**3GPP TSG- Meeting #R4-2002857**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **0224** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <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:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | R\_n53-Core | | | | |  | ***Date:*** | | | 2020-02-14 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of n53 into relevant sections.  NS-45 was incorrectly assigned to n39 but because NS-45 was already used for LTE band 53. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | n53 is added into 38.101-1. New NS-50 is assigned to n39. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | n53 not in specification | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2, 5.3.5, 5.4.2.3, 5.4.3, 6.2.1, 6.2.3, 7.3.2, 7.6.2, 7.6.3, 7.6.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | R4-2000400 is a REL-15 change for n39 and NS-50. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 5.2 Operating bands

NR is designed to operate in the FR1 operating bands defined in Table 5.2-1.

Table 5.2-1: NR operating bands in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | Uplink (UL) *operating band* BS receive / UE transmit  FUL\_low  – FUL\_high | Downlink (DL) *operating band* BS transmit / UE receive  FDL\_low – FDL\_high | Duplex Mode |
| n1 | 1920 MHz – 1980 MHz | 2110 MHz – 2170 MHz | FDD |
| n2 | 1850 MHz – 1910 MHz | 1930 MHz – 1990 MHz | FDD |
| n3 | 1710 MHz – 1785 MHz | 1805 MHz – 1880 MHz | FDD |
| n5 | 824 MHz – 849 MHz | 869 MHz – 894 MHz | FDD |
| n7 | 2500 MHz – 2570 MHz | 2620 MHz – 2690 MHz | FDD |
| n8 | 880 MHz – 915 MHz | 925 MHz – 960 MHz | FDD |
| n12 | 699 MHz – 716 MHz | 729 MHz – 746 MHz | FDD |
| n14 | 788 MHz – 798 MHz | 758 MHz – 768 MHz | FDD |
| n18 | 815 MHz – 830 MHz | 860 MHz – 875 MHz | FDD |
| n20 | 832 MHz – 862 MHz | 791 MHz – 821 MHz | FDD |
| n25 | 1850 MHz – 1915 MHz | 1930 MHz – 1995 MHz | FDD |
| n28 | 703 MHz – 748 MHz | 758 MHz – 803 MHz | FDD |
| n29 | N/A | 717 MHz – 728 MHz | SDL |
| n303 | 2305 Mhz – 2315 MHz | 2350 MHz – 2360 MHz | FDD |
| n34 | 2010 MHz – 2025 MHz | 2010 MHz – 2025 MHz | TDD |
| n38 | 2570 MHz – 2620 MHz | 2570 MHz – 2620 MHz | TDD |
| n39 | 1880 MHz – 1920 MHz | 1880 MHz – 1920 MHz | TDD |
| n40 | 2300 MHz – 2400 MHz | 2300 MHz – 2400 MHz | TDD |
| n41 | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz | TDD |
| n48 | 3550 MHz – 3700 MHz | 3550 MHz – 3700 MHz | TDD |
| n50 | 1432 MHz – 1517 MHz | 1432 MHz – 1517 MHz | TDD1 |
| n51 | 1427 MHz – 1432 MHz | 1427 MHz – 1432 MHz | TDD |
| n53 | 2483.5 MHz – 2495 MHz | 2483.5 MHz – 2495 MHz | TDD |
| n65 | 1920 MHz – 2010 MHz | 2110 MHz – 2200 MHz | FDD4 |
| n66 | 1710 MHz – 1780 MHz | 2110 MHz – 2200 MHz | FDD |
| n70 | 1695 MHz – 1710 MHz | 1995 MHz – 2020 MHz | FDD |
| n71 | 663 MHz – 698 MHz | 617 MHz – 652 MHz | FDD |
| n74 | 1427 MHz – 1470 MHz | 1475 MHz – 1518 MHz | FDD |
| n75 | N/A | 1432 MHz – 1517 MHz | SDL |
| n76 | N/A | 1427 MHz – 1432 MHz | SDL |
| n77 | 3300 MHz – 4200 MHz | 3300 MHz – 4200 MHz | TDD |
| n78 | 3300 MHz – 3800 MHz | 3300 MHz – 3800 MHz | TDD |
| n79 | 4400 MHz – 5000 MHz | 4400 MHz – 5000 MHz | TDD |
| n80 | 1710 MHz – 1785 MHz | N/A | SUL |
| n81 | 880 MHz – 915 MHz | N/A | SUL |
| n82 | 832 MHz – 862 MHz | N/A | SUL |
| n83 | 703 MHz – 748 MHz | N/A | SUL |
| n84 | 1920 MHz – 1980 MHz | N/A | SUL |
| n86 | 1710 MHz – 1780 MHz | N/A | SUL |
| n89 | 824 MHz – 849 MHz | N/A | SUL |
| n90 | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz | TDD5 |
| n91 | 832 MHz – 862 MHz | 1427 MHz – 1432 MHz | FDD9 |
| n92 | 832 MHz – 862 MHz | 1432 MHz – 1517 MHz | FDD9 |
| n93 | 880 MHz – 915 MHz | 1427 MHz – 1432 MHz | FDD9 |
| n94 | 880 MHz – 915 MHz | 1432 MHz – 1517 MHz | FDD9 |
| n958 | 2010 MHz – 2025 MHz | N/A | SUL |
| NOTE 1: UE that complies with the NR Band n50 minimum requirements in this specification shall also comply with the NR Band n51 minimum requirements.  NOTE 2: UE that complies with the NR Band n75 minimum requirements in this specification shall also comply with the NR Band n76 minimum requirements.  NOTE 3: Uplink transmission is not allowed at this band for UE with external vehicle-mounted antennas.  NOTE 4: A UE that complies with the NR Band n65 minimum requirements in this specification shall also comply with the NR Band n1 minimum requirements.  NOTE 5: Unless otherwise stated, the applicability of requirements for Band n90 is in accordance with that for Band n41; a UE supporting Band n90 shall meet the requirements for Band n41.  NOTE 6: A UE that supports NR Band n66 shall receive in the entire DL operating band.  NOTE 7: A UE that supports NR Band n66 and CA operation in any CA band shall also comply with the minimum requirements specified for the DL CA configurations CA\_n66B and CA\_n66(2A) in the current version of the specification.  NOTE 8: This band is applicable in China only.  NOTE 9: Variable duplex operation does not enable dynamic variable duplex configuration by the network, and is used such that DL and UL frequency ranges are supported independently in any valid frequency range for the band. | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 5.3.5 UE channel bandwidth per operating band

The requirements in this specification apply to the combination of channel bandwidths, SCS and operating bands shown in Table 5.3.5-1. The transmission bandwidth configuration in Table 5.3.2-1 shall be supported for each of the specified channel bandwidths. The channel bandwidths are specified for both the TX and RX path.

