**3GPP TSG RAN WG1 #122bis R1-2507743**

**Prague, Czech Republic, October 13th –17th, 2025**

**Agenda Item: 9.14**

**Source: Moderator (AT&T)**

**Title: Summary of UE features for Rel-19 TEI and other relevant issues**

**Document for:** **Discussion/Decision**

# Introduction

This document presents the summary of email discussion [122bis-R19-UE\_features] during RAN1 #122bis. According to the Chair’s Notes:

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| [122bis-R19-UE\_features] Email discussion on Rel-19 UE features – Ralf (AT&T), Naoya (DOCOMO)   * To be used for sharing updates on online/offline schedule, details on what is to be discussed in online/offline sessions, tdoc number of the moderator summary for online session, etc |

The following was discussed during RAN1 #122bis within the scope of [122bis-R19-UE\_features]. All proposals are based on the latest RAN1 UE features list for Rel. 19 in [1].

# Summary of Contributions Submitted to RAN1 #122bis

The following is the moderator’s summary of contributions submitted to RAN1 #122bis in this agenda item. All proposals are based on the latest RAN1 UE features list for Rel. 19 in [1].

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| --- | --- |
| Company | Summary |
| ZTE Corporation/Sanechips [2] | In RAN1#120 meeting and RAN1#120bis meeting, the followings were agreed to support non-RedCap UE performing SRS frequency hopping for positioning.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Agreement   * Extend Rel-18’s UL frequency hopping UL SRS for positioning transmission to non-RedCap UEs in a single carrier * UE capability for non-RedCap UEs for UL SRS frequency hopping for positioning transmission   Send LS to RAN2 to inform this agreement, whether new parameter is needed is up to RAN2 discussion.  Agreement   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 67-2b | UL Time Window and transmission of SRS for positioning with Tx Frequency hopping within the window for non-RedCap UEs [Pos\_SRSHop] | Support of UL Time Window and transmission of SRS for positioning with Tx Frequency hopping within the window | 67-2 | No | N.A. | UE does not support the UL time window for SRS for positioning with Tx frequency hopping | Per band | N.A. | N.A. | N.A. |  | Optional with capability signaling | |   A UE can report whether it supports transmitting positioning SRS with frequency hopping within UTW (UL time window). The UE may be configured by gNB, via *srs-PosUplinkTransmissionWindowConfig*, subject to UE capability, with an UTW where the UE is not expected to transmit other signals/channels and is only expected to transmit the SRS for positioning using frequency hopping. The RRC configuration is shown as below:  -- ASN1START  -- TAG-SRS-PosTx-Hopping-START    SRS-PosTx-Hopping-r18 ::= SEQUENCE {  srs-PosConfig-r18 SRS-PosConfig-r17,  bwp-r18 BWP OPTIONAL, -- Need R  inactivePosSRS-TimeAlignmentTimer-r18 TimeAlignmentTimer OPTIONAL, -- Need M  inactivePosSRS-RSRP-ChangeThreshold-r18 RSRP-ChangeThreshold-r17 OPTIONAL, -- Need M  **srs-PosUplinkTransmissionWindowConfig**-r18 SetupRelease { SRS-PosUplinkTransmissionWindowConfig-r18 } OPTIONAL, -- Need M  ...  }    **SRS-PosUplinkTransmissionWindowConfig**-r18 ::= SEQUENCE {  startSFN-r18 INTEGER(0..1023),  windowPeriodicityAndOffset-r18 CHOICE {  periodicityAndOffset-r18 SRS-PeriodicityAndOffset-r16,  periodicityAndOffset-Ext-r18 SRS-PeriodicityAndOffsetExt-r16  },  duration-r18 ENUMERATED {s1,s2,s4,s6},  ...  }  But in the agreement the column “Need for the gNB to know if the feature is supported” for FG 67-2b is “No”, which means gNB configures UTW without any prior knowledges regarding UE capability for positioning SRS frequency hopping within UTW.  