3GPP TSG-RAN WG2 Meeting #111-e***R2-200xxxx***

Online, August 17 – 28, 2020

**Agenda item:** 6.6.3

**Source:** Qualcomm Incorporated

**Title:** Summary of email discussion [AT111-e][611][POS] LPP miscellaneous CR

**Document for:**  Discussion and Decision

# 1. Introduction

This document summarizes the following email discussion:

* [AT111-e][611][POS] LPP miscellaneous CR (Qualcomm)

Scope: Capture RAN2 decisions on P3-P6 of R2-2008120; discuss P7-P16 of R2-2008120 and merge the results into a rapporteur CR.

Intended outcome: Agreeable CR, in R2-2008260

Deadline: Thursday 2020-08-27 1200 UTC

The discussion is split into two parts:

Part 1: Capture RAN2 decisions on P3-P6 of R2-2008120 [0]

Part 2: Discuss P7-P16 of R2-2008120 [0]

[0] R2-2008120, "Summary of LPP corrections agenda item 6.6.3", Qualcomm Incorporated.

[1] R2-2006543, "Correction of DL-PRS-NumSymbols", vivo.

[2] R2-2006546, "Discussion on remaining issues on LPP", vivo.

[3] R2-2006663, "Correction on 37.355 to capture agreements of area scope for posSIB validity", CATT.

[4] R2-2006847, "Need of reference TRP in the TRP-LocationInfo IE for UE-based assistance data distribution efficiency", Ericsson

[5] R2-2006949, "Handling on RAN1 positioning related capabilities", Intel Corporation.

[6] R2-2006950, "Capture RAN1 positioning related capabilities", Intel Corporation.

[7] R2-2007632, "Addition of missing SRS for Positioning capabilities", Qualcomm Incorporated.

[8] R2-2007634, "Assistance data sharing and priority for measurements", Qualcomm Incorporated.

[9] R2-2007635, "Addition of missing padding rule for initial counter c0", Qualcomm Incorporated.

[10] R2-2007833, "Correction of the SRS capability in LPP", Huawei, HiSilicon.

[11] R2-2007834, "Correction on SignalMeasurementInformation", Huawei, HiSilicon.

[12] R2-2007835, "Correction on ProvideAssistantData", Huawei, HiSilicon.

[13] R2-2007836, "Correction on PRS configuration", Huawei, HiSilicon.

[14] R2-2007941, "Correction to NR-SSB-Config", ZTE Corporation, Sanechips.

[15] R2-200xxxx, "Report of session on positioning and sidelink relay", Session Chair (MediaTek).

# 2. Part 1

The conclusion for the Proposals 3 – 8 [0][15] are implemented in a draft CR which is provided in the offline discussion folder:

<https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_111-e/Inbox/Drafts/%5BOffline-611%5D%5BPOS%5D%20LPP%20miscellaneous%20CR%20(Qualcomm)>

with file name:

R2-200xxxx\_(CR 37355 miscellaneous corrections)\_v1.docx

NOTE: This document also implements Proposal 8 of [0] as a starting point for the discussion taking the on-line comments made into account (although, no conclusion was captured in the meeting notes yet).

Companies are invited to provide any comments on \_v1 of the draft CR.

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| Company | Comments |
| Huawei/HiSilicon | We provided inline comments in the draft CR, including   * Suggestions of changing field names to follow ASN.1 naming convention. * Suggestions of changing the field name of SRS resource capability *srs-PosResourcesBandList* * Suggestions of adding field description on omission of the capability signaling. |
| Intel | 1 support Huawei’s editorial comments on field name, also added additional comemnts on them.  2 do not see the need to clarify the UE does not support the feature if the capability is not included.  3 regarding whether new lists are needed or not on SRS. I agree this aligned with RAN1 conclusion as below  “UE only reports the number on bands for the current configured CA band combination.”  But how can it work in the real deployment? For instance, when the LMF request the UE to report the capability, the CA is configured. Therefore the UE does report the capability. And then the CA is removed during the positioning procedure. What shall the UE/LMF do? |
| vivo | Agree with the CR |
| Nokia | Generally, OK with the CR but see few in-line comments in the CR itself.   1. Field description for associated-dl-PRS-ID and updates to trp-Location field description are difficult to understand. What is associated TRP and what is associated DL PRS ID? What do you mean by adopted? We need to think of a better description. 2. Good to have a field description for the field srs-CapabilityBandList 3. In srs-PosResourcesBandList, instead of saying “for the number of bands” we should say “for each band” |
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RAN1 introduced new capabilities 13-19, 13-19a as below, similar to 13-15 and 13-15c, and ask RAN2 to decide on the necessity for location server to know if the feature is supported

