**3GPP TSG-RAN WG2 Meeting #131bis draftR2-2507121**

**Prague, Czech, 13 - 17 October 2025**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.300** | **CR** | **draft1040** | **rev** | **-** | **Current version:** | **19.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Miscellaneous corrections for stage-2 in Rel-19 Mobility Enhancements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Apple Inc | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_Ph4-Core | | | | |  | ***Date:*** | | | 2025-10-13 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR adds miscellaneous corrections to stage-2 description of NR mobility enhancements Phase 4 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | IThe following corrections were made with this CR.   1. 9.2.3.1 – LTM execution condition failure actions are also applicable for CLTM, clarified this. 2. 9.2.3.5.2 - candidate gNB selection and provision of LTM security information is applicable only to inter-gNB LTM. Clarified this. 3. 9.2.3.7.1 – Miscellaneous corrections to CLTM procedures 4. 9.2.4 – Miscellaneous editorial corrections to L1 event triggered beam evaluations | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Rel-19 NR mobility enhancements Phase 4 description would be ambiguous in some sections for TS 38.300. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 9.2.3.1, 9.2.3.5.2, 9.2.3.7.1, 9.2.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

#### << first change>>

#### 9.2.3.1 Overview

Network controlled mobility applies to UEs in RRC\_CONNECTED and is categorized into two types of mobility: cell level mobility and beam level mobility. Beam level mobility includes intra-cell beam level mobility and inter-cell beam level mobility.

**Cell Level Mobility** requires explicit RRC signalling to be triggered, i.e. handover. For inter-gNB handover, the signalling procedures consist of at least the following elemental components illustrated in Figure 9.2.3.1-1:



Figure 9.2.3.1-1: Inter-gNB handover procedures

1. The source gNB initiates handover and issues a HANDOVER REQUEST over the Xn interface.

2. The target gNB performs admission control and provides the new RRC configuration as part of the HANDOVER REQUEST ACKNOWLEDGE.

3. The source gNB provides the RRC configuration to the UE by forwarding the *RRCReconfiguration* message received in the HANDOVER REQUEST ACKNOWLEDGE. The *RRCReconfiguration* message includes at least cell ID and all information required to access the target cell so that the UE can access the target cell without reading system information. For some cases, the information required for contention-based and contention-free random access can be included in the *RRCReconfiguration* message. The access information to the target cell may include beam specific information, if any.

4. The UE moves the RRC connection to the target gNB and replies with the *RRCReconfigurationComplete*.

NOTE 1: User Data can also be sent in step 4 if the grant allows.

In case of DAPS handover, the UE continues the downlink user data reception from the source gNB until releasing the source cell and continues the uplink user data transmission to the source gNB until successful random access procedure to the target gNB.

Only source and target PCell are used during DAPS handover. CA, DC, SUL, multi-TRP, EHC, CHO, UDC, LTM, NR sidelink configurations and V2X sidelink configurations are released by the source gNB before the handover command is sent to the UE and are not configured by the target gNB until the DAPS handover has completed (i.e. at earliest in the same message that releases the source PCell).

The handover mechanism triggered by RRC requires the UE at least to reset the MAC entity and re-establish RLC, except for DAPS handover, where upon reception of the handover command, the UE:

- Creates a MAC entity for target;

- Establishes the RLC entity and an associated DTCH logical channel for target for each DRB configured with DAPS;

- For each DRB configured with DAPS, reconfigures the PDCP entity with separate security and ROHC functions for source and target and associates them with the RLC entities configured by source and target respectively;

- Retains the rest of the source configurations until release of the source.

The cell switch mechanism triggered by MAC, (i.e., LTM cell switch) requires the UE at least to reset the MAC entity. RLC and PDCP handling depends on the network configuration.

NOTE 2: Void.

NOTE 3: Void.

