**3GPP TSG-RAN WG4 Meeting # 104-e R4-22XXXX**

**Electronic Meeting, 15– 26 August 2022**

**Agenda item:** 7

**Source:** CMCC

**Title:** Rel-17 RAN4 UE feature list for NR

**Document for:** Approval

1. Introduction

This contribution includes the RAN4 UE feature list for Rel-17 NR in RAN4#104-e. The previous RAN4 UE feature list document is R4-2211189, R4-2210436, R4-2202400, R4-2206283, R4-2206283 and R4-2206571.

1. NR\_pos\_enh

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 14. NR\_pos\_enh | 14-1 | per-FR MG for PRS measurement | Capability of supporting per-FR MG for PRS measurement | Rel-15 per-FR gap (independentGapConfig) | yes | no |  | Per UE | No | No | N/A |  | Optional with capability signalling |
| 14NR\_pos\_enh | 14-2 | PRS measurement for reduced sample in RRC\_inactive state | Capability of supporting reduced number of samples (M=1, 2) for PRS measurement in RRC\_inactive state | 27-17 | no |  | The reduced number of samples (M=1,2) for PRS measurement in RRC\_inactive state cannot be supported. The UE is assumed to support M=4 only. | Per UE | No | No | N/A |  | Optional with capability signaling |
| 14. NR\_pos\_enh | 14-3 | PRS measurement without MG | Capability for the threshold used to be compared against with the Rx timing difference to determine whether the PRS from the non-serving cell satisfy the condition of PRS measurement outside MG. | 27-3-2 | yes |  |  | Per band | No | No | N/A | The candidate threshold values: CP length, 1/4 symbol, 1/2 symbol, half of slot | Optional with capability signaling |
| 14. NR\_pos\_enh | 14-4 | Parallel PRS measurements in RRC\_INACTIVE state | Capability for the support of performing RRM measurement and PRS measurement in parallel |  | yes | no | RRM measurement and PRS measurement cannot be performed in parallel | Per UE | No | Yes | N/A | Measurement period for UE suporting this capability scales with Kcarrier\_PRS=1 | Optional with capability signalling |

1. NR\_ext\_to\_71GHz

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 15. NR\_ext\_to\_71GHz | 15-1 | 64QAM for PUSCH for FR2-2 | 1) Support of 64QAM modulation for FR2-2 PUSCH | FFS | Yes | No | UE cannot support PUSCH 64QAM transmission | Per band | N/A | Applicable to FR2-2 only | N/A |  | Optional with capability signalling |
| 15. NR\_ext\_to\_71GHz | 15-3 | UE support of CBW for 480kHz SCS | Support of {800, 1600} CBW for 480kHz SCS | Support of 480kHz SCS | Yes | No | The network does not know if UE can transmit or receive with a specific CBW | Per Band | N/A | Applicable to FR2-2 only | N/A | 400 MHz is a mandatory CBW if the UE supports 480 kHz SCS | Optional with capability signalling |
| 15. NR\_ext\_to\_71GHz | 15-4 | UE support of CBW for 960kHz SCS | Support of {800, 1600, 2000} CBW for 960kHz SCS | Support of 960kHz SCS | Yes | No | The network does not know if UE can transmit or receive with a specific CBW | Per Band | N/A | Applicable to FR2-2 only | N/A | 400 MHz is a mandatory CBW if the UE supports 960 kHz SCS | Optional with capability signalling |
| ~~15. NR\_ext\_to\_71GHz~~ | ~~15-x~~ | ~~[Improved ON/ON transient period]~~ | ~~1) Support of improved ON/ON transient period of [2us]~~ | ~~FFS~~ | ~~Yes~~ | ~~No~~ | ~~UE does not support improved ON/ON transient period and support 5us transient period~~ | ~~Per UE~~ | ~~N/A~~ | ~~Applicable to FR2-2 only~~ | ~~N/A~~ | ~~Further RAN4 discussion is required on whether to support improved ON/ON transient period and X value~~ | ~~Optional with capability signalling~~ |