Table 5.3.5-1 Channel bandwidths for each NR band

|  |  | | NR band / SCS / UE Channel bandwidth | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | SCS  kHz | 5 MHz | | 101,2 MHz | 152 MHz | 202 MHz | 252 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| n1 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n2 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n3 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| n5 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n7 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n8 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n12 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n18 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n28 | 15 | Yes | | Yes | Yes | Yes7 |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes7 |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n29 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| n38 | 15 | Yes | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| n39 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n40 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |
| n41 | 15 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n48 | 15 | Yes5 | | Yes | Yes | Yes |  |  | Yes | Yes6 |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  | Yes | Yes6 | Yes6 |  | Yes6 | Yes6,4 | Yes6 |
| 60 |  | | Yes | Yes | Yes |  |  | Yes | Yes6 | Yes6 |  | Yes6 | Yes6,4 | Yes6 |
| n50 | 15 | Yes | | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes3 |  |  |
| 60 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes3 |  |  |
| n51 | 15 | Yes | |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n66 | 15 | Yes | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| n70 | 15 | Yes | | Yes | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |
| n71 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n74 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n75 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n76 | 15 | Yes | |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n77 | 15 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes4 | Yes |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes4 | Yes |
| n78 | 15 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes | Yes |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes | Yes |
| n79 | 15 |  | |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  | |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  | |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n80 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| n81 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n82 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n83 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n84 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n86 | 15 | Yes | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| n89 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n90 | 15 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n91 | 15 | Yes | | Yes8 |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | 15 | Yes | | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | 15 | Yes | | Yes8 |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | 15 | Yes | | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n95 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: 90% spectrum utilization may not be achieved for 30kHz SCS.  NOTE 2: 90% spectrum utilization may not be achieved for 60kHz SCS.  NOTE 3: This UE channel bandwidth is applicable only to downlink.  NOTE 4: This UE channel bandwidth is optional in this release of the specification.  NOTE 5: For this bandwidth, the minimum requirements are restricted to operation when carrier is configured as an SCell part of DC or CA configuration.  NOTE 6: For this bandwidth, the minimum requirements are restricted to operation when carrier is configured as an downlink SCell part of CA configuration.  NOTE 7: For the 20 MHz bandwidth, the minimum requirements are specified for NR UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz.  NOTE 8: This UE channel bandwidth is applicable only to uplink. | | | | | | | | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 5.4.2.3 Channel raster entries for each operating band

The RF channel positions on the channel raster in each NR operating band are given through the applicable NR-ARFCN in Table 5.4.2.3‑1, using the channel raster to resource element mapping in clause 5.4.2.2.

For NR operating bands with 100 kHz channel raster, ΔFRaster = 20 × ΔFGlobal. In this case every 20th NR-ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in Table 5.4.2.3‑1 is given as <20>.

For NR operating bands with 15 kHz channel raster below 3GHz, ΔFRaster = *I* × ΔFGlobal, where *I ϵ {3,6}*. Every *Ith* NR‑ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in Table 5.4.2.3‑1 is given as < *I* >.

For NR operating bands with 15 kHz channel raster above 3GHz, ΔFRaster = *I* × ΔFGlobal, where *I ϵ {1,2}.* Every *Ith* NR‑ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in table 5.4.2.3-1 is given as <*I*>.

In frequency bands with two ΔFRaster, the higher ΔFRaster applies to channels using only the SCS that is equal to or larger than the higher ΔFRaster and SSB SCS is equal to the higher ∆FRaster .

Table 5.4.2.3-1: Applicable NR-ARFCN per operating band

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | ΔFRaster  (kHz) | Uplink  Range of NREF  (First – <Step size> – Last) | Downlink  Range of NREF  (First – <Step size> – Last) |
| n1 | 100 | 384000 – <20> – 396000 | 422000 – <20> – 434000 |
| n2 | 100 | 370000 – <20> – 382000 | 386000 – <20> – 398000 |
| n3 | 100 | 342000 – <20> – 357000 | 361000 – <20> – 376000 |
| n5 | 100 | 164800 – <20> – 169800 | 173800 – <20> – 178800 |
| n7 | 100 | 500000 – <20> – 514000 | 524000 – <20> – 538000 |
| n8 | 100 | 176000 – <20> – 183000 | 185000 – <20> – 192000 |
| n12 | 100 | 139800 – <20> – 143200 | 145800 – <20> – 149200 |
| n14 | 100 | 157600 – <20> – 159600 | 151600 – <20> – 153600 |
| n18 | 100 | 163000 – <20> – 166000 | 172000 – <20> – 175000 |
| n20 | 100 | 166400 – <20> – 172400 | 158200 – <20> – 164200 |
| n25 | 100 | 370000 – <20> – 383000 | 386000 – <20> – 399000 |
| n28 | 100 | 140600 – <20> – 149600 | 151600 – <20> – 160600 |
| n29 | 100 | N/A | 143400 – <20> – 145600 |
| n30 | 100 | 461000 – <20> – 463000 | 470000 – <20> – 472000 |
| n34 | 100 | 402000 – <20> – 405000 | 402000 – <20> – 405000 |
| n38 | 100 | 514000 – <20> – 524000 | 514000 – <20> – 524000 |
| n39 | 100 | 376000 – <20> – 384000 | 376000 – <20> – 384000 |
| n40 | 100 | 460000 – <20> – 480000 | 460000 – <20> – 480000 |
| n41 | 15 | 499200 – <3> – 537999 | 499200 – <3> – 537999 |
| 30 | 499200 – <6> – 537996 | 499200 – <6> – 537996 |
| n48 | 15 | 636667 – <1> – 646666 | 636667 – <1> – 646666 |
| 30 | 636668 – <2> – 646666 | 636668 – <2> – 646666 |
| n50 | 100 | 286400 – <20> – 303400 | 286400 – <20> – 303400 |
| n51 | 100 | 285400 – <20> – 286400 | 285400 – <20> – 286400 |
| n53 | 100 | 496700 – <20> – 499000 | 496700 – <20> – 499000 |
| n65 | 100 | 384000 – <20> – 402000 | 422000 – <20> – 440000 |
| n66 | 100 | 342000 – <20> – 356000 | 422000 – <20> – 440000 |
| n70 | 100 | 339000 – <20> – 342000 | 399000 – <20> – 404000 |
| n71 | 100 | 132600 – <20> – 139600 | 123400 – <20> – 130400 |
| n74 | 100 | 285400 – <20> – 294000 | 295000 – <20> – 303600 |
| n75 | 100 | N/A | 286400 – <20> – 303400 |
| n76 | 100 | N/A | 285400 – <20> – 286400 |
| n77 | 15 | 620000 – <1> – 680000 | 620000 – <1> – 680000 |
| 30 | 620000 – <2> – 680000 | 620000 – <2> – 680000 |
| n78 | 15 | 620000 – <1> – 653333 | 620000 – <1> – 653333 |
| 30 | 620000 – <2> – 653332 | 620000 – <2> – 653332 |
| n79 | 15 | 693334 – <1> – 733333 | 693334 – <1> – 733333 |
| 30 | 693334 – <2> – 733332 | 693334 – <2> – 733332 |
| n80 | 100 | 342000 – <20> – 357000 | N/A |
| n81 | 100 | 176000 – <20> – 183000 | N/A |
| n82 | 100 | 166400 – <20> – 172400 | N/A |
| n83 | 100 | 140600 – <20> –149600 | N/A |
| n84 | 100 | 384000 – <20> – 396000 | N/A |
| n86 | 100 | 342000 – <20> – 356000 | N/A |
| n89 | 100 | 164800 – <20> – 169800 | N/A |
| n90 | 15 | 499200 – <3> – 537999 | 499200 – <3> – 537999 |
| 30 | 499200 – <6> – 537996 | 499200 – <6> – 537996 |
| 100 | 499200 – <20> – 538000 | 499200 – <20> – 538000 |
| n91 | 100 | 166400 – <20> – 172400 | 285400 – <20> – 286400 |
| n92 | 100 | 166400 – <20> – 172400 | 286400 – <20> – 303400 |
| n93 | 100 | 176000 – <20> – 183000 | 285400 – <20> – 286400 |
| n94 | 100 | 176000 – <20> – 183000 | 286400 – <20> – 303400 |
| n95 | 100 | 402000 – <20> – 405000 | N/A |

### 5.4.3 Synchronization raster

#### 5.4.3.1 Synchronization raster and numbering

The synchronization raster indicates the frequency positions of the synchronization block that can be used by the UE for system acquisition when explicit signalling of the synchronization block position is not present.

