**3GPP TSG RAN WG1 #110bis-e R1-2210281**

e-Meeting, October 10th – 19th, 2022

Source: NTT DOCOMO, INC.

Title: Session Notes for R17 UE Features 1

Agenda Item: 8.16.1

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

***8.16 Rel-17 UE features***

**8.16.1 UE features topics 1**

*For discussions on Rel-17 UE features for eIIoT & URLLC, RedCap, UE power saving, coverage enhancement, NB-IoT & eMTC, sidelink, MBS, 5G terrestrial broadcast, UL TX switching, SDT.*

[110bis-e-R17-UE-features-01] Email discussion on Rel-17 UE features topics 1 by October 19 – Hiroki (NTT DOCOMO)

* eIIoT & URLLC, RedCap, UE power saving, coverage enhancement, NB-IoT & eMTC, sidelink, MBS, 5G terrestrial broadcast, UL TX switching, SDT

**R1-2210275** Summary#1 on UE features for enhanced IIoT and URLLC Moderator (NTT DOCOMO, INC.)

R1-2210421 Summary#2 on UE features for enhanced IIoT and URLLC Moderator (NTT DOCOMO, INC.)

**Agreement:**

The prerequisite FG for FG 25-3a is 25-3.

**Agreement:**

The prerequisite FG for FG 25-3b is 25-3.

**Agreement:**

For component 5 description of FG 25-6, “type 3 or” is kept and the bracket is removed.

**Agreement:**

* Add the following components to FG 25-12:
	+ Component 2: Sensing to initiate a semi-static CO or transmit after a gap greater than 16us from any transmission burst within a UE-initiated CO
	+ Component 3: Determination of COT initiator assumption based on rules for configured UL
	+ Component 4: Validating COT initiator assumption indicated in UL scheduling DCI

**Agreement:**

The prerequisite FG for FG 25-16 is 11-4.

**Agreement:**

* The prerequisite FG for FG 25-18 is FG 6-6.

**Agreement:**

* Add a new FG for support of PRS as spatial relation RS of SRS
	+ The prerequisite FG is 25-19a
	+ The type is per FS and applicable to FR2 only

**R1-2210276** Summary#1 on UE features for NR coverage enhancement Moderator (NTT DOCOMO, INC.)

**R1-2210422** Summary#2 on UE features for NR coverage enhancement Moderator (NTT DOCOMO, INC.)

**Agreement:**

Remove “after the events that violate power consistency and phase continuity” for the description of “Feature group” in FG 30-4g

**Agreement:**

* Add “triggered by DCI or MAC CE” after “event(s)” and a note “Note: Events which are triggered by DCI or MAC CE, but do not require UE capability to resume maintaining power consistency and/or phase continuity as specified in subclause 6.1.7 of 38.214 v17.3.0 are excluded from this feature” for the description of “Components” in FG 30-4g
	+ In the LS to be sent to RAN2 with updated UE features list, RAN1 asks RAN2 to consider to update TS38.331 description based on FG30-4g accordingly, e.g., *pusch-WindowRestart, pucch-WindowRestart*

**Agreement:**

The description of “Consequence if the feature is not supported by the UE” in FG 30-4g is updated as below.

* UE does not support restarting DM-RS bundling after the events triggered by DCI or MAC CE that violate power consistency and phase continuity. Note: Events which are triggered by DCI or MAC CE, but do not require UE capability to resume maintaining power consistency and/or phase continuity as specified in subclause 6.1.7 of 38.214 v17.3.0 are excluded from this feature

**Agreement:**

* Add the following notes specifying the applicable multi-carrier scenarios for FG 30-4a, 4b, 4c, and 4d
	+ This capability is applicable to following multiple carrier scenarios in addition to single carrier scenarios
		- FR1+FR2 UL CA, FR1+FR2 DC, and EN-DC with NR on FR2. DMRS bundling configuration is limited to one uplink NR carrier in total on all FRs at a time.
		- FR1 inter-band DL CA with a “single” uplink band configured, meaning no switching to transmit SRS on another carrier.
		- DL CA with “additional” UL carrier configured with SRS only (i.e. no PUCCH/PUSCH configured)
		- FR1 inter-band UL CA with DMRS bundling
		- SUL with DMRS bundling
	+ For the last three scenarios listed above, DMRS bundling can be applied with the following conditions:
		- Concurrent transmissions scheduled/configured over multiple carriers are not expected by UE
		- Only configuration of a single TAG
		- Only applicable for the back-to-back case (i.e., zero gap between two transmissions within an actual TDW)
		- Only one band can be configured with DMRS bundling at a time
		- Note 1: Under the above conditions, phase continuity and power consistency within any actual TDW on one carrier is not impacted by operations on a different carrier.
		- Note 2: Under the above conditions, the events defined in section 6.1.7 of TS38.214 for the carrier with DMRS bundling are not triggered by any transmission within any actual TDW on the other carrier.
		- Note 3: If the modulation scheme higher than QPSK is scheduled for transmission on any carrier configured with DMRS bundling, DMRS bundling is not applicable according to UE feature 30-4 (i.e., the error case and up to UE implementation)