RRC managed handovers with and without PDCP entity re-establishment are both supported. For DRBs using RLC AM mode, PDCP can either be re-established together with a security key change or initiate a data recovery procedure without a key change. For DRBs using RLC UM mode, PDCP can either be re-established together with a security key change or remain as it is without a key change. For SRBs, PDCP can either remain as it is, discard its stored PDCP PDUs/SDUs without a key change or be re-established together with a security key change.

Data forwarding, in-sequence delivery and duplication avoidance at handover can be guaranteed when the target gNB uses the same DRB configuration as the source gNB.

Timer based handover failure procedure is supported in NR. RRC connection re-establishment procedure is used for recovering from handover failure except in certain CHO, DAPS handover or LTM cell switch scenarios:

- When DAPS handover fails, the UE falls back to the source cell configuration, resumes the connection with the source cell, and reports DAPS handover failure via the source without triggering RRC connection re-establishment if the source link has not been released.

- When initial CHO execution attempt fails or HO fails, the UE performs cell selection, and if the selected cell is a CHO candidate and if network configured the UE to try CHO after handover/CHO failure, then the UE attempts CHO execution once, otherwise re-establishment is performed.

- When LTM execution attempt triggered by LTM cell switch command MAC CE fails or when the CLTM execution attempt by the UE fails, the UE performs cell selection and if the selected cell is an LTM candidate cell and if network configured the UE to try LTM after LTM execution failure, then the UE attempts RACH-based LTM execution once, otherwise re-establishment is performed.

NOTE 4: PDCP SN gap for SRB may exist upon LTM/CLTM attempt toward the selected cell after LTM/CLTM fails. It is up to network implementation to avoid the latency caused by the PDCP SN gap.

DAPS handover for FR2 to FR2 case is not supported in this release of the specification.

#### << next change>>

##### 9.2.3.5.2 C-Plane Handling

Cell switch command is conveyed in a MAC CE, which contains the necessary information to perform the LTM cell switch.

The overall procedure for intra-gNB LTM is shown in Figure 9.2.3.5.2-1 below. Subsequent LTM is done by repeating the early synchronization, LTM cell switch execution, and LTM cell switch completion steps without the need to release, reconfigure or add other LTM candidate configurations after each LTM cell switch completion. The general procedure over the air interface is applicable to SCG LTM. Further details of SCG LTM can be found in TS 37.340 [21].



Figure 9.2.3.5.2-1. Signalling procedure for intra-gNB LTM

The procedure for intra-gNB LTM is as follows:

1. The UE sends a *MeasurementReport* message to the gNB. The gNB decides to configure LTM and initiates LTM preparation.

2. The gNB transmits an *RRCReconfiguration* message to the UE including the LTM candidate configurations.

3. The UE stores the LTM candidate configurations and transmits an *RRCReconfigurationComplete* message to the gNB.

4a. The UE performs DL synchronization with the LTM candidate cell(s) before receiving the cell switch command. The UE may activate and deactivate TCI states of LTM candidate cell(s), as triggered by the gNB and defined in TS 38.133 [13].

4b. The UE may perform UL synchronization with LTM candidate cell(s) before receiving the cell switch command, by using UE-based TA measurement, if configured, and/or by transmitting a preamble towards the candidate cell, as triggered by the gNB. When UE-based TA measurement is configured, UE acquires the TA value(s) of the candidate cell(s) by measurement. UE performs early TA acquisition with the candidate cell(s) as requested by the network before receiving the cell switch command as specified in clause 9.2.6 and TS 38.133 [13]. This is done via CFRA triggered by a PDCCH order from the source cell, following which the UE sends preamble towards the indicated candidate cell. In order to minimize the data interruption of the source cell due to CFRA towards the candidate cell(s), the UE does not receive random access response from the network for the purpose of TA value acquisition and the TA value of the candidate cell is indicated in the cell switch command. The UE does not maintain the TA timer for the candidate cell and relies on network implementation to guarantee the TA validity.