1. NR\_RF\_FR1\_enh

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 16. NR\_RF\_FR1\_enh | 16-1 | Dynamic Tx switching between 2CC 2Tx-2Tx switching | Indicate the supported switching period for dynamic UL Tx switching between two uplink carriers with two transmit antenna connectors in inter-band UL CA or SUL |  | Yes | N/A | UE does not support 2CC 2Tx-2Tx switching for inter-band UL CA and SUL band combinations. | UE signals supported switching period per pair of UL bands per UL band combination | No need | Applicable only to FR1 | Support mixture of FDD/TDD | Candidate value set: {35us, 140 us, 210us}Detailed information can refer to the LS to RAN2 in R4-2103234 and R4-2107847. | Optional with capability signalling |
| 16. NR\_RF\_FR1\_enh | 16-2 | Dynamic Tx switching between 3CC 1Tx-2Tx switching  | Indicate the supported switching period for dynamic UL Tx switching between one band (with one carrier) capable of one transmit antenna connector and one band (with two carriers) capable of two transmit antenna connectors in inter-band UL CA or SUL |  | Yes | N/A | UE does not support Tx switching between 3CC 1Tx-2Tx switching for inter-band UL CA and SUL band combinations. | UE signals supported switching period per pair of UL bands per UL band combination | No need | Applicable only to FR1 | Support mixture of FDD/TDD | Candidate value set: {35us, 140 us, 210us}Detailed information can refer to the LS to RAN2 in R4-2103234 and R4-2107847. | Optional with capability signalling |
| 16. NR\_RF\_FR1\_enh | 16-3 | Dynamic Tx switching between 3CC 2Tx-2Tx switching | Indicate the supported switching period for dynamic UL Tx switching between one band (with one carrier) capable of two transmit antenna connectors and one band (with two carriers) capable of two transmit antenna connectors in inter-band UL CA or SUL |  | Yes | N/A | UE does not support Tx switching between 3CC 2Tx-2Tx switching for inter-band UL CA and SUL band combinations. | UE signals supported switching period per pair of UL bands per UL band combination | No need | Applicable only to FR1 | Support mixture of FDD/TDD | Candidate value set: {35us, 140 us, 210us}Detailed information can refer to the LS to RAN2 in R4-2103234 and R4-2107847. | Optional with capability signalling |
| 16. NR\_RF\_FR1\_enh | 16-4 | Application of DL interruptions due to dynamic UL Tx switching  | Capability to indicate that for the band where DL interruption is needed, the RRM interruption requirements defined in RAN4 shall be applied for duplex mode combinations except the combinations* SUL+TDD
* TDD+TDD CA with the same UL-DL pattern
 | 16-1, 16-2, or 16-3 | Yes | N/A | UE not reporting this capability means DL interruption is not required | UE capability is defined as per band per band combination for each band pair supporting UL Tx switching | No need | Applicable only to FR1 | Support mixture of FDD/TDD | The same capability for Rel-16 DL interruption due to Tx switching is reused.Detailed information can refer to the LS to RAN2 in R4-2103234. | Optional with capability signalling |
| 16. NR\_RF\_FR1\_enh | 16-5 | UL-MIMO coherence capability for dynamic Tx switching between 3CC 1Tx-2Tx switching | Capability to indicate whether UL-MIMO coherence is supported when dynamic Tx switching between 3CC (within 2 bands) 1Tx-2Tx switching is conducted.  | 16-2 | Yes | N/A | Rel-15 per band capability *pusch-TransCoherence* is applicable | Per BC | No need | Applicable only to FR1 | Support mixture of FDD/TDD | The Rel-16 UL-MIMO capability for 2CC 1Tx-2Tx switching is reused.Detailed information can refer to the LS to RAN2 in R4-2120039. | Optional with capability signalling |
| 16. NR\_RF\_FR1\_enh | 16-6 | UL-MIMO coherence capability for dynamic Tx switching between 2Tx-2Tx switching | Capability to indicate whether UL-MIMO coherence is supported when dynamic Tx switching between 2CC or 3CC (within 2 bands) 2Tx-2Tx switching is conducted.  | 16-1 or 16-3 | Yes | N/A | The per BC UL-MIMO coherence capability for 1Tx-2Tx switching or Rel-15 per band capability *pusch-TransCoherence* is applicable | Per band per BC | No need | Applicable only to FR1 | Support mixture of FDD/TDD | Detailed information can refer to the LS to RAN2 in R4-2120039. | Optional with capability signalling |
| 16. NR\_RF\_FR1\_enh | 16-8 | UE power class per band per band combination | Per band per band combination power class |  | Yes | N/A | Per band power class inconsistent | Per band per BC | No | FR1 only | N/A | [It is not applicable to the case when UL-MIMO and intra-band UL CA are in operation at the same time.][It is applicable to uplink inter-band CA.] | Optional with capability signalling |

