**3GPP TSG RAN WG1 #101-e R1-20xxxxx**

e-Meeting, May 25th – June 5th, 2020

Source: NTT DOCOMO, INC.

Title: Session Notes for NR UE Features

Agenda Item: 7.2.11

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

### **7.2.11 NR Rel-16 UE Features (2+3+3+5+2+4+3+2+4+2+1+2+1=32)**

***7.2.11.1 UE features for two-step RACH (2)***

[R1-2004401](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004401.zip) Summary on UE features for two-step RACH Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-2step-01] Email discussion/approval on feature group structure for two-step RACH (25th – 29th May) – Hiroki (DCM)

* Discuss and decide whether FG9-3 (Parallel MsgA and SRS/PUCCH/PUSCH transmissions across CCs in inter-band CA) is kept or removed
* Discuss and decide whether FG9-4 (MsgA operation in a band combination including SUL) is kept or removed
* Discuss and decide whether FG9-6 (up to X of msgBs per slot/within the msgB window) is kept or removed
* Discuss and decide whether any other new FG(s) is added or not
* Discuss and decide capability signaling design for FG(s) decided to be kept/added in this email discussion (if any)

Based on v011

**FL proposal 1:**

* **FG9-3 is removed from the UE features list for 2 step RACH**

**Agreements:**

* **FG9-4 is kept in the UE features list for 2 step RACH**
  + **“TBD” is removed from prerequisite feature groups for FG9-4**

**Agreements:**

* **FG[9-6] is kept with bracket in the UE features list for 2 step RACH**
  + **Add a note “RAN2 to make final decision on whether this FG is needed or not considering the maximum payload size of msgB”**

[101-e-NR-UEFeatures-2step-02] Email discussion/approval on capability signaling design for existing FGs for two-step RACH (25th – 29th May) – Hiroki (DCM)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs
* Discuss and decide any other necessary update for the UE features list for two-step RACH based on identified issues/proposals in [R1-2004401](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004401.zip)

Based on v022

**Updated FL proposal 1:**

* **Components description of FG9-1 is as below**

**1. Fallback procedures from 2-step RACH to 4-step RACH**

**2. msgA PRACH resource and format determination**

**3. msgA PUSCH configuration**

**4. Validation and transmission of MsgA PRACH and PUSCH**

**5. Mapping between preamble of MsgA PRACH and PUSCH occasion with DMRS resource of MsgA PUSCH**

**6. msgB monitoring and decoding**

**7. PUCCH transmission for HARQ-ACK feedback to a msgB**

**8. Power control for msgA PRACH, msgA PUSCH and PUCCH carrying HARQ-ACK feedback to msgB**

**Note:**

**1. Components are not exhaustive list and whether/how to capture them is up to RAN2**

**2. From RAN1 perspective, UE behavior supported for msgB window extended up to 40ms is a part of basic feature for 2-step RACH separately from NR-U feature group, i.e., FG10-2f. It is up to RAN2 to capture the above description if needed.**

**FL proposal 2:**

* **Need for the gNB to know if the feature is supported for FG9-1**
  + **Clarify that “Yes (but gNB does not need to know whether FG9-1 is supported or not for UEs before RRC connection)”**

[R1-2003415](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003415.zip) Discussion on UE features for 2-step RACH vivo

[R1-2003459](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003459.zip) Discussion on the remaining issues of the UE features for two-step RACH ZTE, Sanechips

[R1-2003603](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003603.zip) Discussion of NR Rel-16 UE features for two-step RACH CATT

[R1-2003752](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003752.zip) Discussion on UE features for two-step RACH Intel Corporation

[R1-2003893](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003893.zip) UE features for two-step RACH Samsung

[R1-2004137](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004137.zip) Discussion on UE features for NR 2step RACH LG Electronics

[R1-2004146](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004146.zip) Rel-16 UE features for 2-step RACH Huawei, HiSilicon

[R1-2004240](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004240.zip) Views on NR 2-step RACH UE feature Apple

[R1-2004350](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004350.zip) UE Features for Two-Step RACH Ericsson

[R1-2004400](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004400.zip) Discussion on UE features for Two-step RACH NTT DOCOMO, INC.

[R1-2004476](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004476.zip) Discussion on two step RACH UE features Qualcomm Incorporated

[R1-2004559](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004559.zip) On UE features or 2-step RACH Nokia, Nokia Shanghai Bell

***7.2.11.2 UE features for NR-U (3)***

[R1-2004403](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004403.zip) Summary on UE features for NR-U Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-NRU-01] Email discussion/approval on feature group structure for NR-U (25th – 29th May) – Hiroki (DCM)

* Discuss and decide whether FG10-2a (SSB-based RRM [for semi-static channel access mode]) is kept or merged to FG10-2 (SSB-based RRM [for dynamic channel access mode])
* Discuss and decide whether FG10-2d (SSB-based RLM [for semi-static channel access mode]) is kept or merged to FG10-2c (SSB-based RLM [for dynamic channel access mode])
* Discuss and decide whether FG10-19a ([Support DL reception in a carrier with intra-cell guard-bands]) is kept or removed
* Discuss and decide whether FG10-19b ([Support UL transmission with subset of RB sets passing LBT]) is kept or removed
* Discuss and decide whether FG10-21b (Support UL to DL COT sharing) is kept or removed
* Discuss and decide whether FG10-31 ([Support of CSI-RS measurements for CSI reporting and tracking without COT duration from DCI 2\_0]) is kept or removed
* Discuss and decide whether any additional FG(s) related to SSB-based BFD and CBD with Q is added or not based on proposals identified in [R1-2004403](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004403.zip)
* Discuss and decide whether any additional FG(s) related to intra-cell guard band length smaller than the default intra-cell guard band length defined in RAN4 is added or not based on proposals identified in [R1-2004403](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004403.zip)
* Discuss and decide capability signaling design for FG(s) decided to be kept/added in this email discussion (if any)

Based on v010

Agreements:

* FG10-2a for “SSB-based RRM for semi-static channel access mode” is kept in the UE features list for NR-U
  + Clarify that FG10-2 is for “SSB-based RRM for dynamic channel access mode”

Agreements:

* FG10-2d for “SSB-based RLM for semi-static channel access mode” is kept in the UE features list for NR-U
  + Clarify that FG10-2c is for “SSB-based RLM for dynamic channel access mode”

Agreements:

* A new FG10-2g for “SSB-based BFD/CBD for dynamic channel access mode” is added in the UE features list for NR-U
* A new FG10-2h for “SSB-based BFD/CBD for semi-static channel access mode” is added in the UE features list for NR-U
* A new FG10-2i for “CSI-RS-based BFD/CBD for NR-U” is added in the UE features list for NR-U

Agreements:

* Agree on draft LS (v8 in draft folder) in principle, and update action part with adding RAN2 as CC
* Send LS in R1-2004965 to RAN2/4 for possible FG for “Support of intra-cell guard bands” (based on [FG10-19a]) based on version 14 in draft folder

Agreements:

* Following FGs are kept in UE features list for NR-U
  + FG10-19a: DL wideband carrier operation mode 1: single carrier wideband operation when LBT is successful in all LBT sub-bands of [BWP/carrier]
  + FG10-19b: DL wideband carrier operation mode 2: single wideband carrier when LBT is successful in a subset of the LBT sub-bands which are contiguous
  + FG10-19c: DL wideband carrier operation mode 3: single wideband carrier when LBT is successful in a subset of the LBT sub-bands which are non-contiguous
  + FG10-19d: UL wideband carrier operation mode 1: UE transmits only if LBT passes for all LBT sub-bands of BWP
  + FG10-19e: UL wideband carrier operation mode 2A: UE transmits if LBT passes for single scheduled LBT sub-band
  + FG10-19f: UL wideband carrier operation mode 2B: UE transmits if LBT passes for scheduled multiple contiguous LBT sub-bands
* Add note for FG10-19a/b/c/d/e/f that these FGs are examples on what RAN1 ask RAN2 to reserve capability bits in LS R1-2004965

**FL proposal 7:**

* **FG[10-31] is kept in the UE features list for NR-U**

Agreements:

* A new FG10-21b for “Support UL to DL COT sharing” is added in the UE features list for NR-U
  + Components are followings
    - 1. Support Type 1 LBT for scheduled UL to share COT with gNB for DL without ULtoDL-CO-SharingED-Threshold-r16
    - 2. Support Type 1 LBT for CG-PUSCH to share COT with gNB for DL without ULtoDL-CO-SharingED-Threshold-r16
    - 3. Indicate in CG-UCI the COT sharing information
  + Other FG designs are same as 10-21a

[101-e-NR-UEFeatures-NRU-02] Email discussion/approval on capability signaling design for existing FGs for NR-U (25th May – 2nd June) – Hiroki (DCM)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs
* Discuss and decide any other necessary update for the UE features list for NR-U based on identified issues/proposals in [R1-2004403](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004403.zip)

Based on v025

Agreements:

* Add “and contention window size adjustment” to component 1 of FG10-1

Agreements:

* Add “CP extension up to 1 symbol for PUSCH/PUCCH transmission” as component 4 of FG10-1a
* “TBD” is removed from prerequisite feature groups for FG10-1a

Agreements:

* Modify the component of FG 10-2b from “MIB reading on unlicensed cell” to “MIB reading on unlicensed cell for PCell and PSCell”
* Modify the component of FG 10-2e from “SIB1 reception on unlicensed cell” to “SIB1 reception on unlicensed cell for PCell”
* “TBD” is removed from prerequisite feature groups for FG10-2/2a/2b/2c/2d/2e
* Modify the component of FG 10-2a to “SSB-based RRM with Q for semi-static channel access mode, when SMTC window is no longer than the fixed frame period”
* Modify the component of FG 10-2d to “SSB-based RLM with Q for semi-static channel access mode, when DRS window is no longer than the fixed frame period”

Agreements:

* Modify the component of FG 10-2f to “Support of RAR extension from 10ms to 40ms by decoding of the 2-bit SFN indication in DCI 1\_0”
* “TBD” is removed from prerequisite feature groups for FG10-2f

Agreements:

* ~~FFS: Type of FG10-10 is “Per band”~~
* “TBD” is removed from prerequisite feature groups for FG10-10
* FG10-10 is only for unlicensed bands

**Agreements:**

* **Type of FG10-10 is “Per band”** 
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

Agreements:

* FFS: Type of FG10-11 is “Per UE”
  + Need of xDD/FRx differentiations are “No”
* “TBD” is removed from prerequisite feature groups for FG10-11
* This FG is also applicable to licensed bands