5. The UE performs L1 measurements on the configured LTM candidate cell(s) and transmits L1 measurement reports to the gNB. L1 measurement should be performed as long as RRC reconfiguration (step 2) is applicable. The UE can also perform L3 measurement reporting to the gNB, including beam level measurement results on cell(s) which are configured as LTM candidate cell(s) according to the received network configuration.

6. The gNB decides to execute cell switch to a target cell and transmits an LTM cell switch command MAC CE triggering cell switch by including a target configuration ID which indicates the index of the candidate configuration of the target cell, a beam indicated with a TCI state or beams indicated with DL and UL TCI states, and a timing advance command for the target cell, if available. The UE switches to the target cell and applies the candidate configuration indicated by the target configuration ID.

7. The UE performs the random access procedure towards the target cell, if UE does not have valid TA of the target cell as specified in clause 5.18.35 of TS 38.321[6].

8. The UE completes the LTM cell switch procedure by sending *RRCReconfigurationComplete* message to target cell. If the UE has performed a RA procedure in step 7 the UE considers that LTM cell switch execution is successfully completed when the random access procedure is successfully completed. For RACH-less LTM, the UE considers that LTM cell switch execution is successfully completed when the UE determines that the network has successfully received its first UL data.

The steps 4-8 can be performed multiple times for subsequent LTM cell switch executions using the LTM candidate configuration(s) provided in step 2.

The overall procedure for inter-gNB LTM is shown in Figure 9.2.3.5.2-2 below.



Figure 9.2.3.5.2-2. Signalling procedure for inter-gNB LTM

The procedure for inter-gNB LTM is as follows:

1. The UE sends a MeasurementReport message (L3 measurement result) to the source gNB containing measurements of neighbouring cells.

2. The source gNB decides to configure LTM.

3. The source gNB requests LTM for one or more candidate cells belonging to the source gNB and/or one or more candidate gNB(s). For inter-gNB LTM, the source gNB initiates a HANDOVER REQUEST message per candidate cell containing one candidate cell ID and may contain the CSI resource configuration for subsequent LTM. For both intra and inter-gNB LTM, the source gNB may request the candidate cell(s)/gNB(s) to provide the CSI-RS resource configuration for L1 RSRP measurement and/or for early CSI acquisition. The source gNB may include the LTM security information. For inter-gNB LTM, the source gNB includes the same source NG-RAN node UE XnAP ID for all HANDOVER REQUEST messages to a candidate gNB.

4. Admission Control may be performed by the candidate cells(s)/gNB(s).

5. The candidate prepares and provides the LTM configuration(s) to the source gNB. For inter-gNB LTM, the candidate gNB(s) respond(s) with HANDOVER REQUEST ACKNOWLEDGE message to the source gNB including the generated RRC configurations for the accepted candidate cell. For both intra and inter-gNB LTM, the candidate may also include additional information related to the CSI-RS resource configuration and early sync information upon request. For inter-gNB LTM, the candidate gNB also responds with the selected LTM security information. For inter-gNB LTM, each candidate gNB includes the same target NG-RAN node UE XnAP ID for all HANDOVER REQUEST ACKNOWLEDGE messages it responds.

6. The source gNB sends an LTM CONFIGURATION UPDATE message to the candidate gNB(s) to update the LTM configurations of candidate cell(s). The source gNB may include the common CSI resource configuration, the LTM configuration ID mapping list and the LTM security information.

7. The candidate gNB(s) sends the LTM CONFIGURATION UPDATE ACKNOWLEDGE message to the source gNB. The candidate gNB(s) may also provide the CSI report configuration. The candidate gNB may include the CSI report configuration for CSI acquisition of the candidate cell(s).

NOTE 1: Step 6 may also be triggered after step 14, or after step 17 by implementation for subsequent LTM.

NOTE 2: Step 6 and Step 7 are triggered if CSI acquisition is applied.

8. The source gNB sends an RRCReconfiguration message to the UE.

9. The UE stores the LTM candidate configurations and sends an RRCReconfigurationComplete message to the source gNB.

NOTE 3: The source gNB may initiate CSI-RS Coordination procedure to activate or deactivate CSI-RS resource(s) of some candidate cells(s).