1. NR\_RF\_FR2\_req\_enh2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **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 | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| UL gap for Tx power management | 17-1 | Support of UL gap in FR2 for Tx power management | Capability of performing BPS sensing for Tx power management by the use of uplink gap patterns.(UL MGP #0, #1, #2, #3 as specified in TS 38.133) The UE indicating this capability shall meet the corresponding enhanced UE requirements defined in Section TBD. If UE reports this capability, UE is mandated to report 17-2 |   | yes | no | UE does not support UL gap for Tx power management | Per band | No | FR2 only |  |  | Optional with capability signalling |
| UL gap pattern for Tx power management | 17-2 | Support of UL gap patterns for Tx power management | Capability of supporting UL gap patterns (UL MGP #0, #1, #2, #3 as specified in TS 38.133) needed for performing BPS sensing for Tx power management. The UE indicating this capability shall meet the corresponding enhanced UE requirements defined in Section TBD. UE is mandated to support at least one of UL MGP #1 and #3 when it indicate support of UL gap for Tx power management (FG 17-1). All other gap patterns except for the one or two selected mandatory gap pattern(s) are optional. | 17-1 | yes | no | The UE does not support specified UL gap patterns needed for Tx power management | Per UE | No | FR2 only |  |  | Optional with capability signalling |
| ~~[UL gap for coherent UL MIMO ]~~ | ~~[17-3]~~ | ~~Support of UL gap for coherent UL MIMO~~  | ~~Capability of performing coherent UL MIMO calibration in UL gap. The UE indicating this capability shall meet the corresponding enhanced UE requirements defined in Section TBD.~~  |  | ~~yes~~ | ~~no~~ | ~~UE does not support UL gap for coherent UL MIMO calibration~~  | ~~per UE~~ | ~~No~~ | ~~FR2 only~~ |  |  | ~~Optional with capability signalling~~ |
| 17. FR2 interband CA | 17-4 | Support of beam management | Capability of support of specific beam management type.  |  | yes | no | UE does not support FR2 interband CA | Per band combination | No | FR2 only |  | Indicate the supported beam management type for inter-band CA within FR2. Beam management type can be independent beam management (IBM) or common beam management (CBM), or both.The capability is only applicable to band combinations with two bands.UE is not allowed to report CBM or both in Rel-17. | Optional with capability signalling |
| DC-location | 17-5 | Support of UL DC location(s) report | Capability of support for the extended DC location reporting (based on indicated default DC location) for at least 2 UL CCs in one band. |  | yes | no | UE does not support the Rel-17 extended UL DC location reporting | Per band per BC | No | No |  |  | Optional with capability signalling |
| New CA BW clases | 17-6 | Support of new CA BW Classes | RAN4 has introduced new CA BW Classes R2~R12, and [ ‘R, S, T, U’] for REL17 |  | yes | no | UE does not support the Rel-17 extended FBG2 bandwidths | per band | No | FR2 only |  |  | Optional with capability signalling |
| ~~FBG 3+2~~ | ~~17-7~~ | ~~Support of new CA BW Classes~~ | ~~RAN4 may introduce new fall back group and or new CA BW classes under FBG3+2 discussion~~ |  | ~~yes~~ | ~~no~~ |  | ~~per band~~ | ~~No~~ | ~~FR2 only~~ |  |  | ~~Optional with capability signalling~~ |
| UL transmission in FR2 bands within an UL gap when the UL gap is activated | 17-8 | Support of UL transmission in FR2 bands within an UL gap when the UL gap is activated in inter-band UL CA | UE indicates the constituent band(s) for which UL transmission is supported within an UL gap when the UL gap is activated in inter-band UL CA.  | 17-1 |  |  | The UE does not support UL transmission within an UL gap when the UL gap is activated in inter-band UL CA.  | Per band per band combination | No | FR2 only |  |  | Optional with capability signalling |

