|  |
| --- |
| 3GPP TR 38.847 V0.4.0 (2021-08) |
| Technical Report |
| 3rd Generation Partnership Project;Technical Specification Group Radio Access Network;NR;New frequency range for NR (47.2 – 48.2 GHz); (Release 17) |
|   |
| *5G-logo_175px* | 3GPP-logo_web |
|  |
| The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP.The present document has not been subject to any approval process by the 3GPPOrganizational Partners and shall not be implemented.This Specification is provided for future development work within 3GPPonly. The Organizational Partners accept no liability for any use of this Specification.Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices. |

|  |
| --- |
|  |
| ***3GPP***Postal address3GPP support office address650 Route des Lucioles - Sophia AntipolisValbonne - FRANCETel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16Internethttp://www.3gpp.org |
| ***Copyright Notification***No part may be reproduced except as authorized by written permission.The copyright and the foregoing restriction extend to reproduction in all media.© 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).All rights reserved.UMTS™ is a Trade Mark of ETSI registered for the benefit of its members3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational PartnersLTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational PartnersGSM® and the GSM logo are registered and owned by the GSM Association |

Contents

Foreword 4

1 Scope 5

2 References 5

3 Definitions of terms, symbols and abbreviations 5

3.1 Terms 5

3.2 Symbols 5

3.3 Abbreviations 6

4 Background 6

5 NR Frequency band definition 6

6 Channel numbering and channel bandwidth 6

7 Configurations for intra-band contiguous CA 6

8 RF requirements 6

8.1 UE specific 6

8.1.1 Transmitter characteristics 6

8.1.2 Receiver characteristics 6

8.2 BS specific 6

8.2.1 Transmitter characteristics 6

8.2.2 Receiver characteristics 6

9 RRM 7

9.1 Frequency bands grouping 7

9.2 Conditions for RRM requirements applicability for operating bands 7

9.2.1 Minimum SSB\_RP values for Rx Beam Peak angle of arrival 7

9.2.2 Minimum SSB\_RP values for angle of arrival within Spherical coverage 7

Annex A (informative): Change history 8

# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document is a technical report for Work Item on New Radio (NR) Access Technology, covering the new frequency range between 47.2- 48.2 GHz for NR.

# 2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

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

[2] 3GPP TS 38.141-2: "NR; Base Station (BS) conformance testing; Part 2: Radiated conformance testing".

[3] 3GPP TS 38.133: "NR; Radio Resource Control (RRC); Protocol specification".

[4] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone"

[5] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[6] World Radiocommunication Conference 2019 (WRC-19) Final Acts, ITU-R

[7] Title 47 of the Code of Federal Regulations (CFR) Part 30, FCC

[8] Radio Regulations, Articles, Edition of 2020, ITU

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP 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 3GPP TR 21.905 [1].

## 3.2 Symbols

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

ΔFGlobal Global frequency raster granularity

ΔFRaster Channel raster granularity

FREF-Offs Offset used for calculating FREF

Fstep,X Frequency steps for the OTA transmitter spurious emissions

NREF NR Absolute Radio Frequency Channel Number (NR-ARFCN)

NREF-Offs Offset used for calculating NREF

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

BS Base Station

BW Bandwidth

EIRP Effective Isotropic Radiated Power

FR Frequency Range

GSCN Global Synchronization Channel Number

ICS In-Channel Selectivity

ITU‑R Radiocommunication Sector of the International Telecommunication Union

NR New Radio

NR-ARFCN NR Absolute Radio Frequency Channel Number

OTA Over The Air

RF Radio Frequency

RX Receiver

SCS Sub-Carrier Spacing

TDD Time division Duplex

# 4 Background

## 4.1 ITU-R

As part of facilitating the development of 5G mobile networks, WRC-19 identified the 47 GHz frequency band (47.2-48.2 GHz) for International Mobile Telecommunications (IMT) under Footnote 5.553B of the ITU Radio Regulations for use in 71 nations across Africa, Europe, the Middle East and Asia Pacific (ITU Regions 1 and 3 respectively), in addition to the entire Americas Region (ITU Region 2, which consists of 35 nations) [6]. Table 4.1-1 is the extract of the Radio Regulations ([8]) table of allocations providing the services allocated in the 47.2-48.2 GHz frequency range

Table 4.1-1: Allocation information in the 47.2-48.2 GHz frequency range

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 47.2-47.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.550C 5.552 MOBILE 5.553B 5.552A |
| 47.5-47.9FIXEDFIXED-SATELLITE  (Earth-to-space) 5.550C 5.552 (space-to-Earth) 5.516B 5.554AMOBILE 5.553B | 47.5-47.9 FIXED FIXED-SATELLITE (Earth-to-space) 5.550C 5.552 MOBILE 5.553B |
| 47.9-48.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.550C 5.552 MOBILE 5.553B 5.552A  |

With the footnote 5.553B: In Region 2 and Algeria, Angola, Saudi Arabia, Australia, Bahrain, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Rep., Comoros, Congo (Rep. of the), Korea (Rep. of), Côte d’Ivoire, Djibouti, Egypt, United Arab Emirates, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, India, Iran (Islamic Republic of), Iraq, Japan, Jordan, Kenya, Kuwait, Lesotho, Liberia, Libya, Lithuania, Madagascar, Malaysia, Malawi, Mali, Morocco, Mauritius, Mauritania, Mozambique, Namibia, Niger, Nigeria, Oman, Uganda, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Singapore, Slovenia, Somalia, Sudan, South Sudan, South Africa, Sweden, Tanzania, Chad, Togo, Tunisia, Zambia and Zimbabwe, the frequency band 47.2-48.2 GHz is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which it is allocated, and does not establish any priority in the Radio Regulations. Resolution 243 (WRC-19) applies. (WRC-19)

According to Resolution 243 (WRC-19) [6], IMT in 47.2-48.2 GHz may coexist with satellite services and IMT base stations may require some measure to protect the services by bilateral agreement and possibly with site engineering solutions. Such protection measure is not a scope of 3GPP work, therefore, no specific coexistence requirement is specified in 3GPP for the mobile and base stations to protect other services for example by having additional spurious emission requirements.

