**3GPP TSG-RAN WG1 Meeting #116bis *DraftR1-2403790***

**Changsha, China, April 15 – 19, 2024**

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| *CR-Form-v12.3* |
| **DRAFT CHANGE REQUEST** |
|  |
|  | **38.211** | **CR** |  | **rev** |  | **Current version:** | **18.2.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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|  |
| ***Title:***  | Draft CR for TS 38.211 for introduction of FR2-NTN |
|  |  |
| ***Source to WG:*** | Moderator (Nokia), NTT DOCOMO, INC. |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_NTN\_enh-Core |  | ***Date:*** | 2024-04-26 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | Introduction of NR over NTN for frequency bands defined by FR2-NTN. |
|  |  |
| ***Summary of change:*** | Update references and abbreviations to include definition of FR2-NTN. Update of title of Table 6.3.3.2-4 to include FR2-NTN.Update of Point A description to include FR2-NTN.Update of slot numbering for PRACH to include FR2-NTN.Update of SS/PBCH time/frequency structure to include FR2-NTN. |
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| ***Consequences if not approved:*** | NR over NTN in frequency bands defined by FR2-NTN will not be complete. |
|  |  |
| ***Clauses affected:*** | 2, 3.3, 4.4.4.2, 6.3.3.2, 7.4.3.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.213, TS 38.214 |
| ***affected:*** |  | **X** |  Test specifications |   |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | This is the first version of the CR |

<unchanged parts omitted>

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.201: "NR; Physical Layer – General Description"

[3] 3GPP TS 38.202: "NR; Services provided by the physical layer"

[4] 3GPP TS 38.212: "NR; Multiplexing and channel coding"

[5] 3GPP TS 38.213: "NR; Physical layer procedures for control "

[6] 3GPP TS 38.214: "NR; Physical layer procedures for data "

[7] 3GPP TS 38.215: "NR; Physical layer measurements"

[8] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception"

[9] void

[10] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities"

[11] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification"

[12] 3GPP TS 38.133: "NR; Requirements for support of radio resource management"

[13] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state"

[14] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone"

[15] 3GPP TS 38.101-5: "NR; User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements"

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## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BWP Bandwidth Part

CCE Control Channel Element

CORESET Control Resource Set

CRB Common Resource Block

CSI Channel-State Information

CSI-RS CSI Reference Signal

DCI Downlink Control Information

DM-RS Demodulation Reference Signal

FR1 Frequency Range 1 as defined in TS 38.104 [8]

FR2 Frequency Range 2 as defined in TS 38.104 [8]

FR2-NTN Frequency Range 2 for Non-terrestrial networks as defined in TS 38.101-5 [15]

IAB Integrated Access and Backhaul

IAB-MT IAB Mobile Termination

IE Information Element

NCR Network-Controlled repeater

NCR-MT NCR Mobile Termination

<unchanged parts omitted>

#### 4.4.4.2 Point A

Point A serves as a common reference point for resource block grids and is obtained from:

- *offsetToPointA* for a PCell downlink where *offsetToPointA* represents the frequency offset between point A and the lowest subcarrier of the lowest resource block, which overlaps with the SS/PBCH block, or the SS/PBCH block after puncturing if applicable, used by the UE for initial cell selection, expressed in units of resource blocks assuming 15 kHz subcarrier spacing for FR1 and 60 kHz subcarrier spacing for FR2 and FR2-NTN;

- for operation without shared spectrum channel access in FR1, FR2-1, and FR2-NTN, the lowest resource block has the subcarrier spacing provided by the higher layer parameter *subCarrierSpacingCommon*;

- for operation with shared spectrum channel access in FR1 or FR2, and for operation without shared spectrum channel access in FR2-2, the lowest resource block has the subcarrier spacing same as the SS/PBCH block used by the UE for initial cell selection;

- *absoluteFrequencyPointA* for all other cases where *absoluteFrequencyPointA* represents the frequency-location of point A expressed as in ARFCN.

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#### 6.3.3.2 Mapping to physical resources

The preamble sequence shall be mapped to physical resources according to



where  is an amplitude scaling factor in order to conform to the transmit power specified in [5, TS38.213], and  is the antenna port. Baseband signal generation shall be done according to clause 5.3 using the parameters in Table 6.3.3.1-1 or Table 6.3.3.1-2 with  given by Table 6.3.3.2-1.