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| 13-19 | Simultaneous positioning SRS and MIMO SRS transmission within a band across multiple CCs | 1. The number of SRS resources for positioning and SRS resource for MIMO on a symbol within a band   Candidate values {2}  Note: SRS resource for MIMO refers to SRS resource configured by SRS-Resource.  Note: If UE reports 2 for the candidate value, it means both the number of SRS resource for positioning and SRS resource for MIMO equals to 1.  Note: if the UE does not indicate this capability for a band, the UE does not support the feature in this band |
| 13-19a | Simultaneous positioning SRS and MIMO SRS transmission for a given BC | 1. The number of SRS resources for positioning and SRS resource for MIMO on a symbol for a given BC   Candidate values {2}  Note: SRS resource for MIMO refers to SRS resource configured by SRS-Resource.  Note: If UE reports 2 for the candidate value, it means both the number of SRS resource for positioning and SRS resource for MIMO equals to 1.  Note: For single-band BCs, it defines the capability for intra-band CA, and for BCs with at least two bands, it defines the capability for inter-band CA.  Note: if the UE does not indicate this capability for a band combination, the UE does not support the feature in this band combination |

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| Company | Comments |
| *Intel* | RAN2 have agreed, the LMF does not need to know 13-15, 13-15a. It should be applied for 13-19 and 13-19a, i.e. LMF does not need to know 13-19 and 13-19a. |
| *vivo* | Agree with intel |
| *Nokia* | LMF does not have to know UE capabilities 13-19 and 13-19a. |

# 3. Part 2

## 3.1 Description of TimingReportingGranularityFactor [2]

Reason for change:

The field description for the *TimingReportingGranularityFactor* in IE *NR-DL-TDOA-ReportConfig* and IE *NR-Multi-RTT-ReportConfig* currently specifies:

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| ***timingReportingGranularityFactor***  This field specifies the reporting granularity for the UE timing measurements (DL RSTD, the UE Rx-Tx time difference). |

However, the above description is not enough to reflect the relationship between LMF request and UE report.

Summary of Change:

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| ***timingReportingGranularityFactor***  This field specifies the reporting granularity for the UE timing measurements (DL RSTD, the UE Rx-Tx time difference). Value (0..5 ) correspond to (k0-r16.. k5-r16 ) of nr-RSTD-r16 and nr-RSTD-ResultDiff-r16 in NR-DL-TDOA-MeasElement-r16.  This field in *NR-DL-TDOA-RequestLocationInformation* is used for the LMF to recommend the reporting granularity. The UE may select a granularity value for timing report which is different from the LMF request and informs the LMF. |

Rapporteur Comments:

The description should be for DL RSTD in IE *NR-DL-TDOA-ReportConfig* and for UE Rx-Tx time difference in IE *NR-Multi-RTT-ReportConfig* (i.e., first sentence of the field description should also be corrected).

**Proposal 9:** With respect to the *timingReportingGranularityFactor* field description, RAN2 to check the details of the proposed field description in R2-2006546 [9] and then merge it into LPP Rapporteur CR.