However, it cannot be excluded any requirement is introduced by individual administration in nation level in the future to protect the service in the same or adjacent bands. Current 3GPP framework is flexible enough to introduce additional requirement later by Network signalling mechanism. Therefore, this band can be reused even if additional coexistence requirement is introduced in future by some administrations.

## 4.2 FCC

The US FCC auctioned the 47 GHz band beginning in December 2019 as part of Auction 103. The 47 GHz band (47.2-48.2 GHz) was auctioned in 10 blocks of 100 megahertz in each PEA (Partial Economic Area) license. The auction was concluded on 3/5/2020.

The radio regulatory requirements in FCC rules are specified in CFR Title 47 Part 30 [7]. The channelization is 100 MHz starting from 47.2 GHz ending at 48.2 GHz. The emission requirements for both BS and UE are aligned with other FR2 bands in FCC, i.e., bands n260, and n261 in 3GPP.

The power limits and unwanted emissions for the transportable station (intended for CPE devices) are consistent with the existing UE power class 1 for FR2 bands. The ones for the mobile stations are consistent with the existing FR2 UE power class 2, 3, and 4.

Table 4.2-1 captures channel arrangement, power limits and unwanted emissions specified by FCC.

Table 4.2-1: FCC requirements

|  |  |
| --- | --- |
| Channel arrangement | 47.2-47.3 GHz; 47.3-47.4 GHz; 47.4-47.5 GHz; 47.5-47.6 GHz; 47.6-47.7 GHz; 47.7-47.8 GHz; 47.8-47.9 GHz; 47.9-48.0 GHz; 48.0-48.1 GHz; and 48.1-48.2 GHz |
| Power limit (EIRP) | Base station: +75 dBm/100MHzMobile station: +43 dBmTransportable station: +55 dBm |
| Unwanted emissions | -5 dBm/MHz (within 10% of channel bandwidth separation)-13 dBm/MHz (outside more than 10% of channel bandwidth apart) |

# 5 NR Frequency band definition

The new band 47.2-48.2 GHz is within the range of FR2 (24250 – 52600 MHz) and is proposed as a TDD band (Table 5-1). The first unused FR2 band number, n262, is proposed for this new band.

Table 5-1: New NR band in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Band number | UL | DL | Duplex mode |
| n262 | 47.2 – 48.2 GHz | 47.2 – 48.2 GHz | TDD |

# 6 Channel numbering and channel bandwidth

Though the channelization in FCC rules is 100 MHz, it is not precluded to use 50 MHz channel bandwidth. Allocation block size is still unknown in other administrations. For maximum flexibility, the channel bandwidths for NR band n262 is proposed to be aligned with the existing FR2 bands as shown in Table 6-1.

 Table 6-1: NR channel bandwidth in the frequency range between 47.2-48.2 GHz

|  |  |
| --- | --- |
| NR band | Channel bandwidth |
| Band number | data SCS(kHz) | 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n262 | 60 | Yes | Yes | Yes |  |
| 120 | Yes | Yes | Yes | Yes |

NR-ARFCN parameters for the global frequency raster are presented in TS 38.104, table 6-2:

Table 6-2: NR-ARFCN parameters for the global frequency raster

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency range (MHz) | ΔFGlobal (kHz) | FREF-Offs (MHz) | NREF-Offs | Range of NREF |
| 0 – 3000 | 5 | 0 | 0 | 0 – 599999 |
| 3000 – 24250 | 15 | 3000 | 600000 | 600000 – 2016666 |
| 24250 – 100000 | 60 | 24250.08 | 2016667 | 2016667 – 3279165 |

Using information above and the equation FREF = FREF-Offs + ΔFGlobal (NREF – NREF-Offs), the channel raster for n262 is also proposed to cover all the frequency with the 60/120 kHz channel raster aligned with the other F2 band as presented in Table 6-3.

Table 6-3: Applicable NR-ARFCN in the frequency range between 47.2-48.2 GHz

|  |  |  |
| --- | --- | --- |
| NR Operating Band | ΔFRaster (kHz) | Uplink and DownlinkRange of NREF(First – <Step size> – Last) |
| n262 | 60 | 2399166 – <1> – 2415832 |
| 120 | 2399167 – <2> – 2415831 |

The synchronization raster in the frequency range between 47.2-48.2 GHz is given in Table 6-4. The distance between applicable GSCN entries is given by the <Step size> indicated in Table 6-4 with the step size interval of 17.28 MHz.

Table 6-4: Applicable SS raster entries in the frequency range between 39.5-43.5 GHz

|  |  |  |  |
| --- | --- | --- | --- |
| NR Operating Band | SS Block SCS | SS Block pattern1 | Range of GSCN(First – <Step size> – Last) |
| n262 | 120 kHz | Case D | 23586 – <1> – 23641 |
| 240 kHz | Case E | 23588 – <2> – 23640 |
| NOTE: SS Block pattern is defined in subclause 4.1 in TS 38.213. |

