3GPP TSG-RAN WG2 Meeting #125 R2-2xxxxxx

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Source: CATT，[xxx]

Title: [C113][C114][C116]UE based TA measurement handling

Agenda Item: 7.4.3.1

Document for: Discussion and Decision

# **1 Introduction**

In this contribution, we discuss the RIL issues on UE based TA measurement handling for LTM introduced in R18 Mobility.

# **2 UE based TA measurement handling**

For UE based TA measurement, the RAN2 agreements are as follows,

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| * The UE performs TA measurements for candidate cell(s) after configured by RRC
* R2 assumes that the exact time the UE performs TA measurement is up to UE impl (no need to specify in R2 TS)
 |

In addition to this, UE-MeasuredTA-ID is introduced for candidate cell the current serving cell, it is used to indicate whether the UE should perform UE-based TA measurements towards an LTM candidate (i.e., UE-based TA measurements towards an LTM candidate can be performed only if it has the same UE-MeasuredTA-ID as the current serving cell),the signalling as follows,

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| LTM-Config-r18 ::= SEQUENCE { ltm-ReferenceConfiguration-r18 SetupRelease {ReferenceConfiguration-r18} OPTIONAL, -- Need M ltm-CandidateToReleaseList-r18 SEQUENCE (SIZE (1..maxNrofLTM-Configs-r18)) OF LTM-CandidateId-r18 OPTIONAL, -- Need N ltm-CandidateToAddModList-r18 SEQUENCE (SIZE (1..maxNrofLTM-Configs-r18)) OF LTM-Candidate-r18 OPTIONAL, -- Need Nltm-ServingCellNoResetID-r18 INTEGER (1..maxNrofLTM-Configs-r18-plus-1) OPTIONAL, -- Cond FirstLTM-Only…… ltm-ServingCellUE-MeasuredTA-ID-r18 INTEGER (1..maxNrofLTM-Configs-r18-plus-1) OPTIONAL, -- Cond LTM ...}LTM-Candidate-r18 ::= SEQUENCE { ltm-CandidateId-r18 LTM-CandidateId-r18, ltm-CandidatePCI-r18 PhysCellId, …… ltm-UE-MeasuredTA-ID-r18 INTEGER (1..maxNrofLTM-Configs-r18-plus-1) OPTIONAL, -- Need M ...} |

Based on above, the exact time the UE performs TA measurement is up to UE implementation in lower layer. RRC should inform the lower layers on whether it is allowed to perform UE-based TA measurements for a candidate if it has the same UE-MeasuredTA-ID as the current serving cell. Since subsequent LTM is supported, so there are two cases in which RRC should inform lower layer on this,

* Case 1: upon receiving the LTM configuration from network.
* Case 2: when current serving cell is changed (e.g., when LTM is executed successfully)

**Case 1: upon receiving the LTM configuration from network.**

In case 1, UE should inform lower layer if the UE-MeasuredTA-ID of a candidate is same as the ServingCellUE-MeasuredTA-ID of the initial serving cell. This case has been captured in section 5.3.5.18.3(i.e., LTM candidate configuration addition/modification) as below,

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| 2> if the *LTM-Candidate* with the received *ltm-CandidateId* value includes *ltm-UE-MeasuredTA-ID*:3> if the value of *ltm-UE-MeasuredTA-ID* is equal to the value of *ltm-ServingCellUE-MeasuredTA-ID* within *VarLTM-ServingCellUE-MeasuredTA-ID*:4> inform lower layers that UE is configured with UE-based TA measurements if an LTM cell switch is executed for this LTM candidate configuration; |

However, part of the description (“if an LTM cell switch is executed for this LTM candidate configuration”) above is not suitable as UE can inform low layer once it receive the LTM, the behaviour of informing low layer should not wait the LTM execution. A TP is provided in Annex 1

