3GPP TSG-RAN WG2 Meeting #125 R2-24xxxxxx

Athens, Greece, Feb. 26th – Mar. 1st, 2024

Source: CATT, Thales, vivo, Samsung, Ericsson, Nokia, Nokia Shanghai Bell, Huawei, HiSilicon, ITL … ?

Title: [C606] Further discussion on CHO in EMC

Agenda Item: 7.7.3

Document for: Discussion and Decision

# Introduction

In this contribution, we discuss RIL [C606] as follows:

**[RIL]**: C606 **[Delegate]**: CATT (Xiao) **[WI]**: NTN **[Class]**: 2 **[Status]**: ToDo **[TDoc]**: R2-24xxxxx **[Proposed Conclusion]**: v02

**[Description]**: Missing these two fields in ntn-Config for neighbour cells in SIB19 (thus unable to support the agreement to use ephemeris/epochTime in SIB19 for EMC CHO)

**[Proposed Change]**: There was the below agreement that allows the UE to use ephemeris/epochTime of the corresponding neighbour cell in SIB19 to evaluate CondEventD2.

4. If ephemeris and epochTime information for candidate CHO cell is not provided in RRC Reconfiguration, the UE may use the corresponding neighbour information from SIB19.

However, in this case, the condEventD2 evaluation procedure currently specified in 5.5.4.15a still relies on the referenceLocation2 in reportConfigNR to calculate the candidate cell’s moving reference location. This is techinically infeasible, because the NW does not know when the UE actually acquires the epochTime in SIB19, thus unable to set an associated referenceLocation2 value in dedicated signalling.To support the above agreement, movingReferenceLocation also needs to be introduced into the ntn-Config in ntn-Config for neighbour cells in SIB19.

We will bring a contribution to address this issue.

**[Comments]**:

This contribution proposes candidate solutions to resolve this RIL based on companies' views collected in a pre-meeting offline discussion towards this RIL.

# Discussion on C606

## 2.1 Issue identification and confirmation

The RIL [C606] corresponds to the agreement made in RAN2#124 meeting [1] as follows:

Table 1: Agreements for CHO in EMC in RAN2 #124

1. For CHO in EMC a new event (e.g. condEventD2) is introduced.
2. New event comprises a reference location and distance threshold for source and target cell.
3. Ephemeris and epochTime information for candidate CHO cell is also provided in RRC Reconfiguration (configuring the CHO) within the configuration prepared by the source cell (outside of the new event).
4. If ephemeris and epochTime information for candidate CHO cell is not provided in RRC Reconfiguration, the UE may use the corresponding neighbour information from SIB19.

It can be seen that when the ephemeris and *epochTime* information for candidate CHO cell is not provided in RRC dedicated signalling, the UE may use the corresponding information in SIB19. During the discussion in the last meeting, the agreement was made based on the assumption that for the distance based event, i.e. *condEventD2*, of a candidate EMC target cell, the NW can rely on the *ephemeris* and *epochTime* for the corresponding neighbour cell in SIB19 without need to configure them again in the event configuration, and thus only needs to configure in condEventD2 an reference location information (i.e. referenceLocation2-r18) associated with the *epochTime* in SIB19. So in the current spec, the reference location for neighbour cells (i.e. referenceLocation2-r18) is only included in the *condEventD2* configuration, specified as mandatorily present.

|  |
| --- |
| condEventD2-r18 SEQUENCE {  distanceThreshFromReference1-r18 INTEGER(0.. 65525),  distanceThreshFromReference2-r18 INTEGER(0.. 65525),  referenceLocation1-r18 ReferenceLocation-r17,  referenceLocation2-r18 ReferenceLocation-r17,  hysteresisLocation-r18 HysteresisLocation-r17,  timeToTrigger-r18 TimeToTrigger  } |

However, we find that configuring the *ephemerisInfo*/*epochTime* and associated reference location in different signalling does not work, so above agreement on using SIB19 neighbour cell info for EMC CHO cannot be supported correctly via signalling design in the current Spec.