9a. If early data forwarding is applied, the source gNB sends the EARLY STATUS TRANSFER message to the candidate gNB(s).

10/11. Early DL and UL synchronization to some LTM candidate cell(s) may be performed. The source gNB may activate or deactivate the TCI states of the candidate LTM cells. Depending on network configuration, the UE may perform early UL synchronization with LTM candidate cell(s), by using UE-based TA measurement, if configured, and/or by transmitting a preamble towards the candidate cell, as triggered by the source gNB. With a network triggered UL synchronization, a PDCCH order is received from the source cell to trigger CFRA to a candidate cell, the UE performs early TA acquisition by sending preamble towards the indicated candidate cell. In order to minimize the data interruption on the source cell due to CFRA towards the indicated candidate cell(s), the UE does not receive random access response from the network for the purpose of TA value acquisition. The candidate gNB(s) sends the TA INFORMATION TRANSFER message to the source gNB instead.

12. The UE performs L1 measurements on the configured LTM candidate cell(s) and transmits L1 measurement reports to the source gNB, if configured. L1 measurement should be performed as long as RRC reconfiguration (step 8) is applicable.

13. The source gNB determines to initiate LTM. L3 measurement can also be used to determine this step.

14. The source gNB decides to execute cell switch to a target cell and transmits an LTM cell switch command MAC CE triggering cell switch by including a target configuration ID which indicates the index of the candidate configuration, a beam indicated with a TCI state or beams indicated with DL and UL TCI states, and a TA command for the target cell. In case of a security context change, the LTM cell switch command MAC CE also contains the NCC value. The UE switches to the target cell and applies the candidate configuration indicated by the target configuration ID. In case of security context change, the UE generates and applies the new security keys based on the received NCC value.

NOTE 4: Up to implementation, data forwarding and SN Status Transfer may be initiated once the source gNB triggers the inter-gNB LTM cell switch for the UE in Step 14.

15. The source gNB sends the CELL SWITCH NOTIFICATION message to the target gNB to indicate the initiation of Cell Switch command to the UE. The source gNB may inform the acquired TA related information.

16. The UE performs the random access procedure towards the target cell, if UE does not have valid TA of the target cell as specified in clause 5.18.35 of TS 38.321[6].

17/18. The target gNB sends the HANDOVER SUCCESS message to the source gNB to inform that the UE has successfully accessed the target cell. In return, the source gNB sends the SN STATUS TRANSFER message following the principles described in step 7 of Intra-AMF/UPF Handover in clause 9.2.3.2.1.

NOTE 5: Late data forwarding may be initiated as soon as the source gNB receives the HANDOVER SUCCESS message.

NOTE 6: The source gNB may initiate the CSI-RS Coordination procedure to deactivate CSI-RS resource(s) of candidate cell(s) on the candidate gNB(s) after the UE successfully accesses the target cell.

19. The UE completes the LTM cell switch procedure by sending RRCReconfigurationComplete message to target cell. If the UE has performed a RA procedure in step 16 the UE considers that LTM cell switch execution is successfully completed when the random access procedure is successfully completed. For RACH-less LTM, the UE considers that LTM cell switch execution is successfully completed when the UE determines that the network has successfully received its first UL data

NOTE 7: Steps 17/18 and 19 do not have to occur one after the other. The target gNB may send the HANDOVER SUCCESS message to the source gNB after receiving the RRCReconfigurationComplete message.

20. The new source gNB (i.e., the target gNB) sends the LTM CONFIGURATION UPDATE message to the candidate gNBs. This message includes the new security key(s) to be used with the UE.

21. The candidate gNB(s) responds to the LTM CONFIGURATION UPDATE ACKNOWLEDGE message to the new source gNB.

22. The new source gNB may send the UE CONTEXT RELEASE message to inform the old source gNB to release radio and C-plane related resources associated to the UE context if no LTM candidate cell(s) exist in the old source gNB. Any ongoing data forwarding may continue.