The UE feature was agreed in RAN1#120bis to align with Rel-18 RedCap UE frequency hopping UE features, but configuring a UTW without prior capability indication is fundamentally flawed and should be changed as analysed in our companion contribution [1]. We support the following updates regarding UE capability for positioning SRS frequency hopping within UTW:  **Proposal 1: UE should report FG 67-2b for positioning SRS frequency hopping within UTW to gNB, the following update is supported.**   * **Send LS to RAN2 for this updated UE feature**  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 67-2b | UL Time Window and transmission of SRS for positioning with Tx Frequency hopping within the window for non-RedCap UEs [Pos\_SRSHop] | Support of UL Time Window and transmission of SRS for positioning with Tx Frequency hopping within the window | 67-2 | Yes | N.A. | UE does not support the UL time window for SRS for positioning with Tx frequency hopping | Per band | N.A. | N.A. | N.A. |  | Optional with capability signaling | |
| Ericsson [3] | In the LS[R1-2506716, LS on early CSI acquisition for L3 handover, RAN2, 3GPP TSG RAN WG1#122bis, October 2025], RAN2 provided the following information.  RAN2 discussed on the intention to support early CSI acquisition for L3 handover by re-using the early CSI acquisition framework for LTM. RAN2 discussed the RRC CR (R2-2506450) and agreed that the RRC CR is technically correct. However, RAN2 postponed the CR pending confirmation from RAN1.  RAN2 identified at least the following potential impacts to RAN1:   1. TS 38.214: Describe CSI reporting for L3 handover which will be similar to the description in clause “5.2.4a CSI Reporting for LTM”. 2. TS 38.212: Add a reference to TS 38.214 in clause “6.3.2.1.2 CSI”.   RAN2 assumes there is no RAN4 work.  The changes proposed in the LS are provided in [R1-250xxxx, Introduction Rel-19 early CSI acquisition for L3 handover to TS38.212 [EarlyCSI\_L3HO], Huawei, October 2025] and [R1-250xxxx, Introduction Rel-19 early CSI acquisition for L3 handover to TS38.214 [EarlyCSI\_L3HO], Huawei, October 2025]. In addition, comments to the RAN2 CR [R2-2506450, Support early CSI acquisition for L3 handover [EarlyCSI\_L3HO], RAN2#131, August 2025] are provided in [R1-250xxxx, Discussion on LS on early CSI acquisition for L3 handover, Ericsson, RAN1#122bis, October 2025].  In addition, UE capabilities should be defined for indicating the support for early CSI acquisition for L3 handover and we propose that RAN1 should do that since we have already defined the corresponding feature-groups for LTM. The following feature-groups should be added:   * XX-1, CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on periodic CSI-RS resource: This feature-group corresponds to the LTM FG 63-6. * XX-2, CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on semi-persistent CSI-RS resource: This feature-group corresponds to the LTM FG 63-6a * XX-3, CSI-RS-RS measurement and CSI reporting without CSI-IM reception: This feature-group corresponds to the LTM FG 63-10   The feature-groups proposed above are further detailed below.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Consequence if the feature is not supported by the UE** | **Type** | **Note** | | XX-1 | CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on periodic CSI-RS resource | 1. Support of CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on periodic CSI-RS(s)  2. Maximum number of CSI-RS resources for CMR associated with CSI report configuration for a target cell  3. Max number of ports of CSI-RS resource(s) associated with a CSI report configuration for CSI reporting for a target cell  4. Maximum number of ports in one NZP CSI-RS resource  5. Max rank for CSI reporting for a target cell  6. Maximum number of CSI-IM resources for interference measurement associated with CSI report configuration for a target cell |  | Periodic CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync is not supported | Per band | Component 2 candidate values: {1,2,3,4,5,6,7,8}  Component 3 candidate values: {1,2,4,8,12,16,24,32,48,64,128}  Component 4 candidate values: {1, 2, 4, 8, 12, 16, 24, 32}  Component 5 candidate values: {1,2,3,4,5,6,7,8}  Component 6 candidate values: {1,2,3,4,5,6,7,8} | | XX-2 | CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on semi-persistent CSI-RS resource | 1. Support of CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on semi-persistent p CSI-RS(s)  2. Maximum number of CSI-RS resources for CMR associated with CSI report configuration for a target cell  3. Max number of ports of CSI-RS resource(s) associated with a CSI report configuration for CSI reporting for a target cell  4. Maximum number of ports in one NZP CSI-RS resource  5. Max rank for CSI reporting for a target cell  6. Maximum number of CSI-IM resources for interference measurement associated with CSI report configuration for a target cell |  | Semi-persistent CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync is not supported | Per band | Component 2 candidate values: {1,2,3,4,5,6,7,8}  Component 3 candidate values: {1,2,4,8,12,16,24,32,48,64,128}  Component 4 candidate values: {1, 2, 4, 8, 12, 16, 24, 32}  Component 5 candidate values: {1,2,3,4,5,6,7,8}  Component 6 candidate values: {1,2,3,4,5,6,7,8} | | XX-3 | CSI-RS-RS measurement and CSI reporting without CSI-IM reception | 1. Support of CSI-RS measurement and CSI reporting for a target cell of reconfigurationWithSync without CSI-IM resource configuration | XX-1 or XX-2 | CSI-RS-RS measurement and CSI reporting without CSI-IM reception is not supported | Per band |  | |
| Moderator (AT&T) | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 67. TEI19 [Simul\_SRSCS] | 67-4 | Support of simultaneous SRS carrier switching [Simul\_SRSCS] | 1.- Support simultaneous SRS carrier switches. Two SRS carrier switches are considered to be simultaneous if the SRS transmission (including RF retuning time) in both CCs overlap in time | 2-56 | Yes | N/A | Simultaneous SRS CS across multiple CC is not supported | Per band combination | N/A | N/A | N/A | For each target band, the UE can indicate with which other target bands in the band combination can SRS carrier switching be simultaneously triggered | Optional with capability signaling |   Is this feature ‘per band pair per band combination,’ i.e., indicating whether band pair ‘A=>B’ switching can happen simultaneously with band pair ‘C=>D’ switching? |
| Moderator (AT&T) | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 67. TEI19 [5GB\_CASMuting] | 67-7 | 5GB\_CAS Muting | Muting of always-on signals in 5G broadcast |  | Yes | n/a | UE continually detects CAS subframes which may be muted by NW | CAS Muting cannot be used | Per band | No | No | No | For a MBMS-dedicated cell, there is no RAN4 impact from the above TEI proposal. |   First, the columns are wrong. Two consequences if not supported.  Second, Does this row belong into the LTE UE feature list for Rel. 19?   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Features | Index | Feature group | Components | Prerequisite feature groups | Need for the eNB to know if the feature is supported | Need for the UE to know if the feature is supported (only for V2X WI, where the PC5-RRC capability signalling is delivered between the UEs) | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Capability interpretation for mixture of FDD/TDD | Note | Mandatory/Optional | | 4. TEI19 [5GB\_CASMuting] | 4-1 | 5GB\_CAS Muting | Muting of always-on signals in 5G broadcast |  | Yes | n/a | UE continually detects CAS subframes which may be muted by NW | Per band | No | No | For a MBMS-dedicated cell, there is no RAN4 impact from the above TEI proposal. | Optional with capability signaling | |