**Updated FL proposal 6:**

* **Type of FG10-11 is “Per band”**

Agreements:

* Modify component 1 of FG10-20 to “Maximum number of frequency domain locations for a search space set configuration with freqMonitorLocations-r16”
* Candidate values for component 1 of FG10-20 are {1, 2, 3, 4, 5}
* “TBD” is removed from prerequisite feature groups for FG10-20/20a
* ~~FFS: FG10-20/20a are only for unlicensed bands~~

**Agreements:**

* **FG10-20 is only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**
* **FFS: FG10-20a is also applicable to licensed bands**

**Updated FL proposal 7:**

* **FG10-20a is only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

Agreements:

* Remove “[based on off-sync raster SSB]” from FG name
* Remove “[with an off-sync raster SSB]” from Note

Agreements:

* Change from “when DCI 2\_0 is configured but not detected” to “when SFI field in DCI 2\_0 is configured but DCI 2\_0 is not detected” in FG name and Components of FG10-25
* “TBD” is removed from prerequisite feature groups for FG10-25

Agreements:

* “TBD” is removed from prerequisite feature groups for FG10-27

**FL proposal 11 (wait for outcome of [101-e-NR-unlic-NRU-DL\_Signals\_and\_Channels-02]):**

* **“TBD” is removed from prerequisite feature groups for FG10-29**

**FL proposal 12 (wait for outcome of [101-e-NR-unlic-NRU-DL\_Signals\_and\_Channels-02]):**

* **“TBD” is removed from prerequisite feature groups for FG10-30**

Agreements:

* Remove bracket from “[9, 10,]” in FG name and Components of FG10-8
* FFS: Type of FG10-8 is “Per band”
* This FG is also applicable to licensed bands

**Updated FL proposal 13:**

* **Type of FG10-8 is “Per band”**

Agreements:

* Modify FG name of FG10-9 to “Search space set group switching with DCI 2\_0 monitoring”
* ~~FFS: Type of FG10-9/9b/9d is “Per band”~~
* ~~FFS: Type of FG10-9c is “Per BC”~~
* ~~FFS: FG10-9/9b/9c/9d are only for unlicensed bands~~
* “TBD” is removed from prerequisite feature groups for FG10-9/9b

**Agreements:**

* **Type of FG10-9/9b/9d is “Per band”**
* **Type of FG10-9c is “Per BC”**
* **FFS: FG10-9/9b/9c/9d are also applicable to licensed bands**

**Updated FL proposal 14:**

* **FG10-9/9b/9c/9d are only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

Agreements:

* ~~Type of FG10-14 is “Per band”~~
* ~~FFS: FG10-14 is only for unlicensed bands~~
* “TBD” is removed from prerequisite feature groups for FG10-14

**Agreements:**

* **Type of FG10-14 is “Per band”**
* **FG10-14 is only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

Agreements:

* Type of FG10-15 is “Per band”
* FFS: FG10-15 is only for unlicensed bands
* “TBD” is removed from prerequisite feature groups for FG10-15

**Updated FL proposal 16:**

**Alt.1**

* **Type of FG10-15 is “Per band”**
* **FG10-15 is only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

**Alt.2**

* **Type of FG10-15 is “Per UE”**
* **FG10-15 is also applicable to licensed bands**

Agreements:

* Type of FG10-16 is “Per band”
* FFS: FG10-16 is only for unlicensed bands
* “TBD” is removed from prerequisite feature groups for FG10-16

**Updated FL proposal 17:**

**Alt.1**

* **Type of FG10-16 is “Per band”**
* **FG10-16 is only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

**Alt.2**

* **Type of FG10-16 is “Per UE”**
* **FG10-16 is also applicable to licensed bands**

Agreements:

* Type of FG10-17 is “Per band”
* ~~FFS: FG10-17 is only for unlicensed bands~~
* “TBD” is removed from prerequisite feature groups for FG10-17

**Agreements:**

* **FG10-17 is also applicable to licensed bands**

Agreements:

* Remove brackets from components of 10-26/26a
* “TBD” is removed from prerequisite feature groups for FG10-26/26a

**Agreements:**

* **“TBD” and “One of {10-1, 10-1a}” are removed from prerequisite feature groups for FG10-3/3a**

Agreements:

* “One or both of {5-19, 5-20}” is prerequisite feature groups for FG10-13a

Agreements:

* “One or both of {5-19, 5-20}” is prerequisite feature groups for FG10-18

Agreements:

* Modify the “cat4 LBT” in FG 10-21a to “Type 1 channel access”
* “TBD” is removed from prerequisite feature groups for FG10-21a

Agreements:

* Type of FG10-28 is “Per band”
* ~~FFS: FG10-28 is only for unlicensed bands~~
* “One or both of {5-19, 5-20}” is prerequisite feature groups for FG10-28

**Agreements:**

* **FG10-28 is only for unlicensed bands**
  + **Add a note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used”**

**Updated FL proposal 25:**

* **For NR-U FGs, if it is agreed that the FG is only applicable to unlicensed bands, add a note “the FG is only applicable to unlicensed bands”**
* **For FGs for WIs other than NR-U, if it is agreed that the FG is only applicable to licensed bands, add a note “the FG is only applicable to licensed bands”**
  + **Note that this does not intend to perform exhaustive checking of applicability of FG to unlicensed bands**

[101-e-NR-UEFeatures-NRU-03] Email discussion/approval on basic FGs for each NR-U operation/scenario (29th May – 4th June) – Hiroki (DCM)

* Discuss and down-select from Alt.1 or Alt.2 based on the working assumption
* Discuss and decide basic FGs for each NR-U operation/scenario based on finalized FG structure for NR-U

Based on v008

**Updated FL proposal 2:**

* **Remove the text “This FG may be a part of basic operation for a particular scenario” in mandatory/optional column from following FGs**
  + **10-7 (UL channel access for 10 MHz SCell)**
  + **10-10 (RSSI and channel occupancy measurement and reporting)**
  + **10-11 (SRS starting position at any OFDM symbol in a slot)**
  + **10-20 (Support search space set configuration with freqMonitorLocation-r16)**
  + **10-20a (Support coreset configuration with rb-Offset)**
  + **10-23 (CGI reading on unlicensed cell [based on off-sync raster SSB] for ANR functionality)**
  + **10-25 (Enable configured UL transmissions when DCI 2\_0 is configured but not detected)**

[R1-2003416](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003416.zip) Discussion on UE features for NRU vivo

[R1-2003460](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003460.zip) Discussion on the remaining issues of the UE features for NR-U ZTE, Sanechips

[R1-2003694](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003694.zip) Views on Rel-16 UE features for NR-U MediaTek Inc.

[R1-2003848](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003848.zip) UE features for NR-U Ericsson

[R1-2003894](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003894.zip) UE features for NR-U Samsung

[R1-2004019](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004019.zip) Discussion on UE features for NR-U LG Electronics

[R1-2004091](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004091.zip) Discussion on UE feature for NRU OPPO

[R1-2004152](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004152.zip) Rel-16 UE features for NR-U Huawei, HiSilicon

[R1-2004241](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004241.zip) Discussions on NR-U UE features Apple

[R1-2004402](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004402.zip) UE features for NR-U NTT DOCOMO, INC

[R1-2004477](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004477.zip) Discussion on NR-U UE features Qualcomm Incorporated

[R1-2004560](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004560.zip) On UE features NR Unlicensed Nokia, Nokia Shanghai Bell

***7.2.11.5 UE features for URLLC/IIoT (2)***

[R1-2004406](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004406.zip) Summary on UE features for URLLC/IIoT Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-URLLCIIoT-01] Email discussion/approval on feature group structure for URLLC/IIoT (25th – 29th May) – Hiroki (DCM)

* Discuss and decide whether FG11-4b (DL priority indication in DCI with mixed DCI formats) is kept or removed
* Discuss and decide whether FG11-7b (Independent cancellation of the overlapping PUSCHs in an intra-band UL CA) is kept or removed
* Discuss and decide whether FG12-1a (UL priority indication in DCI with mixed DCI formats) is kept or removed
* Discuss and decide whether/how to define FG(s) for support of Rel-15 monitoring capability and Rel-16 monitoring capability on different serving cells
* Discuss and decide whether/how to introduce additional FGs for FG11-3 (e.g., for the number of PUCCHs per slot, the format of PUCCHs per slot, number of times channels can be multiplexed)
* Discuss and decide whether/how to define FG(s) for support of PUSCH repetition type B
* Discuss and decide whether/how to introduce additional FG for support of enhanced UL power control scheme
* Discuss and decide whether/how to introduce additional FG for relative TDRA for DL
* Discuss and decide whether/how to introduce additional FG for supporting Rel-16 PDCCH monitoring capability with non-aligned spans
* Discuss and decide whether any additional FG(s) is added or not based on proposals identified in [R1-2004406](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004406.zip)
* Discuss and decide capability signaling design for a FG decided to be kept/added (if any)

Based on v031

Agreements:

* FG11-2a for “Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA with Rel-16 PDCCH monitoring capability on all the serving cells” is added in the UE features list for URLLC
  + ~~FFS: details on the FG~~
* FG11-2b for “Mix of Rel. 16 PDCCH monitoring capability and Rel. 15 PDCCH monitoring capability on different carriers” is added in the UE features list for URLLC
  + ~~FFS: Type of FG11-2b is “Per FS”~~
  + Prerequisite feature group for FG11-2b is “FG11-2”
  + FG11-2b is optional with capability signaling
  + ~~FFS: Components other than support of mix of Rel-16 and Rel-15 PDCCH monitoring capability on different carriers~~
* FG11-2c for “Number of carriers for CCE/BD scaling with DL CA with mix of Rel. 16 and Rel. 15 PDCCH monitoring capabilities on different carriers” is added in the UE features list for URLLC
  + ~~FFS: Type of FG11-2c is “Per UE” or “Per BC”~~
    - ~~If it is per UE, Need of FDD/TDD differentiation is “No”~~
    - ~~If it is per UE, Need of FR1/FR2 differentiation is “No”~~
  + Prerequisite feature group for FG11-2c is “FG11-2b”
  + Components
    - Supported combination(s) of (pdcch-BlindDetectionCA-R15, pdcch-BlindDetectionCA-R16)
      * Candidate values for pdcch-BlindDetectionCA-R15 is 1 to 15
      * Candidate values for pdcch-BlindDetectionCA-R16 is 1 to 15
  + ~~Clarify in Note that the summation of the minimum of the capability on the number of CCs with Rel-15 PDCCH monitoring capability and the minimum of the capability on the number of CCs with Rel-16 PDCCH monitoring capability is 3 (depending on [101-e-NR-L1enh-URLLC-PDCCH enhancements-03])~~
  + FG11-2c is optional with capability signaling