Companies are invited to provide any comments on Proposal 9 and/or on the details of the proposed change:

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| Company | Comments |
| Huawei/HiSilicon | OK with the change in general. A small modication is as follows.  ***timingReportingGranularityFactor***  This field specifies the recommendated reporting granularity for the UE timing measurements (DL RSTD, the UE Rx-Tx time difference). Value (0..5 ) correspond to (k0.. k5 ) used for *nr-RSTD* and *nr-RSTD-ResultDiff* in *NR-DL-TDOA-MeasElement*.  The UE may select a different granularity value for *nr-RSTD* and *nr-RSTD-ResultDiff*. |
| Intel | Huawei’s suggestion is ok. |
| vivo | OK with huawei’s suggestion. |
| Nokia | Huawei suggestion is OK. But there are typos in the field description that needs to be corrected. I assume there is more detail in RAN4 specification on these. If so, good to add a RAN4 specification reference to the field description. |
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## 3.2 Description of *nr-RSTD-ResultDiff’* [2],[11]

Reason for change:

In current TS 37.355, there is no descriptions of *nr-RSTD-ResultDiff* in IE *NR-DL-TDOA-SignalMeasurementInformation* field descriptions.

Summary of Change:

[2] proposes:

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| ***nr-RSTD-ResultDiff***  This field specifies the relative timing of the reference TRP between different resources under the reference path.  *nr-RSTD-ResultDiff* also need follow *timingReportingGranularityFactor-r16* requirement in *NR-DL-TDOA-ReportConfig-r16* |

[11] proposes:

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| ***nr-RSTD-ResultDiff***  This field specifies the additional DL RSTD measurement results relative to *nr-RSTD*. Mapping of the measured quantity is defined as in TS 38.133 [46]. |

Rapporteur Comments:

The proposed text in [11] seems clearer; reference for the report mapping is needed. In addition, this is not the only *xxx‑ResultDiff* field description which is missing. [11] adds the other missing descriptions as well (see section 3.4).

**Proposal 10:** With respect to the missing field description for *nr-RSTD-ResultDiff* use R2-2007834 [11] as baseline (see also Proposal 12).

Companies are invited to provide any comments on Proposal 10:

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| Company | Comments |
| Huawei/HiSilicon | Support |
| Intel | Agree |
| vivo | Support in principle, but we think the relationship between granularity of *nr-RSTD-ResultDiff* and *nr-RSTD* should be clarified. Therefore we suggest changing the wording to  ***nr-RSTD-ResultDiff***  This field specifies the additional DL RSTD measurement results relative to *nr-RSTD*. The reporting granularity of *nr-RSTD-ResultDiff* is the same as *nr-RSTD* . Detail mapping of the measured quantity is defined as in TS 38.133 [46]. |
| Nokia | Agree with Proposal 10 (use R2-2007834 [11] as baseline) |
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## 3.3 *areaScope* for posSIB validity [3]

Reason for change:

In last RAN2#110e meeting, it was agreed:

Agreements:

Postpone the separate positioning system information area ID to Rel-17 and reuse the existing area ID.

However, the above agreement highlighted in yellow is not captured in either RRC or LPP.

Summary of Change:

A general description of posSIB validity is introduced in section 7.1:

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| 7.1 General  […]  Any NR posSIB can be configured to be cell specific or area specific, based on *areaScope* in *posSIB-MappingInfo* provided by lower layer. The cell specific posSIB is applicable only within a cell that provides the posSIB while the area specific posSIB is applicable within an area referred to as SI area, which consists of one or several cells and is identified by s*ystemInformationAreaID* provided by lower layer*.* If the UE stores the acquired area specific posSIB, then the UE stores the associated s*ystemInformationAreaID* provided by lower layer. The UE checks the area validity of stored posSIB based on s*ystemInformationAreaID* and *areaScope* specified in TS 38.331 [35], *valueTag* (if available)defined in the IE *AssistanceDataSIBelement*. If both s*ystemInformationAreaID* and *valueTag* (if available) of the stored version of a posSIB are identical to the posSIB received from the current serving cell, the stored posSIB is considered as valid. |

Rapporteur Comments:

It seems that (at least parts of) the proposed text would be more appropriate for TS 38.331. The proposed text also seems to provide some procedure description and not only "general information".

**Proposal 11:** With respect to the *areaScope* for posSIBs, RAN2 to discuss and decide whether any additional specification in TS 37.355 is needed or not. If additional specification is needed in TS 37.355, check the details of the proposed changes in R2-2006663 [3] and then merge it into LPP Rapporteur CR.