A global synchronization raster is defined for all frequencies. The frequency position of the SS block is defined as SSREF with corresponding number GSCN. The parameters defining the SSREF and GSCN for all the frequency ranges are in Table 5.4.3.1-1.

The resource element corresponding to the SS block reference freqeuncy SSREF is given in clause 5.4.3.2. The synchronization raster and the subcarrier spacing of the synchronization block is defined separately for each band.

Table 5.4.3.1-1: GSCN parameters for the global frequency raster

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | SS Block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 MHz | N \* 1200kHz + M \* 50 kHz,  N=1:2499, M ϵ {1,3,5} (Note 1) | 3N + (M-3)/2 | 2 – 7498 |
| 3000 – 24250 MHz | 3000 MHz + N \* 1.44 MHz  N = 0:14756 | 7499 + N | 7499 – 22255 |
| NOTE 1: The default value for operating bands with which only support SCS spaced channel raster(s) is M=3. | | | |

5.4.3.2 Synchronization raster to synchronization block resource element mapping

The mapping between the synchronization raster and the corresponding resource element of the SS block is given in Table 5.4.3.2-1.

Table 5.4.3.2-1: Synchronization raster to SS block resource element mapping

|  |  |
| --- | --- |
| Resource element index | 120 |
|  |  |

 is the subcarrier number of SS/PBCH block defined in TS 38.211 clause 7.4.3.1 [6].

#### 5.4.3.3 Synchronization raster entries for each operating band

The synchronization raster for each band is give in Table 5.4.3.3-1. The distance between applicable GSCN entries is given by the <Step size> indicated in Table 5.4.3.3-1.

Table 5.4.3.3-1: Applicable SS raster entries per operating band

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | SS Block SCS | SS Block pattern1 | Range of GSCN  (First – <Step size> – Last) |
| n1 | 15 kHz | Case A | 5279 – <1> – 5419 |
| n2 | 15 kHz | Case A | 4829 – <1> – 4969 |
| n3 | 15 kHz | Case A | 4517 – <1> – 4693 |
| n5 | 15 kHz | Case A | 2177 – <1> – 2230 |
| 30 kHz | Case B | 2183 – <1> – 2224 |
| n7 | 15 kHz | Case A | 6554 – <1> – 6718 |
| n8 | 15 kHz | Case A | 2318 – <1> – 2395 |
| n12 | 15 kHz | Case A | 1828 – <1> – 1858 |
| n14 | 15 kHz | Case A | 1901 – <1> – 1915 |
| n18 | 15 kHz | Case A | 2156 – <1> – 2182 |
| n20 | 15 kHz | Case A | 1982 – <1> – 2047 |
| n25 | 15 kHz | Case A | 4829 – <1> – 4981 |
| n28 | 15 kHz | Case A | 1901 – <1> – 2002 |
| n29 | 15 kHz | Case A | 1798 – <1> – 1813 |
| n30 | 15 kHz | Case A | 5879 – <1> – 5893 |
| n34 | 15 kHz | Case A | 5030 – <1> – 5056 |
| n38 | 15 kHz | Case A | 6431 – <1> – 6544 |
| n39 | 15 kHz | Case A | 4706 – <1> – 4795 |
| n40 | 15 kHz | Case A | 5756 – <1> – 5995 |
| n41 | 15 kHz | Case A | 6246 – <3> – 6717 |
| 30 kHz | Case C | 6252 – <3> – 6714 |
| n48 | 30 kHz | Case C | 7884 – <1> – 7982 |
| n50 | 15 kHz | Case A | 3584 – <1> – 3787 |
| n51 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n53 | 15 kHz | Case A | 6215 – <1> – 6232 |
| n65 | 15 kHz | Case A | 5279 – <1> – 5494 |
| n66 | 15 kHz | Case A | 5279 – <1> – 5494 |
| 30 kHz | Case B | 5285 – <1> – 5488 |
| n70 | 15 kHz | Case A | 4993 – <1> – 5044 |
| n71 | 15 kHz | Case A | 1547 – <1> – 1624 |
| n74 | 15 kHz | Case A | 3692 – <1> – 3790 |
| n75 | 15 kHz | Case A | 3584 – <1> – 3787 |
| n76 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n77 | 30 kHz | Case C | 7711 – <1> – 8329 |
| n78 | 30 kHz | Case C | 7711 – <1> – 8051 |
| n79 | 30 kHz | Case C | 8480 – <16> – 8880 |
| n90 | 15 kHz | Case A | 6246 – <1> – 6717 |
| 30 kHz | Case C | 6252 – <1> – 6714 |
| n91 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n92 | 15 kHz | Case A | 3584 – <1> – 3787 |
| n93 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n94 | 15 kHz | Case A | 3584 – <1> – 3787 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [8] | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 6.2.1 UE maximum output power

The following UE Power Classes define the maximum output power for any transmission bandwidth within the channel bandwidth of NR carrier unless otherwise stated. The period of measurement shall be at least one sub frame (1ms).

Table 6.2.1-1: UE Power Class

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR  band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) |
| n1 |  |  |  |  | 23 | ±2 |
| n2 |  |  |  |  | 23 | ±23 |
| n3 |  |  |  |  | 23 | ±23 |
| n5 |  |  |  |  | 23 | ±2 |
| n7 |  |  |  |  | 23 | ±23 |
| n8 |  |  |  |  | 23 | ±23 |
| n12 |  |  |  |  | 23 | ±23 |
| n14 | 31 | +2/-3 |  |  | 23 | ±23 |
| n18 |  |  |  |  | 23 | ±2 |
| n20 |  |  |  |  | 23 | ±23 |
| n25 |  |  |  |  | 23 | ±2 |
| n28 |  |  |  |  | 23 | +2/-2.5 |
| n30 |  |  |  |  | 23 | ±2 |
| n34 |  |  |  |  | 23 | ±2 |
| n38 |  |  |  |  | 23 | ±2 |
| n39 |  |  |  |  | 23 | ±2 |
| n40 |  |  |  |  | 23 | ±2 |
| n41 |  |  | 26 | +2/-33 | 23 | ±23 |
| n48 |  |  |  |  | 23 | +2/-3 |
| n50 |  |  |  |  | 23 | ±2 |
| n51 |  |  |  |  | 23 | ±2 |
| n53 |  |  |  |  | 23 | ±2 |
| n65 |  |  |  |  | 23 | ±2 |
| n66 |  |  |  |  | 23 | ±2 |
| n70 |  |  |  |  | 23 | ±2 |
| n71 |  |  |  |  | 23 | +2/-2.5 |
| n74 |  |  |  |  | 23 | ±2 |
| n77 |  |  | 26 | +2/-3 | 23 | +2/-3 |
| n78 |  |  | 26 | +2/-3 | 23 | +2/-3 |
| n79 |  |  | 26 | +2/-3 | 23 | +2/-3 |
| n80 |  |  |  |  | 23 | ±2 |
| n81 |  |  |  |  | 23 | ±2 |
| n82 |  |  |  |  | 23 | ±2 |
| n83 |  |  |  |  | 23 | ±2/-2.5 |
| n84 |  |  |  |  | 23 | ±2 |
| n86 |  |  |  |  | 23 | ±2 |
| n89 |  |  |  |  | 23 | ±2 |
| n91 |  |  |  |  | 23 | ±23, 4 |
| n92 |  |  |  |  | 23 | ±23, 4 |
| n93 |  |  |  |  | 23 | ±23, 4 |
| n94 |  |  |  |  | 23 | ±23, 4 |
| n95 |  |  |  |  | 23 | ±2 |
| NOTE 1: PPowerClass is the maximum UE power specified without taking into account the tolerance  NOTE 2: Powerclass 3 is default power class unless otherwise stated  NOTE 3: Refers to the transmission bandwidths confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high – 4 MHz and FUL\_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.  NOTE 4: The maximum output power requirement is relaxed by reducing the lower tolerance limit by 0.3 dB | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 6.2.3 UE additional maximum output power reduction