Agreements:

* Details on the FG11-2a
  + Candidate value for the component: {2, 3, …, 16}
  + ~~FFS: Type of FG11-2a: Per UE or Per BC~~
  + Prerequisite feature group: 11-2
  + FG11-2a is optional with capability signaling
* Remaining FFS on FG11-2b
  + ~~FFS: Type of FG11-2b: Per FS~~
    - ~~FFS: Reason why FS is selected~~
  + Any other component(s)
    - ~~FFS: Support Rel-15 monitoring capability and Rel-16 monitoring capability on different serving cells~~
    - ~~FFS: report (X,Y) combinations for FG 3-5b and the Rel. 16 PDCCH when the mix is configured for the UE~~
* Remaining FFS on FG11-2c
  + ~~FFS: Type of FG11-2c: Per UE or Per BC~~
  + The minimum of the summation of capability on the number of CCs with Rel-15 PDCCH monitoring capability and the capability on the number of CCs with Rel-16 PDCCH monitoring capability is 3

Agreements:

* ~~FFS: Type of FG11-2a is Per BC~~
* ~~FFS: Type of FG11-2b is Per FS~~
  + ~~Add a note “Per FS is selected because depending on the number of carriers for CA and the BWs to be supported, the complexity of PDCCH decoding impacts the complexity of PDSCH/PUSCH decoding/encoding”~~
* Additional component(s) for FG11-2b
  + Support Rel-15 monitoring capability and Rel-16 monitoring capability on different serving cells
  + ~~FFS: Report (X,Y) combinations for FG 3-5b and the Rel. 16 PDCCH when the mix is configured for the UE~~
* Type of FG11-2c is Per BC

Agreements:

* Type of FG11-2a is Per BC
* Type of FG11-2b is Per FS
  + Per FS is selected because same type with 3-5b is preferred

Working assumption:

* Introduce separated FGs for FG11-3/4 based on below list and discuss further on possible reformulating FG structure
  + ~~UL Control channel for a single 7\*2symbol subslot based HARQ-ACK codebook (11-3a)~~
  + ~~UL Control channel for a single 2\*7symbol subslot based HARQ-ACK codebook (11-3b)~~
  + 2 PUCCH of format 0 or 2 for a single 7\*2 subslot based HARQ-ACK codebook (11-3c)
  + 2 PUCCH of format 0 or 2 for a single 2\*7 subslot based HARQ-ACK codebook (11-3d)
  + 1 PUCCH format 0 or 2 and 1 PUCCH format 1, 3 or 4 in the same subslot for a single 2\*7-symbol HARQ-ACK codebooks (11-3e)
  + 2 PUCCH transmissions in the same subslot for a single 2\*7-symbol HARQ-ACK codebooks which are not covered by 11-3d and 11-3e (11-3f)
  + 2 PUCCH of format 0 or 2 for Two HARQ-ACK codebooks with up to one 7\*2-symbol sub-slot based HARQ-ACK codebook (11-4b)
  + 2 PUCCH of format 0 or 2 in consecutive symbols for two HARQ-ACK codebooks with up to one 2\*7-symbol sub-slot based HARQ-ACK codebook (11-4c)
  + 2 PUCCH of format 0 or 2 for two subslot based HARQ-ACK codebooks (11-4d)
  + 1 PUCCH format 0 or 2 and 1 PUCCH format 1, 3 or 4 in the same subslot for HARQ-ACK codebooks with up to one 2\*7-symbol subslot based HARQ-ACK codebook (11-4e)
  + 1 PUCCH format 0 or 2 and 1 PUCCH format 1, 3 or 4 in the same subslot for two subslot based HARQ-ACK codebooks (11-4f)
  + 2 PUCCH transmissions in the same subslot for two HARQ-ACK codebooks with up to one 2\*7-symbol subslot which are not covered by 11-4c and 11-4e (11-4g)
  + 2 PUCCH transmissions in the same subslot for two subslot based HARQ-ACK codebooks which are not covered by 11-4d and 11-4f (11-4h)
  + SR/HARQ-ACK multiplexing once per subslot using a PUCCH (or HARQ-ACK piggybacked on a PUSCH) when SR/HARQ-ACK are supposed to be sent with different starting symbols in a subslot (11-3g)

Agreements:

* Adding the note for FG11-3/4/4a “The number of PUCCHs for CSI reporting per slot is not impacted compared with Rel-15 by introducing the new HARQ-ACK CBs”

Agreements:

* Following FGs in above working assumption are NOT introduced
  + UL Control channel for a single 7\*2symbol subslot based HARQ-ACK codebook (11-3a)
  + UL Control channel for a single 2\*7symbol subslot based HARQ-ACK codebook (11-3b)
* Add a note “a UE supporting 11-3 is also expected to support FGs 4-1, 4-3, 4-4, 4-5, and 4-19 with a “slot” being replaced by a sub-slot of length 2 or 7 symbols for NCP and (2 and 6 symbols for ECP) for the PUCCH formats that can be accommodated in the corresponding sub-slot durations” for FG11-3

**Updated FL proposal 2:**

* **Confirm working assumption (with removing 11-3a/3b as already agreed)**
  + **Type of FG11-3c/d/e/f/g and FG11-4c/d/e/f/g/h/i is “Per FSPC”**
    - **FFS: necessary note for reason why per FSPC**

Agreements:

* FG11-4b is kept in the UE features list for URLLC
  + FG 11-1 and FG 11-4 are prerequisite feature groups for FG11-4b
  + ~~FFS: Type of FG11-4b is “Per UE” or “Per FSPC”~~
    - ~~Need of FDD/TDD differentiation is “No”~~
    - ~~Need of FR1/FR2 differentiation is “No”~~
  + Change component 1 to “Support of priority indicator field configured in DCI formats 1\_1 and 1\_2 in a BWP when configured to monitor both DCI formats 1\_1 and 1\_2 in the BWP”

Agreements:

* Type of FG11-4b is “Per UE”
  + Need of FDD/TDD differentiation is “No”
  + Need of FR1/FR2 differentiation is “No”

Agreements:

* FG11-5 for “PUSCH repetition type B” is added in the UE features list for URLLC
  + Following components are kept (FFS: wording details)
    - 1) For a transport block, one dynamic UL grant or one configured grant schedules two or more PUSCH repetitions that can be in one slot, or across slot boundary in consecutive available slots.
    - 2) Dynamic indication of the nominal number of repetitions in the DCI scheduling dynamic PUSCH.
    - 3) The time window within which valid symbols are used for transmission is L\*K, starting from the first symbol indicated by the SLIV in TDRA field.
    - 4) PUSCH repetition type B is supported for DCI format 0\_1 and DCI format 0\_2 (for DG and type 2 CG).
    - 5) S and L are separately indicated (4-bit for S and 4-bit for L). L <= 14.
    - 6) Handling of interaction with DL/UL directions depending on whether dynamic SFI is configured or not, including both cases with and without higher layer parameter InvalidSymbolPattern configured
    - 7) Supported maximum number of PUSCH transmissions within a slot for all TB(s), where each actual repetition for PUSCH repetition type B is counted as 1 PUSCH transmission, separately reported for UE processing capability 1 and for UE processing capability 2 if UE supports both processing capabilities
      * Note: Number of TBs are based on reported Rel-15 capability on number of TBs, and reported value for component 7 cannot be smaller than the reported value of the number of TBs
    - 8) Supported PUSCH hopping scheme
  + ~~FFS: Type of FG11-5 is “Per UE”~~
    - ~~Need of FDD/TDD differentiation is “No”~~
    - ~~Need of FR1/FR2 differentiation is “No”~~
  + Following Notes are kept for FG11-5 (FFS: details)
    - Candidate value for component 7a) and 7b): {2, 3, 4, 7, 8, 12}
    - PUSCH repetition type B with configured grant is applied only if UE reports the support of FG 5-19 or FG 5-20, and subjected to the capability of FG 5-19 and FG 5-20
    - The case that both dynamic SFI and InvalidSymbolPattern are configured is applied only if UE reports the support of FG3-6
  + Note that separate FGs related to 11-5 are not introduced
    - Separate FG for component 7 (Handling of interaction with DL/UL directions depending on whether dynamic SFI is configured or not, including both cases with and without higher layer parameter InvalidSymbolPattern configured)
    - “PUSCH repetition type B with up to 1 unicast PUSCHs per slot with UE processing time capability 1”
    - “PUSCH repetition type B with up to 2 unicast PUSCHs per slot with UE processing time capability 1”
    - “PUSCH repetition type B with up to 4 unicast PUSCHs per slot with UE processing time capability 1”
    - “PUSCH repetition type B with up to 7 unicast PUSCHs per slot with UE processing time capability 1”
    - “PUSCH repetition type B with up to 1 unicast PUSCHs per slot with UE processing time capability 2”
    - “PUSCH repetition type B with up to 2 unicast PUSCHs per slot with UE processing time capability 2”
    - “PUSCH repetition type B with up to 4 unicast PUSCHs per slot with UE processing time capability 2”
    - “PUSCH repetition type B with up to 7 unicast PUSCHs per slot with UE processing time capability 2”

Agreements:

* ~~FFS: Type of FG11-5 is “Per FS”~~
  + ~~Reason why Per FS~~
* Add “Candidate value for component 8: {Inter-slot hopping, Inter-repetition hopping, both Inter-slot hopping and Inter-repetition hopping }” for component 8
* Change “Candidate value for component 7a) and 7b): {2, 3, 4, 7, 8, 12}” to “Candidate value for component 7): {2, 3, 4, 7, 8, 12}”

Agreements:

* Type of FG11-5 is “Per FS”
  + Add note for FG11-5 “Per FS is selected to follow Rel-15 reporting type for number of TBs to be supported”

Agreements:

* FG11-7b is kept in the UE features list for URLLC
  + ~~FFS: Component description (UE “may” cancel)~~
  + FG 6-23 and FG 11-7 are prerequisite feature groups for FG11-4b
  + Type of FG11-7b is “Per band”
  + Remove FFS text in Note
  + If UE indicates 6-23 but does not support this FG, UE is not expected to be scheduled simultaneous PUSCHs on multiple carriers but receiving UL CI only for subset of carriers in intra-band carriers