Companies are invited to provide any comments on Proposal 11 and/or on the details of the proposed change:

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| Company | Comments |
| Huawei, HiSilicon | OK to have some descriptions in LPP spec for the posSIB validity.  But in the current text, there is no description for the ExpirationTimer? and if we check the validity of the posSIB, a condition for the expiration timer needs to be added? Also, we have already added value tag there is no reason not to consider for expiration timer |
| Intel | Normally the validity of system information is checked in RRC layer instead of LPP layer. The problem here is, value tag contained in LPP, and area scope is contained in RRC. We still believe it will be good to handle this validity of assistance data in RRC together with other system information. But we do not need to specify how the RRC get the value tag. It can be done by implementation. |
| vivo | This should be part of 38.331. |
| Nokia | We also think that the details of posSIB validity should be captured in 38.331. |
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## 3.4 Signal measurement information [11]

Reason for change:

Several field descriptions in IEs *xxx-SignalMeasurementInformation* are either missing or not correct.

Summary of Change:

1 Add field description for nr-RSRP and nr-RSRQ for NR E-CID.

2 Fixed the citation of the DL PRS-RSRQ with definition in TS 38.215, and mapping in TS 38.133.

3 Add field descriptions for nr-TimeStamp for DL-TDOA, DL-AOD, and Multi-RTT, nr-TimingQuality for Multi-RTT, fields associated with additional measurements for DL-TDOA, DL-AoD, and Multi-RTT.

4 Remove nr-UE-RxTxTimeDiffAdditional from the field description of nr-AdditionalPathList for Multi-RTT.

5 Add field description for nr-DL-TDOA-AdditionalMeasurements, nr-RSTD-ResultDiff, nr-DL-PRS-RSRP-ResultDiff, nr-DL-TDOA-AdditionalMeasurements, dl-PRS-RSRP-ResultDiff

Rapporteur Comments:

There is currently no logic visible in the order of the fields in the field description Tables. In LPP, the fields are typically listed in the order as the field appears in the ASN.1. Given that many new parent IEs contain now several child-IEs in the same section, we could also consider sorting them alphabetically. However, currently, the order seems rather random.

**Proposal 12:** RAN2 to check the details in R2-2007834 [11] and then merge it into the LPP Rapporteur CR.

Companies are invited to provide any comments on Proposal 12 and/or on the details of the proposed change:

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| Company | Comments |
| Huawei/HiSilicon | Agree with the change in [11].  Regarding the field sorting, we are OK with either alphabetically or in the order of field appearance in ASN.1. |
| Intel | Agree with changes. Leave the decision to Rapporteur on whether based on alphabetical order or LPP existing order. |
| vivo | Agree with the CR |
| Nokia | Agree with Proposal 12 to merge R2-2007834 in to the LPP rapporteur CR. On the issue of parent IEs containing several child-IEs in the same section, I am not sure why we did it this way. It would be nice to have these child-IE descriptions as separate field descriptions. In R2-2007834, the reason for change for the fourth change is not very clear. This should be better described in the merged LPP CR. |
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## 3.5 DL-PRS configuration [13]

Reason for change:

Several field descriptions related to DL-PRS configuration are either missing or not correct.

Summary of Change:

1. Remove "reference and neighbour TRP" in the description of the IE to make it general and add field description for nr-DL-PRS-ResourceID-List.

2. Remove field descriptions for dl-PRS-SubcarrierSpacing, dl-PRS-ResourceBandwidth, dl-PRS-StartPRB, dl-PRS-PointA and dl-PRS-CyclicPrefix under NR-DL-PRS-Info.

3. Re-organize the field descriptions of NR-DL-PRS-AssistanceData into NR-DL-PRS-AssistanceData, NR-DL-PRS-AssistanceDataPerFreq, NR-DL-PRS-AssistanceDataPerTRP, NR-DL-PRS-PositioningFrequencyLayer.

4. Correct the field names of "nr-DL-PRS-expectedRSTD", and "nr-DL-PRS-expectedRSTD-uncertainty", and add field descriptions for them.

