3GPP TSG-RAN WG1 Meeting #100bis-e R1-20xxxxx

e-Meeting, April 20th – 30th, 2020

Agenda Item: 6.2.1.4

Source: Moderator (Ericsson)

Title: Feature lead summary for NR coexistence performance improvements for LTE-MTC

Document for: Discussion, Decision

# Introduction

In the Rel-16 work item on “Additional MTC enhancements for LTE” [1], one of the objectives is to specify performance improvements for LTE-MTC coexistence with NR.

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| The objective is to specify the following set of improvements for machine-type communications for BL/CE UEs.  [...]  **Coexistence with NR:**   * Specify the following performance improvements for LTE-MTC coexistence with NR [RAN1, RAN2, RAN4]   + LTE-MTC resource reservation in the DL frequency domain and the DL/UL time domain with slot-level and symbol-level granularity to avoid resource overlap between NR and LTE-MTC when LTE-MTC is deployed within an NR carrier   + LTE-MTC subcarrier puncturing for 1 or 2 LTE-MTC DL subcarriers (excluding CRS) to reduce the number of NR resource blocks that need to be reserved for LTE-MTC when LTE-MTC is deployed within an NR carrier |

RAN1 agreements made until RAN1#99 are summarized in [2] and RAN1 agreements made in RAN1#100e are listed below. RAN2 agreements are summarized in [3]. The endorsed L1 configuration parameter list can be found in [4], the initial RAN1 UE feature list in [5], and the endorsed RAN1 CRs in [6] – [16].

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| [**R1-2001058**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001058.zip) Feature lead summary for NR coexistence performance improvements for LTE-MTC Ericsson  [**R1-2001186**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001186.zip) Feature lead summary#2 for NR coexistence performance improvements for LTE-MTC Ericsson  [**R1-2001221**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001221.zip) Feature lead summary#3 for NR coexistence performance improvements for LTE-MTC Ericsson  [100e-LTE-eMTC5-NR-coexistence-01] – Johan (Ericsson)  Email discussion/approval focusing on the following issues (refering to section 2 of [R1-2001186](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001186.zip)):   * UE-specific resource reservation (including configuration aspects and Type0-CSS aspects) * Clarification of handling of fully and partially reserved subframes * Resource reservation in special subframes in TDD * Definition of subcarrier puncturing   by 2/27; if there is a spec impact, followed by endorsing the corresponding TP by 3/2  **Decision:** As per email decision posted on Mar. 4th,  Agreement  Issue #1: UE-specific resource reservation (including configuration aspects and Type0-CSS aspects)   * The 36.211 TPs in Section 2.1 in FL summary in [R1-2001186](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001186.zip) are endorsed. TP to be included in 36.211 editor’s CR. * The 36.212 TPs in Section 2.1 in FL summary in [R1-2001186](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001186.zip) are endorsed with the following change: the words “given by C-RNTI or SPS C-RNTI” are removed in all four places. TP to be included in 36.212 editor’s CR. * It should be possible to enable the resource reservation feature using UE-specific signaling, separately for DL and UL. Indicate this in the updated L1 parameter list. The details are up to RAN2.   Issue #2: Clarification of handling of fully and partially reserved subframes   * The 36.213 TP in Section 2 in FL summary in [R1-2001221](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001221.zip) is endorsed. TP to be included in 36.213 editor’s CR. * The 36.211 TP in Section 3 in FL summary in [R1-2001221](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001221.zip) is endorsed. TP to be included in 36.211 editor’s CR.   Issue #4: Definition of subcarrier puncturing   * The 36.211 TP on definition of subcarrier puncturing in Section 2.4 in FL summary in [R1-2001186](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001186.zip) is endorsed. TP to be included in 36.211 editor’s CR. |

This document provides a prioritized list of issues and proposals based on the contributions in [17] – [25].

# Issue #1: LS response to RAN2

RAN2 has sent questions regarding configuration of LTE-MTC/NB-IoT resource reservation to RAN1 in the LS in [18], and several companies have provided discussion and proposed answers in [18][19][20][21][23].

1. Discuss LS response to RAN2 in a joint email discussion for LTE-MTC and NB-IoT.

# Issue #2: Special subframes

RAN1#100e discussed whether and how to support resource reservation in special subframes in TDD without reaching a conclusion. Based on the input in contributions [21][22][23][24][25], the following can be considered.

1. Symbol-level granularity resource reservation is not applied in special subframes.

If above proposal can be agreed, the following 36.211 TP from Huawei’s contribution [21] can be considered.

1. Consider the following 36.211 TP on transmission in special subframes.

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| 4.2 Frame structure type 2 **<Unchanged parts are omitted>**  For frame structure type 2, if higher layer parameter *ce-reserved-resource-DL-time* is configured, *ce-reserved-resource-DL-time-symbol-bitmap1* and *ce-reserved-resource-DL-time-symbol-bitmap2* is not applied to special subframes. 4.3 Frame structure type 3 **<Unchanged parts are omitted>** |

# Issue #3: DL DMRS

Qualcomm’s contribution [23] has the following 36.211 TP on DL DMRS transmission (see contribution for further discussion).

