**3GPP TSG RAN WG2 #119-e *draft R2-2208759***

**Online, 17 - 29 Aug, 2022**

**Source:** Nokia

Title: [AT119-e][108][IoT-NTN] UE capabilities (Nokia)

**Agenda Item:** 7.2.5

**Document for:** Discussion and decision

# Introduction

Following e-mail discussion to conclude on the proposals submitted to RAN2-119e related to IoT-NTN UE capabilities.

* [AT119-e][108][IoT-NTN] UE capabilities (Nokia)

Initial scope: Discuss corrections for UE capabilities

Initial intended outcome: Summary of the offline discussion with e.g.:

·         List of proposals for agreement (if any)

·         List of proposals that require online discussions

·         List of proposals that should not be pursued (if any)

Initial deadline (for companies' feedback): Monday 2022-08-22 1200 UTC

Initial deadline (for rapporteur's summary in [R2-22](file:///C:\Users\selvagan\Downloads\null)08759): Monday 2022-08-22 2000 UTC

In this document, company views on the proposals and conclusion on list of proposals for agreement and online discussion is captured.

1. Contact Information

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| --- | --- | --- |
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# Discussion

## UE Capability for Transmission Gaps for UL segemented Transmission

Introduction of new UE capability for the Transmission gap for pre-compensation between UL segments is discussed in [1] [2] and [3]

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| --- | --- |
| Document | Text Proposal |
| [1] | 4.3.38.6 *ntn-NeedSegmentedPrecompensationGaps-r17*  This field indicates the minimum gap value between segments for PUSCH and PUCCH required by an eMTC UE, or for NPUSCH required by a NB-IoT UE, for TA pre-compensation. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*. If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, the UE performs TA pre-compensation at slot boundaries. |
| [2] | 4.3.38.6  *ntn-NeedSegmentedPrecompensationGaps-r17* This field indicates the transmission gap length the UE supports for UL segmented transmission as specified in 36.211 [17]. If a UE does not include this field, UE follows legacy behaviour at slot boundaries due to TA adjustment. |
| [3] | 4.3.38.X *ntn-GapNeededForSegementedTx-r17*This field indicates that UE needs gap for uplink timing precompensation between transmission of segments if segmented uplink transmission is enabled for the UE. The supported gap lengths are indicated as part of this field. The supported gap lengths may be different for UE supporting ce-ModeA-r13 and UE supporting UE-category-NB. This feature is applicable only if UE supports ntn-Connectivity-EPC-r17. If this field is not included the the UE follows legacy behavior for dropping the symbols during transmission of next segment . |

From rapporteur’s perspective, TP in [1] and [3] contains more detailed descriptions to reflect the RAN1 agreements related to new capability for gap-length for segmented transmission. Mainly the channels applicable for gaps is indicated along with the link to base capability. Moreover the gap length values in the capability are different for eMTC and NB-IoT. This is also required in the description.

Proposal : Following TP is considered as basis for new parameter for new parameter. The sentences are given in bullets for easy commenting for individual parts. The TP in [1] is considered as reference. Changes over [1] is highlighted in yellow.

|  |
| --- |
| 4.3.38.6 *ntn-NeedSegmentedPrecompensationGaps-r17*   * This field indicates the minimum gap value between segments for PUSCH and PUCCH required by an UE supporting ce-ModeA-r13 or for UE supporting UE-catagory-NB for TA pre-compensation. * The supported gap length values are different for UE supporting ce-Mode-A-r13 and UE supporting UE-category-NB. * This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*. * If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, the UE performs TA pre-compensation at slot boundaries and the number of symbols dropped due to pre-compensation is left to UE implementation. |