**Agreement:**

* Add the following note specifying the applicable multi-carrier scenarios for FG 30-4h
	+ “Note: This capability is only applicable when UE is configured with single uplink carrier within a frequency range.

R1-2210664 Summary#3 on UE features for NR coverage enhancement Moderator (NTT DOCOMO, INC.)

**Updated Proposal 2-2-3:**

**The type of FGs 30-4a/b/c/d/g/h is per band and per BC**

**Updated Proposal 2-2-4:**

* **Apply either one of following alternatives for the type of FGs 30-4e/f**
	+ **Alt.1: Per UE**
	+ **Alt.2: Per band**

**R1-2210277** Summary#1 on UE features for NR MBS Moderator (NTT DOCOMO, INC.)

**Agreement:**

* Components of FG 33-1 are revised as
	+ Component 1: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by MCCH-RNTI.
	+ Component 2: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by G-RNTI(s) for MTCH.
	+ Component 6: Support of inter-slot TDM between unicast PDSCH and MCCH group-common PDSCH or MTCH group-common PDSCH, or between MCCH group-common PDSCH and MTCH group-common PDSCH, or among unicast PDSCH and MCCH group-common PDSCH and MTCH group-common PDSCH in different slots
	+ Add a component “One G-RNTI per UE is supported for broadcast reception”
	+ Add a component “Support of FDMed MCCH and PBCH”
	+ Add a component “Support of up to 64QAM for FR1/FR2”

**Agreement:**

* Components of FG 33-2 are revised as
	+ Component 1: Support of group-common PDCCH/PDSCH for multicast with CRC scrambled by G-RNTI for PCell.
	+ Component 5: Support of inter-slot TDM between ~~unicast PDSCH and~~ group-common PDSCH for multicast and other PDSCHs in different slots.

**Agreement:**

No additional component is added for FG 33-2i, i.e., FFS can be removed

**Agreement:**

Prerequisite FG for FG 33-2j is FG 33-2

**Agreement:**

The feature group name of FG 33-3-2 is revised as “FDM-ed unicast PDSCH and one group-common PDSCH for multicast”

**Agreement:**

Prerequisite FG for FG 33-3-3 is revised as “33-1 and/or 33-2”

**Agreement:**

* The reporting type of FG 33-3-3 is per FSPC

**Agreement:**

* Components of FG 33-3-3a are revised as “Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH”
* Components of FG 33-3-3b are revised as “Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH”

**Agreement:**

Remove the bracket in components of FG 33-4, i.e., “Support of shared PUCCH resource configurations with unicast” is included in FG 33-4

**Agreement:**

The prerequisite FGs for FG 33-4-1 are FG 33-4 and 33-2f

**Agreement:**

Components of FG 33-4-1 are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signaling via DCI format 4\_2”

**Agreement:**

Components of FG 33-5-1b are revised as “Support of DCI-based enabling/disabling ACK/NACK based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2”.

**Agreement:**

Components of FG 33-5-1g are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2”

**R1-2210423** Summary#2 on UE features for NR MBS Moderator (NTT DOCOMO, INC.)

**Agreement:**

Prerequisite FG for FG 33-3-5 is “FG 33-2a or 33-4 or 33-5-1a or 33-5-1f”

**Agreement:**

Add FG 33-5-1i as a prerequisite FG for FG 33-5-1b

**Agreement:**

Remove the bracket in Components of FG 33-5-1d

**Agreement:**

Components of FG 33-5-1d are revised as “Support of PTP retransmission associated with CS-RNTI for SPS multicast on the cell same as multicast initial transmission”.