See below example in Figure 1. As illustrated above, if the *epochTime* and *ephemerisInfo* are not provided in RRC Reconfiguration for *condEventD2*, the UE will refer to SIB19 to obtain the neighbor information for the corresponding candidate target cell. Then for a given neighbor cell, the UE\_m may obtain SIB19 at t1, and the *epochTime* used by UE\_m is EpochTime\_m; while UE\_n actually obtains SIB19 at t2, and the *EpochTime* used by UE\_n is EpochTime\_n. Since the gNB cannot know the exact moment when UE\_m and UE\_n really acquire SIB19 successfully, it cannot know what exact *epochTime* value UE\_m and UE\_n are actually using respectively. This further leads to the problem that the NW cannot figure out the *referenceLocation2* value associated with the *epochTime* really used by UE\_n and UE\_m, thus unable to configure *referenceLocation2* in *condEventD2* for them at all. Same problem holds for any UE, if NW intends to rely on the neighbor cell assistance information in SIB19 but provide the *referenceLocation2* via dedicated signaling as per the current Spec.



**Figure 1: Unawareness of actual *EpochTime* value acquired by each UE from SIB19 by NW**

Some companies are holding the view that the NW implementation can guarantee configuring in condEventD2 a proper ReferenceLocation2 associated with the *ephemerisInfo*/*epochTime* in the SIB19 for the same neighbor cell. Specifically,

* One argument was that the conditional reconfiguration event is configured by the source node. This node has complete knowledge of which epoch time is being broadcast in Sib19 at the moment of sending the CHO command. Then, it can configure the location accordingly. Thus, any misalignment which could not be solved by network implementation is not seen.
* Also, some other arguments defending this view is that in the scenario presented in the Figure 1, if the NW sends a referenceLocation2 at time t3 and is uncertain which *epochTime* the UE will use for it, then perhaps the NW can send also the associated *epochTime* in the same RRC Reconfiguration. However, if *epochTime* information is missing in RRC Reconfiguration comprising the referenceLocation2, then it means the NW knows what the UE uses (i.e. epochTime\_m or epochTime\_n). From UE’s perspective, the reception of such referenceLocationX shall be simple and should not result in any restart of T430 (if new *epochTime* is not given in RRC Reconfiguration).

As a response to above arguments, the problem in Figure 1 cannot be avoided by the NW implementation that always configures referenceLocation2 according to the latest broadcast epochTime values. Specifically, in Figure 1, when the NW wants to provide the ReferenceLocation2 at t3 to UE\_m and if it configures the referenceLocation2 according to EpochTime\_n (i.e. latest epochTime broadcast at t3), the configured referenceLocation2 suffers from a mismatch w.r.t. the epochTime really used by UE\_m (i.e. EpochTime\_m). The reason why to have this gap is that after UE\_m successfully acquires SIB19 at t1 with EpochTime\_m, it will not re-acquire SIB19 at t2 and thus won’t update to EpochTime\_n, with T430 not having expired yet. Note that it is a typical case that epochTime is updated (much) more frequently than ephemeris update, i.e.: before T430 expiry epochTime may be updated many times already. Also, the problem in Figure 1 is identified from a per-UE perspective, and the key point here is how NW can know what EpochTime value the UE really uses. In general the NW cannot know in which specific moment the UE successfully receives/reads a SIB (due to no reliable SIB delivery mechanism); also, there is no guarantee that all UEs’ T430 expires (thus starting to re-acquire SIB19) at the same time.

Based on companies' views collected during pre-meeting offline discussion, it is proposed that RAN2 first discusses and confirms whether the agreement that "If ephemeris and epochTime information for candidate CHO cell is not provided in RRC Reconfiguration, the UE may use the corresponding neighbour information from SIB19" can be really supported by the Current Spec, considering that s the NW may be unable to configure a moving reference location associated with the neighbor cell *ephemerisInfo*/*epochTime* in SIB19 as per the current signaling design).

**Proposal 0: RAN2 discusses whether the agreement "UE may use the corresponding neighbour information from SIB19" for EMC CHO can be supported by the signaling in current Spec (considering that the NW may be unable to associate in condEventD2 a correct moving reference location with the neighbor cell *ephemerisInfo*/*epochTime* provided in SIB19 for each UE).**

## 2.2 Solution discussion

To address the problem identified in Proposal 0, there are following options proposed by companies during the pre-meeting offline discussion:

* [Option 1]: To resolve the problem and support the above agreement in Table 1 correctly for neighbor cell, it is straightforward that the moving reference location of a neighbor cell should also be broadcasted in SIB19, if the *epochTime* and *ephemerisInfo* are not provided in RRC Reconfiguration. Because for EMC, only if *ephemeris*, *epochTime* and associated moving reference location are configured in the same place, can the UE figure out the real moving reference location associated with the *epochTime*.
* [Option 2]: Change the *epochTime* in condEventD2 to be a mandatory parameter, which acts as the associated *epochTime* to the *referencLocation2*. This typically means a revision to the previous agreement that the UE may only use the *ephermerisInfo*, but not *epochTime* anymore, of the corresponding neighbor cell in SIB19.
* [Option 3]: Revert and no more support the previous agreement to allow the use of neighbor cell *ephemerisInfo*/*epochTime* in SIB19 for EMC CHO. This option was raised due to the fact that there has been no specific signaling/procedure introduced to support this agreement till now, so if there is no longer sufficient desire to pursue the agreement, we can just leave the current Spec as is

In order to resolve the problem identified in Proposal 0, RAN2 is suggested to down-select above options.

**Proposal 1: RAN2 down-selects following options, if it is confirmed that the agreement cannot be supported by current Spec in Proposal 0 for EMC CHO:**

* **Option 1: Introduce moving reference location (which is associated with the *epochTime*) for each neighbor cell indicated in SIB19, and stick to previous agreement.**
* **Option 2: Change the *epochTime* in condEventD2 to be mandatorily present, and revise previous agreement to allow UE to use only *ephemerisInfo* of corresponding neighbor cell in SIB19.**
* **Option 3: Revert previous agreement and no more support the use of neighbor cell *ephemerisInfo*/*epochTime* in SIB19.**

If Option 1 or Option 2 is agreed, another issue from signaling perspective is how to associate the information provided in SIB19 and *condEventD2* provided via dedicated signaling. There are following solutions also appearing in the pre-meeting offline discussion:

* [Solution A]: One solution is to define an index for the candidate target cell, referring to the neighbor list in SIB19. The UE can get the *referenceLocation*, *epochTime* and *ephemerisInfo* of the candidate cell from SIB19 according to the index indicated in the associated *condEventD2*. Then, the UE can perform the evaluation on the candidate cells configured with *condEventD2*, based on the distance threshold carried by dedicated signaling, and *referenceLocation*/*epochTime* and *ephemerisInfo* broadcasted in SIB19. That is, in order to get the moving reference location of the candidate cell, the NW should provide either the reference location directly or the neighbor cellindex referring to SIB19 in condEventD2 via dedicated signalling. So, it is suggested using a Choice structure to realize this purpose.
* [Solution B]: Another solution is to use the "PCI" and "Frequency Information" included in the candidate cell CHO configuration and in the neighbor cell list in SIB19 to do such association.

**Proposal 2: If RAN2 agrees option 1 or 2 in Proposal 1, further down-select the following solutions on how to associate the condEventD2 of a candidate cell with the corresponding neighbor cell information in SIB19:**

* **Solution 1: Define an index in *condEventD2* for candidate target cell, referring to the corresponding neighbor cell in SIB19. Use a Choice signaling structure, the NW configures in *condEventD2* either a *referenceLocation* directly or this index.**
* **Solution 2: Use "PCI" and "Frequency Information" included in the candidate cell CHO configuration and in the neighbor cell configuration in SIB19 to do the association.**

A TP corresponding to Option 1 in Proposal 1 plus Solution 1 in Proposal 2 is proposed in the Annex. RAN2 can take it into account if corresponding option and solution are agreed.

# Relevance with serving cell config. for EMC CHO (w.r.t. C619)

A related issue was raised during pre-meeting offline discussion regarding if the same issue exists for referenceLocation1 in condEventD2 for an earth-moving serving cell, as the serving cell’s epoch time in SIB19 is applied for referenceLocation1. Actually, there is also a relevant issue raised in C619 about the serving cell, and it seems also the RRC Rapp's view that the serving cell *ephemeris* and *epochTime* in SIB19 are used by default, along with referenceLocation1 in condEventD2.

**[RIL]**: C619 **[Delegate]**: CATT (Xiao) **[WI]**: NTN **[Class]**: 2 **[Status]**: PropReject **[TDoc]**: R2-24xxxxx **[Proposed Conclusion]**: v122

**[Description]**: Missing serving cell ephemeris and epochTime information for condEventD2

**[Proposed Change]**: Only the ephemeris and epochTime are specified here for the candidate target cell of condEventD2, but there has been no ephemeris and epochTime information currently introduced also for serving cell. There seems to have been no clear agreement on how the UE calculates the distance with the serving cell for condEventD2 and whether new signaling for serving cell’s ephemeris/epochTime is also needed. Considering that the serving cell’s ephemeris and epochTime is anyway provided in SIB19, there could be two options to address this issue:

* Option 1: Rely always on the ephemeris and epochTime, also the associated movingReferenceLocation, in SIB19, and remove the referenceLocation1 in condEventD2.
* Option 2: Introduce also ephemeris and epochTime in dedicated signaling used for condEventD2, and change referencLocation1 in condEventD2 to OPTIONAL.