**Q1: Please comment on the TP given in the above table. Please indicate your comments /acceptance for 4 bullets within the TP.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| MediaTek | Yes | Fine to include this TP |
| Qualcomm | Yes with revision | It is not clear so prefer to remove “The supported gap length values are different for UE supporting ce-Mode-A-r13 and UE supporting UE-category-NB”.  Also it is better to explain the absent case as in [3] “If this field is not included the the UE follows legacy behavior for dropping the symbols during transmission of next segment .” |
| Intel |  | agree with QC |
| Huawei, HiSilicon | Yes with comments | We are not sure what is the “legacy behaviour” mentioned in QC’s comments.  In TN, there is no pre-compensation, and no dropping of symbols between segments. The issue is new, and restricted to IoT NTN.  Besides, we think the following notes in RAN1 parameter list need to be reflected in the capability description:  eMTC:  For UEs supporting communication via GEO and NGSO NTNs, it must indicate this FG is supported.  NB-IoT:  For UEs supporting communication via NGSO NTNs, it must indicate this FG is supported. |
| Lenovo | Yes | OK with the TP. |
| Turkcell | Yes | Qualcomm’s revision is ok for us. |
| ZTE | Yes | OK with the TP except that, the description “*The supported gap length values are different for UE supporting ce-Mode-A-r13 and UE supporting UE-category-NB.*” is not necessary. The different value range can be reflected by the detailed parameter definition. |
| OPPO | Yes with comments | Fine with the TP in principle. Minor change is needed for the first part.  4.3.38.6 *ntn-NeedSegmentedPrecompensationGaps-r17*   * This field indicates the minimum gap value between segments for PUSCH and PUCCH required by a UE supporting ce-ModeA-r13 or for NPUSCH required by a UE supporting UE-catagory-NB, for TA pre-compensation. * The supported gap length values are different for UE supporting ce-Mode-A-r13 and UE supporting UE-category-NB. * This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*. * If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, the UE performs TA pre-compensation at slot boundaries and the number of symbols dropped due to pre-compensation is left to UE implementation. |
| Ericsson | Yes, with comments | We understand that the “default behaviour” performed by the UE when this capability is not signalled is not to insert a gap. This should be made clear and included in bullet number 4.  We prefer to remove bullet number 2.  As Huawei mentioned, the LS from RAN1 captured that this FG shall always be indicated in eMTC NTN (both GSO and NGSO scenarios) and always be indicated for NGSO in NB-IoT NTN, i.e., conditionally mandatory. |
|  |  |  |

**Rapporteur Summary: Based on discussion following TP for 36.206 is proposed. For 3rd bullet RAN2 two companies’ view is to make the parameter as conditional mandatory. In that case the default behaviour needs to be included as one of gap Length for this parameter. To be in line with RRC CR proposals, this parameter is optional and its absence indicate the default behaviour.**

**Proposal 1: Following TP is considered for 36.306 CR**

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| 4.3.38.6 *ntn-NeedSegmentedPrecompensationGaps-r17*   * This field indicates the minimum gap value between segments for PUSCH and PUCCH required by a UE supporting ce-ModeA-r13 or for NPUSCH required by a UE supporting UE-catagory-NB, for TA pre-compensation. * This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*. * If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, the UE performs TA pre-compensation at slot boundaries and the number of symbols dropped due to pre-compensation is left to UE implementation. |

## New capability for TN band support indication for IoT-NTN UE

[4] proposes to include TN band supported list for IoT-NTN UE for redirection and measurement for TN carriers. From Rapporteur perspective, the TN redirection related changes were not discussed during the WI phase. This new capability for TN-NTN mobility is not critical for Rel-17 scope.

Proposal : Changes in [4] is not pursued for Rel-17.