# 7 Configurations for intra-band contiguous CA

Table 7-1: NR CA configurations, bandwidth combination sets, and fallback group defined for intra-band contiguous CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configurations | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | Maximum aggregatedBW (MHz) | BCS | Fallback group |
| CA\_n262G | CA\_n262G | 50, 100 | 100 |  |  |  |  |  |  |  | 0 | 3 |
| CA\_n262H | CA\_n262GCA\_n262H | 50, 100 | 100 | 100 |  |  |  |  |  |  | 0 |  |
| CA\_n262I | CA\_n262GCA\_n262HCA\_n262I | 50, 100 | 100 | 100 | 100 |  |  |  |  | 400 | 0 |  |
| CA\_n262J | CA\_n262GCA\_n262HCA\_n262ICA\_n262J | 50, 100 | 100 | 100 | 100 | 100 |  |  |  | 500 | 0 |  |
| CA\_n262K | CA\_n262GCA\_n262HCA\_n262ICA\_n262JCA\_n262K | 50, 100 | 100 | 100 | 100 | 100 | 100 |  |  | 600 | 0 |  |
| CA\_n262L | CA\_n262GCA\_n262HCA\_n262ICA\_n262JCA\_n262KCA\_n262L | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 |  | 700 | 0 |  |
| CA\_n262M | CA\_n262GCA\_n262HCA\_n262ICA\_n262JCA\_n262KCA\_n262LCA\_n262M | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 800 | 0 |  |

# 8 RF requirements

## 8.1 UE specific

### 8.1.1 Transmitter characteristics

The following requirements define the maximum output power radiated by the UE for any transmission bandwidth within the channel bandwidth for non-CA configuration, unless otherwise stated. The period of measurement shall be at least one sub frame (1ms). The minimum output power values for EIRP are found in Table 8.1.1-1. The requirement is verified with the test metric of total component of EIRP (Link=TX beam peak direction, Meas=Link angle). The requirement for the UE which supports a single FR2 band is specified in Table 8.1.1-1. The requirement for the UE which supports multiple FR2 bands is specified in both Table 8.1.1-1 and Table 8.1.1-4.

Table 8.1.1-1: UE minimum peak EIRP for power class 1, 2, 3 and 4

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |

|  |  |
| --- | --- |
| Operating band | Min peak EIRP (dBm) |
| PC1 | PC2 | PC3 | PC4 |
| n262 | 34.2 | 22.9 | 16.0 | 28.3 |
| NOTE 1: Minimum peak EIRP is defined as the lower limit without tolerance. |

The maximum output power values for TRP and EIRP are found on the Table 8.1.1-2. The max allowed EIRP is derived from regulatory requirements [8]. The requirements are verified with the test metrics of TRP (Link=TX beam peak direction, Meas=TRP grid) in beam locked mode and the total component of EIRP (Link=TX beam peak direction, Meas=Link angle.

Table 8.1.1-2: UE maximum output power limits for power class 1, 2, 3 and 4

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Operating band | Power Class | Max TRP (dBm) | Max EIRP (dBm) |
| n262 | PC1 | 35 | 55 |
| PC2 | 23 | 43 |
| PC3 | 23 | 43 |
| PC4 | 23 | 43 |

The minimum EIRP at the 50th percentile of the distribution of radiated power measured over the full sphere around the UE is defined as the spherical coverage requirement and is found in Table 8.1.1-3 below. The requirement is verified with the test metric of the total component of EIRP (Link=Beam peak search grids, Meas=Link angle). The requirement for the UE which supports a single FR2 band is specified in Table 8.1.1-3. The requirement for the UE which supports multiple FR2 bands is specified in both Table 8.1.1-3 and Table 8.1.1-4.

Table 8.1.1-3: UE spherical coverage for power class 1, 2, 3 and 4

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |

|  |  |
| --- | --- |
| Operating band | Min EIRP  |
| PC1at 85%-tile CDF (dBm) | PC2at 60%-tile CDF (dBm) | PC3at 50%-tile CDF (dBm) | PC4at 20%-tile CDF (dBm) |
| n262 | 26.0 | 11.0 | 2.9 | 16.2 |
| NOTE 1: Minimum EIRP at 50 %-tile CDF is defined as the lower limit without tolerance. |

For the UEs that support multiple FR2 bands, minimum requirement for peak EIRP and EIRP spherical coverage in Tables 8.1.1-1 and 8.1.1-3 shall be decreased per band, respectively, by the peak EIRP relaxation parameter MBP,n and EIRP spherical coverage relaxation parameter MBS,n, as defined in Table 8.1.1-4.

Table 8.1.1-4: UE multi-band relaxation factors for power class 3

|  |  |  |
| --- | --- | --- |
| **Band** | **MBP,n (dB)** | **MBS,n (dB)** |
| n257 | 0.73 | 0.73 |
| n258 | 0.6 | 0.7 |
| n259 | 0.5 | 0.4 |
| n260 | 0.51 | 0.41 |
| n261 | 0.52,4 | 0.74 |
| n262 | 0.7 | 0.7 |
| Note 1: n260 peak and spherical relaxations are 0 dB for UE that exclusively supports n261+n260Note 2: n261 peak relaxation is 0 dB for UE that exclusively supports n261+n260Note 3: n257 peak and spherical relaxations are 0 dB for UE that exclusively supports n261+n257Note 4: n261 peak and spherical relaxations are 0 dB for UE that exclusively supports n261+n257 |

The minimum output power shall not exceed the values specified in Table 8.8.1-5 for each operating band supported. The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 8.1.1-5: Minimum output power for power class 1, 2, 3 and 4

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band | Power Class | Channel bandwidth(MHz) | Minimum output power(dBm) | Measurement bandwidth(MHz) |
| n262 | PC1 | 50 | 4 | 47.58 |
|  |  | 100 | 4 | 95.16 |
|  |  | 200 | 4 | 190.20 |
|  |  | 400 | 4 | 380.28 |
|  | PC2, PC3 and PC4 | 50 | -13 | 47.58 |
|  |  | 100 | -13 | 95.16 |
|  |  | 200 | -13 | 190.20 |
|  |  | 400 | -13 | 380.28 |

The transmit OFF power is defined as the TRP in the channel bandwidth when the transmitter is OFF. The transmitter is considered OFF when the UE is not allowed to transmit on any of its ports.

The transmit OFF power shall not exceed the values specified in Table 8.8.1-6 for each operating band supported. The requirement is verified with the test metric of TRP (Link=TX beam peak direction, Meas=TRP grid).

