3GPP TS 38.141 V0.4.0 (2018-08)

Technical Specification

3rd Generation Partnership Project;

Technical Specification Group RAN;

NR;

Base Station (BS) conformance testing

Part 1: Conducted conformance testing

(Release 15)

** 

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.

Keywords

Radio, NR

***3GPP***

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis

Valbonne - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://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.

© 2017, 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 members

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners  
LTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners

GSM® and the GSM logo are registered and owned by the GSM Association

Contents

Foreword 7

Introduction 7

1 Scope 8

2 References 8

3 Definitions, symbols and abbreviations 9

3.1 Definitions 9

3.2 Symbols 11

3.3 Abbreviations 12

4 General conducted test conditions and declarations 14

4.1 Measurement uncertainties and test requirements 14

4.1.1 General 14

4.1.2 Acceptable uncertainty of Test System 14

4.1.2.1 General 14

4.1.2.2 Measurement of transmitter 15

4.1.2.3 Measurement of receiver 17

4.1.3 Interpretation of measurement results 19

4.2 Conducted requirement reference points 20

4.2.1 *BS type 1-C* 20

4.2.2 *BS type 1-H* 20

4.3 Base station classes 21

4.4 Regional requirements 22

4.5 BS configurations 22

4.5.1 *BS type 1-C* 22

4.5.1.1 Transmit configurations 22

4.5.1.1.1 General 22

4.5.1.1.2 Transmission with multiple transmitter antenna connectors 23

4.5.1.2 Receive configurations 23

4.5.1.2.1 General 23

4.5.1.2.2 Reception with multiple receiver antenna connectors, receiver diversity 23

4.5.1.3 Duplexers 24

4.5.1.4 Power supply options 24

4.5.1.5 Ancillary RF amplifiers 24

4.5.2 *BS type 1-H* 25

4.5.2.1 Transmit configurations 25

4.5.2.2 Receive configurations 25

4.5.2.3 Power supply options 26

4.6 Manufacturer declarations 26

4.7 Test configurations 31

4.7.1 General 31

4.7.2 Test signal used to build Test Configurations 31

4.7.3 NRTC1: Contiguous spectrum operation 32

4.7.3.1 NRTC1 generation 32

4.7.3.2 NRTC1 power allocation 32

4.7.4 NRTC2: Contiguous CA occupied bandwidth 32

4.7.4.1 NRTC2 generation 32

4.7.4.2 NRTC2 power allocation 33

4.7.5 NRTC3: Non-contiguous spectrum operation 33

4.7.5.1 NRTC3 generation 33

4.7.5.2 NRTC3 power allocation 33

4.7.6 NRTC4: Multi-band test configuration for full carrier allocation 33

4.7.6.1 NRTC4 generation 33

4.7.6.2 NRTC4 power allocation 34

4.7.7 NRTC5: Multi-band test configuration with high PSD per carrier 34

4.7.7.1 NRTC5 generation 34

4.7.7.2 NRTC5 power allocation 35

4.8 Applicability of requirements 35

4.8.1 General 35

4.8.2 Requirement set applicability 35

4.8.3 Applicability of test configurations for *single-band connector* 35

4.8.4 Applicability of test configurations for *multi-band connector* 36

4.9 RF channels and test models 37

[4.10 Relationship between SR and MSR] 37

4.11 Requirements for BS capable of multi-band operation 37

5 Operating bands and channel arrangement 38

6 Conducted transmitter characteristics 39

6.1 General 39

6.1.1 BS type 1-C 39

6.1.2 BS type 1-H 39

6.2 Base station output power 39

6.2.1 Definition and applicability 39

6.2.2 Minimum requirement 40

6.2.3 Test purpose 40

6.2.4 Method of test 40

6.2.4.1 Initial conditions 40

6.2.4.2 Procedure 41

6.2.5 Test requirement 41

6.3 Output power dynamics 41

6.3.1 General 41

6.3.2 RE power control dynamic range 41

6.3.2.1 Definition and applicability 41

6.3.2.2 Minimum requirement 41

6.3.2.3 Test purpose 42

6.3.3 Total power dynamic range 42

6.3.3.1 Definition and applicability 42

6.3.4.2 Minimum requirement 42

6.3.4.3 Test purpose 42

6.3.4.4 Method of test 42

6.3.4.4.1 Initial conditions 42

6.3.4.4.2 Procedure 42

6.3.4.5 Test requirements 43

6.4 Transmit ON/OFF power 43

6.4.1 Transmitter OFF power 43

6.4.1.1 Definition and applicability 43