**Case 2: when current serving cell is changed (e.g., when LTM is executed successfully)**

In case 2, ServingCellUE-MeasuredTA-ID will be updated to the UE-MeasuredTA-ID of the target cell(i.e.,the new serving cell).the UE-MeasuredTA-IDs of other candidates are supposed to be compared with the new ServingCellUE-MeasuredTA-ID again. Low layer should be informed, but it is absent in the current spec, as follows,

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| 5.3.5.18.6 LTM cell switch execution……2> replace the value of *ltm-ServingCellNoResetID* in *VarLTM-ServingCellNoResetID* with the value of *ltm-NoResetID* in the *LTM-Candidate* in *VarLTM-Config* indicated by lower layers or for the selected cell in accordance with 5.3.7.3;1> if the *LTM-Candidate IE* in *VarLTM-Config* indicated by lower layers or for the selected cell in accordance with 5.3.7.3 contains the field *ltm-UE-MeasuredTA-ID*:2> replace the value of ltm-ServingCellUE-MeasuredTA-ID in VarLTM-ServingCellUE-MeasuredTA-ID with the value received within ltm-UE-MeasuredTA-ID; |

One may argue that it can be covered by the description (“inform lower layers that UE is configured with UE-based TA measurements if an LTM cell switch is executed for this LTM candidate configuration”) in section 5.3.5.18.3.This does not work as section 5.3.5.18.3 is not called upon LTM execution. Section 5.3.5.18.3(i.e., LTM candidate configuration addition/modification) is only called upon UE receives the LTM configuration via RRC from network.

To address the issue above, multiple solutions have been suggested by companies,

* Option 1:Specify the UE behaviours in 5.3.5.18.3 and 5.3.5.18.6

Option 1 is suggested in RIL [C113], [C114], [C116], [L005]. An example of TP is provided is in Annex 1.

* Option 2:remove the description in 5.3.5.18.3 and add the description in the field description of ltm-UE-MeasureTA-Id

Option 2 is suggested in RIL [051].

**Observation 1: To address the issue how to inform lower layer that UE is configured with UE-based TA measurements for the candidate, the possible options are as follows,**

* **Option 1: Specify the UE behaviours in 5.3.5.18.3 and 5.3.5.18.6**
* **Option 2:remove the description in 5.3.5.18.3 and add the description in the field description of ltm-UE-MeasureTA-Id**

**Proposal 1: To inform lower layer that UE is configured with UE-based TA measurements for the candidate, in the following cases, 1）Case 1: upon receiving the LTM configuration from network，2）Case 2: When current serving cell is changed (e.g., upon LTM execution) ，RAN2 to discuss which option is selected,**

* **Option 1: Specify the UE behaviours in 5.3.5.18.3 and 5.3.5.18.6**
* **Option 2:remove the description in 5.3.5.18.3 and add the description in the field description of ltm-UE-MeasureTA-Id**
* **Option x:**

# **3 Conclusion**

# **3 Annex 1: TP for option 1**

##### 5.3.5.18.3 LTM candidate configuration addition/modification

The UE shall:

1> for each *ltm-CandidateId* valuein the *ltm-CandidateToAddModList*:

……

2> if the *LTM-Candidate* with the received *ltm-CandidateId* value includes *ltm-UE-MeasuredTA-ID*:

3> if the value of *ltm-UE-MeasuredTA-ID* is equal to the value of *ltm-ServingCellUE-MeasuredTA-ID* within *VarLTM-ServingCellUE-MeasuredTA-ID*:

4> inform lower layers that UE is configured with UE-based TA measurements;

##### 5.3.5.18.6 LTM cell switch execution

……

2> replace the value of *ltm-ServingCellNoResetID* in *VarLTM-ServingCellNoResetID* with the value of *ltm-NoResetID* in the *LTM-Candidate* in *VarLTM-Config* indicated by lower layers or for the selected cell in accordance with 5.3.7.3;