1. NR\_HST\_FR1\_enh

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 18. NR\_HST\_FR1\_enh | 18-1 | Enhanced RRM requirements specified for CA for FR1 HST | Support of the enhanced RRM for requirements CA to support FR1 high speed up to 500 km/h, as specified in TS 38.133 | Rel-16 RAN4 feature 10-1 or 10-4 | Yes | No | The performance of RRM for CA in FR1 HST scenario cannot be guaranteed | Per UE | NO | FR1 only | N/A |  | Optional with capability signalling |
| 18. NR\_HST\_FR1\_enh | 18-2 | Enhanced RRM requirements specified for inter-frequency measurement in connected mode for FR1 HST | Support of the enhanced RRM requirements for inter-frequency measurement in connected mode to support FR1 high speed up to 500 km/h, as specified in TS 38.133 | Rel-16 RAN4 feature 10-1 or 10-4 | Yes | No | The performance of RRM for inter-frequency measurement in connected mode for FR1 HST cannot be guaranteed | Per UE | NO | FR1 only | N/A |  | Optional with capability signalling |
| 18. NR\_HST\_FR1\_enh | 18-3 | Enhanced RRM requirements specified for inter-frequency measurement in Idle and Inactive mode for FR1 HST | Support of the enhanced RRM requirements for inter-frequency measurement in idle and Inactive mode to support FR1 high speed up to 500 km/h, as specified in TS 38.133 |  | No | No | The performance of RRM for inter-frequency measurement in idle and Inactive mode for FR1 HST cannot be guaranteed | Per UE | NO | FR1 only | N/A |  | Optional without capability signalling |
| 18. NR\_HST\_FR1\_enh | 18-4 | Support of enhanced Demodulation requirements for CA in HST SFN FR1 | 1) Support of demodulation processing for HST SFN CA scenario in FR1 | Rel-16 RAN4 feature 10-2 | Yes | No | UE is not able to apply demodulation processing for HST SFN CA scenario in FR1 | per band combination | No | FR1 only | N/A |  | Optional with capability signalling |

1. NR\_MG\_enh

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| Network congrolled small gap | 19-1 | Network controlled small gap (NCSG) | Support of NCSG  |  | yes | no | UE cannot be configured with NCSG | per-UE | No | No |  |  | Optional with capability signalling |
|  | 19-1-1 | Network controlled small gap (NCSG) | Support of per-FR NCSG | 19-1 | yes | no | UE cannot be configured with per-FR NCSG | per-UE | No | No |  |  | Optional with capability signalling |
|  | 19-1-2 | Network controlled small gap (NCSG) | Supported NCSG patterns | 19-1 | yes | no | Network does not know whether some NCSG patterns can be configured to UE | per-UE | No | No |  |  | Optional with capability signallingNCSG patterns #0, #1 are conditional mandatory if UE supports 19-1NCSG patterns #13, #14 are conditional mandatory if UE supports 19-1 and 19-1-1 |
|  | 19-1-3 | Network controlled small gap (NCSG) | Supported NR-only NCSG patterns | 19-1 | yes | no | Network does not know whether some NR-only NCSG patterns can be configured to UE | per-UE | No | No |  |  | Optional with capability signallingNCSG patterns #2 and #3 are conditional mandatory if UE supports 19-1 NCSG patterns #17 and #18 are conditional mandatory if UE supports 19-1 and a FR2 band |
| Concurrent measurement gap | 19-2 | Concurrent measurement gaps | o Support of more than 1 per-UE measurement gap configurationso Support of more than 1 per-FR gap measurement gap configurations in an FR, or simultaneous 1 per-UE measurement gap plus 1 per-FR measurement gap configurations in an FR, or more than 1 per-UE measurement gap configurations for UE capable of Rel-15 per-FR gap (independentGapConfig)Note: The above 2 bullets are not 2 separate indications but a single indication with different interpretations, depending on the support of independentGapConfig. |  | yes | no | UE cannot be configured with concurrent gaps | per UE | No |  |  | This is the baseline capability is to indicate UE support multiple concurrent gaps. | Optional with capability signalling |
| Concurrent measurement gap | 19-2-1 | Concurrent measurement gaps for E-UTRAN measurement objectives | Capability of supporting configurations of E-UTRAN measurement objectives associated with more than 1 concurrent measurement gaps | 19-2 | yes | no | All configured E-UTRAN measurement objectives shall be associated with a single measurement gap  | per UE | No | No |  |  | Optional with capability signalling |
| Pre-configured gap | 19-3-1 | Pre-configured measurement gap with network-controlled activation and deactivation mechanism  | Capability of supporting preconfigured measurement gap with network-controlled mechanism for activation and deactivation |  | yes | no | UE does not support pre-configured measurement gap with Network-controlled mechanism | per UE | No | No |  |  | Optional with capability signalling |
| Pre-configured gap | 19-3-2 | Pre-configured measurement gap with UE autonomous activation and deactivation mechanism  | Capability of supporting preconfigured measurement gap with UE autonomous mechanism for activation and deactivation |  | yes | no | UE does not support pre-configured measurement gap with UE autonomous mechanism | per UE | No | No |  |  | Optional with capability signalling |