Table 8.8.1-6: Transmit OFF power

|  |  |
| --- | --- |
| Operating band | Channel bandwidth / Transmit OFF power (dBm) / measurement bandwidth |
|  | 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n262 | -35 | -35 | -35 | -35 |
|  | 47.58 MHz | 95.16 MHz | 190.20 MHz | 380.28 MHz |

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. ACLR requirement is specified for a scenario in which adjacent carrier is another NRchannel.

NR Adjacent Channel Leakage power Ratio (NRACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned NR channel power and adjacent NR channel power are measured with rectangular filters with measurement bandwidths specified in Table 8.8.1-7.

If the measured adjacent channel power is greater than –35 dBm then the NRACLR shall be higher than the value specified in Table 8.8.1-7. The requirement is verified in beam locked mode with the test metric of TRP (Link=TX beam peak direction, Meas=TRP grid).

Table 8.8.1-7: General requirements for NRACLR

|  |  |
| --- | --- |
|  | Channel bandwidth / NRACLR / Measurement bandwidth |
| 50MHz | 100MHz | 200MHz | 400MHz |
| NRACLR for band n262 | 16 dB | 16 dB | 16 dB | 16 dB |
| NR channel measurement bandwidth (MHz) | 47.58  | 95.16  | 190.20  | 380.28  |
| Adjacent channel centre frequency offset (MHz) | +50/-50 | +100/-100 | +200/-200 | +400/-400 |

This table 8.8.1-8 specifies the requirements for coexistence with protected bands.

Table 8.8.1-8: Requirements

|  |  |
| --- | --- |
| NR Band | Spurious emission |
|  | Protected band/frequency range | Frequency range (MHz) | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n260 | NR Band 257 | FDL\_low | - | FDL\_high | -5 | 100 |  |
|  | NR Band 261 | FDL\_low | - | FDL\_high | -5 | 100 |  |
|  | NR Band 262 | FDL\_low | - | FDL\_high | -5 | 100 |  |
|  | Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| n261 | NR Band 260 | FDL\_low | - | FDL\_high | -2 | 100 |  |
|  | NR Band 262 | FDL\_low | - | FDL\_high | -5 | 100 |  |
|  | Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| n262 | NR Band 260 | FDL\_low | - | FDL\_high | -2 | 100 |  |
|  | NR Band 261 | FDL\_low | - | FDL\_high | -5 | 100 |  |
|  | Frequency range | 57000 | - | 66000 | 2 | 100 |  |

### 8.1.2 Receiver characteristics

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1) with peak reference sensitivity specified in Table 8.1.2-1. The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link Angle).

For the UEs that support multiple FR2 bands, the minimum requirement for Reference sensitivity in Table 8.1.2-1 shall be increased per band, respectively, by the reference sensitivity relaxation parameter ∆MBP,n as specified in clause 8.1.1. The requirement for the UE which supports a single FR2 band is specified in Table 8.1.2-1. The requirement for the UE which supports multiple FR2 bands is specified in both Table 8.1.2-1 and Table 8.1.1-4.

Table 8.1.2-1: Reference sensitivity for power class 1, 2, 3 and 4

|  |  |
| --- | --- |
|  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |

|  |  |  |
| --- | --- | --- |
| Operating band | Power Class | REFSENS (dBm) / Channel bandwidth |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n262 | PC1 | -92.5 | -89.5 | -86.5 | -83.5 |
|  | PC2 | -86.8 | -83.8 | -80.8 | -77.5 |
|  | PC3 | -82.8 | -79.8 | -76.8 | -73.8 |
|  | PC4 | -91.0 | -88.0 | -85.0 | -82.0 |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4. |

The REFSENS requirement shall be met for an uplink transmission using QPSK DFT-s-OFDM waveforms and for uplink transmission bandwidth less than or equal to that specified in Table 8.1.2-1.

Unless given by Table 7.3.2.1-3 in TS 38.101-2, the minimum requirements for reference sensitivity shall be verified with the network signalling value NS\_200 (Table 6.2.3.1-1 in TS 38.101-2) configured. The maximum EIS at the 50th percentile of the CCDF of EIS measured over the full sphere around the UE is defined as the spherical coverage requirement and is found in Table 8.1.2-2 below. The requirement is verified with the test metric of EIS (Link=Spherical coverage grid, Meas=Link angle).

For the UEs that support multiple FR2 bands, the minimum requirement for EIS spherical coverage in Table 8.1.2-2 shall be increased per band, respectively, by the EIS spherical coverage relaxation parameter ∆MBS,n as specified in clause 8.1.1. The requirement for the UE which supports a single FR2 band is specified in Table 8.1.2-2. The requirement for the UE which supports multiple FR2 bands is specified in both Table 8.1.2-2 and Table8.1.1-4.

Table 8.1.2-2: EIS spherical coverage for power class 1, 2, 3 and 4

|  |  |
| --- | --- |
|  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |

|  |  |  |
| --- | --- | --- |
| Operating band | Power Class | EIS at 50th %-tile CCDF (dBm) / Channel bandwidth |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n262 | PC1 | -84.3 | -81.3 | -78.3 | -75.3 |
|  | PC2 | -74.9 | -71.9 | -68.9 | -65.9 |
|  | PC3 | -69.7 | -66.7 | -63.7 | -60.7 |
|  | PC4 | -78.9 | -75.9 | -72.9 | -69.9 |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4NOTE 2: The EIS spherical coverage requirements are verified only under normal thermal conditions as defined in Annex E.2.1. |

The requirement shall be met for an uplink transmission using QPSK DFT-s-OFDM waveforms and for uplink transmission bandwidth less than or equal to that specified in Table 8.1.2-2.

Unless given by Table 7.3.2.1-3 in TS 38.101-2, the minimum requirements for reference sensitivity shall be verified with the network signalling value NS\_200 (Table 6.2.3.1-1 in TS 38.101-2) configured.