#### 6.2.3.1 General

Additional emission requirements can be signalled by the network. Each additional emission requirement is associated with a unique network signalling (NS) value indicated in RRC signalling by an NR frequency band number of the applicable operating band and an associated value in the field *additionalSpectrumEmission.* Throughout this specification, the notion of indication or signalling of an NS value refers to the corresponding indication of an NR frequency band number of the applicable operating band, the IE field *freqBandIndicatorNR* and an associated value of *additionalSpectrumEmission* in the relevant RRC information elements [7]*.*

To meet the additional requirements, additional maximum power reduction (A-MPR) is allowed for the maximum output power as specified in Table 6.2.1-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2.2. Outer and inner allocation notation used in clause 6.2.3 is defined in clause 6.2.2 In absense of modulation and waveform types the A-MPR applies to all modulation and waveform types.

Table 6.2.3.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable operating band(s) for each NS value. In case of a power class 3 UE, when IE *powerBoostPi2BPSK* is set to 1, power class 2 A-MPR values apply. The mapping of NR frequency band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2.3.1-1A.

For almost contiguous allocations in CP-OFDM waveforms in power class 3, the allowed A-MPR defined in clause 6.2.3 is increased by CEIL{ 10 log10(1 + NRB\_gap / NRB\_alloc), 0.5 } dB, where NRB\_gap is the total number of unallocated RBs between allocated RBs and NRB\_alloc is the total number of allocated RBs, and the parameter LCRB is replaced by NRB\_alloc + NRB\_gap in specifying the RB allocation regions.

Table 6.2.3.1-1: Additional maximum power reduction (A-MPR)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Network signalling label | Requirements (clause) | NR Band | Channel bandwidth (MHz) | Resources blocks (*N*RB) | A-MPR (dB) |
| NS\_01 |  | Table 5.2-1 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | Table 5.3.2-1 | N/A |
| NS\_03 | 6.5.2.3.3 | n2, n25, n66,  n70, n86 |  |  | Clause 6.2.3.7 |
| NS\_03U | 6.5.2.3.3, 6.5.2.4.2 | n2, n25, n66, n86 |  |  | Clause 6.2.3.7 |
| NS\_04 | 6.5.2.3.2, 6.5.3.3.1 | n41 | 10, 15, 20, 30, 40, 50, 60 80, 90, 100 |  | Clause 6.2.3.2 |
| NS\_05 | 6.5.3.3.4 | n1, n84 | 5, 10, 15, 20(NOTE 2) |  | Clause 6.2.3.4 |
| NS\_05U | 6.5.3.3.4, 6.5.2.4.2 | n1, n84 | 5, 10, 15, 20 |  | Clause 6.2.3.4 |
| NS\_06 | 6.5.2.3.4 | n12 | 5, 10, 15 |  | N/A |
| n14 | 5,10 |
| NS\_10 |  | n20 | 15, 20 | Table 6.2.3.3-1 | Table  6.2.3.3-1 |
| NS\_17 | 6.5.3.3.2 | n28, n83 | 5,10 | Table 5.3.2-1 | N/A |
| NS\_18 | 6.5.3.3.3 | n28, n83 | 5 |  | Table 6.2.3.13-1, A1 |
| 10, 15, 20 |  | Table 6.2.3.13-1, A2 |
| NS\_21 | 6.5.3.3.12 | n30 | 5, 10 |  | Clause 6.2.3.14 |
| NS\_24 | 6.5.3.3.13 | n65 (NOTE 4) | 5, 10, 15, 20 | Table 6.2.3.15-1 | Clause 6.2.3.15 |
| NS\_27 | 6.5.2.3.8  6.5.3.3.14 | n48 | 5, 10, 15, 20, 40 | Table 6.2.3.16-1 | Table 6.2.3.16-2 |
| NS\_35 | 6.5.2.3.1 | n71 | 5, 10, 15, 20 | Table 5.3.2-1 | N/A |
| NS\_37 | 6.5.3.3.6 | n74  (NOTE 3) | 10, 15 | Table 6.2.3.8-1 | Table  6.2.3.8-1 |
| NS\_38 | 6.5.3.3.7 | n74 | 5, 10, 15, 20 | Table 6.2.3.9-1 | Table  6.2.3.9-1 |
| NS\_39 | 6.5.3.3.8 | n74 | 10, 15, 20 | Table 6.2.3.10-1 | Table 6.2.3.10-1 |
| NS\_40 | 6.5.3.3.9 | n51 | 5 |  | Table  6.2.3.5-1 |
| NS\_41 | 6.5.3.3.10 | n50 | 5, 10, 15, 20, 30, 40, 50, 60 |  | Table 6.2.3.11-1 |
| NS\_42 | 6.5.3.3.11 | n50 | 5, 10, 15, 20, 30, 40, 50, 60 |  | Table 6.2.3.12-1 |
| NS\_43 | 6.5.3.3.5 | n8, n81 | 5, 10, 15 |  | Clause 6.2.3.6 |
| NS\_43U | 6.5.3.3.5, 6.5.2.4.2 | n8, n81 | 5, 10, 15 |  | Clause 6.2.3.6 |
| NS\_44 | 6.5.3.2 | n38 | 40 | Table 6.2.3.20-1 | Table 6.2.3.20-1 |
| NS\_45 | 6.5.3.3.17 | n53 | 5, 10 |  | Clause 6.2.3.21 |
| NS\_46 | 6.5.3.2 | n7 | 25, 30, 40, 50 | Table 6.2.3.17-1 | Table 6.2.3.17-2 |
| NS\_47 | 6.5.3.3.15 | n41 (Note 5) | 30 | Table 6.2.3.18-1 | Table 6.2.3.18-2 |
| NS\_50 | 6.5.3.3.16 | n39 | 25, 30, 40 |  | Clause 6.2.3.19 |
| NS\_100 | 6.5.2.4.2 | n1, n2, n3, n5, n8, n18, n25, n65, n66, n80, n81, n84, n86, n89  (NOTE 1) |  |  | Table  6.2.3.1-2 |
| NOTE 1: This NS can be signalled for NR bands that have UTRA services deployed  NOTE 2: No A-MPR is applied for 5 MHz CBW where the lower channel edge is ≥ 1930 MHz,10 MHz CBW where the lower channel edge is ≥ 1950 MHz and 15 MHz CBW where the lower channel edge is ≥ 1955 MHz.  NOTE 3: Applicable when the NR carrier is within 1447.9 – 1462.9 MHz  NOTE 4: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980 MHz.  NOTE 5: Applicable when the NR carrier is within 2545 – 2575 MHz | | | | | |

[The NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands.]

