**3GPP TSG-RAN WG4 Meeting #111R4-24xxxxx**

**Fukuoka, Japan, 20th May - 24th May 2024**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.102** | **CR** | **0037** | **rev** | **1** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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 |  | Core Network |  |

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| ***Title:*** | (TEI18) CR to 36.102 In-band NB-IoT NTN deployment with NR from Rel-18 [TEI\_NTN] | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks, Apple | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI18 | | | | |  | ***Date:*** | | | 2024-05-09 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | NB-IoT supports In-band and guard-band deployments with LTE carriers since Rel-13 and in-band with NR carriers since Rel-15. Based on the conclusions of TR 37.824 and of the approved TP in R4- 2220812, the current channel arrangement and offset values can already support in-band deployment with NR. However, clarification is required in the spec. | | | | | | | | |
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| ***Summary of change:*** | | Clarify support for in-band deployment of NB-IoT NTN with NR NTN carriers in the same SAN. | | | | | | | | |
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| ***Consequences if not approved:*** | | If not supported by UE: NB-IoT UE will not be able to access the network with carriers deployed in-band with NR NTN  If not supported by the Network: Operators will not be able to deploy NB-IoT NTN in-band with NR NTN | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 5.4B.1, 5.4B.2, 5.4B.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

### << START OF CHANGE >>

## 3.1 Terms

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

**Channel edge:** The lowest and highest frequency of the carrier, separated by the channel bandwidth.

**Channel bandwidth:** The RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

**Category NB1/NB2 stand-alone operation**: category NB1/NB2 is operating standalone when it utilizes its own spectrum, for example the spectrum used by GERAN systems as a replacement of one or more GSM carriers, as well as scattered spectrum for potential IoT deployment.

**Category NB1/NB2** **guard band operation:** category NB1/NB2 is operating in guard band when it utilizes the unused resource block(s) within a E-UTRA carrier’s guard-band.

**Category NB1/NB2** **in-band operation:** category NB1/NB2 is operating in-band when it utilizes the resource block(s) within a normal E-UTRA carrier or within a normal NR carrier plus 15 kHz at each edge (and not within NR minimum guard band).

**Geosynchronous Earth Orbit:** Earth-centred orbit at approximately 35786 kilometres above Earth's surface and synchronised with Earth's rotation. A geostationary orbit is a non-inclined geosynchronous orbit, i.e. in the Earth’s equator plane.

**Low Earth Orbit:** Orbit around the Earth with an altitude between 300 km, and 1500 km.

**Satellite:** A space-borne vehicle embarking a bent pipe payload or a regenerative payload telecommunication transmitter, placed into Low-Earth Orbit (LEO), Medium-Earth Orbit (MEO), or Geosynchronous Earth Orbit (GEO).

**Satellite Access Node:** see definition in TS 36.108 [2].

**sTTI**: A transmission time interval (TTI) of either one slot or one subslot as defined in TS 36.211 [3] on either uplink or downlink.

### << END OF CHANGE >>

### << START OF CHANGE >>

## 5.4B Channel arrangement for category NB1 and NB2

### 5.4B.1 Channel spacing

Nominal channel spacing for UE category NB1 and NB2 in stand-alone mode is 200 kHz. For in-band case, the nominal channel spacing between two adjacent category NB1 or NB2 carriers is 180 kHz.

### 5.4B.2 Channel raster, carrier frequency and EARFCN

The channel raster of UE category NB1/NB2 shall be as defined in clause 5.4A.2, and the channel raster per-frequency band shall be as defined in table 5.4A.2-1.

The carrier frequency of UE category NB1/NB2 in the downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) as defined in Table 5.4A.2-1, and the Offset of category NB1/NB2 Channel Number to EARFCN in the range of {-10, -9, -8, -7, -6, -5, -4, -3, -2, -1, -0.5, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9} for FDD. The relation between EARFCN, Offset of category NB1/NB2 Channel Number to EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where FDL is the downlink carrier frequency of category NB1/NB2, FDL\_low and NOffs-DL are given in table 5.4A.2-1, NDL is the downlink EARFCN, MDL is the Offset of category NB1/NB2 Channel Number to downlink EARFCN.

FDL = FDL\_low + 0.1(NDL – NOffs-DL) + 0.0025\*(2MDL)

The carrier frequency of UE category NB1/NB2 in the uplink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) as defined in Table 5.4A.2-1, and the Offset of category NB1/NB2 Channel Number to EARFCN in the range of {-10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9} for FDD. The relation between EARFCN, Offset of category NB1/NB2 Channel Number to EARFCN and the carrier frequency in MHz for the uplink is given by the following equation, where FUL is the uplink carrier frequency of category NB1/NB2, FUL\_low and NOffs-UL are given in table 5.4A.2-1, NUL is the uplink EARFCN, MUL is the Offset of category NB1/NB2 Channel Number to uplink EARFCN.

FUL = FUL\_low + 0.1(NUL – NOffs-UL) + 0.0025\*(2MUL)

NOTE 1:

NOTE 2: For the carrier including NPSS/NSSS for stand-alone operation, MDL = 0.

### 5.4B.3 TX–RX frequency separation

For UE category NB1/NB2 operation in stand-alone mode, the default TX-RX frequency separation shall be as specified in Table 5.4A.3-1 for the NB-IoT TX and RX channel bandwidth defined in Table 5.3B-1.

For in-band operation mode, the category NB1 and NB2 TX-RX frequency separation is flexible within the assigned channel bandwidth of NR carrier.

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