1. Consider the following 36.211 TP on DL DMRS transmission.

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| 6.10.3.2 Mapping to resource elements **<Unchanged parts are omitted>**  For BL/CE UEs, if higher layer parameter *ce-reserved-resource-DL-freq* or *ce-reserved-resource-DL-time* is configured, and the Resource reservation field in the DCI is set to 1, then in case of PDSCH transmission associated with C-RNTI or SPS C-RNTI using UE-specific MPDCCH search space,  - If and only if all OFDM symbols in a PRB are reserved, the demodulation reference signal transmission in that PRB is dropped.  **<Unchanged parts are omitted>** 6.10.3A.2 Mapping to resource elements **<Unchanged parts are omitted>**  For BL/CE UEs, if higher layer parameter *ce-reserved-resource-DL-freq* or *ce-reserved-resource-DL-time* is configured, then in case of MPDCCH transmission associated with C-RNTI or SPS C-RNTI using UE-specific MPDCCH search space,  - If and only if all OFDM symbols in a PRB are reserved, the demodulation reference signal transmission in that PRB is dropped.  **<Unchanged parts are omitted>** |

# Issue #4: UL DMRS

Huawei’s contribution [21] has the following 36.211 TP on UL DMRS transmission (see contribution for further discussion).

1. Consider the following 36.211 TP on UL DMRS transmission.

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| 5.5.2.1.2 Mapping to physical resources  **<Unchanged parts are omitted>**  For BL/CE UEs, if higher layer parameter ce-reserved-resource-UL-time is configured, and the Resource reservation field in the DCI is set to 1, then in case of PUSCH transmission associated with C-RNTI or SPS C-RNTI,  - In a subframe that is partially reserved, the demodulation reference signal transmission in a SC-FDMA symbol that is reserved is dropped.  **<Unchanged parts are omitted>** |

# Issue #5: SRS

ZTE’s contribution [22] proposes that SRS transmission that would fall into a reserved UL resource should be dropped (see contribution for further discussion).

1. Considering the following 36.213 TP on SRS transmission.

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| 8.2 UE sounding procedure **<Unchanged parts are omitted>**  For a BL/CE UE not configured with the higher layer parameter *srs-UpPtsAdd*, for a SRS transmission in subframe *n* and if the UE transmits PUSCH/PUCCH in subframe *n* and/or *n+1*, the UE shall not transmit the SRS in subframe *n* if the SRS transmission bandwidth in subframe *n* is not completely within the narrowband of PUSCH/PUCCH in subframe *n* and/or *n+1*  A BL/CE UE not configured with the higher layer parameter *srs-UpPtsAdd* shall not transmit SRS in UpPTS if SRS frequency location is different from DwPTS reception narrowband in the same special subframe.  For a BL/CE UE, the SRS transmission that falls into the reserved symbol of a BL/CE UL subframe is dropped.  **<Unchanged parts are omitted>** |

# Issue #6: SPS

Ericsson’s contribution [24] proposes to discuss whether and how to update the formulation “associated with C-RNTI or SPS C-RNTI using UE-specific MPDCCH search space” in 36.211 and 36.213 to cover MPDCCH-less SPS PUSCH transmission in the intended way (see contribution for further discussion).

1. If 36.211/36.213 TPs on SPS transmission can be provided in time, they can be considered in this meeting, otherwise they can be treated in the next meeting.

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# References

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1. [R1-1913594](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_99/Docs/R1-1913594.zip), “RAN1 agreements for Rel-16 Additional MTC Enhancements for LTE”

1. [R2-2001886](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2001886.zip), “RAN2 agreements for Rel-16 additional enhancements for NB-IoT and MTC”

1. [R1-2001477](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001477.zip), “Updated consolidated parameter list for Rel-16 LTE”

1. [R1-2001485](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001485.zip), “RAN1 UE features list for Rel-16 LTE after RAN1#100-E”

1. [R1-1913610](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913610.zip), Addition of feature for 36.211
2. [R1-1913611](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913611.zip), Addition of feature for 36.212
3. [R1-1913612](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913612.zip), Addition of feature for 36.213 (s00-s05)
4. [R1-1913613](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913613.zip), Addition of feature for 36.213 (s06-s07)
5. [R1-1913614](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913614.zip), Addition of feature for 36.213 (s08-s09)
6. [R1-1913684](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913684.zip), Addition of feature for 36.213 (s10-s13)
7. [R1-1913615](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913615.zip), Addition of feature for 36.213 (s14-sxx)

1. [R1-1913683](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_99/Docs/R1-1913683.zip), Addition of feature for 36.214
2. [R1-2001427](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001427.zip), Corrections for 36.211
3. [R1-2001431](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001431.zip), Corrections for 36.212

1. [R1-2001433](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001433.zip), Corrections for 36.213

1. [R1-2001518](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001518.zip), “LS on NR coexistence”, RAN2

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