**3GPP TSG RAN WG1 #108-e R1-2202495**

**e-Meeting, February 21st – March 3rd, 2022**

**Title: FL Summary for Rel-17 RRC parameters for positioning enhancement**

**Source: Moderator (CATT)**

**Agenda item: 8.5**

**Document for:** **Discussion and Decision**

1. Introduction

This document provides a summary of the following email discussion for AI 8.5:

[108-e-R17-RRC-ePos] Email discussion on Rel-17 RRC parameters for positioning enhancement – Ren Da (CATT)

* 1st check point for first LS in [108-e-R17-RRC]: February 24
* Final check point for second LS in [108-e-R17-RRC] if necessary: March 3

The RRC parameters from the last meeting are included in R1-2110573[1].

The general recommendations from the R17-RRC-Moderator for RAN1 RRC parameter preparation are provided in *R1-2111193* [2]. Additional suggestion from the R17-RRC-Moderator includes:

* *use a different color (e.g. “blue”) than “black” for any change applied to a row that is currently “stable” with only-black color.*
* *do not change the content of “Status [106b-e]” and “Status [107bis-e]” columns.*
* *provide the status, i.e. “stable/unstable” for Column [108-e] for any row if the status is “unstable”, or the status is changed from “stable” to “unstable”.*
	+ *If a row remains “stable”, or if a row hasn’t changed, no need to indicate the status. The previous status holds.*
* *Please continue considering the guidelines in R1-2111193 for RRC preparation.*

For Rel-17 ePOS most of the open issues are related to range values. Most of them are “FFS” and some of them are in the squared bracket []. In this meeting, we are targeting to complete the range values for all of the RRS parameters.

Note: We will need to remove the squared brackets “[]” for all agreeable range values, i.e., squared brackets will either be removed or replaced with round brackets “()” for all agreeable range values when submitting the RRC parameter list.

2. Accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays

(Round 1) FL Proposed Changes (marked in red in data Sheet “Positioning (Round 1)”)

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* *Rows 2, 10: Change Value range FFS is changed to “[0, 1, …, 31]” based on Row 11*
* *Rows 4, 9: Change Value range FFS is changed to “[0, 1, …, 7]” based on Row 12.*
* *Row 5: Indicate srs-PosResourceSetId as “****removed”*** *in “Status [108-e]” based on the inputs from multiple companies to RAN2 LS*
* *Row 6: Remove the bracket for srs-PosResourceId*
* *Row 7: Change Value range FFS to N/A;*
* *Row 8: Change Value range FFS to “[0, 1., …, 255] based on previous agreement that the maximum number of Tx TEGs is 256*
* *Row 11: Correction. Change [8] to 32.*
* *Row 12: Change [8] to 8.*
* *Row 13, Change Value range FFS to [64], since the maximum number of SRS resource for positioning is 64. Change “unstable” to “new-stable”. And remove the bracket for the parameter name.*
* *Row 14, Change [256] to 256*
* *Rows 16, 17, 18, 19: Change Value range “FFS” to “~~FFS~~ BOOLEAN” for these simple requests. RAN2/RAN3 may decide whether it is “Yes” only, or has both “Yes” and “No”.*
* *Row 23, change Value range FFS to “FFS for RAN2”. It is up to RAN2 to use an existing format of the timestamp or a new format.*
* *Row 27 : Change Value range FFS to [0, 1, …,7]*
* *Row 30 : a) Change Value range FFS to N/A;*
* *Row 31 : Change Value range FFS to [0, 1, …,255]*
* *Row 32 : Change Value range FFS to [0, 1, …,7]*
* *Row 33 : Change Value range FFS to [0, 1, …,31]*
* *Row 34 : srs-PosResourceSetId as* ***removed*** *in status [#108e]. It seems no need to have the parameter.*
* *Row 35 : Change Value range FFS to [0, 1, …,63]*
* *Row 37 : Remove the bracket of the parameter name and change the Value range FFS to 32*
* *Row 38 : Remove the bracket of the parameter name and change the Value range FFS to 8*
* *Row 39 : Remove the bracket of the parameter name and change the Value range FFS to 64, add “new-stable” to in status [#108e].*
* *Row 40 : Remove the bracket of the parameter name and change the Value range FFS to 256*
* *Row 41 : Change the parameter name and description to match the agreement*
* *Row 42 : Change the parameter name and description to match the agreement, and replace the “agreement”.*
* *Row 43 : Change the parameter name and description to match the agreement*
* *Row 44, 45, 46: Change FFS to “FFS BOOLEAN” for a simple request*
* *Row 47: Add “Removed” in status [#108e], because of the duplication with Row 41, 42, 43.*
* *Row 48: Suggest to let RAN3 to define the timestamp value*

