**3GPP TSG RAN WG1 #101 R1-200xxxx**

**e-Meeting, May 25th – June 5th, 2020**

**Agenda Item: 7.2.11.4**

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

**Title: Summary of email discussion/approval [101-e-Post-NR-UE-Features-06]**

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

# Introduction

This document presents the summary of email discussion/approval [101-e-Post-NR-UE-Features-06] after RAN1 #101-e. According to the Chairman’s Notes:

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| [101-e-Post-NR(LTE)-UE-Features-06] To finalize the LTE V2X UE feature list, till 6/10 – Ralf (AT&T) |

The following was discussed and agreed after RAN1 #101-e within the scope of [101-e-Post-NR-UE-Features-06].

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| 1. Features
 | Index | Feature group | Components | Prerequisite feature groups | Need for the eNB to know if the feature is supported | Need for the UE to know if the feature is supported (only for V2X WI, where the PC5-RRC capability signalling is delivered between the UEs) | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Capability interpretation for mixture of FDD/TDD | Note | Mandatory/Optional |
| 5. 5G\_V2X\_NRSL | 5-1 | Receiving NR sidelink configured by LTE Uu | 1) UE can receive NR PSCCH/PSSCH. Up to [A] sidelink HARQ processes are supported.2) UE can receive [X] NR PSCCH in a slot.3) UE can attempt to decode [Y] RBs per slot4) UE supports reception of NR PSSCH according to the 64QAM MCS table5) UE supports PT-RS reception in FR2.8) UE can receive using the subcarrier spacing and CP length defined for a given band in RAN410) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {10,7} for slots w/wo PSFCH12) UE can receive using 30 kHz subcarrier spacing with normal CP in FR1, 120 kHz subcarrier spacing with normal CP FR2 | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. | Component-1 candidate value set: {value1, value2 …}Component-2 candidate value set: {value1, value2, …}FFS: whether to report different value for each SCS indicated in component-8Component-3 candidate value set: {value1, value2, …}FFS: whether to report different value for each SCS indicated in component-8Component-8 candidate value set in FR1:{{15 kHz}, {30 kHz}, {60 kHz}, {15, 30 kHz}, {30, 60 kHz}, {15, 60 kHz}, {15, 30, 60 kHz}}Component-8 candidate value set in FR2:{{60 kHz}, {120 kHz}, {60, 120 kHz}}Component-8 candidate value set for CP length: {NCP,NCP and ECP} (ECP only applies to SCS of 60 kHz) | Optional with capability signalling |
| 5-2 | Transmitting NR sidelink mode 1 scheduled by LTE Uu | 1) UE can transmit NR PSCCH/PSSCH using configured grant type 1 in NR sidelink mode 1 scheduled by LTE Uu. Up to 8 configured grants can be configured for a UE.2) UE can transmit NR PSSCH according to the normal 64QAM MCS OFDM table.3) UE supports PT-RS transmission in FR2.4) UE can transmit using the subcarrier spacing and CP length it reports.8) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to ~~{~~#PSSCH symbols} = {10,7} for slots w/wo PSFCH.9) Support downlink pathloss based open loop power control | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.FFS: This is the basic FG for sidelinkComponent-4 candidate value set in FR1:{{15 kHz}, {30 kHz}, {60 kHz}, {15, 30 kHz}, {30, 60 kHz}, {15, 60 kHz}, {15, 30, 60 kHz}}Component-6 candidate value set in FR2:{{60 kHz}, {120 kHz}, {60, 120 kHz}}Component-4 candidate value set for CP length: {NCP,NCP and ECP} (ECP only applies to SCS of 60 kHz)Note: For Component 4, the reported numerology shall be the same for sidelink and uplink. | Optional with capability signalling |
| 5-3 | Transmitting NR sidelink mode 2 configured by LTE Uu | 1) UE can transmit NR PSCCH/PSSCH using NR sidelink mode 2 configured by LTE Uu. Up to [B] sidelink processes are supported.2) UE can transmit NR PSSCH according to the normal 64QAM MCS table.3) UE supports PT-RS transmission in FR2.4) UE can perform mode 2 sensing and resource allocation operations.5) UE can transmit using the subcarrier spacing and CP length it reports for FG 5-1.8) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {10,7} for slots w/wo PSFCH.10) UE can transmit using 30 kHz and normal CP subcarrier spacing in FR1, 120 kHz subcarrier spacing with normal CP FR211) DL pathloss based open loop power control | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.FFS: This is the basic FG for sidelinkCandidate values for B are {FFS} | Optional with capability signalling |
| 5-4 | Synchronization sources for NR sidelink |  1) UE can receive S-SSB in NR sidelink if it supports 5-1.2) UE can transmit S-SSB in NR sidelink if it supports 5-2 or 5-3.3) UE supports GNSS and SyncRef UE as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to GNSS and sl-NbAsSync set to false.4) UE can transmit or receive NR sidelink based on the synchronization to an gNB5) UE additionally supports gNB, GNSS and SyncRef UE as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to gnbEnb.6) UE additionally supports gNB, GNSS and SyncRef UE as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to GNSS and sl-NbAsSync set to true. | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. | This is the basic FG for sidelink.Note: configuration by LTE Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 4 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 5 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 6 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1 | Optional with capability signalling |
