3GPP TSG RAN WG 2 Meeting #127bis R2-24xxxxx

Hefei, China, 14 - 18 October 2024

**Title: LS on UE capabilities for inter-frequency L1 measurements for LTM**

**Response to: -**

**Release: Rel-18**

**Work Item: Further NR mobility enhancements (NR\_Mob\_enh2-Core)**

**Source:** **RAN2**

**To:** **RAN1, RAN4**

**Cc: -**

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**Attachments:** None

# 1 Overall description

The UE capability for inter-frequency L1 measurements for LTM (FG 45-1a) is specified as:

| ***interFreqL1-MeasConfig-r18***  Indicates whether UE supports inter-frequency L1-RSRP measurement and reporting based on SSB(s) of candidate cell(s).  This capability signalling comprises of the following parameters:  - *supportedMaxIntraInterFreqCellsConfig-r18* indicates the maximum number of RRC configured candidate cells for intra- and inter-frequency L1-RSRP measurement;  - *supportedMaxIntraInterFreqCellsPerReport-r18* indicates maximum number of candidate cells in one report where a SSBRI-RSRP pair is used for each beam report for intra- and inter-frequency L1-RSRP measurement;  - *supportedMaxIntraInterFreqBeamsPerCellReports-r18* indicates maximum number of candidate beams per candidate cell in one report where a SSBRI-RSRP pair is used for each beam report for intra- and inter-frequency L1-RSRP measurement;  - *supportedMaxIntraInterFreqBeamsReports-r18* indicates maximum number of candidate cells beams in total across all cells in one report where a SSBRI-RSRP pair is used for each beam report for intra- and inter-frequency L1-RSRP measurement;  UE supporting this feature shall also indicate support of *intraFreqL1-MeasConfig-r18*. | BC | No | N/A | N/A |
| --- | --- | --- | --- | --- |

RAN2 understands that, when the UE indicates support of this capability for a BC and the UE is currently operating in this BC (or a subset of it), the SSBs of candidate cells on which the UE can perform inter-frequency L1 measurements according to this UE capabilities can be in any band on which the UE supports LTM.

For example, if the UE has serving cells in bands A and B, indicates support of inter-frequency L1 measurements in a BC (A, B, C) and supports LTM in bands A, B, C, D, E, F and G, the UE can perform inter-frequency L1 measurements of SSBs of candidate cells in bands A, B, C, D, E, F and G.

RAN2 agreed to introduce a new UE capability to allow the UE to indicate, per UE, that the SSBs of LTM candidate cells on which the UE can perform inter-frequency L1 measurements are limited to the BCs in which the UE indicates support of inter-frequency L1 measurements.

RAN2 did not agree yet the final name and description but it could be for example:

| ***interFreqL1-OnlyInBC-r18***  When included, indicates that, for each BC in which the UE indicates support of *interFreqL1-MeasConfig-r18*, the UE only supports inter-frequency L1-RSRP measurement and reporting based on SSB(s) of candidate cell(s) in the BC i.e., the UE does not support L1-RSRP measurement and reporting based on SSB(s) of candidate cell(s) out of the BC. | UE | No | No | No |
| --- | --- | --- | --- | --- |

In the above example, if the UE also signals ***interFreqL1-OnlyBC***, the UE can perform inter-frequency L1 measurements of SSBs of candidate cells in bands A, B and C, but cannot perform inter-frequency L1 measurements of SSBs of candidate cells in bands D, E, F or G.

Such a restriction applies to all UE capabilities related to inter-frequency L1 measurements of SSBs of candidate cells:

Capabilities for which ***interFreqL1-MeasConfig-r18*** is a pre-requisite:

| ***interFreqSSB-L1-MeasWithoutGaps-r18 (R4 39-2)***  Indicates whether UE supports SSB based inter-frequency L1-RSRP measurements on SSBs within active DL BWP without measurement gaps (without interruption on serving cell(s)) for LTM.  UE supporting this feature shall also indicate support of *interFreqL1-MeasConfig-r18.* | BC | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***ltm-InterFreqMeasGap-r18 (R4 39-2a)***  Indicates whether the UE supports SSB based inter-frequency L1-RSRP measurements with measurement gaps for LTM.  A UE supporting this feature shall also indicate support of *interFreqL1-MeasConfig-r18*. | UE | No | No | No | |