*Changes in Column M:*

* *Rows 11, 12, 14: Removed the bracket of “[per UE]”*
* *Rows 16, 17, 18, 19: Remove “FFS”, since it may not be meaningful to define “per UE, ..” for these parameters*
* *Rows 20, 21, 22: Change “FFS” tp “[per band]”*
* *Row 23: Removed “FFS”. since it may not be meaningful to define “per UE, ..” for the parameter*
* *Row 37 to Row 43: Removed the bracket of “[per TRP]”*

(Round 1) Comments

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| **Company** | **comments** |
| Huawei, HiSilicon | Row 20, 21, 22, changing it per band does not make much sense. We understand that the capabilities are per band, but in the actual request, LMF should signal a single value for a positioning method. Suggest to have “[per UE]”, or remove the content entirely.Row 35, srs-PosResourceId should be srs-ResourceId or srs-PosResourceId according to agreement made in RAN1. TRP measurement should be not limited to positioning SRS.Row 41, MeasPosSRSwithDiffRxTEGs\_Request\_RTOA should not have “Pos” in the name.Row 42, MeasPosSRSwithDiffRxTEGs\_Request\_gNBRxTx should not have “Pos” in the name.Row 43, MeasPosSRSwithDiffRxTxTEGs\_Request\_gNBRxTx should not hve “Pos” in the name |
| ZTE | Row 20, 21, 22, we share the same view as HuaweiIn (row 24, column J), the agreement seems not correctly pasted. TheThe parameter is used by the LMF to request a TRP to optionally measure the same SRS resource of a UE with M different TRP Rx TEGs ~~with the same TRP Rx TEG~~ and report the corresponding multiple gNB Rx-Tx time difference measurements. |
| **OPPO** | **Row 11:** As a first step, RAN1 needs to make some clarifications for RAN2. In RAN2, the parameter “maxNumOfUE-RxTEG” was used for differenent purposes in the current running CR (in fact, the name of maxNumOfRxTEGs is used in RAN2), e.g.,* Max value of UE capability reporting: the value should be 8

FL: This is included the UE feature* Max value of the configured Rx TEGs for reporting: the value should be 8 (The agreement as blew)

FL:  There is no need to define the maxum but the ranges of the values as in MeasPRSwithDiffRxTEGs\_Request\_RSTD* Max value of the Rx TEG IDs: the value should be 32

FL: ueRxTEG-ID range is covered in Row 11.Thus, RAN1 should explicitly clarify these different values/parameterns and indicate which of the above value(s) Row 11 belongs to. In our understanding, this parameter indicates the first two values, i.e., 8 for UE capability and configuration of Rx TEG number.

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| **Agreement**Make the following modification on the previous agreement made in RAN#106bis-e:* Subject to UE capability, support the LMF to request a UE to optionally measure the same DL PRS resource of a TRP with N different UE Rx TEGs and report the corresponding multiple RSTD measurements.
	+ - N=[2, 3, 4, 6, 8] ~~(FFS: other values),~~ where the maximum value of N depends on UE capability, and applies to all DL PRS positioning frequency layers
		- Note: If N is not explicitly included in the request, it is up to UE to determine the number of different UE Rx TEGs to measure the same DL PRS resource within its capability
	+ The TRP can be either a “RSTD” reference TRP or a neighbour TRP
	+ FFS: details of the signalling, procedures, and UE capability
	+ The timestamps of the multiple RSTD measurements in the same measurement report can be the same or different.
	+ Note: All RSTD measurements are relative to a single reference timing
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**Row 14:** Simiar comments as Row 11 |
| **FL** | Summary of the changes based on the commentsFor Huawie’s comments:* Row 20, 21, 22: removed the “FFS” for Column M
* Row 35, add SRS resource/SRS resource ID, based on the comment from Huawei
* Row 41, 42, 43, “Pos” in the parameter names are removed. “

