmission other than a PUSCH scheduled by a RAR UL grant or a fallbackRAR UL grant as described in clause 8.2A or 8.3, or a PUCCH with HARQ-ACK information in response to a successRAR as described in clause 8.2A, the corresponding adjustment of the uplink transmission timing applies from the beginning of uplink slot where , is a time duration in msec of symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured, is a time duration in msec of symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214], is the maximum timing advance value in msec that can be provided by a TA command field of 12 bits, is the number of slots per subframe, is the subframe duration of 1 msec, and , where is provided by *cellSpecificKoffset* and is provided by a Differential Koffset MAC CE command [11, TS 38.321]; otherwise, if not respectively provided, or . and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and of all configured DL BWPs for the corresponding downlink carriers. For , the UE assumes [6, TS 38.214]. Slot and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG. is determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and for all configured initial UL BWPs provided by *initialUplinkBWP*. The uplink slot is the last slot among uplink slot(s) overlapping with the slot(s) of PDSCH reception assuming , where the PDSCH provides the timing advance command and is defined in [4, TS 38.211]. For a timing advance command provided in a cell switch command received on uplink slot , the corresponding adjustment of the uplink transmission timing applies from the beginning of uplink slot on the candidate cell that comes after the ending time of slot on serving cell where , is a time duration in msec of symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured, is a time duration in msec of symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214], is the maximum timing advance value in msec that can be provided by a TA command field of 12 bits, is the number of slots per subframe, is the subframe duration of 1 msec, and , where is provided by *cellSpecificKoffset* and is provided by a Differential Koffset MAC CE command [11, TS 38.321]; otherwise, if not respectively provided, or . and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the primary TAG used before the cell switch command is received and of all configured DL BWPs for the corresponding downlink carriers. For , the UE assumes [6, TS 38.214]. Slot and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the primary TAG used before the cell switch command is received. is determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the primary TAG used before the cell switch command is received and for all configured initial UL BWPs provided by *initialUplinkBWP*. The uplink slot is the last slot among uplink slot(s) overlapping with the slot(s) of PDSCH reception assuming , where the PDSCH provides the timing advance command and is defined in [4, TS 38.211].”

\*\*\* Unchanged parts are omitted \*\*\*

### Companies’ views

|  |  |  |
| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | Discussion needed  | Firstly, this CR is for the procedure after cell switch command. Hence, it would be more appropriate to describe the necessary procedure in section 21 of TS 38.213.Secondly, it wouldn’t be so important to define a similar timeline with legacy one. A UE can simply apply the TA in CSC by the first UL transmission at the target cel. (FL thinks this was proposed by Ericsson at RAN1#116)FL is fine to address this issue if the approach above is taken. The final decision/CR can be postponed to the next meeting as this is bis meeting.  |
| Ericsson | No? | The CSC time would be sufficient for the UE to apply the new TA, so it would be sufficient to state that the UE should apply the new TA for the first transmission in the target. This is actually specified for UE-based TA estimation:If *ltm-UE-MeasuredTA-ID* of a candidate cell and *ltm-ServingCellUE-MeasuredTA-ID* of the serving cell are provided to a UE and have same value, the UE estimates based on the UE implementation a timing advance to apply from a first transmission on the candidate cell that is after the reception of a cell switch command for the candidate cell when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied. |
| MediaTek | See comment | Our intention is to clarify which reference configuration is used for the computation of TA application time. If clause 4.2 is used for LTM TA application time, the serving cell configuration should be used as reference (e.g., calculating the minimum SCS of all UL BWP from serving cell).Regarding the comment from Ericsson, we are not sure if the legacy TA application time will always work out to be shorter than the time from CSC to the 1st UL transmission. So, it may not be enough for some cases. We are open to discuss this issue further. |
| Samsung | No | The TA for the candidate cell (in the CSC) is used when candidate TCI state is applied for UL transmission. UE can’t use TA of old serving cell when transmitting to the candidate cell after CSC. |
| Lenovo | No | Agree with Ericsson that it’s sufficient to state that the UE should apply the new TA for the first transmission in the target. |
| NOKIA | See comment | Agree with other companies that its sufficient to state that the UE should apply the TA for the first transmission in the target cell. But if the proponent thinks that CSC time is not sufficient time, then it needs further discussion as this may also impact the HO interruption defined by RAN4. |
| ZTE | No | From our perspective, early TA will be applied after completion of cell switch. It seems that the current spec can cover LTM case. |
| vivo |  | It seems spec clear, not sure about the motivation of the draft CR |
| Huawei, HiSilicon | No | The application of TA should be after cell switch for the 1st UL. From our perspective, the wording of “a timing advance command” do not include CSC carrying TA indication. |
| NTT DOCOMO | No |  |

### FL proposal 6-v1

**Conclusion**: Not captured in the chair’s note, but in FL summary

* R1-2408889 (TA command application time) is postponed
* Proponents are encouraged to continue the discussion especially for the following aspects:
	+ The timing can be the 1st UL transmission or not
	+ Check if the legacy TA application time will always work out to be shorter than the time from CSC to the 1st UL transmission
	+ Which specification the correction is captured, section 4.2 or 21 of 38.213, when necessary.