6.4.1.2 Minimum requirement 44

6.4.1.3 Test purpose 44

6.4.1.4 Method of test 44

6.4.1.5 Test requirements 44

6.4.2 Transmitter transient period 44

6.4.2.1 Definition and applicability 44

6.4.2.2 Minimum requirement 44

6.4.2.3 Test purpose 45

6.4.2.4 Method of test 45

6.4.2.4.1 Initial conditions 45

6.4.2.4.2 Procedure 45

6.4.2.5 Test requirements 45

6.5 Transmitted signal quality 46

6.5.1 General 46

6.5.2 Frequency error 46

6.5.2.1 Definition and applicability 46

6.5.2.2 Minimum Requirement 46

6.5.2.3 Test purpose 46

6.5.2.4 Method of test 46

6.5.2.5 Test Requirements 46

6.5.3 Modulation quality 47

6.5.3.1 Definition and applicability 47

6.5.3.2 Minimum Requirement 47

6.5.3.3 Test purpose 47

6.5.3.4 Method of test 47

6.5.3.4.1 Initial conditions 47

6.5.3.4.2 Procedure 47

6.4.3.5 Test requirements 48

6.5.4 Time alignment error 49

6.5.4.1 Definition and applicability 49

6.5.4.2 Minimum requirement 50

6.5.4.3 Test purpose 50

6.5.4.4 Method of test 50

6.5.4.4.1 Initial conditions 50

6.5.4.4.2 Procedure 50

6.5.4.5 Test requirement 51

6.6 Unwanted emissions 51

6.6.1 General 51

6.6.2 Occupied bandwidth 52

6.6.2.1 Definition and applicability 52

6.6.2.2 Minimum Requirements 52

6.6.2.3 Test purpose 52

6.6.2.4 Method of test 52

6.6.2.4.1 Initial conditions 52

6.6.2.4.2 Procedure 53

6.6.2.5 Test requirements 53

6.6.3 Adjacent Channel Leakage Power Ratio (ACLR) 53

6.6.3.1 Definition and applicability 53

6.6.3.2 Minimum requirement 54

6.6.3.3 Test purpose 54

6.6.3.4 Method of test 54

6.6.3.4.1 Initial conditions 54

6.6.3.4.2 Procedure 54

6.6.3.5 Test requirements 55

6.6.3.5.1 General requirements 55

6.6.3.5.2 Basic limits 55

6.6.3.5.3 *BS type 1-C* 58

6.6.3.5.4 *BS type 1-H* 59

6.6.4 Operating band unwanted emissions 59

6.6.5 Transmitter spurious emissions 59

6.6.5.1 Definition and applicability 59

6.6.5.2 Minimum requirement 60

6.6.5.3 Test purpose 60

6.6.5.4 Method of test 60

6.6.5.4.1 Initial conditions 60

6.6.5.4.2 Procedure 60

6.6.5.5 Test requirements 61

6.6.5.5.1 Basic limits 61

6.6.5.5.1.1 Tx spurious emissions 61

6.6.5.5.1.2 Protection of the BS receiver of own or different BS 61

6.6.5.5.1.3 Additional spurious emissions requirements 62

6.6.5.5.1.4 Co-location with other base stations 68

6.6.5.5.3 *BS type 1-C* 72

6.6.5.5.4 *BS type 1-H* 72

6.7 Transmitter intermodulation 73

6.7.1 Definition and applicability 73

6.7.2 Minimum requirement 73

6.7.3 Test purpose 73

6.7.4 Method of test 73

6.7.4.1 Initial conditions 73

6.7.4.2 Procedure 74

6.7.5 Test requirements 75

6.7.5.1 BS type 1-C 75

6.7.5.1.1 Co-location minimum requirements 75

6.7.5.1.2 Additional requirements 75

6.7.5.2 *BS type 1-H* 75

6.7.5.2.1 Co-location minimum requirements 75

6.7.5.2.2 Intra-system minimum requirements 76

6.7.5.2.3 Additional requirements 76

7 Conducted receiver characteristics 77

7.1 General 77

7.2 Reference sensitivity level 77

7.3 Dynamic range 80

7.3.1 Definition and applicability 80

7.3.2 Minimum requirement 80

7.3.3 Test purpose 80

7.3.4 Method of test 80

7.3.4.1 Initial conditions 80

7.3.4.2 Procedure 81

7.3.5 Test requirements 81

7.4 In-band selectivity and blocking 84

7.5 Out-of-band blocking 91

7.6 Receiver spurious emissions 94

7.7 Receiver intermodulation 96

7.8 In-channel selectivity 101

7.8.1 Definition and applicability 101

8 Conducted performance requirements 104

Annex A (normative): Characteristics of interfering signals 105

Annex B (normative): Environmental requirements for the BS equipment 106

B.1 General 106

B.2 Normal test environment 106

B.3 Extreme test environment 106

B.3.1 Extreme temperature 106

B.4 Vibration 107

B.5 Power supply 107

B.6 Measurement of test environments 107

Annex C (informative): Test tolerances and derivation of test requirements 108

C.1 Measurement of transmitter 109

C.2 Measurement of receiver 111

Annex D (informative): Measurement system set-up 112

Annex E (informative): Change history 113