For ZTE’s comments:* Row 42, Column J: delete “with the same TRP Rx TEG”
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|  | For OPPO’s comments:Row 11, 12: add “per UE” to the description |

***Question 1****: The the “FFS: A triplet of UE {RxTx TEG ID, Rx TEG ID, Tx TEG ID}” in Row 7, different companies may have different understanding on whether the reporting of the triplet of UE {RxTx TEG ID, Rx TEG ID, Tx TEG ID}” is supported based on the existing RAN1 agreement. Companies are invited to provide their views in the following table on:*

* *OP1 (YES): support the reporting of a triplet of UE {RxTx TEG ID, Rx TEG ID, Tx TEG ID}*
* *OP2 (NO): not support the reporting of a triplet of UE {RxTx TEG ID, Rx TEG ID, Tx TEG ID}*

(Round 1) Comments for Q1

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| **Company** | **yes/NO** | **comments** |
| Huawei, HiSilicon | No | This was considered not needed based on RAN1 discussion. |
| ZTE | NO | The benefit is not justified. The same issue exists in row 30. |
| **OPPO** | No | This combination *{RxTx TEG ID, Rx TEG ID, Tx TEG ID}* was discussed in several meetings. However, it was not agreed. |
| CATT | No | There is no need to introduce a triplet of UE {RxTx TEG ID, Rx TEG ID, Tx TEG ID} for ueRxTxTEG-ID-group. |
| FL |  | Row 7: Column J: remove “FFS: *triplet of UE {RxTx TEG ID, Rx TEG ID, Tx TEG ID}*Row 30: Column J: remove “FFS: *triplet of TRP {RxTx TEG ID, Rx TEG ID, Tx TEG ID}* |

**Question 2**: *RAN2 (R1-2200878) LS asks whether Row 15 “numOfUERxTEG-PerPRSResource” is a duplication of Row 20 “MeasPRSwithDiffRxTEGs\_Request\_RSTD”. Based on the contributions [12-20], it seems companies have different views. Companies are invited to provide their views on whether Row 15 “numOfUERxTEG-PerPRSResource” can be removed due to the duplication with Row 20 “MeasPRSwithDiffRxTEGs\_Request\_RSTD”.*

* *OP1 (YES): “numOfUERxTEG-PerPRSResource” can be removed*
* *OP2 (NO): Both “numOfUERxTEG-PerPRSResource” and “MeasPRSwithDiffRxTEGs\_Request\_RSTD” need to be kept.*

(Round 1) Comments for Q2

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| **Company** | **yes/NO** | **comments** |
| Huawei, HiSilicon | Yes, but | As in our paper R1-2202455, we think that the situation at TRP (subject to RAN3 to check) could be different from that at UE.In summary, apart from the suggestion of removing “pos” from the parameter name (given that from TRP side, measuring the MIMO SRS and positioning SRS can be both possible as in the earlier form), we prefer to combine rows 41 and 42, and make it a single RxTEG request applicable to either RTOA or gNB Rx – Tx time difference.FL: There is a discussion on RAN4’s LS on whether Rel-15 SRS can be used for UE/gNB Rx – Tx time difference measurements. Thus, the suggestion is have separate parameters for now. |
| ZTE | YES | We don’t see why both of rwo 15 and 20 should be kept |
| **OPPO** | Yes | Duplicaed parameters |
| CATT | Yes | The parameter of ”numOfUERxTEG-PerPRSResource” can be removed. |
| **FL** |  | Row 15: added “Removed” in Column T for parameter of ”numOfUERxTEG-PerPRSResource”. |

## (Round 2) Comments

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| **Company** | **comments** |
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3. Accuracy improvements for UL-AoA positioning solutions

(Round 1) FL Proposed Changes (marked in red in data Sheet “Positioning (Round 1)”)