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The requirement applies at the RIB when the AoA of the incident wave of the wanted signal and the interfering signal are both from the direction where peak gain is achieved.

The wanted and interfering signals apply to all supported polarizations, under the assumption of polarization match.

The UE shall fulfil the minimum requirement specified in Table 8.1.2-3 for all values of an adjacent channel interferer up to –25 dBm. However, it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 8.1.2-4 and Table 8.1.2-5 where the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2, with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1. The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link angle).

Table 8.1.2-3: Adjacent channel selectivity

|  |  |  |
| --- | --- | --- |
| Operating band | Units | Adjacent channel selectivity / Channel bandwidth |
|  |  | 50MHz  | 100MHz | 200MHz | 400MHz |
| n262 | dB | 22 | 22 | 22 | 22 |

Table 8.1.2-4: Adjacent channel selectivity test parameters, Case 1

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | Channel bandwidth |
|  |  | 50 MHz  | 100 MHz | 200 MHz | 400 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB |
| PInterferer for band n262 | dBm | REFSENS + 34.5 dB | REFSENS +34.5 dB | REFSENS +34.5 dB | REFSENS +34.5 dB |
| BWInterferer  | MHz | 50 | 100 | 200 | 400 |
| FInterferer (offset) | MHz | 50/-50NOTE 3 | 100/-100NOTE 3 | 200/-200NOTE 3 | 400/-400NOTE 3 |
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern as described in Annex A.3.2 and set-up according to Annex C.NOTE 2: The REFSENS power level is specified in Clause 7.3.2, which are applicable to different UE power classes.NOTE 3: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the wanted signal in MHz. Wanted and interferer signal have same SCS.NOTE 4: The transmitter shall be set to 4 dB below the PUMAX,f,c as defined in clause 6.2.4, with uplink configuration specified in Table 7.3.2.1-2. |

Table 8.1.2-5: Adjacent channel selectivity test parameters, Case 2

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | Channel bandwidth |
|  |  | 50 MHz  | 100 MHz | 200 MHz | 400 MHz |
| Power in Transmission Bandwidth Configuration for band n262 | dBm | -45.5 | -45.5 | -45.5 | -45.5 |
| PInterferer | dBm | -25 |
| BWInterferer  | MHz | 50 | 100 | 200 | 400 |
| FInterferer (offset) | MHz | 50/-50NOTE 2 | 100/-100NOTE 2 | 200/-200NOTE 2 | 400/-400NOTE 2 |
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern TDD as described in Annex A and set-up according to Annex C.NOTE 2: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the wanted signal in MHz. Wanted and interferer signal have same SCS. NOTE 3: The transmitter shall be set to 4 dB below the PUMAX,f,c as defined in clause 6.2.4, with uplink configuration specified in Table 7.3.2.1-2. |

In-band blocking is a measure of a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an interferer at a given frequency offset from the centre frequency of the assigned channel.

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1). The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link angle).

Table 8.1.2-6: In band blocking requirements

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units  | Channel bandwidth |
|  |  | 50 MHz  | 100 MHz | 200 MHz | 400 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB |
| BWInterferer | MHz | 50 | 100 | 200 | 400 |
| PInterfererfor band n262 | dBm | REFSENS + 34.5 dB | REFSENS + 34.5 dB | REFSENS + 34.5 dB | REFSENS + 34.5 dB |
| FIoffset | MHz | ≤ -100 & ≥ 100NOTE 5 | ≤ -200 & ≥ 200NOTE 5 | ≤ -400 & ≥ 400NOTE 5 | ≤ -800 & ≥ 800NOTE 5 |
| FInterferer | MHz | FDL\_low + 25to FDL\_high - 25 | FDL\_low + 50to FDL\_high - 50 | FDL\_low + 100to FDL\_high - 100 | FDL\_low + 200to FDL\_high - 200 |
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex A.3.3.2 with one sided dynamic OCNG Pattern OP.1. TDD as described in Annex A.5.2.1 and set-up according to Annex C.NOTE2: The REFSENS power level is specified in Clause 7.3.2, which are applicable according to different UE power classes.NOTE 3: The wanted signal consists of the reference measurement channel specified in Annex A.3.3.2 with one sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 and set-up according to Annex C.NOTE 4: FIoffset is the frequency separation between the center of the channel bandwidth and the center frequency of the Interferer signal.NOTE 5: The absolute value of the interferer offset FIoffset shall be further adjusted (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the wanted signal in MHz. Wanted and interferer signal have same SCS.NOTE 6: FInterferer range values for unwanted modulated interfering signals are interferer center frequencies.NOTE 7: The transmitter shall be set to 4 dB below the PUMAX,f,c as defined in clause 6.2.4, with uplink configuration specified in Table 7.3.2.1-2. |

## 8.2 BS specific

### 8.2.1 Band agnostic requirements

The BS RF requirements summarized in Table 8.2.1-2 is band agnostic RF requirements for FR2 which are applicable for band n262 as well.

Table 8.2.1-2: Summary on band agnostic of BS RF requirements for FR2

|  |  |
| --- | --- |
| BS TX side capture in TS 38.104  | BS RX side capture in TS 38.104  |
| 9.2 Radiated transmit power | 10.3 OTA reference sensitivity level |
| 9.3 OTA Base station output power | 10.5 OTA In-band selectivity and blocking |
| 9.4 OTA Output power dynamics |  |
| 9.5 OTA Transmit ON/OFF power | 10.9 OTA In-channel selectivity |
| 9.6 OTA Transmitted signal quality |  |
| 9.7.2 OTA Occupied bandwidth |  |
| 9.7.5 OTA Transmitter spurious emissions (cat A) |  |

### 8.2.2 Transmitter characteristics

#### 8.2.2.1 Adjacent Channel Leakage Ratio (ACLR)

The BS OTA ACLR limit for spectrum range 37 – 52.6 GHz has been defined in TS 38.104. This is also applicable for Band n262.