## [High] Issue 1-7: Alignment CRs

### Summary of Proposal

R1-2408604 Draft CR for 38.212 on names of LTM parameters Ericsson
R1-2408745 Correction on early UL synchronization for LTM Google

🡪 This CR fixes the parameter name.

**CR for 38.212**

6.3.1.1.2 CSI only

If *cqi-BitsPerSubband* is configured, this Clause 6.3.1.1.2 applies by taking Subband CQI as Subband differential CQI and replacing the corresponding number of bits 2 by 4.

<unchanged text omitted>

**Table 6.3.1.1.2-8C: Mapping order of CSI fields of one report for SSBRI/RSRP reporting for L1/L2‑triggered mobility**

|  |  |
| --- | --- |
| **CSI report number** | **CSI fields** |
| CSI report #n | SSBRI #1 as in Table 6.3.1.1.2-6, if reported |
| SSBRI #2 as in Table 6.3.1.1.2-6, if reported |
| … |
| SSBRI # as in Table 6.3.1.1.2-6, if reported |
| RSRP #1 as in Table 6.3.1.1.2-6, if reported |
| Differential RSRP #2 as in Table 6.3.1.1.2-6, if reported |
| … |
| Differential RSRP # as in Table 6.3.1.1.2-6, if reported |
| NOTE: *L* is the number of reported cells provided by higher layer parameter *nrOfReportedCells* and *M* is the number of reported SSBRI/RSRP pairs per cell and equal to the value provided by higher layer parameter nrOfReportedRS-PerCell*.* |

<unchanged text omitted>

**.3.1.2.1 Format 1\_0**

< Unchanged parts are omitted >

- Cell indicator - bits indicating the cell for the corresponding PRACH transmission if the UE is configured with higher layer parameter *EarlyUL-SyncConfig*, where *C* is the number of candidate cells configured with higher layer parameter *EarlyUL-SyncConfig*; 0 bit otherwise. The bit field index 0 of the cell indicator field is mapped to the serving cell, and other bit field indexes are mapped to the candidate cells configured with higher layer parameter *EarlyUL-SyncConfig* according to an ascending order of a candidate identity configured by *ltm-CandidateId*, with the bit field index 1 mapped to the candidate cell with the smallest candidate identity.

- PRACH association indicator - 0 or 1 bit

- 1bit if the UE is provided with *tag2-Id*, and the UE is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with value 0 for the first CORESETs, and is provided *coresetPoolIndex* with value 1 for the second CORESETs. This field is reserved if the cell indicated by Cell indicator field is a candidate cell.

- This field indicates the PCI associated with the PRACH transmission if the UE is provided *SSB-MTC-AddtionalPCI*. The bit field index 0 of this field is mapped to the PCI of the serving cell, and the bit field index 1 of this field is mapped to the additional PCI associated with active TCI states.

- This field indicates the PL-RS for the PRACH transmission if the UE is not provided *SSB-MTC-AddtionalPCI*. The bit field index 0 of this field is mapped to the DL RS that the DM-RS of the PDCCH order is quasi-collocated with, and the bit field index 1 of this field is mapped to the SS/PBCH indicated by the SS/PBCH index field in this DCI format.

- 0 bit otherwise.

- PRACH retransmission indicator - 0 or 1 bit

- 1bit if the UE is configured with higher layer parameter *EarlyUL-SyncConfig*. This field indicates initial transmission or retransmission of PRACH according to Table 7.3.1.2.1-3 if the cell indicated by Cell indicator field is a candidate cell, and this field is reserved if the cell indicated by Cell indicator field is a serving cell but not a candidate cell.

- 0 bit otherwise.

- Reserved bits - a number of bits as determined by the following:

- (12 - - ) bits for operation in a cell with shared spectrum channel access in frequency range 1 or when the DCI format is monitored in common search space for operation in a cell in frequency range 2-2;

- (10 - - ) bits otherwise;

where,

- if the UE is not configured with higher layer parameter *EarlyUL-SyncConfig*; +1 otherwise.

- if the "PRACH association indicator" field is not present in this DCI format; otherwise.

< Unchanged parts are omitted >

### Companies’ views

|  |  |  |
| --- | --- | --- |
| Company | Essential or Not(Yes or No) | Comment |
| FL | Yes | Both CRs can be included in editor’s alignment CRnrOfReportedRS-PerCellin the first CR should be italic, but the editor can fix it.  |
| Ericsson | yes |  |
| Samsung | Yes | They are editorial changes. |
| Lenovo | Yes |  |
| NOKIA  | Yes |  |
| ZTE | Yes |  |
| vivo | Yes  | Alignment CRs |
| Huawei, HiSilicon | No | According to the guidance from Younsun in last meeting, such kind of changes should be left to editor. |
| NTT DOCOMO | Yes |  |

### FL proposal 7-v1

**Conclusion**

The corrections to TS 38.212 in R1-2408604 and R1-2408745 can be handled by the editor’s alignment CR.