# Foreword

This Technical Specification 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.

# Introduction

This clause is optional. If it exists, it is always the second unnumbered clause.

# 1 Scope

The present document specifies the Radio Frequency (RF) test methods and conformance requirements for NR Base Station (BS). These have been derived from, and are consistent with the NR BS specification defined in 3GPP TS 38.104 [2]. The technical specification 3GPP TS 38.141 is in 2 parts:

1. 3GPP TS 38.141-1 (the present document) covers conducted test requirements
2. 3GPP TS 38.141-2 [3] covers radiated requirements.

A *BS type 1-C* requires only conducted requirements so requires compliance to part 1 of the specification only.

As *BS type 1-H* has both conducted and radiated requirements so requires compliance to the applicable requirements of part 1 and part 2 of the specification.

BS *type 1-O* and *2-O* have only radiated requirements so require compliance to part 2 of the specification only.

# 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 38.104: "NR Base Station (BS) radio transmission and reception"

[3] 3GPP TS 38.141-2: “NR, Base Station (BS) conformance testing, Part 2: Radiated conformance testing”

[4] ITU-R Recommendation M.1545, “Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000”

[5] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain"

[6] IEC 60 721-3-3: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations"

[7] IEC 60 721-3-4: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weather protected locations"

[8] IEC 60 721: "Classification of environmental conditions"

[9] IEC 60 068-2-1 (2007): "Environmental testing - Part 2: Tests. Tests A: Cold"

[10] IEC 60 068-2-2: (2007): "Environmental testing - Part 2: Tests. Tests B: Dry heat"

[11] IEC 60 068-2-6: (2007): "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)"

[12] ITU-R Recommendation SM.328: "Spectra and bandwidth of emissions"

[13] Federal Communications Commission: “Title 47 of the Code of Federal Regulations (CFR)”

[14] ECC/DEC/(17)06: “The harmonised use of the frequency bands 1427-1452 MHz and 1492-1518 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)”

[15] 3GPP TR 25.942: "RF system scenarios"

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions 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].

**aggregated BS channel bandwidth:** the RF bandwidth in which a Base Station transmits and receives multiple contiguously aggregated carriers. The *aggregated BS channel bandwidth* is measured in MHz

**antenna connector:** connector at the conducted interface of the *BS type 1-C*

**active transmitter unit:** transmitter unit which is ON, and has the ability to send modulated data streams that are parallel and distinct to those sent from other transmitter units to a *BS type 1-C* *antenna connector*, or to one or more *BS type 1-H* *TAB connectors* at the *transceiver array boundary*

**Base Station RF Bandwidth**: RF bandwidth in which a base station transmits and/or receives single or multiple carrier(s) within a supported *operating band*

NOTE: In single carrier operation, the *Base Station RF Bandwidth* is equal to the *BS channel bandwidth*.

**Base Station RF Bandwidth edge:** frequency of one of the edges of the *Base Station RF Bandwidth*

**basic limit:** emissions limit relating to the power supplied by a single transmitter to a single antenna transmission line in ITU-R SM.329 [2] used for the formulation of unwanted emission requirements for FR1

**BS channel bandwidth**: RF bandwidth supporting a single NR RF carrier with the transmission bandwidth configured in the uplink or downlink

NOTE 1: The *BS channel bandwidth* is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

NOTE 2: It is possible for the BS to transmit to and/or receive from one or more UE bandwidth parts that are smaller than or equal to the BS transmission bandwidth configuration, in any part of the BS transmission bandwidth configuration.