1. NR\_SAR\_PC2\_interB\_SUL\_2BUL

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 20. NR\_SAR\_PC2\_interB\_SUL\_2BUL | 20-1 | Maximum uplink duty cycle for NR inter-band CA power class 2 (*maxUplinkDutyCycle-interBandCA-PC2-r17*) | Indicates the maximum average percentage of symbols during a certain evaluation period that can be scheduled for uplink transmission so as to ensure compliance with applicable electromagnetic energy absorption requirements provided by regulatory bodies. The average percentage of uplink symbols is specified in 6.2A.1.3 in TS 38101-1[2] and the capability applies to the CA combinations listed in table 6.2A.1.3-1 in TS 38101-1[2].If the field is absent, UE shall work on power class 2 regardless of UL duty cycle and may use P-MPRc as defined in 6.2.4 in TS 38101-1[2] if necessary.Value n50 corresponds to 50%, value n60 corresponds to 60% and so on.NOTE: Specific targeted UL duty cycle percentage is not assumed if the field is absent. |  | Yes  | No | UE shall work on power class 2 regardless of UL duty cycle and may use P-MPRc as defined in 6.2.4 in TS 38101-1[2] if necessary. | Per BC | N/A | FR1 only |  |  | Optional with capability signalling |
| 20. NR\_SAR\_PC2\_interB\_SUL\_2BUL | 20-2 | Maximum uplink duty cycle for NR SUL combination power class 2 (*maxUplinkDutyCycle-SULcombination-PC2-r17*) | Indicates the maximum average percentage of symbols during a certain evaluation period that can be scheduled for uplink transmission so as to ensure compliance with applicable electromagnetic energy absorption requirements provided by regulatory bodies. The average percentage of uplink symbols is specified in 6.2C.1 in TS 38101-1[2] and the capability applies to all the SUL configurations with 1 SUL band + 1 TDD band.If the field is absent, UE shall work on power class 2 regardless of UL duty cycle and may use P-MPRc as defined in 6.2.4 in TS 38101-1[2] if necessary.Value n50 corresponds to 50%, value n60 corresponds to 60% and so on.NOTE: Specific targeted UL duty cycle percentage is not assumed if the field is absent. |  | Yes  | No | If the field is absent, UE shall work on power class 2 regardless of UL duty cycle and may use P-MPRc as defined in 6.2.4 in TS 38101-1[2] if necessary. | Per BC | N/A | FR1 only |  |  | Optional with capability signalling |

1. NR\_PC2\_UE\_FDD

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| ~~[21. NR\_PC2\_UE\_FDD]~~ | ~~[21-1]~~ | ~~[MSD reduction]~~ | ~~[Support of reducing UE Tx power for certain bandwidth in specific bands, where the MSD is larger than or equal to [FFS]dB under power class 2 operation.]~~ | ~~[N/A]~~ | ~~[Yes]~~ | ~~[No]~~ | ~~[UE does not support lowering the MSD by reducing UE Tx power]~~ | ~~[Per Band]~~ | ~~[FDD only]~~ | ~~[FR1 only]~~ | ~~[N/A]~~ | ~~[Network can configure whether to enable the UE capability]~~ | ~~[Optional with capability signalling]~~ |
| ~~[21. NR\_PC2\_UE\_FDD]~~ | ~~[21-2]~~ | ~~[Hybrid duplex operation]~~ | ~~[Support of hybrid duplex operation]~~ | ~~[N/A]~~ | ~~[Yes]~~ | ~~[No]~~ | ~~[UE does not support hybrid duplex operation]~~ | ~~[Per Band]~~ | ~~[FDD only]~~ | ~~[FR1 only]~~ | ~~[N/A]~~ | ~~[FFS RAN1 impact]~~ | ~~[Optional with capability signalling]~~ |