Random access preambles can only be transmitted in the time resources obtained from Tables 6.3.3.2-2 to 6.3.3.2-4 and depends on FR1, FR2, or FR2-NTN and the spectrum type as defined in [8, TS38.104]. The PRACH configuration index in Tables 6.3.3.2-2 to 6.3.3.2-4 is

- for Table 6.3.3.2-3 given by the higher-layer parameter *prach-ConfigurationIndex,* or by *msgA-PRACH-ConfigurationIndex* if configured; and

- for Tables 6.3.3.2-2 and 6.3.3.2-4 given by the higher-layer parameter *prach-ConfigurationIndex,* or by *msgA-PRACH-ConfigurationIndex* if configured.

For the IAB-MT part of an IAB-node, the following applies:

- if the higher-layer parameter *prach-ConfigurationPeriodScaling-IAB* is configured, the variable $x$ used in $n\_{f} mod x=y$ of Tables 6.3.3.2-2 to 6.3.3.2-4 shall be replaced by $ x\_{IAB}$ , where $ x\_{IAB}=δx$ and $δ$ is given by the higher-layer parameter *prach-ConfigurationPeriodScaling-IAB* and the IAB-node does not expect $x\_{IAB}$ to be larger than 64;

- if the higher-layer parameter *prach-ConfigurationFrameOffset-IAB* is configured, the variable $y$ used in $n\_{f} mod x=y$ of Tables 6.3.3.2-2 to 6.3.3.2-4 shall be replaced by $y\_{IAB}=\left(y+Δy\right) mod x$ where $Δy $ is given by the higher-layer parameter *prach-ConfigurationFrameOffset-IAB*, and $ x is the value used in n\_{f} mod x=y$;

- if the higher-layer parameter *prach-ConfigurationSOffset-IAB* is configured, the subframe number $s\_{n}$ from Tables 6.3.3.2-2 to 6.3.3.2-3 and the slot number $s\_{n}$ from Table 6.3.3.2-4 shall be replaced by $\left(s\_{n}+Δs\right) mod L$ where $Δs\in \left\{0,1,…,L-1\right\}$ is given by the higher-layer parameter *prach-ConfigurationSOffset-IAB*, and $L$ is the number of subframes in a frame when using Tables 6.3.3.2-2 to 6.3.3.2-3 and the number of slots in a frame for 60 kHz subcarrier spacing when using in Table 6.3.3.2-4.

Random access preambles can only be transmitted in the frequency resources given by either the higher-layer parameter *msg1-FrequencyStart* or *msgA-RO-FrequencyStart* if configured as described in clause 8.1 of [5 TS 38.213]. The PRACH frequency resources $n\_{RA}\in \left\{0,1,…,M-1\right\}$, where $M$ equals the higher-layer parameter *msg1-FDM* or *msgA-RO-FDM* if configured, are numbered in increasing order within the initial uplink bandwidth part during initial access, starting from the lowest frequency. Otherwise, $n\_{RA}$ are numbered in increasing order within the active uplink bandwidth part, starting from the lowest frequency.

For operation with shared spectrum channel access, for $L\_{RA}=139$, a UE expects to be provided with higher-layer parameter *msg1-FrequencyStart* or *msgA-RO-FrequencyStart* if configured, and higher-layer parameter *msg1-FDM* or *msgA-RO-FDM* if configured, such that a random-access preamble is confined within a single RB set. The UE assumes that the RB set is defined as when the UE is not provided *intraCellGuardBandsPerSCS* for an UL carrier as described in Clause 7 of [6, TS 38.214].

For operation with shared spectrum channel access, for $L\_{RA}=571$ or $1151$ and Type-2 random access, a UE expects to be provided with higher-layer parameter *msgA-RO-FDM* equals to one.

For the purpose of slot numbering in the tables, the following subcarrier spacing shall be assumed:

- 15 kHz for FR1

- 60 kHz for FR2 and FR2-NTN.

For handover purposes to a target cell in paired or unpaired spectrum where the target cell uses $L\_{max}=4$, the UE may assume the absolute value of the time difference between radio frame $i$ in the current cell and radio frame$i$ in the target cell is less than $153600T\_{s}$ if the association pattern period in clause 8.1 of [5, TS 38.213] is not equal to 10 ms.

For inter frequency handover purposes where the source cell is either in paired or unpaired spectrum and the target cell is in unpaired spectrum and uses $L\_{max}=8$, the UE may assume the absolute value of the time difference between radio frame $i$ in the current cell and radio frame $i$ in the target cell is less than $76800T\_{s}.$

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Table 6.3.3.2-4: Random access configurations for FR2 and unpaired spectrum, and for FR2-NTN and paired spectrum.

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### 7.4.3 SS/PBCH block

#### 7.4.3.1 Time-frequency structure of an SS/PBCH block

In the time domain, an SS/PBCH block consists of 4 OFDM symbols, numbered in increasing order from 0 to 3 within the SS/PBCH block, where PSS, SSS, and PBCH with associated DM-RS are mapped to symbols as given by Table 7.4.3.1-1.