The steps 10-22 can be performed multiple times for subsequent LTM cell switch executions using the LTM candidate configuration(s) provided in step 8.

The procedure over the air interface described in Figure 9.2.3.5.2-1 is applicable to both intra-gNB LTM and inter-gNB LTM. The overall LTM procedures over F1-C interface are captured in TS 38.401[4].

#### << next change>>

#### 9.2.3.7 Conditional L1/L2 Triggered Mobility

##### 9.2.3.7.1 General

CLTM cell switch is executed by the UE when L1-based or L3-based LTM cell switch execution conditions are met. The same LTM procedures as described in clause 9.2.3.5.1 on network activation of TCI states for DL synchronization and on configuration and initiation of UL TA acquisition (via PDCCH order) are also applicable for CLTM. CLTM can coexist with network triggered L3 HO, CHO and network triggered PScell change, while the coexistence of CLTM and DAPS HO is not supported. The overall procedure for CLTM is as shown in Figure 9.2.3.7.1-1:



Figure 9.2.3.7.1-1. Signalling procedure for CLTM

The procedure for CLTM is as follows:

1. The UE sends a MeasurementReport message to the gNB. The gNB decides to configure CLTM and initiates CLTM preparation.

2. The source gNB can request the candidate cells to provide conditional execution configurations and the candidate cells provide the conditional configuration including their own execution conditions, to be used in subsequent CLTM.

3. The source gNB sends an RRCReconfiguration message to the UE and this includes the CLTM configurations of candidate cells as well as the execution condition for the CLTM.

4. The UE stores the CLTM candidate configurations and transmits an RRCReconfigurationComplete message to the gNB. The UE starts evaluating the execution conditions based on the provided configuration.

5/6. Early DL and UL synchronization to some LTM candidate cell(s) may be performed. The source gNB may activate or deactivate the TCI states of the candidate LTM cells. The source gNB can trigger early synchronization (for example, based on the L1 or L3 measurement reports from the UE, if configured) to the UE and steps 4a/4b from figure 9.2.3.5.2-1 are applicable here as well. In addition, the source gNB can provide the TA value for each of the candidate cells the UE has performed UL synchronization with. Depending on network configuration, the UE may perform early UL synchronization with CLTM candidate cell(s), by using UE-based TA measurement, if configured.

7. The CLTM execution condition is satisfied at the UE and on (at least) one satisfied candidate LTM cell, the UE performs the CLTM execution by applying the configuration of the satisfied LTM candidate cell. If the UE has valid TA as part of the UL early synchronization from step 6, the UE skips RACH. Otherwise, RACH is performed as part of the CLTM execution.

8. The UE completes the CLTM cell switch procedure by sending RRCReconfigurationComplete message to the switched LTM cell. For RACH-based CLTM, the UE considers that CLTM cell switch execution is successfully completed when the random access procedure is successfully completed. For RACH-less CLTM, the UE considers that CLTM cell switch execution is successfully completed when the UE determines that the network has successfully received its first UL data. The UE does not release any valid TA value(s) of LTM candidate cells with CLTM configuration.

The steps 5-8 can be performed multiple times for subsequent CLTM cell switch executions using the CLTM candidate configuration(s) provided in step 2.

The following principles apply to CLTM:

- CLTM is supported for intra-gNB LTM when DC is not configured. Inter-gNB CLTM is not supported.

- CLTM can be RACH-based or RACH-less. RACH-based CLTM includes CFRA and CBRA, and only CG based RACH-less CLTM is supported.

- U-Plane handling from clause 9.2.3.5.3 applies to CLTM as well and since there is no LTM cell switch command MAC CE reception for CLTM, the UE performs MAC reset as part of the CLTM execution.