1. NR\_HST\_FR2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 22. NR\_HST\_FR2 | 22-1 | Support of FR2 HST operation | 1) Support of FR2 UE PC62) Support of enhanced RRM requirements for FR2 HST (except the requirement for one shot large UL timing adjustment)3) Support of demodulation processing for FR2 HST |  | Yes | No | UE does not meet FR2 high speed train scenario | Per Band | NO | FR2 only | N/A | FR2 UE power class PC6 signalling is used to indicate support of feature group | Optional with capability signalling |
| 22. NR\_HST\_FR2 | 22-2 | Support of one shot large UL timing adjustment | 1) Support of one shot large UL timing adjustment | 22-1 Support of FR2 HST operation | Yes | No | UE does not support one shot large UL timing adjustment | Per Band | NO | FR2 only | N/A |  | Optional with capability signaling |

1. NR\_UE\_pow\_sav\_enh

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 23. NR\_UE\_pow\_sav\_enh | 23-1 | Support of RLM relaxation | For the UE capable of SSB-based RLM, and/or CSI-RS based RLM, the feature indicates the support of corresponding RLM relaxation measurement. | 1-3 SS block based RLM and/or 1-7 CSI-RS based RLM and/or | Yes | No |  | Per UE | NO | Yes | N/A | The feature group can be supported by UE if any prerequisite feature group is supported by UE. | Optional with capability signalling |
| 23. NR\_UE\_pow\_sav\_enh | 23-2 | Support of BFD relaxation | For the UE capable of SSB-based BFD, and/or CSI-RS based BFD, the feature indicates the support of corresponding BFD relaxation measurement. | 2-31 Beam failure recovery | Yes | No |  | Per UE | NO | Yes | N/A |  | Optional with capability signalling |

1. NR\_demod\_enh2-Perf

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 24.NR\_demod\_enh2-Perf | 24-1 | CRS-IM (Interference Mitigation) in DSS scenario | Support of neighboring LTE cell CRS-IM in DSS scenario with NR 15 kHz SCSNote: In the DSS scenario, serving and neighboring cells are both operating with dynamic spectrum sharing (DSS) of NR and LTE. | 5-28 (Rate-matching around LTE CRS) | Yes | N/A | NR UE does not support neighboring LTE cell CRS-IM in DSS scenario  | Per FSPC | No | Applicable only to FR1 | Support mixture of FDD/TDD | Note: UE can support the feature on the CC(s) in a band only if the UE indicates support of rateMatchingLTE-CRS on that band. | Optional with capability signaling |
| 24.NR\_demod\_enh2-Perf | 24-2 | CRS-IM in non-DSS and 15 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth | Support of neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidthNote: In the non-DSS scenario, serving cell is operating in NR, and neighboring cells are operating in LTE. |  | Yes | N/A | NR UE does not support neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth | Per FSPC | No | Applicable only to FR1 | Support mixture of FDD/TDD |  | Optional with capability signaling |
| 24.NR\_demod\_enh2-Perf | 24-3 | CRS-IM in non-DSS and 15 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth | Support of neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth |  | Yes | N/A | NR UE does not support neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth | Per FSPC | No | Applicable only to FR1 | Support mixture of FDD/TDD |   | Optional with capability signaling |
| 24.NR\_demod\_enh2-Perf | 24-4 | CRS-IM in non-DSS and 30 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth | Support of neighboring LTE cell CRS-IM in non-DSS and 30 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth |  | Yes | N/A | NR UE does not support neighboring LTE cell CRS-IM in non-DSS and 30 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth | Per FSPC | No | Applicable only to FR1 | Support mixture of FDD/TDD |  | Optional with capability signaling |
| 24.NR\_demod\_enh2-Perf | 24-5 | CRS-IM in non-DSS and 30 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth | Support of neighboring LTE cell CRS-IM in non-DSS and 30 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth |  | Yes | N/A | NR UE does not support neighboring LTE cell CRS-IM in non-DSS and 30 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth | Per FSPC | No | Applicable only to FR1 | Support mixture of FDD/TDD |   | Optional with capability signaling |
| 24.NR\_demod\_enh2-Perf | 24-6 | MMSE-IRC receiver for scenarios with inter-cell and intra-cell inter-user interference | Support of MMSE-IRC processing for scenarios with inter-cell and intra-cell inter-user interference |   | No | No | UE can’t apply mitigation of inter-cell and intra-cell inter-user interference | Per UE | No | FR1 only | N/A |   | Optional without capability signalling for Rel-15 and Rel-16Mandatory without capability signalling from Rel-17 |