Table 6.2.3.1-1A: Mapping of network signaling label

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Value of additionalSpectrumEmission | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| n1 | NS\_01 | NS\_100 | NS\_05 | NS\_05U |  |  |  |  |
| n2 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  |  |
| n3 | NS\_01 | NS\_100 |  |  |  |  |  |  |
| n5 | NS\_01 | NS\_100 |  |  |  |  |  |  |
| n7 | NS\_01 | NS\_46 |  |  |  |  |  |  |
| n8 | NS\_01 | NS\_100 | NS\_43 | NS\_43U |  |  |  |  |
| n12 | NS\_01 | NS\_06 |  |  |  |  |  |  |
| n14 | NS\_01 | NS\_06 |  |  |  |  |  |  |
| n18 | NS\_01 | NS\_100 |  |  |  |  |  |  |
| n20 | NS\_01 | Void | NS\_10 |  |  |  |  |  |
| n25 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  |  |
| n28 | NS\_01 | NS\_17 | NS\_18 |  |  |  |  |  |
| n30 | NS\_01 | NS\_21 |  |  |  |  |  |  |
| n34 | NS\_01 |  |  |  |  |  |  |  |
| n38 | NS\_01 | NS\_44 |  |  |  |  |  |  |
| n39 | NS\_01 | NS\_50 |  |  |  |  |  |  |
| n40 | NS\_01 |  |  |  |  |  |  |  |
| n41 | NS\_01 | NS\_04 | NS\_47 |  |  |  |  |  |
| n48 | NS\_01 | NS\_27 |  |  |  |  |  |  |
| n50 | NS\_01 | NS\_41 | NS\_42 |  |  |  |  |  |
| n51 | NS\_01 | NS\_40 |  |  |  |  |  |  |
| n53 | NS\_01 | NS\_45 |  |  |  |  |  |  |
| n65 | NS\_01 | NS\_24 | NS\_100 |  |  |  |  |  |
| n66 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  |  |
| n70 | NS\_01 | NS\_03 |  |  |  |  |  |  |
| n71 | NS\_01 | NS\_35 |  |  |  |  |  |  |
| n74 | NS\_01 | NS\_37 | NS\_38 | NS\_39 |  |  |  |  |
| n77 | NS\_01 |  |  |  |  |  |  |  |
| n78 | NS\_01 |  |  |  |  |  |  |  |
| n79 | NS\_01 |  |  |  |  |  |  |  |
| n80 | NS\_01 | NS\_100 |  |  |  |  |  |  |
| n81 | NS\_01 | NS\_100 | NS\_43 | NS\_43U |  |  |  |  |
| n82 | NS\_01 | Void |  |  |  |  |  |  |
| n83 | NS\_01 | NS\_17 | NS\_18 |  |  |  |  |  |
| n84 | NS\_01 | NS\_100 | NS\_05 | NS\_05U |  |  |  |  |
| n86 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  |  |
| n89 | NS\_01 | NS\_100 |  |  |  |  |  |  |
| n95 | NS\_01 |  |  |  |  |  |  |  |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 6.2.3.19 A-MPR for NS\_50

Table 6.2.3.19-1: A-MPR regions for NS\_50

|  |  |  |  |
| --- | --- | --- | --- |
| **Channel Bandwidth (MHz)** | RBstart\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 25 MHz | ≤ LCRB\*12\*SCS - 5 | > 5 | A7 |
| ≤ 20 | ≤ 1.44 | A8 |
| 30 MHz | ≤ LCRB\*12\*SCS - 5 | > 5 | A7 |
| ≤ 25 | ≤ 1.44 | A8 |
| ≤ 3.6 | A9 |
| 40 MHz | ≤ 4.32 | > 0 | A1 |
| > 4.32, ≤ 10.44 | ≤ 10.8 | A3 |
| > 4.32, ≤ 18 | > 10.8 | A2 |
| > 18, ≤ 31.68 | > max (31.68 – RBstart\*12\*SCS, 0) | A6 |
| > 31.68 | > 0 | A5 |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.19-2. | | | |

Table 6.2.3.19-2: A-MPR for NS\_50

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | A2 (dB) | A3 (dB) | A5 (dB) | A6 (dB) | A7 (dB) | A8 (dB) |
| Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 | ≤ 2 | ≤ 4 | ≤ 2 |
| QPSK | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 | ≤ 2 | ≤ 5 | ≤ 2 |
| 16 QAM | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 | ≤ 2 | ≤ 5 | ≤ 2.5 |
| 64 QAM | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 |  | ≤ 5 |  |
| 256 QAM | ≤ 11 | ≤ 7 |  | ≤ 5 |  | ≤ 5 |  |
| CP-OFDM | QPSK | ≤ 12 | ≤ 8 | ≤ 4.5 | ≤ 5 | ≤ 3.5 | ≤ 6.5 |  |
| 16 QAM | ≤ 12 | ≤ 8 | ≤ 4.5 | ≤ 5 | ≤ 3.5 | ≤ 6.5 |  |
| 64 QAM | ≤ 12 | ≤ 8 | ≤ 4.5 | ≤ 5 |  | ≤ 6.5 |  |
| 256 QAM | ≤ 12 | ≤ 8 |  |  |  | ≤ 6.5 |  |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 6.2.3.21 A-MPR for NS\_45

Table 6.2.3.21-1: A-MPR for NS\_45

|  |  |  |
| --- | --- | --- |
| Modulation/Waveform | | Outer |
| DFT-s-OFDM | Pi/2 BPSK | ≤ [1.5] |
| QPSK | ≤ [2] |
| 16 QAM | ≤ [2.5] |
| 64 QAM | ≤ [3] |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 6.5.3.2 Spurious emissions for UE co-existence

This clause specifies the requirements for NR bands for coexistence with protected bands.

Table 6.5.3.2-1: Requirements for spurious emissions for UE co-existence

| NR Band | Spurious emission for UE co-existence | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n1, n84 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76,  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 3, 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
| Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n2 | E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 43 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n3, n80 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76.  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 13 |
| E-UTRA Band 22, 42, 52,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 13 |
| n5, n89 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 18, 19, 24, 25, 26, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 53, 65, 66, 70, 71, 73, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 41, 52 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 39 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8,39 |
| n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| n8, n81 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA band 3, 7, 22, 41, 42, 43, 52,  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA 8 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 48, 50, 51, 53, 71, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 4, 10, 66, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n14 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 53, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| n18 | E-UTRA Band 1, 3, 11, 21, 34, 42, 65  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 799 | -50 | 1 |  |
| Frequency range | 799 | - | 803 | -40 | 1 |  |
| Frequency range | 860 | - | 890 | -40 | 1 |  |
| Frequency range | 945 | - | 960 | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| Frequency range | 2545 | - | 2575 | -50 | 1 |  |
| Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| n20, n82 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 42, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 38, 42, 69,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 788 | -50 | 1 |  |
| n25 | E-UTRA Band 4, 5, 10,12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 53, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 43 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n28, n83 | E-UTRA Band 1, 4, 10, 22, 32, 42, 43, 50, 51, 52, 65, 66, 73, 74, 75, 76,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 25 |
| E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 66, 72,  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 24 |
| Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| Frequency range | 773 | - | 803 | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| n30 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 53, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 74, 75, 76,  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| n39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45, 50, 51, 52, 74,  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1805 | - | 1855 | -40 | 1 | 33 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 15, 26, 33 |
| n40 | E-UTRA Band 1, 3, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 30 |
| Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8, 30 |
| n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 65, 66, 67, 68 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n53 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n65 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76,  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n66, n86 | E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 42, 48 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n70 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25, 41, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
| E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
| Frequency range | 1475 | - | 1488 | -50 | 1 | 42 |
| Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| n77, n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n79 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n95 | E-UTRA Band 1, 3 , 5, 8, 39, 40, 41,  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 in TS 38.101-1 or Table 5.5-1 in TS 36.101  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: 15 kHz SCS is assumed when RB is mentioned in the note when channel bandwidth is less than or equal to 50 MHz, lowest SCS is assumed when channel bandwidth is larger than 50 MHz. The transmission bandwidth in terms of RB position and range is not limited to 15 kHz SCS and shall scale with SCS accordingly.  NOTE 4: Void  NOTE 5: For non-synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band  NOTE 6: N/A  NOTE 7: Void  NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 9: Void  NOTE 10: Void  NOTE 11: Void  NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB  NOTE 13: This requirement applies for 5, 10, 15 and 20 MHz NR channel bandwidth allocated within 1744.9 MHz and 1784.9 MHz.  NOTE 14: Void  NOTE 15: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 20: Void  NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 2 UE for any channel bandwidths within the range 2570 - 2615 MHz, NS\_44 shall apply. For power class 2 or 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 23: Void  NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 28: Void  NOTE 29: Void  NOTE 30: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz  NOTE 31: Void  NOTE 32: Void  NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 - 1903 MHz. For 25 MHz, 30 MHz, and 40 MHz channel bandwidths, NS\_48 shall apply.  NOTE 34: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.  NOTE 35: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 36: Void  NOTE 37: Void  NOTE 38: Void  NOTE 39: Void  NOTE 40: Void  NOTE 41: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth.  NOTE 42: Applicable for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is less than or equal to 1467 MHz assigned for 10 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is less than or equal to 1463.8 MHz for 15 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is less than or equal to 1460.8 MHz for 20 MHz bandwidth. | | | | | | | |