* *Row 57: Change value range FFS to N/A*
* *Row 58, 59, 60,61, 62, 63, 64: changes are made according to approved RAN3 CR (R3-220072), and change “new-stable” in status [#108e]*
* *Row 65: Change “FFS” to “N/A”*
* *Row 66: Change the value FFS to “Defined in 9.2.38, TS 38.455”*
* *Row 69: Change the value rage to INTEGER(0..63) according to TS 38.455*
* *Row 70: Change the value rage to INTEGER(0..63) according to TS 38.455*

(Round 1) Comments

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| **Company** | **comments** |
| Huawei, HiSilicon | Row 58 and 59, no need to have value 1 and [0, 1]. Leaving it blank would suffice.Row 72, TS 38.456 should be changed TS 38.455. |
| FL | For Huawei’s comments:* Row 58 and 59: just remove “FFS” and leave blank in column
* Row 72: correct the typo
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## (Round 2) Comments

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| **Company** | **comments** |
| vivo | For Row 21 and Row 22, the related agreements should be exchanged.For Row 22, change the column J as ‘The parameter is used by a LMF to request a UE to measure the same DL PRS with different UE RxTX TEGs with the same UE Tx TEG for UX Rx-Tx measurements’.For Row 43, similar to Row 22, change the column J as ‘The parameter is used by the LMF to request a TRP to optionally measure the same SRS resource of a UE with M different TRP RxTx TEGs with the same TRP Tx TEG and report the corresponding multiple gNB Rx-Tx time difference measurements.’For Row 50 and 54, a typo in column J, ‘The maximum number of reported …’. |
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4. Accuracy improvements for DL-AoD positioning solutions

(1st Round) FL Proposed Changes (marked in red in Excel Sheet ePOS#v000)

* *Row 76: Change Value range “FFS” to “~~FFS~~ BOOLEAN” for the simple request. RAN2/3 may decide whether it is “Yes” only, or has both “Yes” and “No”.*
* *Row 77: Change FFS to N/A. No value range for an IE structure.*
* *Row 78: Change Value range “FFS” to “~~FFS~~ BOOLEAN” for the simple request. RAN2/3 may decide whether it is “Yes” only, or has both “Yes” and “No”.*
* *Row 79: Remove FFS. No value range for an IE structure. Also Remove FFS: The details of TRP beam/antenna information, since the details of trpBeamAntennaInformation are defined in Row 95 to 98,*
* *Row 80: Add the value range of PRS Resource ID based on the current range value defined e.g., in TS 38.355/455.*
* *Row 81: Add a new row for missing PRS Resource Set ID.*
* *Row 82, 83: The value ranges can be decided based on exiting range defined TS 38.455*
* *Row 85: Change Value range “FFS” to “~~FFS~~ BOOLEAN” for the simple request. RAN2/3 may decide whether it is “Yes” only, or has both “Yes” and “No”.*
* *Row 86: Change “FFS” to [Ref. TS38.133] and add RAN4 LS R4-2202780 “• PRS-RSRPP may be reported by reusing absolute and differential PRS-RSRP measurement report mapping tables in TS38.133 clause 10.1.24.3.1 and 10.1.24.3.2 respectively” in the comment column.*
* *Rows 90: Change “FFS” to “N/A”*
* *Rows 91: Change “FFS” to BOOLEAN*
* *Rows 92: Change “FFS” to BOOLEAN*
* *Rows 93 to 96: Suggest the values related to the expected DL-AOA values are defined in a similar way as expected UL-AOA values*
* *Rows 97 to 103: Making similar changes as Rows 90 to 96*
* *Row 104: Change “FFS” to “N/A”*
* *Row 105: Change FFS to INTEGER(0..63)*
* *Row 106: Change “FFS” to “N/A”*
* *Row 107, 108: Change FFS to the value range based on 38.455.*

(Round 1) Comments

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| **Company** | **comments** |
| Huawei, HiSilicon | Row 91, 92, 98 and 99, no need to have “BOOLEAN”, since they are the parent IE/fields. |
| ZTE | Row 78: It seems we haven’t changed Value range “FFS” to “~~FFS~~ BOOLEAN”Row 102, Column G and J, we think they should be for AoD rather than AoA.Expected DL Zenith AoD~~A~~ Value Expected DL Zenith AoD~~A~~ Value |
| **FL** | For Huawei’s comments:* Row 91, 92, 98 and 99: leave blank in Column Kand all other