#### 8.2.2.2 OTA operating band unwanted emissions

The BS OTA operating band unwanted emission for spectrum range 37 – 52.6 GHz has been specified in TS 38.104, section 9.7. Those limits are applicable for Band n262.

#### 8.2.2.3 Step frequencies for Tx spurious emission

The 47.2-48.2 GHz frequency range has not yet been regulated in Region where Category B limits are applicable. The Category B Tx spurious limits doesn’t have to updated (at least for the time being).

### 8.2.3 Receiver characteristics

#### 8.2.3.1 Step frequencies for Rx spurious emission

The band n262 shall be added to Table 8.2.3.1-1 in TS 38.104 as proposed below.

Table 8.2.3.1-1: Step frequencies for defining the radiated Rx spurious emission limits for *BS type 2-O*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band | Fstep,1(GHz) | Fstep,2(GHz) | Fstep,3(GHz) | Fstep,4(GHz) | Fstep,5(GHz) | Fstep,6(GHz) |
| n257 | 18 | 23.5 | 25 | 31 | 32.5 | 41.5 |
| n258 | 18 | 21 | 22.75 | 29 | 30.75 | 40.5 |
| n259 | 23,5 | 35,5 | 38 | 45 | 47,5 | 59,5 |
| n260 | 25 | 34 | 35.5 | 41.5 | 43 | 52 |
| n261 | 18 | 25.5 | 26.0 | 29.85 | 30.35 | 38.35 |
| n262 | 37.2 | 45.2 | 45.7 | 49.7 | 50.2 | 58.2 |

8.2.4 BS conformance aspects

On top of generic FR2 BS test requirements, the following 38.141-2 transmitter test requirements changes are expected due to introduction of n262:

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |
|  |  |  |
|  |  |
|  |
|  |  |  |

1. Define maximum OTA test system uncertainty for FR2 OTA transmitter tests to be applicable up to 48.2GHz

|  |  |
| --- | --- |
| Subclause | Maximum OTA Test System uncertainty |
| 6.2 Radiated transmit power | Normal condition:±1.7 dB (24.25 – 29.5 GHz)±2.0 dB (37 – 43.5 GHz)±2.2 dB (43.5GHz < f ≤ 48.2 GHz) |
|  | Extreme condition:±3.1 dB (24.25 – 29.5 GHz)±3.3 dB (37 – 43.5 GHz)±3.5 dB (43.5 GHz < f ≤48.2 GHz) |
| 6.3 OTA base station output power | ±2.1 dB (24.25 – 29.5 GHz)±2.4 dB (37 – 43.5 GHz)±2.6 dB (43.5 GHz < f ≤48.2 GHz) |
| 6.4.2 OTA RE power control dynamic range | N/A |
| 6.4.3 OTA total power dynamic range  | ±0.4 dB |
| 6.5.1 OTA transmitter OFF power | ±2.9 dB (24.25 – 29.5 GHz)±3.3 dB (37 – 43.5 GHz)±3.6 dB (43.5 GHz < f ≤48.2 GHz) |
| 6.5.2 OTA transmitter transient period | N/A |
| 6.6.2 OTA frequency error | ±12 Hz |
| 6.6.3 OTA modulation quality | 1% |
| 6.6.4 OTA time alignment error | ±25 ns |
| 6.7.2 OTA occupied bandwidth | 600 kHz |
| 6.7.3 OTA ACLR | Relative ACLR:±2.3 dB (24.25 – 29.5 GHz)±2.6 dB (37 – 43.5 GHz)±2.8 dB (43.5 GHz < f ≤48.2 GHz)Absolute ACLR: ±2.7 dB (24.25 – 29.5 GHz)±2.7 dB (37 – 43.5 GHz)±2.9 dB (43.5 GHz < f ≤48.2 GHz) |
| 6.7.4 OTA operating band unwanted emissions | ±2.7 dB (24.25 – 29.5 GHz)±2.7 dB (37 – 43.5 GHz)±2.9 dB (43.5 GHz < f ≤48.2 GHz) |
| 6.7.5.2 OTA transmitter spurious emissions, mandatory requirements | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz±2.7 dB, 6 GHz < f ≤ 40 GHz±5.0 dB, 40 GHz < f ≤ 60 GHz |
| 6.7.5.4 OTA transmitter spurious emissions, additional requirements | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz±2.7 dB, 6 GHz < f ≤ 40 GHz±5.0 dB, 40 GHz < f ≤ 60 GHz |
| NOTE: Test system uncertainty values are applicable for normal condition unless otherwise stated. |

On top of generic FR2 BS test requirements, the following 38.141-2 receiver test requirements changes are expected due to introduction of n262:

1. Introduction of step frequencies for defining the radiated Rx spurious emission limits for n262

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band | Fstep,1(GHz) | Fstep,2(GHz) | Fstep,3(GHz) | Fstep,4(GHz) | Fstep,5(GHz) | Fstep,6(GHz) |
| n257 | 18 | 23.5 | 25 | 31 | 32.5 | 41.5 |
| n258 | 18 | 21 | 22.75 | 29 | 30.75 | 40.5 |
| n259 | 23.5 | 35.5 | 38 | 45 | 47.5 | 59.5 |
| n260 | 25 | 34 | 35.5 | 41.5 | 43 | 52 |
| n261 | 18 | 25.5 | 26.0 | 29.85 | 30.35 | 38.35 |
| n262 | 37.2 | 45.2 | 45.7 | 49.7 | 50.2 | 58.2 |