### 9.2.4 Measurements

In RRC\_CONNECTED, both layer 1 (L1) and layer 3 (L3) based measurements are supported, L1 measurement reporting is evaluated based on beam quality and L3 measurement reporting is evaluated based on cell quality.

For L3 based measurement, the UE measures multiple beams (at least one) of a cell and the measurements results (power values) are averaged to derive the cell quality. In doing so, the UE is configured to consider a subset of the detected beams. Filtering takes place at two different levels: at the physical layer to derive beam quality and then at RRC level to derive cell quality from multiple beams. Cell quality from beam measurements is derived in the same way for the serving cell(s) and for the non-serving cell(s). Measurement reports may contain the measurement results of the *X* best beams if the UE is configured to do so by the gNB.

For L1 based measurement used in LTM event-triggered measurement, the UE measures the beams configured for LTM. Filtering takes place at the physical layer to derive the beam quality. The measurement reports are sent using MAC CE and contain the measurement results of the *X* (at least one) beams.

The corresponding high-level measurement model is described below:



Figure 9.2.4-1: Measurement Model

NOTE 1: K beams correspond to the measurements on SSB or CSI-RS resources configured for L3 mobility by gNB and detected by UE at L1.

- **A**: measurements (beam specific samples) internal to the physical layer.

- **Layer 1 filtering**: internal layer 1 filtering of the inputs measured at point A. Exact filtering is implementation dependent. How the measurements are actually executed in the physical layer (inputs A and Layer 1 filtering) is not constrained by the standard.

- **A1**: measurements (i.e. beam specific measurements) reported by layer 1 to layer 3 after layer 1 filtering.

**- Beam Consolidation/Selection**: beam specific measurements are consolidated to derive cell quality. The behaviour of the Beam consolidation/selection is standardised and the configuration of this module is provided by RRC signalling. Reporting period at B equals one measurement period at A1.

**- B**: a measurement (i.e. cell quality) derived from beam-specific measurements reported to layer 3 after beam consolidation/selection.

- **Layer 3 filtering for cell quality**: filtering performed on the measurements provided at point B. The behaviour of the Layer 3 filters is standardised and the configuration of the layer 3 filters is provided by RRC signalling. Filtering reporting period at C equals one measurement period at B.

- **C**: a measurement after processing in the layer 3 filter. The reporting rate is identical to the reporting rate at point B. This measurement is used as input for one or more evaluation of reporting criteria.

- **Evaluation of reporting criteria**: checks whether actual measurement reporting is needed at point D. The evaluation can be based on more than one flow of measurements at reference point C e.g. to compare between different measurements. This is illustrated by input C and C1. The UE shall evaluate the reporting criteria at least every time a new measurement result is reported at point C, C1. The reporting criteria are standardised and the configuration is provided by RRC signalling specified in TS 38.331 [12].

- **D**: measurement report information (message) sent on the radio interface.

- **L3 Beam filtering**: filtering performed on the measurements (i.e. beam specific measurements) provided at point A1. The behaviour of the beam filters is standardised and the configuration of the beam filters is provided by RRC signalling. Filtering reporting period at E equals one measurement period at A1.

- **E**: a measurement (i.e. beam-specific measurement) after processing in the beam filter. The reporting rate is identical to the reporting rate at point A1. This measurement is used as input for selecting the X measurements to be reported.

- **Beam Selection for beam reporting**: selects the X measurements from the measurements provided at point E. The behaviour of the beam selection is standardised and the configuration of this module is provided by RRC signalling.

- **F**: beam measurement information included in measurement report (sent) on the radio interface.

Layer 1 filtering introduces a certain level of measurement averaging. How and when the UE exactly performs the required measurements is implementation specific to the point that the output at B fulfils the performance requirements set in TS 38.133 [13]. Layer 3 filtering for cell quality and related parameters used are specified in TS 38.331 [12] and do not introduce any delay in the sample availability between B and C. Measurement at point C, C1 is the input used in the event evaluation. L3 Beam filtering and related parameters used are specified in TS 38.331 [12] and do not introduce any delay in the sample availability between A1 and E.