We will bring a contribution to address this issue.

**[Comments]**: [Ericsson - Ignacio] We think this was already discussed during RAN2#124. UE already has ephemeris info and epochTime from serving satellite. Otherwise, RRC connection would not be possible. [CATT (Xiao)\_v167] If one assumes relying on ephemeris info and epochTime in SIB19, the procedure for condEventD2 evaluation needs to clarify this. Also, it is technically infeasible to rely on the ephemeris info and epochTime in SIB19, and at the same time rely on the referenLocation1 in condEventD2. We will elaborate this problem, along with C606, in a contribution.

Till now, there is no serving cell *ephemerisInfo*/*epochTime* specified in condEventD2, and if above assumption to use SIB19 for serving cell is the common understanding/consensus, it is straightforward that same issue in Proposal 0 holds for the serving cell, with now the *ephemerisInfo*/*epochTime* configured in SIB19 but the associated moving reference location configured in dedicated signaling.

To this end, after a solution is concluded above for candidate target cell above, we suggest RAN2 to discuss whether the same solution to be agreed can be directly used to address the serving cell case.

**Proposal 3: If a solution is agreed above to use neighbor cell *ephemerisInfo* and/or *epochTime* in SIB19 for EMC CHO, RAN2 discusses whether the same solution can be reused for serving cell.**

# Conclusion

In this document, we analyse RIL issues C606 for CHO in EMC and our observations andproposals are provided below:

**Proposal 0: RAN2 discusses whether the agreement "UE may use the corresponding neighbour information from SIB19" for EMC CHO can be supported by the signaling in current Spec (considering that the NW may be unable to associate in condEventD2 a correct moving reference location with the neighbor cell *ephemerisInfo*/*epochTime* provided in SIB19 for each UE).**

**Proposal 1: RAN2 down-selects following options, if it is confirmed that the agreement cannot be supported by current Spec in Proposal 0 for EMC CHO:**

* **Option 1: Introduce moving reference location (which is associated with the *epochTime*) for each neighbor cell indicated in SIB19, and stick to previous agreement.**
* **Option 2: Change the *epochTime* in condEventD2 to be mandatorily present, and revise previous agreement to allow UE to use only *ephemerisInfo* of corresponding neighbor cell in SIB19.**
* **Option 3: Revert previous agreement and no more support the use of neighbor cell *ephemerisInfo*/*epochTime* in SIB19.**

**Proposal 2: If RAN2 agrees option 1 or 2 in Proposal 1, further down-select the following solutions on how to associate the condEventD2 of a candidate cell with the corresponding neighbor cell information in SIB19:**

* **Solution 1: Define an index in *condEventD2* for candidate target cell, referring to the corresponding neighbor cell in SIB19. Use a Choice signaling structure, the NW configures in *condEventD2* either a *referenceLocation* directly or this index.**
* **Solution 2: Use "PCI" and "Frequency Information" included in the candidate cell CHO configuration and in the neighbor cell configuration in SIB19 to do the association.**

**Proposal 3: If a solution is agreed above to use neighbor cell *ephemerisInfo* and/or *epochTime* in SIB19 for EMC CHO, RAN2 discusses whether the same solution can be reused for serving cell.**

# Reference

1. RAN2#124 meeting report

# Annex A: TP for Option 1 in Proposal 1 plus Solution 1 in Proposal 2

6.3.1 System information blocks

*– SIB19*

*SIB19* contains satellite assistance information for NTN access.