Define maximum OTA test system uncertainty for FR2 OTA receiver tests to be applicable up to 48.2GHz

|  |  |
| --- | --- |
| Subclause | Maximum OTA Test System uncertainty |
| 7.3 OTA reference sensitivity level | ±2.4 dB, 24.25 GHz < f ≤ 29.5 GHz±2.4 dB, 37 GHz < f ≤ 43.5 GHz+[3.5] dB, 43.5 GHz < f ≤ 48.2 GHz |
| 7.5.1 OTA adjacent channel selectivity | ±3.4 dB, 24.25 GHz < f ≤ 29.5 GHz±3.4 dB, 37 GHz < f ≤ 43.5 GHz+[5.1] dB, 43.5 GHz < f ≤ 48.2 GHz |
| 7.5.2 In-band blocking (General) | ±3.4 dB, 24.25 GHz < f ≤ 29.5 GHz±3.4 dB, 37 GHz < f ≤ 43.5 GHz+[5.1] dB, 43.5 GHz < f ≤ 48.2 GHz |
| 7.6 OTA out-of-band blocking  | ±3.6 dB, 24.25 GHz < f ≤ 29.5 GHz±3.6 dB, 37 GHz < f ≤ 43.5 GHz+[4.5] dB, 43.5 GHz < f ≤ 48.2 GHz |
| 7.7 OTA receiver spurious emissions  | ±2.5 dB, 30 MHz ≤ f ≤ 6 GHz±2.7 dB, 6 GHz < f ≤ 40 GHz±5.0 dB, 40 GHz < f ≤ 60 GHz |
| 7.8 OTA receiver intermodulation | ±3.9 dB, 24.25 GHz < f ≤ 29.5 GHz±3.9 dB, 37 GHz < f ≤ 43.5 GHz+[5.4] dB, 43.5 GHz < f ≤ 48.2 GHz |
| 7.9 OTA in-channel selectivity  | ±3.4 dB, 24.25 GHz < f ≤ 29.5 GHz±3.4 dB, 37 GHz < f ≤ 43.5 GHz+[5.1] dB, 43.5 GHz < f ≤ 48.2 GHz |
| NOTE1: Test system uncertainty values are applicable for normal condition unless otherwise stated.NOTE 2: The maximum OTA Test System uncertainty in the frequency range 43.5 GHz < f ≤ 48.2 GHz is a composite of signal generator and external RF front-end with mixer. Future evaluation and improvement of uncertainty values will be performed once the signal generator internal RF supports higher frequency so external mixer is not used. |

# 9 RRM

## 9.1 Frequency bands grouping

## 9.2 Conditions for RRM requirements applicability for operating bands

### 9.2.1 Minimum SSB\_RP values for Rx Beam Peak angle of arrival

### 9.2.2 Minimum SSB\_RP values for angle of arrival within Spherical coverage

# 10 Performance requirements

## 10.1 Base station requirements

The BS demodulation requirements in 38.104 are defined for the whole of FR2 (i.e. up to 52.6GHz) and thus can be re-used for n262. The SNR is not expected to differ for any of the requirements.

Conformance testing for the base station requirements is limited by the OTA link budget in the test chamber and available output power of test equipment. For the existing FR2 bands, the maximum testable SNR is limited to 20dB due to link budget considerations.

For n262, the pathloss will differ to some degree, and also the availability of power amplifiers for the test equipment may differ. The link budget has been checked to determine whether also for n262 the 20dB assumption is valid.

The test set-up in figure 10.1-1 is assumed. After the output of the test equipment, a pre-amplifier and PA are included to increase the power available in the test chamber.

**Figure 10.1-1 BS test setup**



Table 10.1-1 captures assumptions on the losses and amplifier gains for the test setup.

Table 10.1-1 Assumptions for test set-up losses/gains

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency (GHz) | 47 | 38 | Note |
|  (dB) | 3 | 3 | Coupler loss |
|  | 37 | 37 | Gain of power amplifier |
|  | 2 | 2 | 2dB attenuator loss |
|  | 25 | 25 | Gain of pre-amplifier |
|  (dB) | 2.5 | 2.5 | 1m cable loss |
|  | 2 | 2 | Variable attenuator loss |
|  (dB) | 4 | 4 | Combiner loss |
|  (dB) | 11 | 10 | 5m cable loss |
|  | -42.5 | -41.5 |  |

At the RIB (i.e. BS antenna array), if a reference sensitivity of -100dBm in 50MHz is assumed then according to 38.141-2, the AWGN level at the RIB should be -79dBm for a 200MHz channel. For the wanted signal, a margin of 10dB for the fading channel is assumed and an SNR of 20dB. Thus, the wanted signal power should be -79dBm AWGN + 20dB SNR + 10dB margin for fading channel = -49dBm.

It is worth to note that the in-band blocking level for a BS with a sensitivity of -100dBm in 50MHz is -70dBm. Thus, the in-channel power here is considerably larger than the in-band blocking level. This reflects the reduced risk of blocking in FR2 due to beamforming. The -49dBm used in this estimate is an absolute worst case with high SNR, high channel margin in order to gain an understanding whether the link budget in the chamber can work in the worst case scenario.

To estimate the output power requirement for the PA, the pathloss within the test chamber should be considered. Two types of test chamber have been studied; Indoor Anechoic Chamber (IAC) and Compact Antenna Test Range (CATR).

For the IAC, the test antenna must be placed in the far-field of the BS array. The far field distance is related to the dimensions of the BS. Two BS dimensions have been considered; 5 times and 10 times the wavelength. Combining the chamber pathloss with the test setup Ltotal and the power level at the RIB enables the needed output power levels at the PA output and signal generator to be calculated.

Table 10.1-2: Power requirements for BS demodulation testing in an IAC

|  |  |  |  |
| --- | --- | --- | --- |
| Carrier Frequency (GHz) | 47 | 38 | Note |
| Dimension (m) | 0.15 | 0.25 | 0.15 | 0.25 | 5 times of wave length and 10 times of wave length |
|  | 7 | 19.6 | 5.7 | 15.8 | Far field distance |
|  | 82.9 | 91.8 | 79.2 | 88.1 | Free space loss |
|  | 13.9 | 22.8 | 10.2 | 19.1 |  |
|  | -28.6 | -19.7 | -31.3 | -22.4 | Estimated wanted signal level at SG |

For the CATR, the coupling loss between the test antenna and BS can be calculated as:

Assuming the CATR area to be 20m2, the CATR power requirements are as in table 10.1-3.