Agreements:

* FG11-8 for “Enhanced UL power control scheme” is added in the UE features list for URLLC
  + Change component description to “For DG-PUSCH, one bit (separately from SRI) in UL grant is used to indicate the P0 value if SRI is present in the UL grant, and 1 or 2 bits is used to indicate the P0 value if SRI is not present in the UL grant”
  + FFS: Type of FG11-8 is “Per UE” or “Per band”
    - If it is per UE, Need of FDD/TDD differentiation is “No”
    - If it is per UE, Need of FR1/FR2 differentiation is “No”

**Updated FL proposal 6:**

* **Type of FG11-8 is “Per UE”**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “Yes”**
  + **Add “Note: Differentiation is from the perspective of the scheduled carrier”**

Agreements:

* A new FG11-1b for “Type 1 HARQ-ACK codebook support for relative TDRA for DL” is added in the UE features list for URLLC
  + Component description for the FG is “Support Type 1 HARQ-ACK codebook for TDRA using the starting symbol of the PDCCH monitoring occasion in which the DL assignment is detected as the reference of the SLIV”
  + FFS: Type of FG11-1b is “Per FS”
  + FG11-1 is prerequisite feature group for FG11-1b
  + FG11-1b is “Optional with capability signaling”

**Updated FL proposal 7:**

* **Type of FG11-1b is “Per UE”**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “Yes”**
  + **Add “Note: Differentiation is from the perspective of the scheduled carrier”**

Agreements:

* FG12-1a is kept in the UE features list for URLLC
  + FG 12-1 and 11-1 are prerequisite feature groups for FG12-1a
  + FFS: Type of FG12-1a is “Per UE” or “Per FSPC”
    - Need of FDD/TDD differentiation is “No”
    - Need of FR1/FR2 differentiation is “No”
  + Change component 1 to “Support of priority indicator field configured in DCI formats 0\_1 and 0\_2 in a BWP when configured to monitor both DCI formats 0\_1 and 0\_2 in the BWP”

**Updated FL proposal 9:**

* **Type of FG12-1a is “Per UE”**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**

**FL proposal 10:**

* **A new FG 12-1x for “TB CRC for cancelled initial PUSCH with CBG based re-transmission” is added in UE features list for IIoT**
  + **Component description is “PUSCH TB CRC calculated according to Section 6.2.1 of TS 38.212 for a re-transmission of a TB in case the initial transmission was cancelled and CBG-based re-transmission is configured”**
  + **Type of FG12-1x is “Per band”**
  + **[FG5-25] FG12-1 is prerequisite feature group for FG12-1x**
  + **FG12-1x is “Optional with capability signaling”**

[101-e-NR-UEFeatures-URLLCIIoT-02] Email discussion/approval on capability signaling design for existing FGs for URLLC/IIoT (25th May – 2nd June) – Hiroki (DCM)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs
* Discuss and decide any other necessary update for the UE features list for URLLC/IIoT based on identified issues/proposals in [R1-2004406](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004406.zip)

Based on v021

**FL proposal 1:**

* **Type of FG11-1/1a is “Per UE”**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**

**FL proposal 2:**

* **Component 2 is removed for FG11-2**
* **A new component on maximum number of DL and UL unicast DCI formats in a span is added**
  + **For the set of monitoring occasions which are within the same span:**
    - **Processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for FDD**
    - **Processing one unicast DCI scheduling DL and two unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for TDD**
    - **Processing two unicast DCI scheduling DL and one unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for TDD**
* **Type of FG11-2 is Per FS for component 1 and per BC for component 2**
* **3-5b is removed from prerequisite feature groups for FG11-2**
* **A new FG for “Supported span arrangement for CA” is added**
  + **Values: {aligned spans only, aligned spans and non-aligned spans}**
  + **Type:**

**FL proposal 3:**

* **Component 3 is kept for FG11-3**
* **Type of FG11-3 is Per UE or Per FS (in bands or BCs with large number of carriers or large BW, the UE’s processing power is spent on PDCCH/PDSCH decoding. Hence, in some cases, the support of the new codebook or some codebook configurations may not be possible)**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **FFS text is removed from Note for FG11-3**

Agreements:

* FFS: Component 4 and 6 are kept for FG11-4/4a
* FFS: Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4
* FG11-3 is removed from prerequisite feature groups for FG11-4
* FFS: FG11-3 and 11-4 are prerequisite feature groups for FG11-4a
* FFS: Type of FG11-4/4a is Per FS
* The bracket is removed from Note for FG11-4

**Updated FL proposal 4:**

* **Component 4 is kept and component 6 is removed for FG11-4/4a**
* **Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4**
* **FG11-3 and 11-4 are prerequisite feature groups for FG11-4a**
* **Type of FG11-4/4a is Per FS**
  + **Add a note “Per FS is selected because in bands or BCs with large number of carriers or large BW, the UE’s processing power is spent on PDCCH/PDSCH decoding and hence in some cases, the support of the new codebook or some codebook configurations may not be possible”**

**Agreements:**

* **FFS: Type of FG11-6 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **FFS: FG5-17 is a prerequisite feature group for FG11-6**
* **FFS text is removed from the Note for FG11-6**

**Updated FL proposal 5:**

* **Type of FG11-6 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **FG5-17 is a prerequisite feature group for FG11-6**

**Agreements:**

* **Text within bracket in Component 1 is kept for FG11-7**
* **Text within bracket below Component 3 is removed for FG11-7**
* **FFS: Type of FG11-7/7a is Per FS**
* **FFS: The bracket is removed from Note for FG11-7/7a, and add 11-2/2a in the note**

**Updated FL proposal 6:**

* **Type of FG11-7/7a is Per FS**
  + **Per FS is selected because these two FGs are also very demanding in UE processing, considering that this can be a UE with processing capability 1 but required to be able to cancel according to processing capability 2, and hence it is important to take into account the BC information for dimensioning purpose**
* **The bracket is removed from Note for FG11-7/7a**

**Agreements:**

* **FFS: Component 2 and 3 are kept for FG11-9**
  + **Candidate values for component 2: {1, 2, 4, 8, 12}**
  + **Candidate values for component 3: {2, …, 24}**
  + **“configured/active” in component 2/3 is changed to “configured”**
* **One of {5-19, 5-20} is a prerequisite feature group for FG11-9**
* **FG 11-9 is a prerequisite feature group for FG11-9a**
* **FFS: Type of FG11-9/9a is Per UE or per band**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **FFS: Add following notes for FG11-9**
  + **The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**
  + **For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values**
* **Remove note for FG11-9a**

**Updated FL proposal 7:**

* **Component 2 and 3 are kept for FG11-9**
  + **Candidate values for component 2: {1, 2, 4, 8, 12}**
  + **Candidate values for component 3: {2, …, 32}**
  + **“configured/active” in component 2/3 is changed to “configured”**
  + **Component 2 and 3 are reported separately for different processing capabilities**
* **Type of FG11-9/9a is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “Yes”**
* **Add following notes for FG11-9**
  + **For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values**

**Agreements:**

* **FFS: Type of FG11-10 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **FG5-20 is a prerequisite feature group for FG11-10**
* **FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received**
* **FFS: Text is removed from the Note for FG11-10**

**Updated FL proposal 8:**

* **Type of FG11-10 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **Text is kept in the Note for FG11-10**

**Agreements:**

* **FFS: Type of FG11-11 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **FG5-20 and 5-11 are prerequisite feature groups for FG11-11**
* **FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received**
* **FFS: Text is removed from the Note for FG11-11**

**Updated FL proposal 9:**

* **Type of FG11-11 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **Text is kept in the Note for FG11-11**

**FL proposal 10:**

* **Component 1 is kept for FG12-1**
* **FG11-4 is a prerequisite feature group for FG12-1**
* **Type of FG12-1 is Per FSPC**
  + **Per FSPC is selected because this FG involves various kinds of prioritization/cancellation/multiplexing, it is very processing intensive, and hence it is important to have finer granularity so that the UE does not have to under-report based on the worst band/band combination**
* **The bracket is removed from Note for FG12-1**

**FL proposal 11:**

* **Change “[16]” to “32” for Component 1 of FG12-2**
* **Maximum candidate value for component 3 of FG12-2 is 32 (per cell group)**
* **Type of FG12-2/2a is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “Yes”**

**FL proposal 12:**

* **Type of FG12-3/3a is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**
* **Text is removed from the Note for FG12-3**

**FL proposal 13:**

* **Type of FG12-5 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**

**FL proposal 14:**

* **Type of FG12-6 is Per UE**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “Yes”**

[R1-2003316](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003316.zip) UE features for URLLC China Unicom

[R1-2003333](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003333.zip) Discussion on UE feature for URLLC/IIoT ZTE

[R1-2003418](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003418.zip) Discussion on URLLC/IIOT UE features vivo

[R1-2003446](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003446.zip) On UE Features for URLLC and IIoT Ericsson

[R1-2003606](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003606.zip) Discussion of UE features for NR URLLC/IIoT CATT

[R1-2003695](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003695.zip) Views on Rel-16 UE features for NR URLLC/IIoT MediaTek Inc.