For ZTE’s comments:* Row 78: changed Value range “FFS” to “~~FFS~~ BOOLEAN” (To all: the parameter was not agreed)
* Row 102, Column G and J: corrected
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## (Round 2) Comments

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| **Company** | **comments** |
| vivo | For Row 88, column K, for the maximum number of DL PRS RSRP measurements per TRP, the values can be one of [16, 24];For Row 89, column K, for the maximum number of DL Path PRS RSRPP measurements per TRP, the values can be one of [2,4,8,16,24]. |
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5. Latency improvements for both DL and DL+UL positioning

(Round 1) FL Proposed Changes (marked in red in data Sheet “Positioning (Round 1)”)

* *Row 112: It seems the value range of a simple request can simply be a Boolean value decided by RAN2*
* *Row 118, It seems the value range of preconfigMG\_ID can be decided by RAN2*
* *Row 119: It seems the value range of a simple request can simply be a Boolean value decided by RAN2*
* *Row 120: Change the value range from FFS to [0, 1, 2] to represent the three options in the agreement*
* *Row 121: The value range should be “N/A”*
* *Row 122, 123: Change the value range from FFS to “[Ref. NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset in TS 37.355”*
* *Row 124:*
* *Row 125: Change the value range from FFS to “[Ref. NR-PhysCellID and nr-CellGlobalID In TS 37.355”*
* *Row 126: Change the value range from FFS for [15, 30, 60, 120] kHz*
* *Row 127: The value of the request can simply be a Boolean value decided by RAN3.*

(Round 1) Comments

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| **Company** | **comments** |
| Huawei, HiSilicon | Row 112, we do not think BOOLEAN is correct. RAN3 agreed to have a UE associated class 2 NRPPa message for it. Suggest to just remove FFS.**Support the MG activation request by the LMF.****The signaling procedure of the MG activation request uses an UE-associated class 2 signaling procedure. FFS on whether to use new defined or existing signaling procedure?**Row 118, we think this can be decided by RAN1. We have two proposals handled under 8.5.4 to discuss the maximum number of preconfigured MGs (8 or 16).Row 125 and 126, with regards to cell information and SCS information, we will have some discussion whether the PRS processing window is per UE or per BWP (based on RAN2 agreement). Maybe we can leave FFS for both rows, and try to settle it in 8.5.4.Row 127, we do not think BOOLEAN is correct. RAN3 agreed to have a single message for MG activation request and PPW activation request.**For activation request procedure initiated by non-LMF, an unified signaling procedure over NRPPa can be adopted for the delivery of pre-configured MG and PRS processing Window configuration information.** |
| ZTE | We have agreed a UE capability for lower Rx beam sweeping factor in FR2, the corresponding higher layer parameter should be supported in LPPa signaling as well.  |
| **FL** | For Huawei’s comments:* Row 112: It might better to change “FFS” to “FFS RAN3” .
* Row 118, then let us keep it as “FFS”, and then make the update based on the discussion results of this meeting
* Row 125 and 126, Okay. Let up keep and then make the updates based on the discussion results of this meeting
* Row 127, change “FFS” to “FFS RAN3”.

For ZTE’s comments:* The parameters related to UE capability, which only has impact of the signaling of UE capability, are included in UE feature list.

To All: I * Row 111: “FFS: others” is cahnegd to “FFS RAN2”, since it is unclear what “others” means
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## (Round 2) Comments

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| **Company** | **comments** |
| vivo | * Regarding Row 110/column K, in addition to the value of 1 and 4, other values cannot be excluded, since RAN4 is discussing the reduced value of M. RAN4 may introduce M=2, of which 1 sample is used for AGC. Please add ‘other values: FFS RAN4’ in clolumn K.

* We find that ‘MG activation request’ is captured in the list marked by yellow, similarly, should the parameter like ‘preconfiguration MG request’ also be captured based on RAN3 conclusion?

