**3GPP TSG RAN WG1 #107bis-e R1-200xxxx**

**e-Meeting, January 17th – 25th, 2022**

**Source: Ad-Hoc Chair (AT&T)**

**Title: Session Notes of AI 8.15.2**

**Agenda Item:** **8.15.2**

**Document for:** **Endorsement**



#### 8.15.2 UE features for supporting NR from 52.6 GHz to 71 GHz

[107bis-e-R17-UE-features-52-71GHz-01] Email discussion UE features for supporting NR from 52.6 GHz to 71 GHz – Ralf (AT&T)

* 1st check point: January 20
* Final check point: January 25

**Agreement: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 24. NR\_ext\_to\_71GHz | 24-1 | Basic FR2-2 DL support | 1. Support reception of 120kHz subcarrier spacing for DL data and control channels, SSB, and reference signals in FR2-2 for non-initial access |  | Yes | N/A | FR2-2 is not supported | ~~[per UE][~~per band~~]~~ | N/A | N/A | N/A |  | Optional with capability signalling  A UE that supports FR2-2 must indicate this FG is supported |

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| 24. NR\_ext\_to\_71GHz | 24-1a | Basic FR2-2 UL support | 1. PRACH with 120KHz SCS and length 139  2. Support transmission of 120kHz subcarrier spacing for UL data and control channels and reference signals in FR2-2 | ~~[~~24-1~~]~~ | Yes | N/A | UL in FR2-2 is not supported | ~~[per UE][~~per band~~]~~ | N/A | N/A | N/A |  | Optional with capability signalling  [A UE that supports FR2-2 must indicate this FG is supported] |

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| 24. NR\_ext\_to\_71GHz | 24-1c | Multi-RB support PUCCH format 0/1/4 for 120 kHz in FR2-2 ~~[with/without shared spectrum channel access]~~ | 1. Support multi-RB PUCCH format 4 for 120 kHz  2. Support multi-RB PUCCH format 0/1 for 120 kHz | ~~[~~24-1a~~]~~ | Yes | N/A | Multi-RB support  PUCCH format 0/1/4 for 120 kHz in FR2-2 is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling  [A UE that supports [24-1a/24-2/FR2-2] must indicate this FG is supported]  This FG is only supported in bands under PSD limitation in shared spectrum operation |

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| 24. NR\_ext\_to\_71GHz | 24-4c | Multi-RB PUCCH format 0/1/4 for 480 kHz in FR2-2 ~~[with/without shared spectrum channel access]~~ | Support multi-RB PUCCH format 0/1/4 for 480 kHz | 24-4a | Yes | N/A | Multi-RB PUCCH format 0/1/4 for 480 kHz in FR2-2 is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling  This FG is only supported in bands under PSD limitation in shared spectrum operation |

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| 24. NR\_ext\_to\_71GHz | 24-5c | Multi-RB PUCCH format 0/1/4 for 960 kHz in FR2-2 ~~[with/without shared spectrum channel access]~~ | Support multi-RB PUCCH format 0/1/4 for 960 kHz | 24-5a | Yes | N/A | Multi-RB PUCCH format 0/1/4 for 960 kHz in FR2-2 is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling  This FG is only supported in bands under PSD limitation in shared spectrum operation |

**Proposed Agreement: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 24. NR\_ext\_to\_71GHz | 24-10 | Additional beam switching time delay | Supported additional beam switching time delay d for 480 kHz SCS |  | Yes | N/A | Additional beam switching time delay is not supported | Per UE | N/A | N/A | N/A | Candidate value set: 56 or 112 symbols | Optional with capability signalling |