5. Re-organize the field descriptions of NR-DL-PRS-Info into NR-DL-PRS-ResourceSet, NR-DL-PRS-Resource, and DL-PRS-QCL-Info.

6. Add missing field descriptions for NR-DL-PRS-Info.

7. Add missing field descriptions for NR-SSB-Config.

8. Add missing field descriptions for NR-TimeStamp.

Rapporteur Comments:

1. There is some small overlap with the CR in [8]; e.g. change 1 and *nr-SelectedDL-PRS-FrequencyLayerIndex*.

2. There is some overlap with the CRs in [2],[14] (see section 3.2 above): deletion of *ssb-index* field descriptionin IE NR-SSB-Config.

3. The CR proposes multiple field description Tables for a single IE section. This is typically done in TS 38.331, but not in LPP.

**Proposal 13:** RAN2 to check the details in R2-2007836 [13] and then merge it into LPP Rapporteur CR.

Companies are invited to provide any comments on Proposal 13 and/or on the details of the proposed change:

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| Company | Comments |
| Huawei/HiSilicon | Support the changes in [13].  Regarding the field sorting, we are OK with either alphabetically or in the order of field appearance in ASN.1.  Regarding the field description grouping, we are OK either put them under its parent IE or under a jumbo top-level IE in the nested structure.  Of the descriptions that proposed [13], we think the following fields descriptions are essential.   * *nr-DL-PRS-expectedRSTD* * *nr-DL-PRS-expectedRSTD-uncertainty* * *dl-PRS-ResourcePower* |
| Intel | Ok with the changes. Only one comments  ***nr-DL-PRS-ResourceID-List***  This field provides a list of DL-PRS resources under the same DL-PRS resource set.  It should be “a list of DL-PRS resource IDs” |
| vivo | Agree with the CR |
| Nokia | Agree with Proposal 13 i.e. to resolve overlaps and merge R2-2007836 with LPP rapporteur CR. Good to adopt the 38.331 style for field description organization. |
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## 3.6 Assistance data sharing and priority for measurements [8],[12]

Reason for change:

1. There is currently no description for the assistance data sharing via *NR-SelectedDL-PRS-IndexList*.

2. There is currently no priority order in the *NR-DL-PRS-AssistanceData*.

Summary of Change:

1. Missing (field) descriptions for *NR-DL-PRS-AssistanceData* and *NR-SelectedDL-PRS-IndexList* is added.

2. It is specified that the UE should assume that the assistance data are sorted in decreasing order of priority.

Rapporteur Comments:

1. For change 1 above, the CRs in [8] and [12] overlap. [8] is more comprehensive, since it e.g. adds the missing description for the IE *NR-SelectedDL-PRS-IndexList* as well.

2. [12] specifies in e.g., *NR-DL-TDOA-ProvideAssistanceData* that if the *nr-SelectedDL-PRS-IndexList* field is present, "the *nr-DL-PRS-AssistanceData* shall be present in one and only one of *NR-DL-TDOA-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, and *NR-Multi-RTT-ProvideAssistanceData*."  
I believe the "shall" is not correct here (or at least not needed). This is a network behaviour which is typically not associated with a "shall" requirement (unless needed for the functionality to work). The *nr-SelectedDL-PRS-IndexList* may be present without any *nr-DL-PRS-AssistanceData* in *NR-DL-TDOA-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, or *NR-Multi-RTT-ProvideAssistanceData,* e.g., in case of *NR-DL-PRS-AssistanceData* are provided via broadcast or in case multiple LPP Provide Assistance Data messages are used in a location session. I also think that the *NR-DL-PRS-AssistanceData* do not necessarily need to be provided in one and only one of the IEs *NR-DL-TDOA-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, and *NR-Multi-RTT-ProvideAssistanceData.* I.e., this can be up to network implementation, as long as it is clear that the *NR-SelectedDL-PRS-IndexList* (if present) provides the applicable resources.