Table 10.1-3: Power requirements for BS demodulation testing in an CATR

|  |  |  |  |
| --- | --- | --- | --- |
| Carrier frequency (GHz) | 47 | 38 | Note |
|  (dB) | 67.9 | 66.1 | coupling loss |
|  | 21.9 | 20.1 |  |
|  | -20.6 | -21.4 |  |

A signal generator can be estimated to provide an output power of up to -10dBm with the required linearity. For both the CATR and IAC, the output power from the signal generator will not be a limiting factor.

Expectations on PA output power in some other frequency ranges are indicated in table 10.1-4.

Table 10.1-4: PA output power expectations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency (GHz) | 2~20 | 18~26.5 | 27~31 | 30~40 |
|  (dB) | 43 | 40 | 43 | 37 |
| OIP3 (dBm) | 42 | 40 | 42 | 37 |
|  (dB) | 10 | 10 | 10 | 10 |
| (dBm) | 27 | 25 | 27 | 22 |
|  (dBm) | -16 | -15 | -16 | -15 |

If PAs are available for 47GHz with the same output power as those for 30-40GHz are available, then the link budget is only just achievable. However, the estimate of the needed input power to the RIB has been based on a sensitivity level of -100 dBm/50MHz, large fading channel variation, 200MHz bandwidth and a 20dB SNR (the largest SNR for 200MHz is actually around 15dB). which are all rather pessimistic and so in most situations a margin is likely to be available.

Based on the link budget assessment, all of the conformance tests for BS demodulation requirements are retained for n262.

## 10.2 UE requirements

The UE performance requirements in 38.101-4 have prior to the introduction of n262 been specified for frequencies of up to 40GHz. To check whether the requirements can also be applicable, simulations were performed considering PDSCH with a high MCS. It is assumed that if no significant difference is observable with this high MCS then no difference will occur for all other requirements.

Table 10.2-1 Simulation parameters for evaluation of PDSCH performance impacts for 47 GHz band.

|  |  |  |
| --- | --- | --- |
| Parameter | Scenario 1 | Scenario 2 |
| Bandwidth | 100 MHz | 50 MHz |
| SCS | 120 kHz | 120 kHz |
| Other parameters | Test 1-3 Table 7.2.2.2.1-3 from 38.101-4 V16.4.0TDLA30-3002x2 ULA LowFRC: R.PDSCH.5-3.1 TDDMCS18 in MCS table 1 (64QAM CR=0.46)Rank 16% EVMAssume phase noise | Test 1-4 Table 7.2.2.2.1-3 from 38.101-4 V16.4.0TDLD30-752x2 ULA LowFRC: R.PDSCH.5-9.1 TDDMCS 20 in MCS table 2 (256QAM CR=0.67)Rank 13% EVMAssume phase noise |
| Receiver | MMSE-IRC | MMSE-IRC |



**Figure 10.2-1 PDSCH BLER vs SNR (Carrier frequency: 30 GHz).**



**Figure 10.2-2 PDSCH BLER vs SNR (Carrier frequency: 45 GHz)**

Figures 10.2-1 and 10.2-2 show the simulation results with carrier frequency of 30GHz and carrier frequency of 45GHz, respectively. Both figures show the results when the common phase error (CPE) compensation or inter-carrier interference (ICI) compensation is applied.

UE demodulation performance requirements set in RAN4 are usually SNR to achieve 70% of the maximum throughput (BLER=0.3 in the figures 10.2-1 and 10.2-2). From the simulation results, no difference in performance is observed for Scenario 1 (64QAM CR=0.46) about SNR to achieve 70% of the maximum throughput. On the other hand, it is observed performance difference for Scenario 2 between 30 GHz and 45 GHz depending on which compensation technique is applied by UE, but implementing the proper compensation technique in 45GHz can achieve the same performance as 30GHz. Therefore, it is concluded that UE performance requirements specified for FR2 can be extended up to 48.2GHz.

Although RAN5 specifies UE conformance testing, absolute Noc levels are specified in 38.101-4. For n262, the Noc levels are calculated based on the reference sensitivity as described in section 4.5.3.3 of TS 38.101-2.

Annex A (informative):
Change history

|  |
| --- |
| **Change history** |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 08/2020 | RAN4-96e |  |  |  |  | TR Skeleton | 0.0.0 |
| 02/2021 | RAN4-98e |  |  |  |  | Agreed Text Proposal from RAN4#97-e:R4-2016883 BS RF Requirements and System parameters - TP to TR 38.847R4-2016884 TP to TR 38.847: BS RF requirements | 0.1.0 |
| 04/2021 | RAN4-98bis-e |  |  |  |  | Agreed Text Proposal from RAN4#98-e:R4-2103204 TP to TR 38.847: UE Tx requirement for n262R4-2103206 TP to TR 38.847: UE Rx requirement for n262R4-2103874 TP to TR 38.847: BS conformance aspects | 0.2.0 |
| 05/2021 | RAN4#99-e |  |  |  |  | Fixed some references and tables numbering issues.Agreed Text Proposal from RAN4#98-bis-e:R4-2104682 pCR to TR 38.847: BS demodulation requirementsR4-2106860 pCR to 38.847: UE performance requirementsR4-2107038 TP to TR 38.847: BS conformance aspects | 0.3.0 |
| 08/2021 | RAN4#100-e |  |  |  |  | Agreed Text Proposal from RAN4#100-e:R4-2113735 TP to TR 38.847R4-2115634 TP to TR 38.847: BS conformance aspects | 0.4.0 |