**Q2: Please indicate your views for the proposal related to [4]. If you indicate the preference to pursue, please provide your comments on the TP given in [4].**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| MediaTek | Yes |  |
| Qualcomm | No to proposal | Following is the agreement we made in the last meeting. The redirection should be possible as claimed. Otherwise it is not clear how it works without source knowing which TN band the UE supports.  Agreement:   * For eMTC, Inter [TN, NTN] - redirection can work. For inter [TN, NTN] - HO, the target node will not know the UE caps of target network type.   + R2 will not specify that HO is disallowed, but expect it can only work in restricted way (if at all). R2 does not expect to work further on inter [TN, NTN] – HO in Rel-17. |
| Intel | Yes | ok with no further optimization in Rel-17 spec, up to network to handle this issue |
| Huawei, HiSilicon | Yes | In R17, the redirection can work in a restricted way due to the agreements we made for UE capability reporting (similar to HO). |
| Lenovo | Yes | Not essential in Rel-17. |
| Turkcell | No |  |
| ZTE | Yes to proposal | It has been agreed that UE capability provided is only valid in the network type [TN, NTN] where it was provided. The inter [TN, NTN] capability can be discussed in Rel-18, if necessary. |
| OPPO | Yes | Agree with Rapporteur. |
| Ericsson | Yes | This enhancement can be considered in Release 18 |
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**Rapporteur Summary: Only 2 companies including proponents are against the proposal where 7 companies are OK with the proposal.**

**Proposal 2: Changes in [4] is not pursued for Rel-17.**

## Clarification on GNSS Support capability for IoT-NTN

Following proposals are maded in [5] to further clarify the GNSS support capability for IoT-NTN.

* [Proposal 1:Modify the description of standaloneGNSS-Location to include IoT NTN use.](#_Toc111016905)
* [Proposal 2:Clarify if GNSS capability for NB-IoT is implicit with the indication of ntn-Connectivity-EPC-r17.](#_Toc111016906)
* [Proposal 3 Introduce a separate UE capability indication to signal the presence of a GNSS receiver in NB-IoT.](#_Toc111016907)

**Q3: Please indicate your views for P1/P2/P3 and agreement on the proposals for GNSS support capability for IoT-NTN**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| MediaTek | No: Proposal 3.  Yes: Proposal 1 and Proposal 2 | There is no solid requirement for Proposal 3 in Rel-17. |
| Qualcomm | No | Agree with MediaTek, there is no such requirement of Proposal 3 for NB-IoT UEs as there is no NB-IoT UE location reporting to eNB.  In Msg5, it is mandatory for UE to include remaining GNSS validity duration. In a way, UE already indicates to network via this remaining GNSS validity duration that UE supports GNSS location. Fixed dish type UE can indicate value “infinity”. This is enough.  In NR and eMTC, we have not touched anything on standaloneGNSS-Location UE capability as it was existing one.  In TS 36.306, following is already clarified. *ntn-Connectivity-EPC-r17* This field indicates whether the UE supports NTN access. This field is only applicable if the UE supports *ce-ModeA-r13* or any *ue-Category-NB*. If the UE indicates this capability the UE shall support the following enhancements:  - General:  - handling of *cellBarred-NTN-r17* and *trackingAreaList-r17* in *SystemInformationBlockType1(-NB)* as specified in TS 36.331 [5];  - reception of *SystemInformationBlockType31(-NB)* as specified in TS 36.331 [5];  - derivation of its position based on its GNSS measurements;  - reporting of the remaining GNSS validity duration as specified in TS 36.331 [5]; |
| Intel | ok with P1 and P2 | for NB IoT NTN, if P2 is agreed that “GNSS capability for NB-IoT is implicit with the indication of ntn-Connectivity-EPC-r17”, there is no need to define a separate GNSS UE capability. |
| Huawei, HiSilicon | Ok with P2 | For NB-IoT, we prefer to keep the number of capabilities to a minimum. As QC pointed out, this is already reflected in the descriptions of *ntn-Connectivity-EPC-r17*, so no spec change is needed. |
| Lenovo | Agree P1 and P2 | P3 is not essential and P2 can solve. |
| Turkcell | Agree P1 and P2 |  |
| ZTE | Ok with P1 and P2 | P3 is not necessary if P1 and P2 are agreed. |
| OPPO | Yes for P1 and P2  No for P3 | We share the views that GNSS capability for NB-IoT is implicit with the indication of ntn-Connectivity-EPC-r17. |
| Ericsson | Yes | Regarding Qualcomm’s comment on proposal 1. In NR NTN, the text for GNSS capability was modified to include the NTN use:  ***gnss-Location-r16***  Indicates whether the UE is equipped with a GNSS or A-GNSS receiver that may be used to provide detailed location information along with SON, MDT, and NTN related measurements in RRC\_CONNECTED, RRC\_IDLE and RRC\_INACTIVE. A UE shall set this field to *supported* if it indicates the support of *nonTerrestrialNetwork-r17*.  This clarification of NTN use should also be present for IoT NTN. Otherwise, the current text only reflects its use for measurement reports. *standaloneGNSS-Location* This parameter defines whether the UE is equipped with a standalone GNSS receiver that may be used to provide detailed location information in RRC measurement report and logged measurements in RRC\_IDLE. |
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**Rapporteur Summary: 7 companies agrees for P1 and P2. One company is OK for P2. For P1 we think that clarification provided from proponent is needed for gnss-Location-r16.**