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 24. NR\_ext\_to\_71GHz | 24-1b | Wideband PRACH for 120 kHz in FR2-2 ~~[with/without shared spectrum channel access]~~ | Enhanced PRACH design for operation by adopting a single long ZC sequence, with ZC sequence equal to 1151 for 120kHz and ZC sequence equal to 571 for 120kHz | ~~[~~24-1a~~]~~ | Yes | N/A | Wideband PRACH for 120 kHz in FR2-2 is not supported | Per band | N/A | N/A | N/A | ~~FFS: whether to split this FG for SA and DC~~ | Optional ~~[~~with~~/without]~~capability signalling  [Note: This FG is only supported in bands for shared spectrum operation]  ~~[A UE that supports [24-1a/24-2/FR2-2] must indicate this FG is supported]~~ |

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| 24. NR\_ext\_to\_71GHz | 24-4b | Wideband PRACH for 480 kHz in FR2-2 ~~[with/without shared spectrum channel access]~~ | PRACH with 480KHz and length 571 | 24-4a | Yes | N/A | Wideband PRACH for 480 kHz in FR2-2 is not supported | Per band | N/A | N/A | N/A | ~~FFS: whether to split this FG for SA and DC~~  ~~[Agreement:~~  ~~Do not support PRACH length L=571, 1151 for 960kHz PRACH and at least L =1151 for 480kHz PRACH]~~ | Optional with capability signalling  [Note: This FG is only supported in bands for shared spectrum operation] |

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| 24. NR\_ext\_to\_71GHz | 24-4 | 480KHz SCS support for DL | 1. 480KH SCS for DL data and control channels, SSB, and reference signal reception in FR2-2 for non-initial access  2. Multiple-slot PDCCH monitoring for 480KHz with ~~X=4 slots~~ (Xs,Ys) = (4,1)  ~~FFS:~~ 3. Multi- PDSCH scheduling by single DCI for the operation with 480 kHz SCS and corresponding HARQ enhancements  4. Within the Ys = 1 slot, monitoring of type 1 CSS with dedicated RRC configuration, type 3 CSS, and UE-SS according to FG 3-5b with set2 = (4, 3) and (7, 3) symbols  5. Processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per slot group of Xs slots per scheduled CC for FDD (This supersedes corresponding component of FG 3-5b)  6. Processing one unicast DCI scheduling DL and 2 unicast DCI scheduling UL per slot group of Xs slots per scheduled CC for TDD (This supersedes Component 6 of FG 3-5b) | 24-1 | Yes | N/A | 480KHz SCS for DL is not supported | ~~[~~Per ~~UE/~~band~~]~~ | N/A | N/A | N/A |  | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-5 | 960KHz SCS support for DL | 1. 960KHz SCS for DL data and control channels, SSB, and reference signal reception in FR2-2 for non-initial access  2. Multiple-slot PDCCH monitoring for 960KHz with (Xs,Ys)=(8,1) ~~slots~~  ~~FFS:~~ 3. Multi-PDSCH scheduling by single DCI for the operation with 960 kHz SCS and corresponding HARQ enhancements  3. Within the Ys = 1 slot, monitoring of type 1 CSS with dedicated RRC configuration, type 3 CSS, and UE-SS according to FG 3-5b with set1 = (7, 3) symbols  4. Processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per slot group of Xs slots per scheduled CC for FDD (This supersedes corresponding component of FG 3-5b)  5. Processing one unicast DCI scheduling DL and 2 unicast DCI scheduling UL per slot group of Xs slots per scheduled CC for TDD (This supersedes Component 6 of FG 3-5b) | 24-1 | Yes | N/A | 960KHz SCS support for DL is not supported | ~~[~~Per ~~UE/~~band~~]~~ | N/A | N/A | N/A |  | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-4f | Enhanced PDCCH monitoring for 480KHz in FR2-2 | [1.) Multiple-slot PDCCH monitoring for 480KHz with (Xs,Ys)=(2,1)]  2.) Multiple-slot PDCCH monitoring for 480KHz with (Xs,Ys)=~~[~~(4,2)~~] slots~~  3. Within each of the Ys = 2 slots, monitoring of type 1 CSS with dedicated RRC configuration, type 3 CSS, and UE-SS according to FG 3-1 | 24-4 | Yes | N/A | Enhanced PDCCH monitoring for 480KHz in FR2-2 is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-5f | Enhanced PDCCH monitoring for 960KHz | 1.) Multiple-slot PDCCH monitoring for 960KHz with (Xs,Ys)=(4,1)  2.) Multiple-slot PDCCH monitoring for 960KHz with (Xs,Ys)= (4,2)  3.) Multiple-slot PDCCH monitoring for 960KHz with (Xs,Ys)=(8,4) ~~slots~~  3. Within each of the Ys = 2 or 4 slots, monitoring of type 1 CSS with dedicated RRC configuration, type 3 CSS, and UE-SS according to FG 3-1 | 24-5 | Yes | N/A | Enhanced PDCCH monitoring for 960KHz is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-1a | Basic FR2-2 UL support | 1. PRACH with 120KHz SCS and length 139  2. Support transmission of 120kHz subcarrier spacing for UL data and control channels and reference signals in FR2-2 | 24-1 | Yes | N/A | UL in FR2-2 is not supported | per band | N/A | N/A | N/A |  | Optional with capability signalling  ~~[A UE that supports FR2-2 must indicate this FG is supported]~~ |