***SIB19* information element**

-- ASN1START

-- TAG-SIB19-START

SIB19-r17 ::= SEQUENCE {

ntn-Config-r17 NTN-Config-r17 OPTIONAL, -- Need R

t-Service-r17 INTEGER (0..549755813887) OPTIONAL, -- Need R

referenceLocation-r17 ReferenceLocation-r17 OPTIONAL, -- Need R

distanceThresh-r17 INTEGER(0..65525) OPTIONAL, -- Need R

ntn-NeighCellConfigList-r17 NTN-NeighCellConfigList-r17 OPTIONAL, -- Need R

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[

ntn-NeighCellConfigListExt-v1720 NTN-NeighCellConfigList-r17 OPTIONAL -- Need R

]],

[[

movingReferenceLocation-r18 ReferenceLocation-r17 OPTIONAL, -- Need R

satSwitchWithReSync-r18 SatSwitchWithReSync-r18 OPTIONAL, -- Need R

ntn-NeighCellConfigList-v18xy NTN-NeighCellConfigList-v18xy OPTIONAL, -- Need R

ntn-NeighCellConfigListExt-v18xy NTN-NeighCellConfigList-v18xy OPTIONAL -- Need R

]]

}

NTN-NeighCellConfigList-r17 ::= SEQUENCE (SIZE(1..maxCellNTN-r17)) OF NTN-NeighCellConfig-r17

NTN-NeighCellConfigList-v18xy ::= SEQUENCE (SIZE(1..maxCellNTN-r17)) OF NTN-NeighCellConfig-v18xy

NTN-NeighCellConfig-r17 ::= SEQUENCE {

ntn-Config-r17 NTN-Config-r17 OPTIONAL, -- Need R

carrierFreq-r17 ARFCN-ValueNR OPTIONAL, -- Need R

physCellId-r17 PhysCellId OPTIONAL -- Need R

}

NTN-NeighCellConfig-v18xy ::= SEQUENCE {

movingNeighCellReferenceLocation-r18 ReferenceLocation-r17 OPTIONAL -- Need R

}

SatSwitchWithReSync-r18 ::= SEQUENCE {

ntn-Config-r18 NTN-Config-r17,

t-ServiceStart-r18 INTEGER (0..549755813887) OPTIONAL, -- Need R

ssb-TimeOffset-r18 INTEGER (0..159) OPTIONAL -- Need R

}

-- TAG-SIB19-STOP

-- ASN1STOP

| ***SIB19* field descriptions** |
| --- |
| ***distanceThresh***  Distance from the serving cell reference location and is used in location-based measurement initiation in RRC\_IDLE and RRC\_INACTIVE, as defined in TS 38.304 [20]. Each step represents 50m. |
| ***movingReferenceLocation***  Reference location of the serving cell of an NTN Earth moving system at a time reference. It is used in location-based measurement initiation in RRC\_IDLE and RRC\_INACTIVE, as defined in TS 38.304 [20]. The time reference of this field is indicated by *epochTime* in *ntn-Config* of the serving cell. This field is excluded when determining changes in system information, i.e., changes to *movingReferenceLocation* should neither result in system information change notifications nor in a modification of *valueTag* in *SIB1*. This field is only present in an NTN cell. |
| ***movingNeighCellReferenceLocation***  Reference location of the neighbour cell of an NTN Earth moving system at a time reference. It is used for *CondEventD2* measurement evaluation. The time reference of this field is indicated by *epochTime* in *ntn-Config* of the neighbour cell. This field is excluded when determining changes in system information, i.e., changes to *movingNeighCellReferenceLocation* should neither result in system information change notifications nor in a modification of *valueTag* in *SIB1*. This field is only present in an NTN cell. |
| ***ntn-Config***  Provides parameters needed for the UE to access NR via NTN access such as Ephemeris data, common TA parameters, k\_offset, validity duration for UL sync information and epoch. In a TN cell, this field is only present in *ntn-NeighCellConfigList* and *ntn-NeighCellConfigListExt*. |
| ***ntn-NeighCellConfigList, ntn-NeighCellConfigListExt***  Provides a list of NTN neighbour cells including their *ntn-Config*, carrier frequency and *PhysCellId*. This set includes all elements of *ntn-NeighCellConfigList* and all elements of *ntn-NeighCellConfigListExt*. If *ntn-Config* is absent for an entry in *ntn-NeighCellConfigListExt*, the *ntn-Config* provided in the entry at the same position in *ntn-NeighCellConfigList* applies. Network provides *ntn-Config* for the first entry of *ntn-NeighCellConfigList.* If the *ntn-Config* is absent for any other entry in *ntn-NeighCellConfigList*, the *ntn-Config* provided in the previous entry in *ntn-NeighCellConfigList* applies. If *ntn-NeighCellConfigList-v18xy/ntn-NeighCellConfigListExt-v18xy* is present, it shall contain the same number of entries, listed in the same order as in *ntn-NeighCellConfigList/* *ntn-NeighCellConfigListExt* (without suffix). |
| ***referenceLocation***  Reference location of the serving cell provided via NTN quasi-Earth fixed system and is used in location-based measurement initiation in RRC\_IDLE and RRC\_INACTIVE, as defined in TS 38.304 [20]. This field is only present in an NTN cell. |
| ***satSwitchWithReSync***  Provides parameters for the target satellite required to perform satellite switch with re-synchronization. This field is only present in an NTN cell and its presence indicates that satellite switch without PCI change is supported in the cell. |
| ***t-Service***  Indicates the time information on when a cell provided via NTN system is going to stop serving the area it is currently covering. This field applies for both service link switches in NTN quasi-Earth fixed system and feeder link switches for both NTN quasi-Earth fixed and Earth moving system. The field indicates a time in multiples of 10 ms after 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Sunday, December 31, 1899 and Monday, January 1, 1900). The exact stop time is between the time indicated by the value of this field minus 1 and the time indicated by the value of this field. This field is only present in an NTN cell. The reference point for t-Service is the uplink time synchronization reference point of the cell. |