NOTE: To simplify Table 6.5.3.2-1, E-UTRA band numbers are listed for bands which are specified only for E-UTRA operation or both E-UTRA and NR operation. NR band numbers are listed for bands which are specified only for NR operation.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

##### 6.5.3.3.17 Requirement for network signalled value "NS\_45"

When "NS\_45" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Tables 6.5.3.3.17-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.17-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | Measurement bandwidth |
| 5 | **10** |
| 0.009 < f ≤ 2473.5 | -25 | -25 | 1 MHz |
| 2473.5 < f ≤ 2477.5 | -25 | -13 |  |
| 2477.5 < f ≤ 2478.5 | -13 | -13 | 1 MHz |
| 2478.5< f ≤ 2483.5 | -10 | -10 | 1 MHz |
| 2495 ≤ f < 2496 | -13 | -13 | 1% of Channel Bandwidth |
| 2496 ≤ f < 2501 | -13 | -13 | 1 MHz |
| 2501 < f ≤ 2505 | -25 | -13 |  |
| 2505 ≤ f ≤ 5th harmonic of the upper frequency edge of the UL operating band | -25 | -25 | 1 MHz |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 7.3.2 Reference sensitivity power level

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.2-1 and Table 7.3.2-2.

Table 7.3.2-1: Two antenna port reference sensitivity QPSK PREFSENS

|  | Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 70  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n1 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 | -95.1 | -94.0 |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 | -95.4 | -94.2 |  |  |  |  |  |  |  |  |  |
| n2 | | 15 | -98.0 | -94.8 | -93.0 | -91.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -95.1 | -93.1 | -92.0 |  |  |  |  |  |  |  |  |  |
| 60 |  | -95.5 | -93.4 | -92.2 |  |  |  |  |  |  |  |  |  |
| n3 | | 15 | -97.0 | -93.8 | -92.0 | -90.8 | -89.7 | -88.9 |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 | -92.1 | -91.0 | -89.8 | -89.0 |  |  |  |  |  |  |  |
| 60 |  | -94.5 | -92.4 | -91.2 | -90.0 | -89.1 |  |  |  |  |  |  |  |
| n5 | | 15 | -98.0 | -94.8 | -93.0 | -86.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -95.1 | -93.1 | -88.6 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n71 | | 15 | -98.0 | -94.8 | -93.0 | -91.8 | -90.7 | -89.9 | -88.6 | -81.5 |  |  |  |  |  | FDD |
| 30 |  | -95.1 | -93.1 | -92.0 | -90.8 | -90.0 | -88.7 | -81.5 |  |  |  |  |  |
| 60 |  | -95.5 | -93.4 | -92.2 | -91.0 | -90.1 | -88.9 | -81.5 |  |  |  |  |  |
| n8 | | 15 | -97.0 | -93.8 | -91.4 | -85.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 | -91.7 | -87.2 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n12 | | 15 | -97.0 | -93.8 | -84.0 |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 | -84.1 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | | 15 | -97.0 | -93.8 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n18 | | 15 | -100.0 | -96.8 | -95.0 |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 | -95.1 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | | 15 | -97.0 | -93.8 | -91.0 | -89.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 | -91.1 | -90.0 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | | 15 | -96.5 | -93.3 | -91.5 | -90.3 | -89.3 | -82.2 | -79.5 |  |  |  |  |  |  | FDD |
| 30 |  | -93.6 | -91.6 | -90.5 | -89.4 | -82.3 | -79.6 |  |  |  |  |  |  |
| 60 |  | -94.0 | -91.9 | -90.7 | -89.6 | -82.4 | -79.7 |  |  |  |  |  |  |
| n28 | | 15 | -98.5 | -95.5 | -93.5 | -90.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -95.6 | -93.6 | -91.0 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | | 15 | -99.0 | -95.8 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.1 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | | 15 | -100.0 | -96.8 | -95.0 |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | -97.1 | -95.1 |  |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 | -95.4 |  |  |  |  |  |  |  |  |  |  |
| n381 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 |  |  | -90.6 |  |  |  |  |  |  | TDD |
| 30 |  | -97.1 | -95.1 | -94.0 |  |  | -90.7 |  |  |  |  |  |  |
| 60 |  | -97.5 | -95.4 | -94.2 |  |  | -90.9 |  |  |  |  |  |  |
| n39 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 | -91.9 | -90.6 |  |  |  |  |  |  | TDD |
| 30 |  | -97.1 | -95.1 | -94.0 | -92.8 | -92.0 | -90.7 |  |  |  |  |  |  |
| 60 |  | -97.5 | -95.4 | -94.2 | -93.0 | -92.1 | -90.9 |  |  |  |  |  |  |
| n40 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 | -91.9 | -90.6 | -89.6 |  |  |  |  |  | TDD |
| 30 |  | -97.1 | -95.1 | -94.0 | -92.8 | -92.0 | -90.7 | -89.7 | -88.9 |  | -87.6 |  |  |
| 60 |  | -97.5 | -95.4 | -94.2 | -93.0 | -92.1 | -90.9 | -89.8 | -89.1 |  | -87.6 |  |  |
| n411 | | 15 |  | -94.8 | -93.0 | -91.8 |  | -89.9 | -88.6 | -87.6 |  |  |  |  |  | TDD |
| 30 |  | -95.1 | -93.1 | -92.0 |  | -90.0 | -88.7 | -87.7 | -86.9 |  | -85.6 | -85.1 | -84.7 |
| 60 |  | -95.5 | -93.4 | -92.2 |  | -90.1 | -88.9 | -87.8 | -87.1 |  | -85.6 | -85.1 | -84.7 |
| n481 | | 15 | -99 | -95.8 | -94.0 | -92.7 |  |  | -89.6 | -88.65 |  |  |  |  |  | TDD |
| 30 |  | -96.1 | -94.1 | -92.9 |  |  | -89.7 | -88.75 | -87.95 |  | -86.65 | -86.15 | -85.65 |
| 60 |  | -96.5 | -94.4 | -93.1 |  |  | -89.9 | -88.85 | -88.05 |  | -86.75 | -86.25 | -85.75 |
| n50 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 |  | -91.9 | -90.6 | -89.6 |  |  |  |  |  | TDD |
| 30 |  | -97.1 | -95.1 | -94.0 |  | -92.0 | -90.7 | -89.7 | -88.9 |  | -87.6 |  |  |
| 60 |  | -97.5 | -95.4 | -94.2 |  | -92.1 | -90.9 | -89.8 | -89.1 |  | -87.6 |  |  |
| n51 | | 15 | -100.0 |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | | 15 | -100.0 | -96.8 |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | -97.1 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 |  |  |  |  |  |  |  |  |  |  |  |
| n65 | | 15 | -99.5 | -96.3 | -94.5 | -93.3 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.6 | -94.6 | -93.5 |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.0 | -94.9 | -93.7 |  |  |  |  |  |  |  |  |  |
| n66 | | 15 | -99.5 | -96.3 | -94.5 | -93.3 |  |  | -90.1 |  |  |  |  |  |  | FDD |
| 30 |  | -96.6 | -94.6 | -93.5 |  |  | -90.2 |  |  |  |  |  |  |
| 60 |  | -97.0 | -94.9 | -93.7 |  |  | -90.4 |  |  |  |  |  |  |
| n70 | | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 | -95.1 | -94.0 | -92.8 |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 | -95.4 | -94.2 | -93.0 |  |  |  |  |  |  |  |  |
| n71 | | 15 | -97.2 | -94.0 | -91.6 | -86.0 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.3 | -91.9 | -87.4 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n74 | | 15 | -99.53 | -96.33 | -94.53 | -89.33 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.63 | -94.63 | -89.53 |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.03 | -94.93 | -89.63 |  |  |  |  |  |  |  |  |  |
| n771,4 | | 15 |  | -95.3 | -93.5 | -92.2 | -91.2 | -90.4 | -89.1 | -88.1 |  |  |  |  |  | TDD |
| 30 |  | -95.6 | -93.6 | -92.4 | -91.3 | -90.5 | -89.2 | -88.2 | -87.4 | -86.7 | -86.1 | -85.6 | -85.1 |
| 60 |  | -96.0 | -93.9 | -92.6 | -91.5 | -90.6 | -89.4 | -88.3 | -87.5 | -86.8 | -86.2 | -85.7 | -85.2 |
| n781 | | 15 |  | -95.8 | -94.0 | -92.7 | -91.7 | -90.9 | -89.6 | -88.6 |  |  |  |  |  | TDD |
| 30 |  | -96.1 | -94.1 | -92.9 | -91.8 | -91 | -89.7 | -88.7 | -87.9 | -87.2 | -86.6 | -86.1 | -85.6 |
| 60 |  | -96.5 | -94.4 | -93.1 | -92 | -91.1 | -89.9 | -88.8 | -88.0 | -87.3 | -86.7 | -86.2 | -85.7 |
| n791 | | 15 |  |  |  |  |  |  | -89.6 | -88.6 |  |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  | -89.7 | -88.7 | -87.9 |  | -86.6 |  | -85.6 |
| 60 |  |  |  |  |  |  | -89.9 | -88.8 | -88.0 |  | -86.7 |  | -85.7 |
| n91 | | 15 | -100 |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | | 15 | -100 | -96.8 | -95.0 | -93.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 | -95.1 | -94.0 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | | 15 | -100 |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | | 15 | -100 | -96.8 | -95.0 | -93.8 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 | -95.1 | -94.0 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4  NOTE 3: The requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9 - 1510.9 MHz.  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration | | | | | | | | | | | | | | | | |

For UE(s) equipped with 4 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3.2-1 shall be modified by the amount given in ΔRIB,4R in Table 7.3.2-2 for the applicable operating bands.

Table 7.3.2-2: Four antenna port reference sensitivity allowance ΔRIB,4R

|  |  |
| --- | --- |
| Operating band | ΔRIB,4R (dB) |
| n28, n71 | -2.71 |
| n1, n2, n3, n40, n7, n34, n38, n39, n41, n66, n70 | -2.7 |
| n48, n77, n78, n79 | -2.2 |
| NOTE 1: 4 Rx operation is targeted for FWA form factor | |

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3.2-1 and Table 7.3.2-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2-3.

Table 7.3.2-3: Uplink configuration for reference sensitivity

|  | Operating band / SCS / Channel bandwidth / Duplex mode | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | | SCS kHz | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25 MHz | 30 MHz | 40  MHz | 50  MHz | 60  MHz | 70  MHz | 80  MHz | 90  MHz | 100 MHz | Duplex Mode |
| n1 | | 15 | 25 | 501 | 751 | 1001 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 24 | 361 | 501 |  |  |  |  |  |  |  |  |  |
| 60 |  | 101 | 18 | 24 |  |  |  |  |  |  |  |  |  |
| n2 | | 15 | 25 | 501 | 501 | 501 |  |  |  |  |  |  |  |  |  | FDD |
| 30 | 101 | 24 | 241 | 241 |  |  |  |  |  |  |  |  |  |
| 60 |  | 101 | 101 | 101 |  |  |  |  |  |  |  |  |  |
| n3 | | 15 | 25 | 501 | 501 | 501 | 501 | 501 |  |  |  |  |  |  |  | FDD |
| 30 |  | 24 | 241 | 241 | 241 | 241 |  |  |  |  |  |  |  |
| 60 |  | 101 | 101 | 101 | 101 | 101 |  |  |  |  |  |  |  |
| n5 | | 15 | 25 | 251 | 201 | 201 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 121 | 101 | 101 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n7 | | 15 | 25 | 501 | 751 | 751 | 721 | 641 | 451 | 451 |  |  |  |  |  | FDD |
| 30 |  | 24 | 361 | 361 | 361 | 321 | 201 | 201 |  |  |  |  |  |
| 60 |  | 101 | 18 | 181 | 181 | 161 | 101 | 101 |  |  |  |  |  |
| n8 | | 15 | 25 | 251 | 201 | 201 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 121 | 101 | 101 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n12 | | 15 | 201 | 201 | 201 |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | | 15 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n18 | | 15 | 25 | 251 | 251 |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | | 15 | 25 | 201 | 202 | 202 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 102 | 102 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | | 15 | 25 | 501 | 501 | 501 | 501 | 481 | 401 |  |  |  |  |  |  | FDD |
| 30 |  | 24 | 241 | 241 | 241 | 241 | 201 |  |  |  |  |  |  |
| 60 |  | 101 | 101 | 101 | 101 | 101 | 101 |  |  |  |  |  |  |
| n28 | | 15 | 25 | 251 | 251 | 251 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 | 101 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | | 15 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | | 15 | 25 | 50 | 75 |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10 | 18 |  |  |  |  |  |  |  |  |  |  |
| n38 | | 15 | 25 | 50 | 75 | 100 |  |  | 216 |  |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 |  |  | 100 |  |  |  |  |  |  |
| 60 |  | 10 | 18 | 24 |  |  | 50 |  |  |  |  |  |  |
| n39 | | 15 | 25 | 50 | 75 | 100 | 128 | 160 | 216 |  |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 | 64 | 75 | 100 |  |  |  |  |  |  |
| 60 |  | 10 | 18 | 24 | 30 | 36 | 50 |  |  |  |  |  |  |
| n40 | | 15 | 25 | 50 | 75 | 100 | 128 | 160 | 216 | 270 |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 | 64 | 75 | 100 | 128 | 162 |  | 216 |  |  |
| 60 |  | 10 | 18 | 24 | 30 | 36 | 50 | 64 | 75 |  | 100 |  |  |
| n41 | | 15 |  | 50 | 75 | 100 |  | 160 | 216 | 270 |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 |  | 75 | 100 | 128 | 162 |  | 216 | 243 | 270 |
| 60 |  | 10 | 18 | 24 |  | 36 | 50 | 64 | 75 |  | 100 | 120 | 135 |
| n48 | | 15 | 25 | 50 | 75 | 100 |  |  | 216 |  |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 |  |  | 100 |  |  |  |  |  |  |
| 60 |  | 10 | 18 | 24 |  |  | 50 |  |  |  |  |  |  |
| n50 | | 15 | 25 | 50 | 75 | 100 |  | 160 | 216 | 270 |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 |  | 75 | 100 | 128 | 162 |  | NOTE 3 |  |  |
| 60 |  | 10 | 18 | 24 |  | 36 | 50 | 64 | 75 |  | NOTE 3 |  |  |
| n51 | | 15 | 25 |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | 24 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10 |  |  |  |  |  |  |  |  |  |  |  |
| n65 | | 15 | 25 | 501 | 751 | 1001 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 24 | 361 | 501 |  |  |  |  |  |  |  |  |  |
| 60 |  | 101 | 18 | 24 |  |  |  |  |  |  |  |  |  |
| n66 | | 15 | 25 | 501 | 751 | 1001 |  |  | 216 |  |  |  |  |  |  | FDD |
| 30 |  | 24 | 361 | 501 |  |  | 1001 |  |  |  |  |  |  |
| 60 |  | 101 | 18 | 24 |  |  | 501 |  |  |  |  |  |  |
| n70 | | 15 | 25 | 501 | 751 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 24 | 361 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |
| 60 |  | 101 | 18 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |
| n71 | | 15 | 25 | 251 | 201 | 201 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 121 | 101 | 101 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n74 | | 15 | 25 | 251 | 251 | 251 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 | 101 |  |  |  |  |  |  |  |  |  |
| 60 |  | 51 | 51 | 51 |  |  |  |  |  |  |  |  |  |
| n77 | | 15 |  | 50 | 75 | 100 | 128 | 160 | 216 | 270 |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 | 64 | 75 | 100 | 128 | 162 | 180 | 216 | 243 | 270 |
| 60 |  | 10 | 18 | 24 | 30 | 36 | 50 | 64 | 75 | 90 | 100 | 120 | 135 |
| n78 | | 15 |  | 50 | 75 | 100 | 128 | 160 | 216 | 270 |  |  |  |  |  | TDD |
| 30 |  | 24 | 36 | 50 | 64 | 75 | 100 | 128 | 162 | 180 | 216 | 243 | 270 |
| 60 |  | 10 | 18 | 24 | 30 | 36 | 50 | 64 | 75 | 90 | 100 | 120 | 135 |
| n79 | | 15 |  |  |  |  |  |  | 216 | 270 |  |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  | 100 | 128 | 162 |  | 216 |  | 270 |