Capabilities for which one of the two above is a pre-requisite:

| ***multiCellL1-measRTD-greaterThan-CP-r18 (R4 39-1)***  Indicates the capability of simultaneous L1-RSRP measurements for more than one cell when the max RTD among the cells on the same frequency layer or in the same active BWP is larger than CP length of the cell on the frequency layer or in the same active BWP.  A UE supporting this feature shall also indicate support of either *intraFreqL1-MeasConfig-r18, interFreqSSB-L1-MeasWithoutGaps-r18* or *ltm-InterFreqMeasGap-r18.* | BC | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***maxFreqLayersL1-Meas-r18 (R4 39-3-1)***  Indicates the number of frequency layers for L1-RSRP measurement.  This capability signalling comprises of the following parameters:  - *supportedMaxIntraInterFreqLayersWithoutGaps-r18* indicates the maximum number of frequency layers UE can measure for intra- and inter-frequency without measurement gaps L1-RSRP measurement.  A UE indicating support for this component shall also indicate support for *intraFreqL1-MeasConfig-r18* and/or *interFreqSSB-L1-MeasWithoutGaps-r18.*  - *supportedMaxIntraInterFreqLayersWithGaps-r18* indicates the maximum number of frequency layers UE can measure for inter-frequency L1-RSRP measurement with measurement gaps. A UE indicating support for this component shall also indicate support for *ltm-InterFreqMeasGap-r18*. | BC | No | N/A | N/A |
| ***maxNeighCellsPerFreqLayerL1-Meas-r18 (R4 39-3-2)***  Indicates the number of neighbouring cells per frequency layer for L1-RSRP measurement.  This capability signalling comprises of the following parameters:  - *supportedMaxNeighCellsPerFreqLayersWithoutGaps-r18* indicates the max number of neighbour cells UE can measure for L1-RSRP per frequency layer for intra-frequency or inter-frequency without measurement gaps.  A UE indicating support for this component shall also indicate support for *intraFreqL1-MeasConfig-r18* or *interFreqSSB-L1-MeasWithoutGaps-r18.*  - *supportedMaxNeighCellsPerFreqLayersWithGaps-r18* indicates the max number of neighbour cells UE can measure for L1-RSRP per frequency layer for inter-frequency with measurement gaps. A UE indicating support for this component shall also indicate support for *ltm-InterFreqMeasGap-r18.* | BC | No | N/A | N/A |
| ***supportedMaxCellsWithoutGapsL1-Meas-r18 (R4 39-3-3)***  Indicates the max number of total cells of serving cells and neighbouring cells across all frequency layers of intra-frequency and inter-frequency without measurement gaps for L1 measurement.  A UE indicating support for this feature shall also indicate support for *intraFreqL1-MeasConfig-r18* or *interFreqSSB-L1-MeasWithoutGaps-r18*. | BC | No | N/A | N/A |
| ***supportedMaxSSB-WithinSlotL1-Meas-r18 (R4 39-3-4)***  Indicates the max number of SSB resources for L1-RSRP measurement that UE can measure within a slot across candidate cells for intra- and inter-frequency without gap L1-RSRP measurement.  A UE indicating support for this feature shall also indicate support for *intraFreqL1-MeasConfig-r18* or *interFreqSSB-L1-MeasWithoutGaps-r18*. | BC | No | N/A | N/A |
| ***maxSSB-PerFreqLayerL1-Meas-r18 (R4 39-3-5)***  Indicates the maximum number of SSB resources for L1-RSRP measurement per frequency layer UE can measure.  This capability signalling comprises of the following parameters:  - *supportedMaxSSB-PerFreqLayersWithoutGaps-r18* indicates the max number of SSB resources UE can measure for L1-RSRP per frequency layer for intra-frequency or inter-frequency without measurement gaps.  A UE indicating support for this component shall also indicate support for *intraFreqL1-MeasConfig-r18* or *interFreqSSB-L1-MeasWithoutGaps-r18.*  - *supportedMaxSSB-PerFreqLayersWithGaps-r18* indicates the max number of SSB resources UE can measure for L1-RSRP per frequency layer for inter-frequency with measurement gaps. A UE indicating support for this component shall also indicate support for *ltm-InterFreqMeasGap-r18*. | BC | No | N/A | N/A |
| ***supportedMaxSSB-L1-Meas-r18 (R4 39-3-6)***  Indicates the max number of total SSB resources of serving cells and neighbouring cells across all frequency layers of intra-frequency and inter-frequency without measurement gaps for L1 measurement.  A UE indicating support for this feature shall also indicate support for *intraFreqL1-MeasConfig-r18* or *interFreqSSB-L1-MeasWithoutGaps-r18*. | BC | No | N/A | N/A |

RAN2 plans to agree corresponding CRs for TS 38.306 and TS 38.331 at the next RAN2 meeting.

# 2 Actions

**To RAN1, RAN4**

**ACTION: RAN2 kindly ask RAN1 and RAN4 to take into account the above information and inform RAN2 if they see an issue.**

# 3 Dates of next TSG RAN WG 2 meetings

RAN2#128 11 - 18 November 2024 Orlando, US

RAN2#129 17 - 21 February 2025 Athens, Greece