| ***satSwitchWithReSync* field descriptions** |
| --- |
| ***ssb-TimeOffset***  Indicates the time offset between the SSB from source and target satellite at the uplink time synchronization reference point. It is given in number of subframes. |
| ***t-ServiceStart***  Indicates the time information on when the target satellite is going to start serving the area currently covered by the serving satellite. The field indicates a time in multiples of 10 ms after 00:00:00 on Gregorian calendar date 1st January 1900 (midnight between Sunday, December 31, 1899, and Monday, January 1, 1900). The exact start time is between the time indicated by the value of this field minus 1 and the time indicated by the value of this field. |

[...]

6.3.2 Radio resource control information elements

– *ReportConfigNR*

[...]

***ReportConfigNR* information element**

-- ASN1START

-- TAG-REPORTCONFIGNR-START

ReportConfigNR ::= SEQUENCE {

reportType CHOICE {

periodical PeriodicalReportConfig,

eventTriggered EventTriggerConfig,

...,

reportCGI ReportCGI,

reportSFTD ReportSFTD-NR,

condTriggerConfig-r16 CondTriggerConfig-r16,

cli-Periodical-r16 CLI-PeriodicalReportConfig-r16,

cli-EventTriggered-r16 CLI-EventTriggerConfig-r16,

rxTxPeriodical-r17 RxTxPeriodical-r17,

reportOnScellActivation-r18 ReportOnScellActivation-r18

}

}

ReportCGI ::= SEQUENCE {

cellForWhichToReportCGI PhysCellId,

...,

[[

useAutonomousGaps-r16 ENUMERATED {setup} OPTIONAL -- Need R

]]

}

ReportSFTD-NR ::= SEQUENCE {

reportSFTD-Meas BOOLEAN,

reportRSRP BOOLEAN,

...,

[[

reportSFTD-NeighMeas ENUMERATED {true} OPTIONAL, -- Need R

drx-SFTD-NeighMeas ENUMERATED {true} OPTIONAL, -- Need R

cellsForWhichToReportSFTD SEQUENCE (SIZE (1..maxCellSFTD)) OF PhysCellId OPTIONAL -- Need R

]]

}

CondTriggerConfig-r16 ::= SEQUENCE {

condEventId CHOICE {

condEventA3 SEQUENCE {

a3-Offset MeasTriggerQuantityOffset,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger

},

condEventA5 SEQUENCE {

a5-Threshold1 MeasTriggerQuantity,

a5-Threshold2 MeasTriggerQuantity,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger

},

...,

condEventA4-r17 SEQUENCE {

a4-Threshold-r17 MeasTriggerQuantity,

hysteresis-r17 Hysteresis,

timeToTrigger-r17 TimeToTrigger

},

condEventD1-r17 SEQUENCE {

distanceThreshFromReference1-r17 INTEGER(0.. 65525),

distanceThreshFromReference2-r17 INTEGER(0.. 65525),

referenceLocation1-r17 ReferenceLocation-r17,

referenceLocation2-r17 ReferenceLocation-r17,

hysteresisLocation-r17 HysteresisLocation-r17,

timeToTrigger-r17 TimeToTrigger

},

condEventT1-r17 SEQUENCE {

t1-Threshold-r17 INTEGER (0..549755813887),

duration-r17 INTEGER (1..6000)