| 60 |  |  |  |  |  |  | 50 | 64 | 75 |  | 100 |  | 135 |
| n91 | | 15 | 254 | 201,4 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | | 15 | 25 | 201 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | | 15 | 254 | 251,4 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | | 15 | 25 | 251 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 121 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.3.2-1).  NOTE 2: For Band 20; for 15 kHz SCS, in the case of 15 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 11 and in the case of 20 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 16; for 30 kHz SCS, in the case of 15 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 6 and in the case of 20 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 8; for 60 kHz SCS, in the case of 15 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 3 and in the case of 20 MHz channel bandwidth, the UL resource blocks shall be located at RBstart 4;  NOTE 3: For DL channel bandwidths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest TX-RX separation (Table 5.4.4-1) shall be used.  NOTE 4: For band n91 and n93, largest supported UL bandwidth configuration shall be used. | | | | | | | | | | | | | | | | |

Unless given by Table 7.3.2-4, the minimum requirements specified in Tables 7.3.2-1 and 7.3.2-2 shall be verified with the network signalling value NS\_01 (Table 6.2.3-1) configured.

Table 7.3.2-4: Network signaling value for reference sensitivity

|  |  |
| --- | --- |
| Operating band | Network Signalling value |
| n2 | NS\_03 |
| n12 | NS\_06 |
| n14 | NS\_06 |
| n25 | NS\_03 |
| n30 | NS\_21 |
| n48 | NS\_27 |
| n53 | NS\_45 |
| n66 | NS\_03 |
| n70 | NS\_03 |
| n71 | NS\_35 |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 7.6.2 In-band blocking

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.2-1 and Table 7.6.2-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.2-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | 6 | 7 | 9 | 10 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 11 | 12 | 13 | 14 | 15 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | |  |  |  |
|  | dB | 15.5 | 16 |  |  |  |
| BWinterferer | MHz | 5 | |  |  |  |
| FIoffset, case 1 | MHz | 7.5 | |  |  |  |
| FIoffset, case 2 | MHz | 12.5 | |  |  |  |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS. | | | | | | |

Table 7.6.2-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
| Pinterferer | dBm | -56 | -44 | -15 | -38 |
| Finterferer (offset) | MHz | -CBW/2 –  FIoffset, case 1  and  CBW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |  | -CBW/2-11 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28,n34, n38,n39, n40, n41, n50, n51, n53, n65, n66, n70, n74, n75, n76 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| n30 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  | FDL\_low – 11 |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1 | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 7.6.3 Out-of-band blocking

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3-1 and Table 7.6.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.3-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | | | |
| dB | 6 | 6 | 7 | 9 | 10 |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 11 | 12 | 13 | 14 | 15 |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | |  |  |  |
| dB | 15.5 | 16 |  |  |  |
| NOTE: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4. | | | | | | |

Table 7.6.3-2: Out of-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range 1 | Range 2 | Range 3 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28, n30,  n34, n38,  n39, n40, n41, n50, n51, n535, n65, n66, n70, n71, n74, n75, n76 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz.  NOTE 2: For band 51 the FDL\_high of band 50 is applied as FDL\_high for band 51. For band 50, the FDL\_low of band 51 is applied as FDL\_low for band 50.  NOTE 3: For band 76 the FDL\_high of band 75 is applied as FDL\_high for band 76. For band 75, the FDL\_low of band 76 is applied as FDL\_low for band 75.  NOTE 4: For UEs supporting both bands 38 and 41, the FDL\_high and FDL\_low of band 41 is applied as FDL\_high and FDL\_low for band 38.  NOTE 5: The power level of the interferer (PInterferer) for Range 3 shall be modified to [-20 dBm] for FInterferer > [2555 MHz] and FInterferer < [2775 MHz]. | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* No changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 7.6.4 Narrow band blocking

This requirement is measure of a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The relative throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.4-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.4-1: Narrow Band Blocking

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Channel Bandwidth | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28, n30, n34, n38, n39, n40, n41, n50, n51,  n53,  n65, n66, n70, n71, n74, n75, n76 | Pw | dBm |  | PREFSENS + channel-bandwidth specific value below | | | | | | | | | | |
| 16 | 13 | 14 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| Puw (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 |
| Fuw (offset SCS= 15 kHz) | MHz | 2.7075 | 5.2125 | 7.7025 | 10.2075 | 13.0275 | 15.6075 | 20.5575 | 25.7025 | NA | NA | NA | NA |
| Fuw (offset SCS= 30 kHz) | MHz | NA | NA | NA | NA | NA | NA | NA | NA | 30.855 | 40.935 | 45.915 | 50.865 |
| NOTE 1: The transmitter shall be set a 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4  NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.  NOTE 3: The PREFSENS power level is specified in Table 7.3.2-1 and Table 7.3.2-2 for two and four antenna ports, respectively. | | | | | | | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*