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| 24. NR\_ext\_to\_71GHz | 24-1c | Multi-RB support PUCCH format 0/1/4 for 120 kHz in FR2-2 | 1. Support multi-RB PUCCH format 4 for 120 kHz  2. Support multi-RB PUCCH format 0/1 for 120 kHz | 24-1a | Yes | N/A | Multi-RB support  PUCCH format 0/1/4 for 120 kHz in FR2-2 is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling  ~~[A UE that supports [24-1a/24-2/FR2-2] must indicate this FG is supported]~~  This FG is only supported in bands under PSD limitation in shared spectrum operation |

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| 24. NR\_ext\_to\_71GHz | 24-1d | Multiple PDSCH scheduling by single DCI for 120kHz | 1. Multi-PDSCH scheduling by single DCI for the operation with 120 kHz SCS  2. HARQ enhancements | ~~[~~24-1~~]~~ | Yes | N/A | Multiple PDSCH scheduling by single DCI for 120kHz is not supported | Per band | N/A | N/A | N/A | FFS: to extend this FG to other frequency ranges such as FR1 and FR2-1 | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-1e | Multiple PUSCH scheduling by single DCI for 120kHz | 1. Multi-PUSCH scheduling by single DCI for the operation with 120 kHz SCS | ~~[~~24-1a~~]~~ | Yes | N/A | Multiple PUSCH scheduling by single DCI for 120kHz is not supported | Per band | N/A | N/A | N/A | FFS: to extend this FG to other frequency ranges such as FR1 and FR2-1 | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-2 | 120KHz SSB support for ~~SA/DC~~ initial access in FR2-2 | 1. Support 120KHz SSB for ~~SA/DC~~ initial access in FR2-2 | ~~[~~24-1, 24-1a~~]~~ | N/A | N/A | 120KHz SSB based ~~stand-alone~~ initial access in FR2-2 is not supported | ~~N/A~~ Per band | N/A | N/A | N/A | ~~per band~~  ~~FFS: whether to split this FG for SA and DC~~ | Optional ~~[~~with~~/without]~~ capability signalling  ~~[A UE that supports FR2-2 must indicate this FG is supported]~~ |