},

condEventD2-r18 SEQUENCE {

distanceThreshFromReference1-r18 INTEGER(0.. 65525),

distanceThreshFromReference2-r18 INTEGER(0.. 65525),

referenceLocation1-r18 ReferenceLocation-r17,

referenceLocation2-r18 CHOICE {

referenceLocation-r18 ReferenceLocation-r17,

neighCellConfigIndex-r18 INTEGER(1..maxCellNTN-r18)

},

hysteresisLocation-r18 HysteresisLocation-r17,

timeToTrigger-r18 TimeToTrigger

}

},

rsType-r16 NR-RS-Type,

...,

[[

nesEvent-r18 ENUMERATED {true} OPTIONAL -- Need R

]]

}

[...]

CellIndividualOffsetList-r18 ::= SEQUENCE {

physCellId-r18 PhysCellId,

cellIndividualOffset-r18 Q-OffsetRangeList

}

-- TAG-REPORTCONFIGNR-STOP

-- ASN1STOP

|  |
| --- |
| ***CondTriggerConfig* field descriptions** |
| ***a3-Offset***  Offset value(s) to be used in NR conditional reconfiguration triggering condition for cond event a3. The actual value is field value \* 0.5 dB. |
| ***a4-Threshold***  Threshold value associated to the selected trigger quantity (e.g. RSRP, RSRQ, SINR) per RS Type (e.g. SS/PBCH block, CSI-RS) to be used in NR conditional reconfiguration triggering condition for cond event a4. |
| ***a5-Threshold1/ a5-Threshold2***  Threshold value associated to the selected trigger quantity (e.g. RSRP, RSRQ, SINR) per RS Type (e.g. SS/PBCH block, CSI-RS) to be used in NR conditional reconfiguration triggering condition for cond event a5. In the same *condeventA5*, the network configures the same quantity for the *MeasTriggerQuantity* of the *a5-Threshold1* and for the *MeasTriggerQuantity* of the *a5-Threshold2*. |
| ***condEventId***  Choice of NR conditional reconfiguration event triggered criteria. |
| ***distanceThreshFromReference1, distanceThreshFromReference2***  Distance from a fixed reference location configured with *referenceLocation1* or *referenceLocation2* or a moving reference location determined by the UE based on *referenceLocation1* or *referenceLocation2*. Each step represents 50m. |
| ***duration***  This field is used for defining the leaving condition T1-2 for conditional HO event *condEventT1*. Each step represents 100ms. |
| ***nesEvent***  Indicates the event is a NES-specific CHO event and the event is only considered to be satisfied if indication from lower layers is received indicating the applicability of NES-specific CHO event and the related entry condition(s) is fulfilled. This field can only be configured for *condEventA3*, *condEventA4* or *condEventA5*. |
| ***referenceLocation1, referenceLocation2***  Reference locations used for *condEventD1* and *condEventD2*. The r*eferenceLocation1* is associated to serving cell and *referenceLocation2* is associated to candidate target cell.  For candidate target cell, if *neighCellConfigIndex* is configured, itrefers to a neighbour cell included in the *ntn-NeighCellConfigList* and *ntn-NeighCellConfigListExt* in SIB19. Value 1 indicate the first entry of *ntn-NeighCellConfigList*, Value 2 indicate the second entry of *ntn-NeighCellConfigList*, and so on. Value 5 indicate the first entry of *ntn-NeighCellConfigListExt*, Value 6 indicate the second entry of *ntn-NeighCellConfigListExt*, and so on. For the neighbour cell indexed, the *movingNeighCellReferenceLocation* and corresponding epoch time and satellite ephemeris included in *ntn-Config* is used for the evaluation of *condEventD2*. If *referenceLocation* is configured, network configures also *ntn-NeighbourCellInfo* for the candidate target cell in the corresponding *measObjectNR*. |
| ***t1-Threshold***  The field counts the number of UTC seconds in 10 ms units since 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Sunday, December 31, 1899 and Monday, January 1, 1900). |
| ***timeToTrigger***  Time during which specific criteria for the event needs to be met in order to execute the conditional reconfiguration evaluation. |

[...]