[R1-2003755](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003755.zip) On UE features for Rel-16 eURLLC and IIoT Intel Corporation

[R1-2003897](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003897.zip) UE features for URLLC/IIoT Samsung

[R1-2004036](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004036.zip) Discussion on UE features for URLLC/IIoT LG Electronics

[R1-2004122](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004122.zip) Discussion on UE features for URLLC/IIoT OPPO

[R1-2004157](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004157.zip) Rel-16 UE features for URLLC Huawei, HiSilicon

[R1-2004243](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004243.zip) Discussions on UE Features for URLLC/IIoT Apple

[R1-2004405](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004405.zip) Rel-16 UE features for URLLC/IIoT NTT DOCOMO, INC

[R1-2004480](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004480.zip) Discussion on eURLLC and IIOT UE features Qualcomm Incorporated

[R1-2004563](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004563.zip) On UE features for URLLC/IIOT Nokia, Nokia Shanghai Bell

***7.2.11.8 UE features for NR positioning (2)***

[R1-2004408](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004408.zip) Summary on UE features for NR positioning Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-positioning-01] Email discussion/approval on feature group structure for NR positioning (25th – 29th May) – Hiroki (DCM)

* Discuss and decide whether FG13-7/7a (Support of SSB from neighbor cell (DL PRS from serving/neighbor cell) as QCL source of a DL PRS) is kept or removed
* Discuss and decide whether FG13-11 (UE Rx-Tx Measurement Report for Multi-RTT) is kept or removed
* Discuss and decide whether FG13-12/12a (NR E-CID DL SSB (CSI-RS) RRM measurements with LPP support for NR Positioning) is kept or removed
* Discuss and decide whether a new FG 13-1a (Common DL PRS Processing Capability without MG) is introduced or not, and if not, what is the expected UE behavior if MG is not configured (according to outcome of the email discussion/approval in 7.2.8)
* Discuss and decide whether a new FG 13-10g (AP-SRS with carrier switching) is introduced or not (according to outcome of the email discussion/approval in 7.2.8)
* Discuss and decide whether FG13-9c, FG13-9d, FG13-10 and FG13-10a are combined into a new single basic FG
* Discuss and decide whether a new FG (Parallel LTE/NR PRS processing) is introduced or not, and if not, what is the expected UE behavior if both NR and LTE PRS are configured

Based on v031

Agreements:

* FG 13-7 for “Support of SSB from neighbor cell as QCL source of a DL PRS” is kept in the UE features list for Positioning
  + Component 1 is kept as below
    - 1. Support of SSB from neighbor cell as QCL source of a DL PRS
      * Support of reuse SSB measurement from RRM for receiving PRS
  + 13-1 is prerequisite feature group for FG13-7
  + Type of FG13-7 is “Per band”
* FG 13-7a for “Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS” is kept in the UE features list for Positioning
  + Component 1 is kept
  + 13-1 is prerequisite feature group for FG13-7a
  + Type of FG13-7a is “Per band”
  + Add a Note “DL PRSs are in the same band”

Agreements:

* Not to combine FG13-9c, FG13-9d, FG13-10, FG13-10a into a single basic FG
* FG [13-9d] (OLPC for SRS for positioning based on SSB from serving cell) is removed
  + OLPC for SRS for positioning based on SSB from serving cell is a part of 13-8
* FG 13-9e for “PathLoss estimate maintenance” is kept in the UE features list for Positioning
  + Component 1 and 2 are kept ~~(FFS: component 1 is for all cells across all bands or on a band)~~
  + One of {13-9, 13-9a, 13-9b, 13-9c} is prerequisite feature group for FG13-9e
  + ~~FFS: Type of FG13-9e is “Per band”~~
  + Add the note that “SRS and SSB and/or PRS are in the same band”

Agreements:

* FG 13-9e for “PathLoss estimate maintenance per serving cell” is kept in the UE features list for Positioning
  + Component 1 is “Max number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning per serving cell in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions”
    - Candidate values are {1, 4, 8, 16}
  + One of {13-9, 13-9a, 13-9b, 13-9c} is prerequisite feature group for FG13-9e
  + Type of FG13-9e is “Per band”
  + Add the note that “SRS and SSB and/or PRS are in the same band”
  + Add the note that “SRS in “PUSCH/PUCCH/SRS” refers to SRS configured by SRS-Resource”
* A new FG 13-9f for “PathLoss estimate maintenance across all cells” is added in the UE features list for Positioning
  + Component 1 is “Max number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning across all cells in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions”
    - Candidate values are {1, 4, 8, 16}
  + One of {13-9, 13-9a, 13-9b, 13-9c} is prerequisite feature group for FG13-9f
  + ~~FFS: Type of FG13-9f is “Per UE”~~
    - ~~Need of FDD/TDD differentiation is “No”~~
    - ~~Need of FR1/FR2 differentiation is “No”~~
  + Add the note that “SRS and SSB and/or PRS are in the same band”
  + Add the note that “SRS in “PUSCH/PUCCH/SRS” refers to SRS configured by SRS-Resource”

**Agreements:**

* **Type of FG13-9f is “Per UE”**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “No”**

Agreements:

* FG 13-10f for “Spatial relation maintenance” is kept in the UE features list for Positioning
  + Component 1 is kept (component 1 is for all cells across all bands)
  + One of {13-10, 13-10a, 13-10b, 13-10d, 13-10e} is prerequisite feature group for FG13-10f
  + Type of FG13-10f is “Per UE”
  + Add the note that “SRS and SSB and/or PRS are in the same band”

Agreements:

* FG 13-11 for “UE Rx-Tx Measurement Report for Multi-RTT” is kept in the UE features list for Positioning
  + Component 1 and 2 are kept
    - Value for component 1: {1,2,3,4}
    - Note for component 1 is removed, and clarify that DL PRS resource/sets are on the same frequency layer
    - Note for component 2 “If the UE reports value 1 for component 2, same number of RSRP measurements supported as UE Rx-Tx measurements for component 1” is added
  + ~~FFS: Type of FG13-11 is “Per band” or “Per UE”~~
    - ~~If FG13-11 covers the case that SRS and DL PRS are on the same band~~

Agreements:

* FFS: Type of FG13-11 is “Per UE”
* Add a note “FG13-11 covers the case that SRS and DL PRS are on the same band”

**Updated FL proposal 5:**

* **Type of FG13-11 is “Per UE”**
* **Add “Note: the number of UE Rx – Tx time difference measurements refers to the measurements for a single TRP” for FG13-11**

Agreements:

* FG 13-12 for “NR E-CID DL SSB RRM measurements with LPP support for NR Positioning” is kept in the UE features list for Positioning
  + Component 1 is kept
  + 1-1 is prerequisite feature group for FG13-12
  + Working assumption: Type of FG13-12 is “Per UE”
    - Need of FDD/TDD differentiation is “No”
    - Need of FR1/FR2 differentiation is “No”
* FG 13-12a for “NR E-CID DL CSI-RS RRM measurements with LPP support for NR Positioning” is kept in the UE features list for Positioning
  + Component 1 is kept
  + 1-4 is prerequisite feature group for FG13-12a
  + Working assumption: Type of FG13-12a is “Per UE”
    - Need of FDD/TDD differentiation is “No”
    - Need of FR1/FR2 differentiation is “No”

Agreements:

* Confirm following working assumptions
  + Type of FG13-12 is “Per UE”
    - Need of FDD/TDD differentiation is “No”
    - Need of FR1/FR2 differentiation is “No”
  + Type of FG13-12a is “Per UE”
    - Need of FDD/TDD differentiation is “No”
    - Need of FR1/FR2 differentiation is “No”

Agreements:

* A new FG 13-18 for “Support of parallel processing of LTE PRS and NR PRS” is added in UE features list for Positioning
  + Note that introduction of this FG does not introduce any new additional DL PRS processing capabilities in LTE and in NR
  + ~~FFS: details of FG design~~

Agreements:

* There is no prerequisite FG for FG13-18
* Need for the gNB to know is “No” for FG13-18
* Type of FG13-18 is “Per UE”
  + Need of FDD/TDD differentiation is “No”
  + Need of FR1/FR2 differentiation is “No”
* Add a note “Need for location server to know if the feature is supported” for FG13-18
* FG13-18 is optional with capability signaling

**Agreements:**

* **FG13-5a for “Inter-frequency measurement for DL-AoD” is removed from the UE features list for positioning**
* **FG13-6a for “Inter-frequency measurement for DL-TDOA” is removed from the UE features list for positioning**

[101-e-NR-UEFeatures-positioning-02] Email discussion/approval on capability signaling design for existing FGs for NR positioning (25th May – 2nd June) – Hiroki (DCM)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs and for already agreed new FGs (simultaneous SRS transmission for intra/inter-band CA)
* Discuss and decide any other necessary update for the UE features list for NR positioning based on identified issues/proposals in [R1-2004408](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004408.zip)

Based on v039

Agreements:

* FFS text in components of FG13-1 is removed
* Notes for component 3 of FG13-1 is moved to Note column
* ~~FFS: additional candidate value(s) of component 3 (e.g., 6, 32)~~
* ~~FFS: Add additional component “max number of positioning frequency layer per band”~~
* ~~FFS: Add 48 as candidate value of component 4 of FG13-1 and other values in brackets are removed~~
* ~~FFS: Change “X%” to “30%” for FG13-1 (depending on [101-e-NR-Pos-01])~~
* Need for the gNB to know if the feature is supported is “No” for FG13-1

Agreements:

* Add N=6 and N=32 as additional candidate values of component 3
* ~~FFS: Add additional component “max number of positioning frequency layer per band”~~
* Add 6, 24 and 48 as candidate values of component 4 of FG13-1

**Agreements:**

* **A new FG for max number of positioning frequency layers UE supports across all positioning methods across all bands is introduced**
  + **Values = {1, 2, 3, 4}**
  + **Type of this FG is per UE**
* **Change “X%” to “30%” for FG13-1**

**Agreements:**

* **FG13-2 is restructured as below**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 13-2 | DL PRS Resources for DL AoD | 1. Max number of DL PRS Resource Sets per TRP per frequency layer supported by UE.   Values = {1, 2}   1. Max number of TRPs across all positioning frequency layers per UE.   Values = {[3], 6, 12, 16, 24, 32, 64, 128, 256}   1. Max number of positioning frequency layers UE supports   Values = {1, 2, 3, 4} | 13-1 | No | N/A |  | Per UE |
| 13-2a | DL PRS Resources for DL AoD on a band | 1. Max number of DL PRS Resources per DL PRS Resource Set   Values = {2, 4, 8, 16, 32, 64}  Note: 16, 32, 64 are only applicable to FR2 bands   1. Max number of DL PRS Resources per positioning frequency layer.   Values = {6, 24, 32, 64, 96, 128, 256, 512, 1024}  Note: 6 is only applicable to FR1 bands | 13-1 | No | N/A |  | Per band |
| 13-2b | DL PRS Resources for DL AoD on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.   Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.   Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.   Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.   Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | No | N/A |  | Per BC |

**Updated FL proposal 2:**

* **Candidate value [3] for component 2 of FG13-2 is removed**
* **Type of FG13-2b is Per BC**

**Agreements:**

* **FG13-3 is restructured as below**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 13-3 | DL PRS Resources for DL-TDOA | 1. Max number of DL PRS Resource Sets per TRP per frequency layer supported by UE.   Values = {1, 2}   1. Max number of TRPs across all positioning frequency layers per UE.   Values = {[3], 6, 12, 16, 24, 32, 64, 128, 256}   1. Max number of positioning frequency layers UE supports   Values = {1, 2, 3, 4} | 13-1 | No | N/A |  | Per UE |
| 13-3a | DL PRS Resources for DL-TDOA on a band | 1. Max number of DL PRS Resources per DL PRS Resource Set   Values = {1, 2, 4, 8, 16, 32, 64}  Note: 16, 32, 64 are only applicable to FR2 bands   1. Max number of DL PRS Resources per positioning frequency layer.   Values = {6, 24, 32, 64, 96, 128, 256, 512, 1024}  Note: 6 is only applicable to FR1 bands | 13-1 | No | N/A |  | Per band |
| 13-3b | DL PRS Resources for DL-TDOA on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.   Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.   Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.   Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.   Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | No | N/A |  | Per BC |