**Agreement:**

Prerequisite FG for FG 33-5-1i is FG 33-5-1

**Agreement:**

Prerequisite FG for FG 33-5-2 is revised to FG 33-5-1

**Agreement:**

The reporting type of FG 33-6-1 is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

Components of FG 33-6-1a are revised as “Support of priority indicator field configured in DCI formats 4\_2 for multicast HARQ-ACK feedback of SPS multicast”

**Agreement:**

The reporting type of FG 33-6-1a is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

The reporting type of FG 33-6-2 is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

The reporting type of FG 33-6-3 is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on Scell

* Add FG 33-2h and 33-5-1 as prerequisite FGs

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| 33. NR\_MBS | 33-5-3 | One SPS group-common PDSCH configuration for multicast for Scell | 1. Support one SPS group-common PDSCH configuration for multicast for Scell.2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH for Scell. | 33-5-1, 33-2h  | Yes | Per FSPC | N/A | N/A |  |  | Optional with capability signalling |
| 33. NR\_MBS | 33-5-4 | Up to 8 SPS group-common PDSCH configurations per CFR for multicast for SCell | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast for Scell.2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast for Scell.3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M.4. The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32. | 33-5-3 | Yes | Per FSPC | N/A | N/A |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling |

**Agreement:**

Modify 33-3-3a and 3b as below.

* Further discuss on the consequence

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| 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1. Support of FDM-ed Type-1 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast2. Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a, 33-3-2 | Yes |  | FFS | Per BC  |  N/A | N/A |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.Candidate values of X is {2, 3, 4} with X no larger than max number of G-RNTIs of FG33-2e | Optional with capability signalling |
| 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1.Support of Mode 2 TDM-ed Type-1 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast2.Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a | Yes |  | FFS | Per BC  |  N/A | N/A |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.Candidate values of X is {2, 3, 4} with X no larger than max number of G-RNTIs of FG33-2e | Optional with capability signalling |

**Agreement:**

Components of FG 33-3-5 are revised as “Support of multiplexing HARQ-ACK for unicast and for multicast with the same priority and different HARQ-ACK codebook types in a PUCCH or in a PUSCH”

**Agreement:**

The prerequisite FG for FG 33-6-1 is FG 33-2a and 33-2f

**Agreement:**

The prerequisite FG for FG 33-8-1 is 33-2a

**Agreement:**

Introduce FG for support of the followings

* Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations
* Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations

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| 33. NR\_MBS | 33-8-2 | Up to 2 PUCCH resources configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-8-1, 33-6-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |
| 33. NR\_MBS | 33-8-3 | PUCCH resource configuration for multicast feedback for SPS GC-PDSCH | Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

R1-2210665 Summary#3 on UE features for NR MBS Moderator (NTT DOCOMO, INC.)

**High priority proposal 2-9-1:**

* **Apply following notes for component 5 of FG 33-3-3.**
	+ **Note: The number of M, N, K and L are determined based on the numbers reported by FG5-11 and/or FG5-11a and/or FG5-11b.**
	+ **Note: up to one broadcast PDSCH is supported in a slot.**
* **Add FG 5-11 and/or 5-11a and/or 5-11b as prerequisite FGs for FG 33-3-3**

**High priority proposal 2-10-3:**

**The prerequisite FG for FG 33-3-3a is FG 33-2a, 33-3-2**

**High priority proposal 2-10-4:**

**The prerequisite FG for FG 33-3-3b is FG 33-2a**

**High priority proposal 2-10-5:**

**The reporting type of FG 33-3-3a is Per BC**

**High priority proposal 2-10-6:**

**The reporting type of FG 33-3-3b is Per BC**

**High priority proposal 2-11-1:**

**The reporting type of FG 33-3-4 is Per BC**

**High priority proposal 2-12-3:**

**The reporting type of FG 33-3-5 is Per UE**

**High priority proposal 2-16-3:**

* **Components of FG 33-5-1 are revised as**
	+ **Add a component “Support of group-common PDCCH/PDSCH with CRC scrambled by G-CS-RNTI(s) for multicast”**
	+ **Add a component “Support of DCI format 4\_1 with CRC scrambled with G-CS-RNTI for multicast”**

**High priority proposal 2-17-1:**

**Components of FG 33-5-1a are revised as**

* **Add a component “Support of PTM retransmission for SPS multicast associated with G-CS-RNTI”**
* **Add a component “Support of Type-1 and Type-2 HARQ-ACK CB for SPS multicast feedback only”**
* **Add a component “Support of shared SPS-PUCCH-AN-List configuration from unicast SPS”**

**High priority proposal 2-20-1:**

**Apply one of the following alternatives for the reporting type of FG 33-5-1e**

* **Alt.1: Per UE**
* **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation**
* **Alt.3: Per BC**
* **Alt.4: Per FS**