1> if the *LTM-Candidate IE* in *VarLTM-Config* indicated by lower layers or for the selected cell in accordance with 5.3.7.3 contains the field *ltm-UE-MeasuredTA-ID*:

2> replace the value of ltm-ServingCellUE-MeasuredTA-ID in VarLTM-ServingCellUE-MeasuredTA-ID with the value received within ltm-UE-MeasuredTA-ID;

2> for each *ltm-CandidateId* valuein the *ltm-CandidateToAddModList*:

2> if the *LTM-Candidate* with the received *ltm-CandidateId* value includes *ltm-UE-MeasuredTA-ID*:

3> if the value of *ltm-UE-MeasuredTA-ID* is equal to the value of *ltm-ServingCellUE-MeasuredTA-ID* within *VarLTM-ServingCellUE-MeasuredTA-ID*:

4> inform lower layers that UE is configured with UE-based TA measurements

# **4 Annex 2: TP for option 2**

##### 5.3.5.18.3 LTM candidate configuration addition/modification

The UE shall:

1> for each *ltm-CandidateId* valuein the *ltm-CandidateToAddModList*:

……

### 6.3.2 Radio resource control information elements

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| *LTM-Candidate* field descriptions |
| ***ltm-CandidateConfig***This field includes an RRCReconfiguration message used to configure an LTM candidate cell. |
| ***ltm-CandidateId***This field indicates an LTM candidate configuration. |
| ***ltm-CandidatePCI***This field identifies the PCI of the SpCell of the configuration contained in *ltm-CandidateConfig*. |
| ***ltm-ConfigComplete***This field indicates whether the LTM candidate configuration within *ltm-CandidateConfig* is a complete configuration. |
| ***ltm-DL-OrJointTCI-StateToAddModList***A list of TCI states for LTM to add and/or modify. |
| ***ltm-DL-OrJointTCI-StateToReleaseList***A list of TCI states for LTM to remove. |
| ***ltm-EarlyUL-SyncConfig, ltm-EarlyUL-SyncConfigSUL***A configuration used to perform the early UL synchronization procedure over an UL or SUL carrier. |
| ***ltm-nzp-CSI-RS-ResourceSetToAddModList***A list of nzp-CSI-RS-Resources set for LTM to add and/or modify. |
| ***ltm-nzp-CSI-RS-ResourceSetToReleaseList***A list of nzp-CSI-RS-Resources set for LTM to remove. |
| ***ltm-nzp-CSI-RS-ResourceToAddModList***A list of nzp-CSI-RS-Resources for LTM to add and/or modify. |
| ***ltm-nzp-CSI-RS-ResourceToReleaseList***A list of nzp-CSI-RS-Resources for LTM to remove. |
| ***ltm-SSB-Config***This field indicates the configuration of SS/PBCH blocks to be used for L1 measurements configured with *ltm-CSI-ReportConfigToAddModList* in *CSI-MeasConfig* and for TCI states configured in other fields in *LTM-Candidate*. |
| ***ltm-UE-MeasuredTA-ID***This field indicates whether the UE should perform UE-based TA measurements towards an LTM candidate. The UE based TA measurement for the LTM candidate cell is allowed if the value of this field is equal to the value of the ltm-ServingCellUE-MeasuredTA-ID within the current VarLTM-ServingCellUE-MeasuredTA-ID. |
| ***ltm-UL-TCI-StatesToAddModList***A list of uplink TCI states for LTM to add and/or modify. |
| ***ltm-UL-TCI-StatesToReleaseList***A list of uplink TCI states for LTM to remove. |
| ***pathlossReferenceRS-ToAddModList***A list of Reference Signals to be used for path loss estimation for unified TCI state for LTM to add and/or modify. |
| ***pathlossReferenceRS-ToReleaseList***A list of Reference Signals to be used for path loss estimation for unified TCI state for LTM to add and/or modify. |

# **4 Annex 3???**

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# **7 Reference**

[1] xxx

[2] xxx