The high-level model for LTM event-triggered measurement is described below:



Figure 9.2.4-2: LTM Event-triggered Measurement Model

NOTE 1a: K beams correspond to the measurements on SSB or CSI-RS resources configured for LTM by gNB and detected by UE at L1.

- **A:** measurements (beam specific samples) internal to the physical layer.

**- Layer 1 filtering:** internal layer 1 filtering of the inputs measured at point A. Exact filtering is implementation dependent. How the measurements are actually executed in the physical layer (inputs A and Layer 1 filtering) is not constrained by the standard.

**- B:** a measurement after layer 1 filtering. This beam measurement is used as input for one or more evaluation of LTM event triggering and reporting criteria.

**- Evaluation of reporting criteria:** checks whether actual measurement reporting is needed at point C. The evaluation can be based on more than one flow of measurements at reference point B e.g. to compare between different measurements. This is illustrated by input B and B1. The UE shall evaluate the reporting criteria at least every time a new measurement result is reported at point B, B1. The reporting criteria are standardised and the configuration is provided by RRC signalling specified in TS 38.331 [12.

**- C:** LTM MAC CE measurement report information (message) sent on the radio interface.

Measurement reports for L3 based measurements are characterized by the following:

- Measurement reports include the measurement identity of the associated measurement configuration that triggered the reporting;

- Cell and beam measurement quantities to be included in measurement reports are configured by the network;

- The number of non-serving cells to be reported can be limited through configuration by the network;

- Cells belonging to an exclude-list configured by the network are not used in event evaluation and reporting, and conversely when an allow-list is configured by the network, only the cells belonging to the allow-list are used in event evaluation and reporting;

- Beam measurements to be included in measurement reports are configured by the network (beam identifier only, measurement result and beam identifier, or no beam reporting).

Measurement reports for LTM event triggered measurements are characterized by the following:

- Measurement reports include the reporting configuration identity that triggered the reporting;

- The max number of beam and the beam measurement quantities to be included in measurement reports are configured by network;

- The current beam of the serving cell to be included in measurement reports are configured by the network;

- When multi-TRP is configured for the serving cell, the UE uses the best beam of the current beams for LTM event evaluation and reporting. It is up to the UE implementation how to choose the best beam.

Intra-frequency neighbour (cell) measurements and inter-frequency neighbour (cell) measurements are defined as follows:

- SSB based intra-frequency measurement: a measurement is defined as an SSB based intra-frequency measurement provided the SSB frequency configured in the measurement object associated with the serving cell and the center frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs is also the same.

- SSB based inter-frequency measurement: a measurement is defined as an SSB based inter-frequency measurement provided the SSB frequency configured in the measurement object associated with the serving cell and the center frequency of the SSB of the neighbour cell are different, or the subcarrier spacing of the two SSBs is different.

NOTE 2: For SSB based measurements, one measurement object corresponds to one SSB and the UE considers different SSBs as different cells.

NOTE 2a: If a UE is configured to perform serving cell measurements based on an NCD-SSB configured in its active BWP, this NCD-SSB is considered as the SSB of the serving cell in the definition of intra-frequency and inter-frequency measurements as above.

NOTE 2b: The above measurement object associated with the serving cell refers to the serving cell measurement object for OD-SSB when OD-SSB is activated, otherwise it refers to the serving cell measurement object for SSB.

- CSI-RS based intra-frequency measurement: a measurement is defined as a CSI-RS based intra-frequency measurement provided that:

- The subcarrier spacing of CSI-RS resources on the neighbour cell configured for measurement is the same as the SCS of CSI-RS resources on the serving cell indicated for measurement; and

- For 60kHz subcarrier spacing, the CP type of CSI-RS resources on the neighbour cell configured for measurement is the same as the CP type of CSI-RS resources on the serving cell indicated for measurement; and

- The centre frequency of CSI-RS resources on the neighbour cell configured for measurement is the same as the centre frequency of CSI-RS resource on the serving cell indicated for measurement.