6.4 RRC multiplicity and type constraint values

– Multiplicity and type constraint definitions

-- ASN1START

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxAdditionalRACH-r17 INTEGER ::= 256 -- Maximum number of additional RACH configurations.

maxAI-DCI-PayloadSize-r16 INTEGER ::= 128 --Maximum size of the DCI payload scrambled with ai-RNTI

maxAI-DCI-PayloadSize-1-r16 INTEGER ::= 127 --Maximum size of the DCI payload scrambled with ai-RNTI minus 1

maxBandComb INTEGER ::= 65536 -- Maximum number of DL band combinations

maxBandsUTRA-FDD-r16 INTEGER ::= 64 -- Maximum number of bands listed in UTRA-FDD UE caps

maxCandidateBandIndex-r18 INTEGER ::= 8 -- Maximum number of band entry index for MUSIM capability

maxBH-RLC-ChannelID-r16 INTEGER ::= 65536 -- Maximum value of BH RLC Channel ID

maxBT-IdReport-r16 INTEGER ::= 32 -- Maximum number of Bluetooth IDs to report

maxBT-Name-r16 INTEGER ::= 4 -- Maximum number of Bluetooth name

maxCAG-Cell-r16 INTEGER ::= 16 -- Maximum number of NR CAG cell ranges in SIB3, SIB4

maxTwoPUCCH-Grp-ConfigList-r16 INTEGER ::= 32 -- Maximum number of supported configuration(s) of {primary PUCCH group

-- config, secondary PUCCH group config}

maxTwoPUCCH-Grp-ConfigList-r17 INTEGER ::= 16 -- Maximum number of supported configuration(s) of {primary PUCCH group

-- config, secondary PUCCH group config} for PUCCH cell switching

maxCBR-Config-r16 INTEGER ::= 8 -- Maximum number of CBR range configurations for sidelink communication

-- congestion control

maxCBR-Config-1-r16 INTEGER ::= 7 -- Maximum number of CBR range configurations for sidelink communication

-- congestion control minus 1

maxCBR-Level-r16 INTEGER ::= 16 -- Maximum number of CBR levels

maxCBR-Level-1-r16 INTEGER ::= 15 -- Maximum number of CBR levels minus 1

maxCellATG-r18 INTEGER ::= 8 -- Maximum number of ATG neighbour cells for which assistance information is

-- provided

maxCellExcluded INTEGER ::= 16 -- Maximum number of NR exclude-listed cell ranges in SIB3, SIB4

maxCellGroupings-r16 INTEGER ::= 32 -- Maximum number of cell groupings for NR-DC

maxCellHistory-r16 INTEGER ::= 16 -- Maximum number of visited PCells reported

maxPSCellHistory-r17 INTEGER ::= 16 -- Maximum number of visited PSCells across all reported PCells

maxCellInter INTEGER ::= 16 -- Maximum number of inter-Freq cells listed in SIB4

maxCellIntra INTEGER ::= 16 -- Maximum number of intra-Freq cells listed in SIB3

maxCellMeasEUTRA INTEGER ::= 32 -- Maximum number of cells in E-UTRAN

maxCellMeasIdle-r16 INTEGER ::= 8 -- Maximum number of cells per carrier for idle/inactive measurements

maxCellMeasUTRA-FDD-r16 INTEGER ::= 32 -- Maximum number of cells in FDD UTRAN

maxCellNTN-r17 INTEGER ::= 4 -- Maximum number of NTN neighbour cells for which assistance information is

-- provided

maxCellNTN-r18 INTEGER ::= 8 -- Maximum number of cell index referring to NTN neighbour cells in SIB19

maxCarrierTypePairList-r16 INTEGER ::= 16 -- Maximum number of supported carrier type pair of (carrier type on which

-- CSI measurement is performed, carrier type on which CSI reporting is

-- performed) for CSI reporting cross PUCCH group

maxCellAllowed INTEGER ::= 16 -- Maximum number of NR allow-listed cell ranges in SIB3, SIB4

maxEARFCN INTEGER ::= 262143 -- Maximum value of E-UTRA carrier frequency

maxEUTRA-CellExcluded INTEGER ::= 16 -- Maximum number of E-UTRA exclude-listed physical cell identity ranges

-- in SIB5

[...]

maxNrofBWPsInSetOfCells-r18 INTEGER ::= 16 -- Maximum number of BWPs configured in a set of cells for multi-cell

-- PDSCH/PUSCH scheduling

maxLowerMSD-r18 INTEGER ::= 256 -- Maximum number of lower MSD capability sets for a victim band

maxLowerMSDInfo-r18 INTEGER ::= 64 -- Maximum number of lower MSD capability sets for a band combination

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP

-- ASN1STOP