**Updated FL proposal 3:**

* **Candidate value [3] for component 2 of FG13-3 is removed**
* **Type of FG13-3b is Per BC**

**Agreements:**

* **FG13-4 is restructured as below**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 13-4 | DL PRS Resources for Multi-RTT | 1. Max number of DL PRS Resource Sets per TRP per frequency layer supported by UE.   Values = {1, 2}   1. Max number of TRPs across all positioning frequency layers per UE.   Values = {[3], 6, 12, 16, 24, 32, 64, 128, 256}   1. Max number of positioning frequency layers UE supports   Values = {1, 2, 3, 4} | 13-1 | No | N/A |  | Per UE |
| 13-4a | DL PRS Resources for Multi-RTT on a band | 1. Max number of DL PRS Resources per DL PRS Resource Set   Values = {1, 2, 4, 8, 16, 32, 64}  Note: 16, 32, 64 are only applicable to FR2 bands   1. Max number of DL PRS Resources per positioning frequency layer.   Values = {6, 24, 32, 64, 96, 128, 256, 512, 1024}  Note: 6 is only applicable to FR1 bands | 13-1 | No | N/A |  | Per band |
| 13-4b | DL PRS Resources for Multi-RTT on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.   Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.   Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.   Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands   1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.   Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | No | N/A |  | Per BC |

**Updated FL proposal 4:**

* **Candidate value [3] for component 2 of FG13-4 is removed**
* **Type of FG13-4b is Per BC**

Agreements:

* ~~FFS: Type of FG13-5 is “Per UE”~~
  + ~~Need of FDD/TDD differentiation is “No”~~
  + ~~Need of FR1/FR2 differentiation is “Yes”~~
* Type of FG13-5a is “Per band”

Agreements:

* Type of FG13-5 is “Per UE”
  + Need of FDD/TDD differentiation is “No”
  + Need of FR1/FR2 differentiation is “Yes”
* Add a note “the number of RSRP measurement on a particular band is also upper bounded by the number of resources per set supported by UE reported per band”

Agreements:

* “RSTD/[RSRP]” in FG name of FG13-6 is removed
* The component 1 and 2 of FG13-6 are kept (FFS: add “maximum number”)
* FFS: Type of FG13-6 is “Per UE”
  + Need of FDD/TDD differentiation is “No”
  + Need of FR1/FR2 differentiation is “Yes”
* Type of FG13-6a is “Per band”

**Updated FL proposal 6:**

* **Type of FG13-6 is “Per UE”**
  + **Need of FDD/TDD differentiation is “No”**
  + **Need of FR1/FR2 differentiation is “Yes”**
* **~~Add a note “the number of RSTD/RSRP measurement on a particular band is also upper bounded by the number of resources per set supported by UE reported per band”~~**

Agreements:

* The component 3, 5 and 6 of FG13-8 are kept, and the component 4 of FG13-8 is removed
* The component 2 of FG13-8a is kept
* The component 2 of FG13-8b is kept
* ~~FFS: Type of FG13-8/8a/8b is “Per FS”~~
* ~~FFS: Note is [removed or kept]~~

**Agreements:**

* **Type of FG13-8/8a/8b is “Per FS”**
  + **Add a note “Per FS is selected because similar capability was reported per FS (in FeatureSetUplink) in Rel-15”**
* **Note for FG13-8/8a/8b is removed**

Agreements:

* Add “in the same band” in component description for 13-9/9a/9b/9c
* Type of FG13-9/9a/9b/9c is “Per band”
* 13-1 and 13-8 are prerequisite feature groups for FG13-9
* 13-8 is a prerequisite feature group for FG13-9a
* 13-9 is a prerequisite feature group for FG13-9b
* 13-8 is a prerequisite feature group for FG13-9c
* Need for the gNB to know if the feature is supported is “Yes” for FG13-9/9a/9b/9c
* FFS: Note is [removed or kept]

**Updated FL proposal 8:**

* **Note for FG13-9/9a/9b/9c is kept with change to “Need for location server to know if the feature is supported and the corresponding reporting type if reported to LMF are up to RAN2”**

Agreements:

* Type of FG13-10/10a/10b/10c/10d/10e is “Per band”
* Need for the gNB to know if the feature is supported is “Yes” for FG13-10/10a/10b/10c/10d/10e
* FFS: Note is [removed or kept]

**Updated FL proposal 9:**

* **Note for FG13-10/10a/10b/10c/10d/10e is kept with change to “Need for location server to know if the feature is supported and the corresponding reporting type if reported to LMF are up to RAN2”**
* **Add “in the same band” in component description for 13-10/10a/10b/10c/10d/10e**

Agreements:

* FFS: Add “The DL PRS resource/resource sets can be in different positioning frequency layers” and “PRS and SRS used for the measurements are in a different band” in component description of FG13-11a
* 13-4 and 13-8 are prerequisite feature groups for FG13-11a
* FFS: Type of FG13-11a is “Per UE”
  + Need of FDD/TDD differentiation is “No”
  + Need of FR1/FR2 differentiation is “Yes”
* Need for the gNB to know if the feature is supported is “No” for FG13-11a

**Updated FL proposal 10:**

* **~~FG13-11a is kept with following components.~~**
  + **~~1. Support of measurements derived on DL PRS resource/resource sets which are in different positioning frequency layers~~**
  + **~~2. Support of measurements derived on PRS and SRS which may be in a different band~~**
* **~~Type of FG13-11a is “Per band”~~**
* **Change FG13-11a as below**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 13. NR Positioning | 13-11a | SRS-PRS association for Multi-RTT | 1. Support of measurements derived on DL PRS resource/resource sets which are in different positioning frequency layers for SRS transmitted in a single CC.   Note: ~~Support of measurements derived on~~ PRS and SRS ~~which~~ may be in a different band | 13-4 and 13-8 |

**FL proposal 11:**

* **Type of FG13-13 is “Per band”**

**FL proposal 12:**

* **Type of FG13-14 is “Per band”**

Agreements:

* For new FG 13-15 for “Simultaneous SRS transmission for intra-band CA”
  + Candidate values of the number of SRS resources for positioning on a symbol for intra-band CA are {1, 2}
  + 13-8 is prerequisite feature group for FG13-15
  + Type of FG13-15 is “Per band”
  + FG13-15 is “Optional with capability signaling”
* For new FG 13-15a for “Simultaneous SRS transmission for inter-band CA”
  + Candidate values of the number of SRS resources for positioning on a symbol for inter-band CA are {1, 2}
  + 13-8 is prerequisite feature group for FG13-15a
  + Type of FG13-15a is “Per BC”
  + FG13-15a is “Optional with capability signaling”
* FFS: Note “Need for location server to know if the feature is supported” is [added or not added] for FG13-15/15a

**Updated FL proposal 13:**

* **Note “Need for location server to know if the feature is supported and the corresponding reporting type if reported to LMF are up to RAN2” is added for FG13-15/15a**

**FL proposal 14:**

* **The note “Need for location server to know if the feature is supported” is kept for SRS related capabilities except for 13-10d and 13-11e with change to “Need for location server to know if the feature is supported and the corresponding reporting type if reported to LMF are up to RAN2”.**

[R1-2003421](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003421.zip) Discussion on UE features for NR positioning vivo

[R1-2003477](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003477.zip) NR positioning UE features ZTE

[R1-2003609](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003609.zip) Discussion of UE features for NR positioning CATT

[R1-2003693](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003693.zip) Views on Rel-16 UE features for NR positioning MediaTek Inc.

[R1-2003758](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003758.zip) On UE features for NR positioning Intel Corporation

[R1-2003899](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003899.zip) UE features for NR positioning Samsung

[R1-2004060](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004060.zip) Discussion on UE features for NR Positioning OPPO

[R1-2004139](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004139.zip) Discussion on UE features for NR positioning LG Electronics

[R1-2004154](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004154.zip) Rel-16 UE features for NR positioning Huawei, HiSilicon

[R1-2004483](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004483.zip) Discussion on NR Positioning UE features Qualcomm Incorporated

[R1-2004566](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004566.zip) On UE features for NR Positioning Nokia, Nokia Shanghai Bell

[R1-2004648](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004648.zip) View on UE features for NR positioning Ericsson

***7.2.11.10 UE features for MR-DC/CA (2)***

[R1-2004410](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004410.zip) Summary on UE features for MR-DC/CA Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-MRDCCA-01] Email discussion/approval on feature group structure for MR-DC/CA (25th – 29th May) – Hiroki (DCM)

* Discuss and decide whether FG18-4b (Support of SCell dormancy indication without data scheduling within active time) is kept or removed
* Discuss and decide whether FG18-5c (DL cross-carrier scheduling with different SCS and PDSCH processing capability 2) and FG18-5d (UL cross-carrier scheduling with different SCS and PUSCH processing capability 2) are kept or removed
* Discuss and decide whether any additional FG(s) related to cross-carrier scheduling is added or not based on proposals identified in [R1-2004410](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004410.zip)
* Discuss and decide whether any other new FG(s) is added or not based on proposals identified in [R1-2004410](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004410.zip)
* Discuss and decide capability signaling design for FG(s) decided to be kept/added in this email discussion (if any)

Based on v023

**FL proposal 1:**

* **FG[18-4b] is removed from the UE features list for MR-DC/CA**

Agreements:

* FG[18-5c] and [18-5d] are removed from the UE features list for MR-DC/CA enhancements
* UE is not required to support following cases in Rel-16
  + For DL cross-carrier scheduling with same SCS, both the scheduling and scheduled carriers support processing capability 2
  + For UL cross-carrier scheduling with same SCS, both the scheduling and scheduled carriers support processing capability 2
  + For DL cross-carrier scheduling with same SCS, only the scheduling carrier supports processing capability 2
  + For UL cross-carrier scheduling with same SCS, only the scheduling carrier supports processing capability 2
  + For DL cross-carrier scheduling with same SCS, only the scheduled carrier supports processing capability 2
  + For UL cross-carrier scheduling with same SCS, only the scheduled carrier supports processing capability 2
  + For DL cross-carrier scheduling with different SCS, both the scheduling and scheduled carriers support processing capability 2
  + For UL cross-carrier scheduling with different SCS, both the scheduling and scheduled carriers support processing capability 2
  + For DL cross-carrier scheduling with different SCS, only the scheduling carrier supports processing capability 2
  + For UL cross-carrier scheduling with different SCS, only the scheduling carrier supports processing capability 2
  + For DL cross-carrier scheduling with different SCS, only the scheduled carrier supports processing capability 2
  + For UL cross-carrier scheduling with different SCS, only the scheduled carrier supports processing capability 2

**Updated FL proposal 3:**

**Further Updated Alt 1:**

* **A new FG for “Processing up to X unicast DCI scheduling for DL per scheduled CC” is added in UE features list for MR-DC/CA**
  + **When all search space configurations are within a single span of [2 or] 3 consecutive OFDM symbols in a slot, the number of DL DCIs in the span for each pair of (scheduling CC SCS, scheduled CC SCS) is no larger than X, [with more than one unicast DL DCI for a scheduled CC in a same PDCCH monitoring occasion,] and one span per slot with gap of 14 OFDM symbols between start of any two spans**
    - **UE can report one value of X from candidate values per each pair of scheduling CCS, scheduled CC SCS)**
    - **Candidates values:**
      * **{2,4} for (15 kHz,120 kHz),**
      * **{2,4} for (30 kHz,120 kHz),**
      * **{2,4} for (60 kHz, 120 kHz),**
      * **{2,4} for (15 kHz,60 kHz),**
      * **{2,4} for (30 kHz,60 kHz),**
      * **{2,4} for (15 kHz,30 kHz)**
  + **Type: [Per UE]**
  + **FDD/TDD differentiation: Yes**
  + **FR1/FR2 differentiation: Yes**
  + **Optional with capability signalling**
* **A new FG for “Processing up to X unicast DCI scheduling for UL per scheduled CC” is added in UE features list for MR-DC/CA**
  + **When all search space configurations are within a single span of [2 or] 3 consecutive OFDM symbols in a slot, the number of UL DCIs in the span for each pair of (scheduling CC SCS, scheduled CC SCS) is no larger than X, [with more than one unicast UL DCI for a scheduled CC in a same PDCCH monitoring occasion,] and one span per slot with gap of 14 OFDM symbols between start of any two spans**
    - **UE can report one value of X from candidate values per each pair of scheduling CCS, scheduled CC SCS)**
    - **Candidates values:**
      * **{2,4} for (15 kHz,120 kHz),**
      * **{2,4} for (30 kHz,120 kHz),**
      * **{2,4} for (60 kHz, 120 kHz),**
      * **{2,4} for (15 kHz,60 kHz),**
      * **{2,4} for (30 kHz,60 kHz),**
      * **{2,4} for (15 kHz,30 kHz)**
  + **Type: [Per UE]**
  + **FDD/TDD differentiation: Yes**
  + **FR1/FR2 differentiation: Yes**
  + **Optional with capability signalling**

**Alt.2**

* **Component 2 in FG18-5/5b is removed**
  + **FFS: Modify the note to “In case UE supports 3-5b, the limits do not apply for each span for FDD scheduling cell and TDD scheduling cell” for FG18-5/5b**

[101-e-NR-UEFeatures-MRDCCA-02] Email discussion/approval on capability signaling design for existing FGs for MR-DC/CA (25th May – 2nd June) – Hiroki (DCM)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs
* Discuss and decide any other necessary update for the UE features list for MR-DC/CA based on identified issues/proposals in [R1-2004410](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004410.zip)

Based on v026

Agreements:

* The text in prerequisite feature groups of FG18-1 is removed for now
  + Wait for RAN2 feedback

Agreements:

* FFS: Type of FG18-4/4a is “Per BC”
  + Need of FR1/FR2 differentiation is “N/A”
* 19-1 is kept for prerequisite feature groups for FG18-4a
* ~~FFS: Add notes “One dormant BWP and one non-dormant BWP is supported per carrier”, “DCI-based SCell dormancy indication is supported” and “More than one non-dormant BWP per carrier is supported only if UE feature 6-3/6-4 is also supported” for FG18-4/4a~~

**Agreements:**

* **FFS: Type of FG18-4/4a is “Per UE”**
  + **Need of FR1/FR2 differentiation is “Yes”**
* **Add notes “One dormant BWP and one non-dormant BWP is supported per carrier” and “More than one non-dormant BWP per carrier is supported only if UE feature 6-3/6-4 is also supported” for FG18-4/4a**
* **FFS: add note “Dormant BWP is considered as an RRC-configured BWP” for FG18-4/4a**

**Updated FL proposal 2:**

* **Type of FG18-4/4a is “Per BC”**

Agreements:

* Add “for same/different numerologies” in component of FG18-5a
* ~~FFS: Type of FG18-5/5a/5b is “Per band and Per BC”~~
  + ~~Need of FR1/FR2 differentiation is “N/A”~~
* Prerequisite feature groups for FG18-5a is “one of {6-10, 18-5}”
* ~~FFS: Remove “one of {6-9, 6-9a}” from prerequisite feature groups for FG18-5/5b~~

**Agreements:**

* **Type of FG18-5/5a/5b is Per BC**
* **Remove “one of {6-9, 6-9a}” as prerequisite feature groups for FG18-5/5b**

Agreements:

* Add “for same/different numerologies” in component of FG18-6a
* ~~FFS: Type of FG18-6/6a is “Per band and Per BC”~~
  + ~~Need of FR1/FR2 differentiation is “N/A”~~

**Agreements:**

* **Type of FG18-6/6a is Per BC**

Agreements:

* FG18-8 is “Optional with capability signaling”

**Updated FL proposal 6:**

* **Component 4 is removed from FG18-2/2a**
* **Type of FG18-3a is “Per BC”**
* **6-13 is kept as prerequisite feature groups for FG18-2a/3**
* **The note “[this FG is for synchronous EN-DC]” is kept for FG18-2a/2b/3/3a**
* **The component description for FG18-3a is updated to “UE configured with tdm-patternConfig-r16 can transmit semi-statically configured LTE UL transmissions in all UL subframes not limited to the reference tdm-pattern (only for type 1 UE)”**

**FL proposal 7:**

* **6-5 is prerequisite feature group for DL CA with non-aligned frame boundaries for inter-band CA**
* **6-6 is prerequisite feature group for UL CA with non-aligned frame boundaries for inter-band CA**

[R1-2003335](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003335.zip) Discussion on UE feature for MR-DC ZTE

[R1-2003677](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003677.zip) Views on Rel-16 UE features for MR-DC/CA MediaTek Inc.

[R1-2003760](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003760.zip) UE feature for MR-DC Intel Corporation

[R1-2003901](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003901.zip) UE features for MR-DC/CA Samsung

[R1-2004144](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004144.zip) Rel-16 UE features for MR-DC/CA Huawei, HiSilicon

[R1-2004369](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004369.zip) Discussion on UE features for MR-DC Ericsson

[R1-2004409](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004409.zip) Discussion on UE features for MR-DC/CA enhancement NTT DOCOMO, INC.

[R1-2004485](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004485.zip) Discussion on UE features for MR-DC/CA Qualcomm Incorporated

[R1-2004568](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004568.zip) On UE features for MR-DC/CA Nokia, Nokia Shanghai Bell

***7.2.11.11 UE features for CLI/RIM (1)***

[R1-2004412](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004412.zip) Summary on UE features for CLI/RIM Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-CLIRIM-01] Email discussion/approval on remaining issues on UE features for CLI/RIM (25th – 29th May) – Hiroki (DCM)

* Discuss and decide whether/how to handle licensed/unlicensed differentiation for FG17-1/2
* Discuss and decide whether to keep the current notes for FG17-3/4 or to remove them

Agreements:

l  Note for FG17-1 and FG17-2

Ø  Replace “FFS: whether or how to handle licensed/unlicensed differentiation” by “CLI measurement is not supported in unlicensed bands in Rel-16”

² No change on reporting type for FG17-1 and 17-2

Agreements:

l  Note for FG17-3 and FG17-4

Ø  Keep the current notes i.e., remove brackets, and add “(How to capture this sentence is up to RAN2)”

[R1-2003491](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003491.zip) Discussion on UE feature for CLI ZTE

[R1-2004140](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004140.zip) Discussion on UE features for NR CLIRIM LG Electronics

[R1-2004145](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004145.zip) Rel-16 UE features for CLI/RIM Huawei, HiSilicon

[R1-2004411](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004411.zip) Discussion on UE features for CLI/RIM NTT DOCOMO, INC.

[R1-2004486](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004486.zip) Discussion on UE features for CLI Qualcomm Incorporated

[R1-2004587](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004587.zip) UE features for CLI/RIM Ericsson

***7.2.11.12 UE features for TEIs (2)***

[R1-2004414](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004414.zip) Summary on UE features for TEIs Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-TEIs-01] Email discussion/approval on feature group structure for NR TEI (25th – 27th May)- Hiroki (DCM)

* Discuss and decide whether FG14-5a (Half-duplex UE behaviour in TDD CA with different SCS) is kept or removed
* Discuss and decide whether FG14-7 (New capability for beamSwitchTiming values of 224 and 336) is kept or removed
* Discuss and decide whether FG14-8 (Active BWP when receiving the CSI triggering DCI and when receiving the associated CSI-RS) is kept or removed
* Discuss and decide capability signaling design for FG(s) decided to be kept/added in this email discussion (if any)

Based on v015

**Agreements:**

* FG[14-5a] is removed from the UE features list for NR TEIs

**Agreements:**

* FG14-7 is kept in the UE features list for NR TEIs
  + Update the component to “Indicates the minimum number of required OFDM symbols {224, 336} between the DCI triggering aperiodic CSI-RS and the corresponding aperiodic CSI-RS transmission in a CSI-RS resource set configured with repetition ‘ON’”
  + Prerequisite feature group for FG14-7 is “2-28”
  + Candidate values for FG14-7 are {224, 336}

Agreements:

* FG14-8 is kept in the UE features list for NR TEIs
  + “TBD” is removed from prerequisite feature groups for FG14-8
  + The FG name and component are changed to “CSI trigger states containing non-active BWP”
  + RAN1 agreements for the TEI “CSI trigger states containing non-active BWP” is added in the note
  + ~~FFS: necessary TP due to introduction of this FG~~