# Discussion Items during RAN1 #122bis

After review of contributions submitted to RAN1 #122bis in this agenda item, the following topics were identified by the moderator for discussion during RAN1 #122bis.

**General comments**

|  |  |
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| Company | Comments/Questions/Suggestions |
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## Pos\_SRSHop

After review of contributions submitted to RAN1 #122bis in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 67. TEI19 [Pos\_SRSHop] | 67-2b | UL Time Window and transmission of SRS for positioning with Tx Frequency hopping within the window for non-RedCap UEs [Pos\_SRSHop] | Support of UL Time Window and transmission of SRS for positioning with Tx Frequency hopping within the window | 67-2 | ~~No~~ Yes | N.A. | UE does not support the UL time window for SRS for positioning with Tx frequency hopping | Per band | N.A. | N.A. | N.A. |  | Optional with capability signaling |

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| Company | Comments/Questions/Suggestions |
| Huawei, HiSilicon | We generally supports this change.  In fact, we believe the root cause of this dates back to Rel-18 UTW of SRS hopping for RedCap UE, which should be addressed first during Rel-18 maintenance. |

## EarlyCSI\_L3HO

After review of contributions submitted to RAN1 #122bis in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Introduce the following Rel. 19 UE FGs (yellow highlighting, if any, shows text that’s not yet agreed)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 67. TEI19 [EarlyCSI\_L3HO] | 67-11 | CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on periodic CSI-RS resource | 1. Support of CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on periodic CSI-RS(s)  2. Maximum number of CSI-RS resources for CMR associated with CSI report configuration for a target cell  3. Max number of ports of CSI-RS resource(s) associated with a CSI report configuration for CSI reporting for a target cell  4. Maximum number of ports in one NZP CSI-RS resource  5. Max rank for CSI reporting for a target cell  6. Maximum number of CSI-IM resources for interference measurement associated with CSI report configuration for a target cell |  | Yes | n/a | Periodic CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync is not supported | Per band | n/a | n/a | n/a | Component 2 candidate values: {1,2,3,4,5,6,7,8}  Component 3 candidate values: {1,2,4,8,12,16,24,32,48,64,128}  Component 4 candidate values: {1, 2, 4, 8, 12, 16, 24, 32}  Component 5 candidate values: {1,2,3,4,5,6,7,8}  Component 6 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signaling |
| 67. TEI19 [EarlyCSI\_L3HO] | 67-12 | CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on semi-persistent CSI-RS resource | 1. Support of CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync based on semi-persistent p CSI-RS(s)  2. Maximum number of CSI-RS resources for CMR associated with CSI report configuration for a target cell  3. Max number of ports of CSI-RS resource(s) associated with a CSI report configuration for CSI reporting for a target cell  4. Maximum number of ports in one NZP CSI-RS resource  5. Max rank for CSI reporting for a target cell  6. Maximum number of CSI-IM resources for interference measurement associated with CSI report configuration for a target cell |  | Yes | n/a | Semi-persistent CSI-RS and CSI-IM measurement and CSI reporting for a target cell of reconfigurationWithSync is not supported | Per band | n/a | n/a | n/a | Component 2 candidate values: {1,2,3,4,5,6,7,8}  Component 3 candidate values: {1,2,4,8,12,16,24,32,48,64,128}  Component 4 candidate values: {1, 2, 4, 8, 12, 16, 24, 32}  Component 5 candidate values: {1,2,3,4,5,6,7,8}  Component 6 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signaling |
| 67. TEI19 [EarlyCSI\_L3HO] | 67-13 | CSI-RS-RS measurement and CSI reporting without CSI-IM reception | 1. Support of CSI-RS measurement and CSI reporting for a target cell of reconfigurationWithSync without CSI-IM resource configuration | 67-11 or 67-12 | Yes | n/a | CSI-RS-RS measurement and CSI reporting without CSI-IM reception is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Nokia | RAN1 has received an LS from RAN2 in this meeting on this new feature.  Since this feature has not been discussed in RAN1, it would be better to first reach a consensus on supporting the feature before agreeing on any related UE capabilities. |

## Simul\_SRSCS

After review of contributions submitted to RAN1 #122bis in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 67. TEI19 [Simul\_SRSCS] | 67-4 | Support of simultaneous SRS carrier switching [Simul\_SRSCS] | 1.- Support simultaneous SRS carrier switches. Two SRS carrier switches are considered to be simultaneous if the SRS transmission (including RF retuning time) in both CCs overlap in time | 2-56 | Yes | N/A | Simultaneous SRS CS across multiple CC is not supported | Per band pair per band combination | N/A | N/A | N/A | For each target band, the UE can indicate with which other target bands in the band combination can SRS carrier switching be simultaneously triggered | Optional with capability signaling |

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| Company | Comments/Questions/Suggestions |
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## 5GB\_CASMuting

After review of contributions submitted to RAN1 #122bis in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal:**

* **Delete/remove the following Rel. 19 NR UE FG**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ~~67. TEI19 [5GB\_CASMuting]~~ | ~~67-7~~ | ~~5GB\_CAS Muting~~ | ~~Muting of always-on signals in 5G broadcast~~ |  | ~~Yes~~ | ~~n/a~~ | ~~UE continually detects CAS subframes which may be muted by NW~~ | ~~CAS Muting cannot be used~~ | ~~Per band~~ | ~~No~~ | ~~No~~ | ~~No~~ | ~~For a MBMS-dedicated cell, there is no RAN4 impact from the above TEI proposal.~~ |

* **Introduce the following Rel. 19 LTE UE FG**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4. TEI19 [5GB\_CASMuting] | 4-1 | 5GB\_CAS Muting | Muting of always-on signals in 5G broadcast |  | Yes | n/a | UE continually detects CAS subframes which may be muted by NW | Per band | No | No | For a MBMS-dedicated cell, there is no RAN4 impact from the above TEI proposal. | Optional with capability signaling |

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| Company | Comments/Questions/Suggestions |
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# Conclusion

Agreements reached during RAN1 #122bis as part of this agenda item are summarized in [4].

# References

1. R1-2506627, Updated RAN1 UE features list for Rel-19 NR after RAN1 #122, Moderators (AT&T, NTT DOCOMO, INC.)
2. R1-2507195, UE features for positioning SRS frequency hopping for non-RedCap UE, ZTE Corporation/Sanechips
3. R1-2507477, UE features for early CSI acquisition for L3 handover, Ericsson
4. R1-25nnnnn, Session Notes of AI 9.14, Ad-Hoc Chair (AT&T)