In the frequency domain, an SS/PBCH block consists of 240 contiguous subcarriers with the subcarriers numbered in increasing order from 0 to 239 within the SS/PBCH block. The quantities $k$ and $l$ represent the frequency and time indices, respectively, within one SS/PBCH block. The UE may assume that the complex-valued symbols corresponding to resource elements denoted as 'Set to 0' in Table 7.4.3.1-1 are set to zero. The quantity $v$ in Table 7.4.3.1-1 is given by $v=N\_{ID}^{cell} mod 4$. The quantity $k\_{SSB}$ is the subcarrier offset from subcarrier 0 in common resource block $N\_{CRB}^{SSB}$ to the lowest-numbered subcarrier of the SS/PBCH block, or the SS/PBCH block after puncturing if applicable, where $N\_{CRB}^{SSB}$ is obtained from the higher-layer parameter *offsetToPointA*.

- For operation with shared spectrum channel access in FR2-2 and for operation without shared spectrum channel access, the 4 least significant bits of $k\_{SSB}$ are given by the higher-layer parameter *ssb-SubcarrierOffset* and for FR1 the most significant bit of $k\_{SSB}$ is given by $\overbar{a}\_{\overbar{A}+5}$ in the PBCH payload as defined in clause 7.1.1 of [4, TS 38.212].

- For operation with shared spectrum channel access in FR1, the 4 least significant bits of $\overbar{k}\_{SSB}$ are given by the higher-layer parameter *ssb-SubcarrierOffset* and the most significant bit of $\overbar{k}\_{SSB}$ is given by $\overbar{a}\_{\overbar{A}+5}$ in the PBCH payload as defined in clause 7.1.1 of [4, TS 38.212]. If $\overbar{k}\_{SSB}\geq 24$, $k\_{SSB}=\overbar{k}\_{SSB}$ ; otherwise, $k\_{SSB}=2\left⌊{\overbar{k}\_{SSB}}/{2}\right⌋$.

If *ssb-SubcarrierOffset* is not provided, $k\_{SSB}$ is derived from the frequency difference between the SS/PBCH block and Point A.

The UE may assume that the complex-valued symbols corresponding to resource elements that are part of a common resource block partially or fully overlapping with an SS/PBCH block, or an SS/PBCH block after puncturing if applicable, and not used for SS/PBCH transmission are set to zero in the OFDM symbols partially or fully overlapping with OFDM symbols where SS/PBCH is transmitted.

For an SS/PBCH block, the UE shall assume

- antenna port $p=4000$ is used for transmission of PSS, SSS, PBCH and DM-RS for PBCH,

- the same cyclic prefix length and subcarrier spacing for the PSS, SSS, PBCH and DM-RS for PBCH,

- for SS/PBCH block type A, $μ\in \left\{0,1\right\}$ and $k\_{SSB}\in \left\{0, 1, 2, …, 23\right\}$ with the quantities $k\_{SSB}$, and $N\_{CRB}^{SSB}$ expressed in terms of 15 kHz subcarrier spacing, and

- for SS/PBCH block type B in FR2-1 and FR2-NTN, $μ\in \left\{3,4\right\}$ and $k\_{SSB}\in \left\{0, 1, 2, …, 11\right\}$ with the quantity $k\_{SSB}$ expressed in terms of the subcarrier spacing provided by the higher-layer parameter *subCarrierSpacingCommon* and $N\_{CRB}^{SSB}$ expressed in terms of 60 kHz subcarrier spacing;

- for SS/PBCH block type B in FR2-2, $μ\in \left\{3,5,6\right\}$ and $k\_{SSB}\in \left\{0,1,2,…,11\right\}$ with the quantity $k\_{SSB}$ expressed in terms of the SS/PBCH block subcarrier spacing and $N\_{CRB}^{SSB}$ expressed in terms of 60 kHz subcarrier spacing;

- the centre of subcarrier 0 of resource block $N\_{CRB}^{SSB}$ coincides with the centre of subcarrier 0 of a common resource block with the subcarrier spacing

- provided by the higher-layer parameter *subCarrierSpacingCommon* for operation without shared spectrum channel access in FR1, FR2-1, and FR2-NTN; and

- same as the subcarrier spacing of the SS/PBCH block for operation without shared spectrum access in FR2-2 and for operation with shared spectrum channel access.

- This common resource block overlaps with subcarrier 0 of the lowest-numbered resource block of the SS/PBCH block, or the SS/PBCH block after puncturing if applicable.

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