**High priority proposal 2-21-1:**

* **Introduce an FG for support of NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast**

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| 33. NR\_MBS | 33-5-1j | NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast | 1. Support NACK-only based HARQ-ACK feedback for SPS PDSCH for multicast, including: a) Multiple TBs with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.2. Support of separate SPS-PUCCH-AN-List from unicast | 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

**High priority proposal 2-21-2:**

**Components of FG 33-5-1f are revised as**

* **Add a component “a) A single TB with NACK-only feedback transmitted in PUCCH”**
* **Add a component “b) [A single or] multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits to generate Type-1 or Type-2 HARQ-ACK CB for multicast feedback only”**
* **Add a component “Support of [shared or] separate SPS-PUCCH-AN-List configuration from unicast SPS”**
* **[Add a component “Support of PTM retransmission associated with G-CS-RNTI for SPS multicast”]**

**High priority proposal 2-21-3:**

**Apply one of the following alternatives for the reporting type of FG 33-5-1f**

* **Alt.1: Per UE**
* **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation**
* **Alt.3: Per BC**

**High priority proposal 2-22-2:**

**Add FG 33-5-1i as a prerequisite FG for FG 33-5-1g**

**High priority proposal 2-22-3:**

**The reporting type of FG 33-5-1g is Per UE**

**High priority proposal 2-23-1:**

**Retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI is included in FG 33-5-1i**

**High priority proposal 2-23-3:**

**The reporting type of FG 33-5-1i is Per UE**

**High priority proposal 2-24-1:**

**Remove the bracket and modify “per cell” to “in a BWP of a serving cell” in Component 3 of FG 33-5-2**

**High priority proposal 2-24-4:**

**The reporting type of FG 33-5-2 is Per UE**

**High priority proposal 2-26-2:**

**Apply one of the following alternatives for prerequisite FG for FG 33-6-1a**

* **Alt.1: FG 33-6-1**
* **Alt.2: FG 33-5-1a and 33-5-1i**

**High priority proposal 2-29-2:**

**Apply one of the following alternatives for the reporting type of FG 33-8-1**

* **Alt.1: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation**
* **Alt.2: Per Band**
* **Alt.3: Per BC**

**High priority proposal 2-30-1:**

**The prerequisite FG for FG 33-9 is FG 33-5-1 and FG 12-2**

**High priority proposal 2-30-2:**

**Apply one of the following alternatives for the reporting type of FG 33-9**

* **Alt.1: Per UE**
* **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation**
* **Alt.3: Per BC**

R1-2210278 Summary#1 on UE features for SL enh and RedCap Moderator (NTT DOCOMO, INC.)

**Agreement**

Reply LS to RAN2 (RAN2 LS in R1-2208727) on per-FS L1 feature for NR sidelink discovery BC-list is agreed. Final LS in R1-2210492.

[R1-2208461](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2208461.zip) Remaining issues for UE features set 1 topics Huawei, HiSilicon

[R1-2208530](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2208530.zip) Discussion on UE features for topics 1 ZTE

[R1-2208538](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2208538.zip) UE features for R17 NR MBS Spreadtrum Communications

[R1-2208622](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2208622.zip) Remaining issues on UE features for MBS, Coeverage enhancement and URLLC vivo

[R1-2208767](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2208767.zip) Remaining issues on UE features for Rel-17 NR coverage enhancements China Telecom

[R1-2208868](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2208868.zip) Discussion on UE features (Topic-1) OPPO

[R1-2209038](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209038.zip) Discussion on UE features for NR coverage enhancement Intel Corporation

[R1-2209319](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209319.zip) Maintenance on Rel.17 UE features for NR coverage enhancement CMCC

[R1-2209528](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209528.zip) Views on UE feature Topic 1 MediaTek Inc.

[R1-2209670](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209670.zip) Rel-17 UE features topics set #1 Ericsson

[R1-2209709](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209709.zip) UE features for Coverage Enhacement Samsung

[R1-2209886](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209886.zip) Discussion on remaining issues regarding Rel-17 RAN1 UE features topics 1 NTT DOCOMO, INC.

[R1-2209963](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2209963.zip) Discussion on Rel-17 UE features topic 1 Qualcomm Incorporated

[R1-2210098](file:///C%3A%5C3GPP%20work%5CRAN1%5CDocs%5CR1-2210098.zip) Remaining issues for UE features topics 1 Nokia, Nokia Shanghai Bell