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| 24. NR\_ext\_to\_71GHz | 24-3 | 480KHz SSB support for ~~SA/DC~~ initial access in FR2-2 | 1. Support 480KHz SSB for ~~SA/DC~~ initial access in FR2-2 | ~~24-1[~~, 24-2, 24-4, 24-4a~~]~~ | ~~FFS~~ N/A | N/A | 480KHz SSB for initial access in FR2-2 is not supported | ~~[per UE][~~per band~~]~~ | N/A | N/A | N/A | ~~FFS: whether to split this FG for SA and DC~~ | Optional ~~[~~with~~/without]~~ capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-4a | 480KHz SCS support for UL | 1. PRACH with 480KHz and length 139  2. 480KHz SCS for UL data and control channels and reference signal transmission in FR2-2  3. Multi-PUSCH scheduling by single DCI for the operation with 480 kHz SCS | 24-1a, 24-4 | Yes | N/A | 480KHz SCS support for UL is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-5a | 960KHz SCS support for UL | 1. PRACH with 960KHz and length 139  2. 960KHz SCS for UL data and control channels and reference signal transmission in FR2-2  ~~[~~3. Multi-PUSCH scheduling by single DCI for the operation with 960 kHz SCS~~]~~ | 24-1a, 24-5 | Yes | N/A | 960KHz SCS support for UL is not supported | Per band | N/A | N/A | N/A |  | Optional with capability signalling |

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| 24. NR\_ext\_to\_71GHz | 24-6 | ~~Support [~~Type 1~~]~~ channel access procedure in uplink for FR2-2 ~~unlicensed operation~~ with shared spectrum channel access | 1. Support ~~[~~Type 1~~]~~ channel access procedure  [2. Support LBT performed per carrier/BWP bandwidth] | 24-1a | Yes | N/A | Type 1 channel access procedure in uplink for FR2-2 with shared spectrum channel access is not supported | per band | N/A | N/A | N/A |  | Optional with capability signalling  ~~[~~A UE that supports FR2-2 must indicate this FG is supported when required by regulation~~]~~ |

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| 24. NR\_ext\_to\_71GHz | 24-7 | ~~Support [~~Type 2~~]~~ channel access procedure in uplink for FR2-2 ~~unlicensed operation~~ with shared spectrum channel access | 1. Support ~~[~~Type 2~~]~~ channel access procedure  [2. Support LBT performed per carrier/BWP bandwidth] | 24-1a, 24-6 | Yes | N/A | Type 2 channel access procedure in uplink for FR2-2 with shared spectrum channel access is not supported | per band | N/A | N/A | N/A |  | Optional with capability signalling  ~~[~~A UE that supports FR2-2 must indicate this FG is supported when required by regulation~~]~~ |

[R1-2200050](../../Docs/R1-2200050.zip) Rel-17 UE features for extension to 71 GHz Huawei, HiSilicon

[R1-2200099](../../Docs/R1-2200099.zip) Discussions on UE features for NR operation from 52.6GHz to 71GHz vivo

[R1-2200217](../../Docs/R1-2200217.zip) UE features for supporting NR from 52.6 GHz to 71 GHz Samsung

[R1-2200247](../../Docs/R1-2200247.zip) Views on Rel-17 UE features for supporting NR in FR2-2 NTT DOCOMO, INC.

[R1-2200266](../../Docs/R1-2200266.zip) Discussion on UE features for 52.6 to 71GHz ZTE, Sanechips

R1-2200312 UE features for NR from 52.6 Ghz to 71 Ghz Qualcomm Incorporated

Late submission

[R1-2200330](../../Docs/R1-2200330.zip) Discussion on UE feature for FR2-2 OPPO

[R1-2200390](../../Docs/R1-2200390.zip) Discussion on UE capability for extending NR up to 71 GHz Intel Corporation

[R1-2200408](../../Docs/R1-2200408.zip) UE features for extending current NR operation to 71 GHz Ericsson

[R1-2200431](../../Docs/R1-2200431.zip) Views on Rel-17 Beyond 52.6 GHz UE features Apple

[R1-2200543](../../Docs/R1-2200543.zip) Views on UE features for supporting NR from 52.6 GHz to 71 GHz MediaTek Inc.

[R1-2200582](../../Docs/R1-2200582.zip) Discussion on UE features for NR above 52.6 GHz LG Electronics

[R1-2200623](../../Docs/R1-2200623.zip) On UE features for supporting NR from 52.6 GHz to 71 GHz Nokia, Nokia Shanghai Bell