**Agreements:**

* Adopt following TP for TS38.214

|  |
| --- |
| 5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology  For CSI-RS resource sets associated with Resource Settings configured with the higher layer parameter *resourceType* set to 'aperiodic', 'periodic', or 'semi-persistent', trigger states for Reporting Setting(s) (configured with the higher layer parameter *reportConfigType* set to 'aperiodic') and/or Resource Setting for channel and/or interference measurement on one or more component carriers are configured using the higher layer parameter *CSI-AperiodicTriggerStateList*. For aperiodic CSI report triggering, a single set of CSI triggering states are higher layer configured, wherein the CSI triggering states can be associated with any candidate DL BWP. A UE is not expected to receive more than one DCI with non-zero CSI request per slot. A UE is not expected to be configured with different *TCI-StateId*'s for the same aperiodic CSI-RS resource ID configured in multiple aperiodic CSI-RS resource sets with the same triggering offset in the same aperiodic trigger state. A UE is not expected to receive more than one aperiodic CSI report request for transmission in a given slot. If a UE does not indicate its capability of “[CSItriggerStateContainingNonactiveBWP]”, the UE is not expected to be triggered with a CSI report for a non-active DL BWP. Otherwise, when a UE is triggered with a CSI report for a DL BWP that is non-active when expecting to receive the most recent occasion, no later than the CSI reference resource, of the associated NZP CSI-RS, the UE is not expected to report the CSI for the non-active DL BWP and the CSI report associated with that BWP is omitted. When a UE is triggered with aperiodic NZP CSI-RS in a DL BWP that is non-active when expecting to receive the NZP CSI-RS, the UE is not expected to measure the aperiodic CSI-RS. In the carrier of the serving cell expecting to receive that associated NZP CSI-RS, if the active DL BWP when receiving the NZP CSI-RS is different from the active DL BWP when receiving the triggering DCI,  - the last symbol of the PDCCH span of the DCI carrying the BWP switching shall be no later than the last symbol of the PDCCH span of the DCI carrying the CSI trigger, irrespective of whether they are in the same carrier of a serving cell or not and irrespective of whether they are in the same SCS or not;  - the UE is not expected to have any other BWP switching in that carrier after the last symbol of the PDCCH span covering the DCI carrying the CSI trigger and before the first symbol of the triggered NZP CSI-RS or CSI-IM. |

**Updated FL proposal 3:**

* **FG14-8 is “[mandatory or optional] with capability signaling”**

[101-e-NR-UEFeatures-TEIs-02] Email discussion/approval on capability signaling design for existing FGs for NR TEI (25th – 29th May) – Hiroki (DCM)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs
* Discuss and decide any other necessary update for the UE features list for NR TEI based on identified issues/proposals in [R1-2004414](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004414.zip)

Based on v010

Agreements:

* “[(indicating component 1 value larger than component 2 value)]” and “One of {16-2, 16-2a}” are removed from prerequisite feature groups
* Components of 14-2 are “support of PDSCH Type B scheduling of length 9 and 10 OFDM symbols” and “support of DMRS shift for length-10 symbols”
* ~~FFS: Type of FG14-2 is “Per UE” or “Per band”~~
  + ~~Need of FDD/TDD differentiation is “No”~~
  + ~~Need of FR1/FR2 differentiation is “No”~~
* FG14-2 is “Optional with capability signaling”

**Agreements:**

* **Type of FG14-2 is “Per band”**
  + **Need of FDD/TDD differentiation is “N/A”**
  + **Need of FR1/FR2 differentiation is “N/A (FR1 only)”**

Agreements:

* ~~FFS: Remove component 2 and 3 of FG14-4~~
  + ~~Corresponding FFS text in note of FG14-4 and descriptions on candidate value sets are also removed~~
  + ~~FFS: necessary clarification on how Rel-15 capability on impacted DL/UL bands should be used for the xTyR reported values in Rel-16~~
* Type of FG14-4 is “Per BC (same reporting type as srs-TxSwitch in Rel-15)”

**Agreements:**

* Remove component 2 and 3 of FG14-4
  + Corresponding FFS text in note of FG14-4 and descriptions on candidate value sets are also removed

Agreements:

* Type of FG14-5 is “Per BC”
  + Need of FDD/TDD differentiations is “N/A (TDD only)”
  + Need of FR1/FR2 differentiation is “N/A”
* FG14-5 is “Optional with capability signaling”

[R1-2003422](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003422.zip) Discussion on UE features for TEI 14-7 vivo

[R1-2003478](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003478.zip) NR TEI UE features ZTE

[R1-2003604](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003604.zip) Discussion on UE features for TEI CATT

[R1-2003691](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003691.zip) Views on Rel-16 UE features for NR TEIs MediaTek Inc.

[R1-2003761](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003761.zip) UE features for NR TEI Intel Corporation

[R1-2004061](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004061.zip) Discussion on Rel-16 UE features for TEIs OPPO

[R1-2004161](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004161.zip) Discussion on Rel-16 UE features for TEIs Huawei, HiSilicon

[R1-2004177](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004177.zip) Remaining issues of UE features for TEIs Ericsson

[R1-2004413](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004413.zip) Discussion on UE features for NR TEI NTT DOCOMO, INC.

[R1-2004487](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004487.zip) Discussion on UE features for TEIs Qualcomm Incorporated

[R1-2004569](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004569.zip) On UE features for TEIs Nokia, Nokia Shanghai Bell

***7.2.11.13 Others (1)***

*Including interactions among UE features across WIs*

[R1-2004415](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004415.zip) Summary on NR UE features for others Moderator (NTT DOCOMO, INC.)

[101-e-NR-UEFeatures-Others-01] Email discussion/approval on potential new FGs that are not dedicated to a specific Rel-16 work item/TEI (25th – 27th May) – Hiroki (DCM)

* Discuss and decide whether or not to introduce any new FG(s) (or which WI will handle the new FG) based on identified issues/proposals in [R1-2004415](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004415.zip)
* Discuss and decide whether/how to introduce a new FG for uplink Tx switching according to the agreements made at RAN1#100bis-e
* Discuss and decide capability signaling design for FG(s) decided to be added in this email discussion (if any)

Based on v020

Agreements

* A new FG for indicating supported option for UL Tx switching for inter-band UL CA is added in the UE features list
  + Candidate values set is {option1, option2, [both option 1 and option 2]}
  + Type of the FG is “Per BC”
  + This FG is "Conditional mandatory with capability signalling".  Signaling of this FG is mandatory conditioned on the support of switching time capability for Tx switching between two uplink carriers in inter-band UL CA band combinations in RAN4 FG 7-1 (i.e. Tx switching period between two uplink carriers).
  + 6-6 and RAN4 FG 7-1 are prerequisite feature groups for the new FG
  + Note “[it is up to RAN2 how to report support of both option 1 and option 2]”
  + Add "FR1 only" in the column of FR1/FR2 differentiation

Agreements:

* A new FG 22-2 for indicating supported option for UL Tx switching for EN-DC is added in the UE features list
  + Candidate values set is {option1, option2~~, [both option 1 and option 2]~~}
  + Type of the FG is “Per BC”
  + This FG is "Conditionally mandatory with capability signalling".  Signaling of this FG is mandatory conditioned on the support of switching time capability for Tx switching between two uplink carriers in EN-DC in RAN4 FG 7-1 (i.e. Tx switching period between two uplink carriers).
  + EN-DC and RAN4 FG 7-1 are prerequisite feature groups for the new FG
  + Add "FR1 only" in the column of FR1/FR2 differentiation
* ~~Add a note depending on the outcome from [101-e-LS-TxSwitching-01] to both FG 22-1 and FG 22-2 - e.g. ["It has been agreed in RAN1 that UE can report support of one of the three candidates {option1, option2, both option1 and option2}.  It is up to RAN2 to design the corresponding UE capability signalling."]~~

Agreements:

* New FGs for simultaneous use of CBG-based transmission for PUSCH(s) with UE processing time capability 2 are introduced
  + 22-3a: CBG based transmission for UL with 1 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 2
  + 22-3b: CBG based transmission for UL with up to 2 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 2
  + 22-3c: CBG based transmission for UL with up to 7 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 2
  + 22-3d: CBG based transmission for UL with up to 4 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 2
* New FGs for simultaneous use of CBG-based transmission for PDSCH(s) with UE processing time capability 2 are introduced
  + 22-3e: CBG based transmission for DL with 1 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 2
  + 22-3f: CBG based transmission for DL with up to 2 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 2
  + 22-3g: CBG based transmission for DL with up to 7 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 2
  + 22-3h: CBG based transmission for DL with up to 4 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 2
* Introduce one bit Rel-16 RRC parameter to confirm Rel-16 configuration

Agreements:

* New FGs for simultaneous use of CBG-based transmission for PUSCH(s) with UE processing time capability 1 are introduced
  + 22-4a: CBG based transmission for UL with 1 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 1
  + 22-4b: CBG based transmission for UL with up to 2 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 1
  + 22-4c: CBG based transmission for UL with up to 7 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 1
  + 22-4d: CBG based transmission for UL with up to 4 unicast PUSCHs per slot per CC for different TBs with UE processing time Capability 1
* New FGs for simultaneous use of CBG-based transmission for PDSCH(s) with UE processing time capability 1 are introduced
  + 22-4e: CBG based transmission for DL with 1 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 1
  + 22-4f: CBG based transmission for DL with up to 2 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 1
  + 22-4g: CBG based transmission for DL with up to 7 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 1
  + 22-4h: CBG based transmission for DL with up to 4 unicast PDSCHs per slot per CC for different TBs with UE processing time Capability 1
* Introduce one bit Rel-16 RRC parameter to confirm Rel-16 configuration

[R1-2003336](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003336.zip) Remaining issues on Rel-16 NR UE features ZTE

[R1-2003762](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003762.zip) Rel-16 UE feature - Others Intel Corporation

[R1-2003902](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003902.zip) UE features for other aspects Samsung

[R1-2004062](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004062.zip) Discussion on the support of SRS transmission in all symbols of a slot OPPO

[R1-2004488](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004488.zip) Discussion on UE features for Others Qualcomm Incorporated

[R1-2004682](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004682.zip) General discussion on NR Rel-16 UE features Ericsson

Revision of [R1-2004586](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004586.zip)

[R1-2004628](file:///C:\Users\Hiroki%20Harada\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2004628.zip) Other aspects of Rel-16 NR UE features Huawei, HiSilicon