[Proposal 3:Modify the description of standalone GNSS-Location to include IoT NTN use.](#_Toc111016905)

[Proposal 4:Clarify if GNSS capability for NB-IoT is implicit with the indication of ntn-Connectivity-EPC-r17.](#_Toc111016906)

## Other comments

Q4: Please indicate additional comments if any not captured in the above sections related to submitted contributions in the below table.

**Q4: Please indicate your views for P1/P2/P3 in [5] and agreement for GNSS support capability for IoT-NTN**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
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# Conclusion

**Proposal 1: Following TP is considered for 36.306 CR.**

**Proposal 2: Changes in [4] is not pursued for Rel-17.**

[Proposal 3:Modify the description of standalone GNSS-Location to include IoT NTN use.](#_Toc111016905)

[Proposal 4:Clarify if GNSS capability for NB-IoT is implicit with the indication of ntn-Connectivity-EPC-r17.](#_Toc111016906)

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| 4.3.38.6 *ntn-NeedSegmentedPrecompensationGaps-r17*   * This field indicates the minimum gap value between segments for PUSCH and PUCCH required by a UE supporting ce-ModeA-r13 or for NPUSCH required by a UE supporting UE-catagory-NB, for TA pre-compensation. * This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*. * If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, the UE performs TA pre-compensation at slot boundaries and the number of symbols dropped due to pre-compensation is left to UE implementation. |

# Reference

1. [R2-2207058](file:///C:\Data\3GPP\Extracts\R2-2207058-%20Discussion%20on%20UE%20capability%20on%20segmented%20precompensation%20gap%20in%20IoT%20NTN.doc)    Discussion on UE capability on segmented precompensation gap in IoT NTN         OPPO   discussion   Rel-17   LTE\_NBIOT\_eMTC\_NTN
2. [R2-2207307](file:///C:\Data\3GPP\Extracts\R2-2207307%20Add%20TX%20gap%20capability%20for%20IoT%20NTN%2036.306.docx)    Add TX gap capability for IoT NTN            MediaTek Inc.    CR        Rel-17   36.306  17.1.0   1854     -   F          LTE\_NBIOT\_eMTC\_NTN-Core
3. [R2-2208044](file:///C:\Data\3GPP\Extracts\R2-2208044_36306-UE-Capability-correction.docx)    New UE capability for Pre-compensation-gap for IoT-NTN  Nokia, Nokia Shanghai Bell        CR        Rel-18            36.306  17.1.0   1855     -           B         LTE\_NBIOT\_eMTC\_NTN
4. [R2-2207352](file:///C:\Data\3GPP\Extracts\36331_CR4841_(Rel-17)_R2-2207352%20TN%20support%20indication.docx)    Reporting the support of TN bands to NTN            Qualcomm Incorporated CR        Rel-17   36.331  17.1.0   4841     -           F          LTE\_NBIOT\_eMTC\_NTN
5. [R2-2208666](file:///C:\Data\3GPP\Extracts\R2-2208666%20-%20R17%20IoT%20NTN%20UE%20Capabilities%20corrections.docx)    R17 IoT NTN UE Capabilities corrections   Ericsson           discussion        Rel-17