**3GPP TSG-RAN WG1 Meeting #116bis *R1-24xxxxx***

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

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.213** | **CR** | **DRAFT** | **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 38.213 for introduction of FR2-NTN |
|  |  |
| ***Source to WG:*** | Nokia, NTT DOCOMO, INC. |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_NTN\_enh-Core |  | ***Date:*** | 2024-04-16 |
|  |  |  |  |  |
| ***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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***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 cell search procedure to include FR2-NTN.Update of UE procedure for reporting control information 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, 4.1, 9 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  |  |
| ***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 38.211: "NR; Physical channels and modulation"

[5] 3GPP TS 38.212: "NR; Multiplexing and channel coding"

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

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

[8-1] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone"

[8-2] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone"

[8-3] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios"

[8-4] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements"

[8-5] 3GPP TS 38.101-5: " User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements NR"

[9] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception"

[10] 3GPP TS 38.133: "NR; Requirements for support of radio resource management"

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

[12] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification"

[13] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures"

[14] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification"

[15] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access"

[16] 3GPP TS 38.473: "F1 application protocol (F1AP)"

[17] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state"

[18] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities"

[19] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description"

[20] 3GPP TS 38.106: "NR; NR Repeater Radio Transmission and Reception"

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## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in [1, TR 21.905].

BPRE Bits Per Resource Element

BWP Bandwidth Part

CB Code Block

CBG Code Block Group

CBR Channel Busy Ratio

CCE Control Channel Element

CORESET Control Resource Set

CP Cyclic Prefix

CRC Cyclic Redundancy Check

C-RNTI Cell RNTI

CS-RNTI Configured Scheduling RNTI

CSI Channel State Information

CSS Common Search Space

DAI Downlink Assignment Index

DAPS Dual Active Protocol Stack

DC Dual Connectivity

DCI Downlink Control Information

DL Downlink

DL-SCH Downlink Shared Channel

EPRE Energy Per Resource Element

EN-DC E-UTRA NR Dual Connectivity with MCG using E-UTRA and SCG using NR

FR1 Frequency Range 1

FR2 Frequency Range 2

FR2-NTN Frequency Range 2 for non-terrestrial networks [8-5]

G-CS-RNTI Group Configured Scheduling RNTI

G-RNTI Group RNTI

GSCN Global Synchronization Channel Number

HARQ-ACK Hybrid Automatic Repeat reQuest Acknowledgement

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## 4.1 Cell search

Cell search is the procedure for a UE to acquire time and frequency synchronization with a cell and to detect the physical layer Cell ID of the cell.

A UE receives the following synchronization signals (SS) in order to perform cell search: the primary synchronization signal (PSS) and secondary synchronization signal (SSS) as defined in [4, TS 38.211].

A UE assumes that reception occasions of a physical broadcast channel (PBCH), PSS, and SSS are in consecutive symbols, as defined in [4, TS 38.211], and form a SS/PBCH block. The UE assumes that SSS, PBCH DM-RS, and PBCH data have same EPRE. The UE may assume that the ratio of PSS EPRE to SSS EPRE in a SS/PBCH block is either 0 dB or 3 dB. If the UE has not been provided dedicated higher layer parameters, the UE may assume that the ratio of PDCCH DMRS EPRE to SSS EPRE is within -8 dB and 8 dB when the UE monitors PDCCHs for a DCI format 1\_0 with CRC scrambled by SI-RNTI, P-RNTI, or RA-RNTI, or for a DCI format 2\_7, or for a DCI format 4\_0.

For a half frame with SS/PBCH blocks, the first symbol indexes for candidate SS/PBCH blocks are determined according to the SCS of SS/PBCH blocks as follows, where index 0 corresponds to the first symbol of the first slot in a half-frame.

- Case A - 15 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes of $\left\{2,8\right\}+14⋅n$.

- For operation without shared spectrum channel access:

- For carrier frequencies smaller than or equal to 3 GHz, $n=0,1$.

- For carrier frequencies within FR1 larger than 3 GHz, $n=0,1,2,3$.

- For operation with shared spectrum channel access, as described in [15, TS 37.213], $n=0, 1, 2, 3, 4$.

- Case B - 30 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{4,8,16,20\right\}+28⋅n$. For carrier frequencies smaller than or equal to 3 GHz, $n=0$. For carrier frequencies within FR1 larger than 3 GHz, $n=0,1$.

- Case C - 30 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{2,8\right\}+14⋅n$.

- For operation without shared spectrum channel access

- For paired spectrum operation

- For carrier frequencies smaller than or equal to 3 GHz, $n=0,1$. For carrier frequencies within FR1 larger than 3 GHz, $n=0,1,2,3$.

- For unpaired spectrum operation

- For carrier frequencies smaller than 1.88 GHz, $n=0,1$. For carrier frequencies within FR1 equal to or larger than 1.88 GHz, $n=0,1,2,3$.

- For operation with shared spectrum channel access, $n=0, 1, 2, 3, 4, 5, 6, 7, 8, 9$.

- Case D - 120 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{4,8,16,20\right\}+28⋅n$. For carrier frequencies within FR2 and FR2-NTN, $n=0, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18$.

- Case E - 240 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{8,12,16,20,32,36,40,44\right\}+56⋅n$. For carrier frequencies within FR2-1 and FR2-NTN, $n=0, 1, 2, 3, 5, 6, 7, 8$.

- Case F – 480 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{2, 9\right\}+14⋅n$. For carrier frequencies within FR2-2, $n=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31.$

- Case G – 960 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{2, 9\right\}+14⋅n$. For carrier frequencies within FR2-2, $n=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31.$

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# 9 UE procedure for reporting control information

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For the remaining of this clause, if a UE is provided $K\_{cell,offset}$ by *cellSpecificKoffset* or $K\_{UE,offset}$ by a MAC CE command, reference to a slot $n+k$ for a PUCCH transmission or PUSCH transmission corresponds to a slot $n+k+2^{μ-μ\_{K\_{offset}}}∙K\_{offset}$ for the PUSCH or the PUCCH transmission, and reference to a slot $n\_{U}-K\_{1,k}$ corresponds to slot $n\_{U}-K\_{1,k}-2^{μ-μ\_{K\_{offset}}}∙K\_{offset}$, where $μ$ is the SCS configuration for the PUCCH transmission or PUSCH transmission, $K\_{offset}$ is defined in clause 4.2, and $μ\_{K\_{offset}}=0$ in FR1 and in FR2-NTN. If *cellSpecificKoffset* or if the MAC CE command is not provided, $K\_{cell,offset}=0$ or $K\_{UE,offset}=0$, respectively. If the PUCCH or PUSCH transmission is scheduled by a DCI format, or if SRS transmission is triggered by a DCI format, the value of $K\_{UE,offset}$ is the one that is applicable at the slot overlapping with the last symbol of the PDCCH reception providing the DCI format. If the PUCCH transmission or the PUSCH transmission is scheduled by a DCI format with CRC scrambled by TC-RNTI, $K\_{UE,offset}=0$. If the UE is provided a $K\_{UE,offset}$ value by a MAC CE command, the UE applies the MAC CE command in the first slot that is after slot $k+3N\_{slot}^{subframe,μ}$ where $k$ is the slot where the UE would transmit a PUCCH with HARQ-ACK information for the PDSCH providing the MAC CE command, $μ$ is the SCS configuration for the PUCCH transmission that is determined in the slot when the MAC CE command is applied.

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