1. NR\_NTN\_solutions

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 25.NR\_NTN\_solutions | 25-1 | Parallel measurements on multiple SMTC-s for a single frequency carrier | Support of measurements on target cells belonging to 4 SMTC-s on a single frequency carrier |  | Yes | N/A | UE does not support NTN RRM measurements with more than 2 SMTC-s | Per UE | FDD only | FR1 only | NA | UE is mandatory to support 2 and can optionally support 4 if the feature is supported | Optional with capability signaling |
| 25.NR\_NTN\_solutions | 25-2 | Parallel measurements on cells belonging to a different NGSO satellite than a serving satellite without scheduling restrictions on normal operations with the serving cell | Support of measurements on cells belonging to different satellite as the serving cell in parallel with normal operation (i.e. data/control transmission and/or reception, and L1 measurements) of serving cell without scheduling restrictions. The feature is applicable only when the serving satellite is NGSO. If the serving cell belongs to GSO satellite, the scheduling restriction is not applied on the premise that a mixed type of satellites on the same frequency layer is not supported in this release (Rel-17). |  | Yes | N/A | UE does not support normal operation from the serving cell in parallel with measurements on cells belonging to a different NGSO satellite | Per Band | FDD only | FR1 only | NA | For UEs not able to perform measurements in parallel with normal operation of serving cell scheduling restrictions shall apply. | Optional with capability signaling |
| 25.NR\_NTN\_solutions | 25-3 | Parallel measurements with multiple measurement gaps | Support of 2 measurement gaps |  | Yes | N/A | UE does not support more than one measurement gap for NTN RRM measurements | Per UE | FDD only | FR1 only | NA | UE is mandatory to support 1 measurement gaps | Optional with capability signaling |
| 25.NR\_NTN\_solutions | 25-4 | Enhanced RRM requirements for measurements in IDLE and INACTIVE modes | If UE does not support the capability, legacy TN non-HST measurement requirements for both LEO and GEO. |  | No | N/A | UE does not support enhanced RRM requirements for measurements in IDLE and INACTIVE modes | Per Band | FDD only | FR1 only | NA |  | Optional without capability signaling |
| 25.NR\_NTN\_solutions | 25-5 | Parallel measurements on multiple NGSO satellites within a SMTC | Support of simultaneously measurements on target cells belonging to different NGSO satellites within a SMTC |  | yes | no | UE does not support simultaneously measurements with multiple  NGSO satellites within a SMTC | Per Band | FDD only | FR1 only | NA | Candidate values for the number of NGSO satellites are 1,2,3, or 4 |  |
| 25.NR\_NTN\_solutions | 25-6 | Relaxed cell reselection on GEO | Support of relaxed cell reselection on GEO |  | No | N/A | UE does not support relaxed cell reselection | Per UE | FDD only | FR1 only | NA | Only applicable for GEO | Optional with capability signaling |
| 25. NR\_NTN\_solutions | 25-7 | The number of target LEO satellites the UE can monitor per carrier including serving satellite | On serving carrier, it indicates the number of target LEO satellites the UE can monitor per carrier including serving satelliteOn non-serving carrier, it indicates the number of target LEO satellites the UE can monitor per carrier. |  | Yes | N/A | The number of target satellites UE can monitor per carrier is 2. | Per band | FDD only | FR1 only | NA |  | Optional with capability signaling |

1. Higher Power Limit CA\_DC

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the Gnb to know if the feature is supported** | **Applicable to the capability signalling exchange between Ues (V2X WI only)”.** | **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** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 26.Increased MOP for CA and DC | 26-1 | Higher Power Limit CA\_DC | Support of increase in maximum output power above the power class indication |  | Yes | N/A | UE is limited in MOP as indicated by the power class when configured for CA or DC | Per BC | N/A | FR1 only | NA |  | Optional with capability signaling |