- CSI-RS based inter-frequency measurement: a measurement is defined as a CSI-RS based inter-frequency measurement if it is not a CSI-RS based intra-frequency measurement.

NOTE 3: Extended CP for CSI-RS based measurement is not supported in this release.

- CSI-RS based intra-frequency L1 measurement for LTM: a measurement is defined as a CSI-RS based intra-frequency L1 measurement for LTM provided that:

- The subcarrier spacing of the CSI-RS resources of the LTM candidate cell(s) configured for L1 measurement is the same as the subcarrier spacing of active DL BWP; and

- For 60kHz subcarrier spacing, the CP type of the CSI-RS resource of LTM candidate cell(s) configured for L1 measurement is the same as the CP type of active DL BWP; and

- At least 48 RBs of the CSI-RS resource of LTM candidate cell(s) configured for L1 measurement are included within the active DL BWP.

- CSI-RS based inter-frequency L1 measurement for LTM: a CSI-RS L1 based measurement for LTM is defined as a CSI-RS based inter-frequency L1 measurement for LTM if it is not a CSI-RS based intra-frequency measurement for LTM.

Whether a measurement is non-gap-assisted or gap-assisted depends on the capability of the UE, the active BWP of the UE and the current operating frequency:

- For SSB based inter-frequency measurement, if the measurement gap requirement information is reported by the UE, a measurement gap configuration may be provided according to the information. Otherwise, a measurement gap configuration is always provided in the following cases:

- If the UE only supports per-UE measurement gaps;

- If the UE supports per-FR measurement gaps and any of the serving cells are in the same frequency range of the measurement object.

- For SSB based intra-frequency measurement, if the measurement gap requirement information is reported by the UE, a measurement gap configuration may be provided according to the information. Otherwise, a measurement gap configuration is always provided in the following case:

- If the serving cell is associated with SSB, other than the initial BWP, if any of the UE configured BWPs do not contain the frequency domain resources of the SSB associated to the initial DL BWP, and are not configured with NCD-SSB for serving cell measurement;

- If the serving cell is not associated with SSB (i.e. SSB-less SCell), if the initial BWP or any of the UE configured BWPs do not contain the SSB frequency configured in the measurement object associated with the serving cell, and are not configured with NCD-SSB for serving cell measurement.

- For CSI-RS based intra-frequency measurement, no measurement gap is needed;

- For CSI-RS based inter-frequency measurement, a measurement gap configuration is always provided in the following cases:

- If the UE only supports per-UE measurement gaps;

- If the UE supports per-FR measurement gaps and any of the serving cells are in the same frequency range of the measurement object.

In non-gap-assisted scenarios, the UE shall be able to carry out such measurements without measurement gaps. In gap-assisted scenarios, the UE cannot be assumed to be able to carry out such measurements without measurement gaps.

Network may request the UE to measure NR and/or E-UTRA carriers in RRC\_IDLE or RRC\_INACTIVE via system information or via dedicated measurement configuration in *RRCRelease*. If the UE was configured to perform measurements of NR and/or E-UTRA carriers while in RRC\_IDLE or in RRC\_INACTIVE, it may provide an indication of the availability of corresponding measurement results to the gNB in the *RRCSetupComplete* message. The network may request the UE to report those measurements after security activation. The request for the measurements can be sent by the network immediately after transmitting the Security Mode Command (i.e. before the reception of the Security Mode Complete from the UE).

If the UE was configured to perform measurements of NR and/or E-UTRA carriers while in RRC\_INACTIVE, the gNB can request the UE to provide corresponding measurement results in the *RRCResume* message and then the UE can include the available measurement results in the *RRCResumeComplete* message. Alternatively, the UE may provide an indication of the availability of the measurement results to the gNB in the *RRCResumeComplete* message and the gNB can then request the UE to provide these measurement results.

======================================END OF CHANGES================================