| 5-5 | Sidelink congestion control | 1) UE can report CBR measurement to eNB when operating in Mode 1 and mode 2.2) UE can adjust its radio parameters based on CBR measurement and CRlimit.3) UE can process CBR and CR within the time it indicates | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. | Note: component 1 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Component-3 candidate value set{Congestion process time 1, Congestion process time 2} whereCongestion process time 1: 2, 2, 4, 8 slots for 15, 30, 60, 120 kHz subcarrier spacing.Congestion process time 2: 2, 4, 8, 16 slots for 15, 30, 60, 120 kHz subcarrier spacing | Optional with capability signalling |
| 5-6 | Short-term time-scale TDM for in-device coexistence | 1. Support prioritization between LTE sidelink transmission/reception and NR sidelink transmission/reception
2. FFS: Maximum time required for the inter-RAT conflict resolution is X
 | All basic FGs in NR V2XUE supports LTE V2X sidelink | No | N/A | FFS | Per band | N.A. | N.A. |  | Optional with capability signalling |
| 5-7 | 256QAM sidelink transmission | 1) UE can transmit NR PSSCH according to the 256QAM MCS table | All basic FGs in NR V2X | Yes | N/A | UE does not support transmission according to the 256QAM MCS table | Per band | N.A. | N.A. | Note: RAN4 to decide | Optional with capability signalling |
| 5-8 | PSFCH format 0  | 1) UE can transmit and receive NR PSFCH format 0.2) UE can receive N NR PSFCH(s) in a slot.3) UE can transmit M NR PSFCH(s) in a slot. | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. | This is the basic FG for sidelink.Candidate values for N are {5, 15, 25, 32, 35, 45, 50, 64}Candidate values for M are {[1], 4, [5,] 8, 16} | Optional with capability signalling |
| 5-9 | Low-spectral efficiency 64QAM MCS table | 1) UE can transmit and receive NR PSSCH according to the low-spectral efficiency 64QAM MCS table | All basic FGs in NR V2X | Yes | N/A | UE does not support transmission/reception according to the low spectral-efficiency 64QAM MCS table | Per band | N.A. | N.A. |  | Optional with capability signalling |
| 5-10 | eNB type synchronization source for NR sidelink | 1) UE can transmit or receive NR sidelink based on the synchronization to an eNB.2) If UE supports 5-4, UE additionally supports eNB, GNSS and SyncRef UE as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to gnbEnb.3) If UE supports 5-4, UE additionally supports eNB, GNSS and SyncRef UE as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to GNSS and sl-NbAsSync set to true. | All basic FGs in NR V2X | Yes | N/A |  | Per band | N.A. | N.A. |  | Optional with capability signalling |
|  | 5-11 | Simultaneous transmission of uplink and sidelink | 1) UE supports simultaneous transmission of LTE uplink and NR sidelink (in different bands) in a band combination for which the UE indicated simultaneous sidelink and uplink support in a band combination. | All basic FGs in NR V2X | Yes | N/A |  | Per band combination | N.A. | N.A. |  | Optional with capability signalling |
|  | 5-12 | Support of fewer than 14 consecutive sidelink symbols in a slot  | 1) UE additionally supports transmission/reception of SL slot configured with 7, 8, 9, 10, 11, 12, 13 consecutive symbols | All basic FGs in NR V2X | Yes | N/A | UE supports SL only in a SL slot configured with 14 consecutive symbols. | Per band | N.A. | N.A. |  | Optional with capability signalling |
|  | 5-13 | FFS: Support of multiple synchronization references | [1) UE can support sidelink reception using up to A synchronization references in a carrier/BWP.] | All basic FGs in NR V2X | Yes | N/A | UE supports only a single synchronization reference in a carrier/BWP. | Per band | N.A. | N.A. |  | Optional with capability signalling |
|  | 5-14 | Support of rank 2 transmission | 1) UE additionally supports rank 2 PSSCH transmission | All basic FGs in NR V2X | FFS | N/A | UE supports rank 1 PSSCH transmission only. | Per band |  N.A. | N.A. | This FG is a WA | Optional with capability signalling |
|  | 5-15 | Support of rank 2 reception | 1) UE additionally supports rank 2 PSSCH reception | All basic FGs in NR V2X | FFS | N/A | UE supports rank 1 PSSCH reception only. | Per band |  N.A. | N.A. | This FG is a WA. FFS: This is the basic FG for NR sidelink | Optional with capability signalling |
|  | 5-16 | Support of open loop SL power control and RSRP report | 1. Support sidelink pathloss based open loop power control and RSRP report in case of unicast
 | All basic FGs in NR V2X | FFS | N/A |  | Per band |  N.A. | N/A | Working assumption: This FG is a basic UE FG [at least] for UEs supporting mode 1FFS: whether this is a basic FG also for UEs not supporting mode 1 | Optional with capability signalling |
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