A UE-associated class 1 procedure is used to provide a full PRS configuration to gNB as assistance information of the pre-configuration of MG (FFS on procedure details) |
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6. Potential enhancements of information reporting from UE and gNB for multipath/NLOS mitigation

(Round 1) FL Proposed Changes (marked in red in data Sheet “Positioning (Round 1)”)

* *Row 130: Added the agreements related to the reporting of the losNlosIndicator from UE*
* *Row 131: Added the agreements related to the reporting of the losNlosIndicator from TRP*
* *Row 132: Change FFS to the same value as row 131*
* *Row 135: Change the value range of FFS to [4, 8]*
* *Rows 137 to 143: Change Value range “FFS” to “~~FFS~~ BOOLEAN” for these simple requests. RAN2/RAN3 may decide whether it is “Yes” only, or has both “Yes” and “No”.*

(Round 1) Comments

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| **Company** | **comments** |
| Huawei, HiSilicon | Row 135, we wonder why 1 and 2 are not added to the list? |
| FL | To Huawei’s comments:* Row 135: added the values 1 and 2.
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## (Round 2) Comments

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| **Company** | **comments** |
| vivo | For Row 134, column K, we doubt the value of 4, there is no agreement capturing it. Even if in UE feature list, the candidate values are marked by yellow in FG-27-14.Component 1 candidate values: [{4, 6, 8}] |
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7. On-demand transmission and reception of DL PR

(Round 1) FL Proposed Changes (marked in red in data Sheet “Positioning (Round 1)”)

* *Row 146: Change “FFS” to “[Ref. TS 37.355]”, assume all existing PRS periodicities are supported*
* *Row 168: Change “FFS” to “BOOLEAN” since the parameter is an ON/OFF indicator*

## (Round 2) Comments

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| **Company** | **comments** |
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8. Support of positioning for UEs in RRC\_ INACTIVE state

(Round 1) FL Proposed Changes (marked in red in data Sheet “Positioning (Round 1)”)

* *Row 175: Change “FFS” to “[Ref. TS 37.355]” based on RAN1’s agreement that “SRS for positioning for UEs in RRC\_INACTIVE state is configured using the SRS-PosResourceSet IE”.*

## (Round 2) Comments

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| **Company** | **comments** |
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9. Summary

TBD

10. References

1. R1-2111193 Recommendations for RAN1 RRC Parameter Preparation Moderator(Ericsson)
2. R1-2112979, Collection of updated higher layers parameter list for Rel-17 LTE and NR, Moderator (Ericsson)
3. R1-2200780, Updated RAN1 UE features list for Rel-17 NR after RAN1 #107bis-e, Moderators (AT&T, NTT RAN1 Chair’s Notes#104e.
4. R1-2112508, FL Summary for Rel-17 RRC parameters for positioning enhancement, Moderator (CATT)
5. R1-2200878 (R2-2201776), Response LS on the reporting of the Tx TEG association information, RAN2 (CATT)
6. RAN1 Chair’s Notes#104bis-e.
7. RAN1 Chair’s Notes#105e.
8. RAN1 Chair’s Notes#106e.
9. RAN1 Chair’s Notes#106bis-e.
10. RAN1 Chair’s Notes#107-e.
11. R1-2200878 Response LS on the reporting of the Tx TEG association information RAN2, CATT
12. R1-2201009 Draft reply LS on reporting of the Tx TEG association information Huawei
13. R1-2201054 Draft reply LS on reporting of the Tx TEG association information vivo
14. R1-2201207 Draft reply LS on the reporting of the Tx TEG association information ZTE
15. R1-2201247 Discussion on "Response LS on the reporting of the Tx TEG association information" OPPO
16. R1-2201317 Discussion on the reporting of the Tx TEG association information CATT
17. R1-2201318 Draft reply LS on the reporting of the Tx TEG association information CATT
18. R1-2202106 Draft Reply to RAN2 LS on the reporting of the Tx TEG association information Qualcomm Incorporated
19. R1-2202297 Draft Reply LS on the reporting of the Tx TEG association information LG Electronics
20. R1-2202327 Draft reply to Response LS on the reporting of the Tx TEG association information Ericsson