3. On the priority order in the *NR-DL-PRS-AssistanceData* (Change 2 above), there are currently still two FFSs in RAN1:

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| Agreement:   * When a UE is configured in the assistance data of a positioning method with a number of PRS resources beyond its capability (FG 13-2,13-3,13-4 for AoD, TDOA, MRTT respectively),  the UE assumes the DL-PRS Resources in the assistance data are sorted in a decreasing order of measurement priority. Specifically, according to the current RAN2 structure of the assistance data, the following priority is assumed:  1. FFS: the 4 frequency layers are sorted according to priority, 2. The 64 TRPs per frequency layer are sorted according to priority, 3. The 2 sets per TRP of the frequency layer are sorted according to priority, 4. FFS: The 64 resources of the set per TRP per frequency layer are sorted according to priority.  * The reference indicated by nr-DL-PRS-ReferenceInfo-r16 for each frequency layer has the highest priority at least for DL-TDOA |

**Proposal 14:** With respect to the assistance data sharing via IE *NR-SelectedDL-PRS-IndexList,* use the CR in R2-2007634 [8] as baseline. RAN2 to check the details of [8] and then merge it into the LPP Rapporteur CR.

**Proposal 15:** With respect to the assistance data order in IE *NR-DL-PRS-AssistanceData* and/or *NR-SelectedDL-PRS-IndexList*, await the conclusion in RAN1.

Companies are invited to provide any comments on Proposal 14/15 and/or on the details of the proposed change:

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| Company | Comments |
| Huawei/HiSilicon | We are OK with both proposals.  However, we would like to ask two questions for clarification.   * Since *nr-SelectedDL-PRS-IndexListPerFreq*, *dl-SelectedPRS-ResourceSetIndexList-r16*, *dl-SelectedPRS-ResourceIndexList-r16* are optional, is it correct understanding that if they are omitted, all are selected? * If *NR-*DL*-PRS-ProvideAssistanceData* is present in DL-TDOA and DL-AoD, can Multi-RTT contains only selected index, but not *NR-DL-PRS-ProvideAssistanceData*, and if so which *NR-DL-PRS-ProvideAssistanceData* corresponds the selected index? (It is reason why we proposed that if a method uses selected index, *NR-DL-PRS-ProvideAssistanceData* can be present in **one and only one** of the methods). We understand things may be complicated if broadcast AD is involved, that the current structure allows room for ambiguity at UE side. |
| Intel | For Huawei first comments, based on currenct descriptions, we cannot support this.Looks like it is a further optimization on the signaling.  Tend to agree with Huawe’s second comments on if assistance data is present in two positioning methods, it will be difficult to use index for the third positioning methods. Therefore, it should be “present in only one method or present in all methods”; |
| vivo | Agree with Proposal14 but for proposal 15 we should wait for RAN1 conclusion and cannot make a decision from RAN2. |
| Nokia | Agree with Proposal 14 and Proposal 15. |
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## 3.7 Padding rule for initial counter C0 in the posSIB ciphering [9]

Reason for change:

For deciphering of the broadcast assistance data, the UE receives the first portion of the initial counter denoted C0 using NAS signalling, as specified in TS 24.301 and TS 24.501. This NAS signalling provides the C0 value as a variable length octet string which may contain less than 128-bits. If the C0 value is less than 128-bits, zero padding to obtain a 128-bits value must be performed by the UE, which however, is currently not specified.

Summary of Change:

It is specified that if the C0 bit string contains less than 128-bits, the UE should pad out the bit string with zeroes in most significant bit positions to achieve 128 bits.

Rapporteur Comments:

The issue exists already in Rel-15. However, I think a Rel-16 CR would be sufficient.

**Proposal 16:** RAN2 to check the details in R2-2007635 [9] and then merge it into LPP Rapporteur CR.

Companies are invited to provide any comments on Proposal 16 and/or on the details of the proposed change:

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| Company | Comments |
| Huawei, HiSilicon | Whether or not to have padding is not that important becuase the UE will not add any values to those fields anyway. We prefer to keep the current spec as it is. |
| Intel | Agree with Rapporteur. We need to specify the UE behavior on how to handle C0 less than 128 bits. |
| vivo | Agree with Rapporteur. |
| Nokia | Agree with Proposal 16. We are OK to also have this fixed in Rel-15. |
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