**BS type 1-C:** NR base station operating at FR1 with requirements set consisting only of conducted requirements defined at individual *antenna connectors*

**BS type 1-H:** NR base station operating at FR1 with a requirement set consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB

**BS type 1-O:** NR base station operating at FR1 with a requirement set consisting only of OTA requirements defined at the RIB

NOTE: *BS type 1-O* conformance requirements are captured in TS 38.141-2 [3] and are out of scope of this specification.

**BS type 2-O:** NR base station operating at FR2 with a requirement set consisting only of OTA requirements defined at the RIB

NOTE: *BS type 2-O* conformance requirements are captured in TS 38.141-2 [3] and are out of scope of this specification.

**channel edge:** lowest or highest frequency of the NR carrier, separated by the *BS channel bandwidth*

**carrier aggregation:** aggregation of two or more component carriers in order to support wider transmission bandwidths

**carrier aggregation configuration:** a set of one or more *operating bands* across which the BS aggregates carriers with a specific set of technical requirements

**contiguous carriers:** set of two or more carriers configured in a spectrum block where there are no RF requirements based on co-existence for un-coordinated operation within the spectrum block

**contiguous spectrum:** spectrum consisting of a contiguous block of spectrum with no sub-block gap(s)

**highest carrier:** The carrier with the highest carrier frequency transmitted/received in a specified frequency band

**inter-band carrier aggregation:** carrier aggregation of component carriers in different operating bands

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

**intra-band contiguous carrier aggregation:** *contiguous carriers* aggregated in the same operating band

**intra-band non-contiguous carrier aggregation:** non-contiguous carriers aggregated in the same operating band

**[Inter RF Bandwidth gap:** frequency gap between two consecutive Base Station RF Bandwidths that are placed within two supported *operating bands*]

**lowest carrier:** the carrier with the lowest carrier frequency transmitted/received in a specified frequency band

**lower sub-block edge:** frequency at the lower edge of one *sub-block*

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

**maximum carrier output power:** mean power level measured per carrier at the indicted interface, during the *transmitter ON period* in a specified reference condition

**maximum total output power:** mean power level measured within the *operating band* at the indicated interface, during the *transmitter ON period* in a specified reference condition

**measurement bandwidth**: RF bandwidth in which an emission level is specified

**multi-band connector**: *antenna* connector of the *BS type 1-C* or *TAB connector* of the *BS type 1-H* associated with a transmitter or receiver that is characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different *operating band* than the other carrier(s) and where this different *operating band* is not a sub-band or superseding-band of another supported operating band

**multi-carrier transmission configuration:** set of one or more contiguous or non-contiguous carriers that a BS is able to transmit simultaneously according to the manufacturer’s specification

**non-contiguous spectrum:** spectrum consisting of two or more sub-blocks separated by *sub-block gap*(s)

**operating band:** frequency range in which NR operates (paired or unpaired), that is defined with a specific set of technical requirements

NOTE: The *operating band*(s) for a BS is declared by the manufacturer according to the designations in tables 5.2-1 and 5.2-2.

**Radio Bandwidth:** frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier

**rated carrier output power:** mean power level associated with a particular carrier the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition

**rated total output power:** mean power level associated with a particular *operating band* the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition

**requirement set:** one of the NR base station requirement’s set as defined for *BS type 1-C*, *BS type 1-H*, *BS type 1-O*, and *BS type 2-O*

**single-band connector:** *antenna connector* of the *BS type 1-C* or *TAB connector* of the *BS type 1-H* supporting operation either in a single *operating band* only, or in multiple *operating bands* but does not meet the conditions for a *multi-band connector*

**sub-block:** one contiguous allocated block of spectrum for transmission and reception by the same base station

NOTE: There may be multiple instances of sub-blocks within a Base Station RF Bandwidth.

**sub-block gap:** frequency gap between two consecutive sub-blocks within a Bae Station RF Bandwidth, where the RF requirements in the gap are based on co-existence for un-coordinated operation

**TAB connector:** *transceiver array boundary* connector

**TAB connector RX min cell group:** *operating band* specific declared group of *TAB connectors* to which *BS type 1-H* conducted RX requirements are applied

NOTE: Within this definition, the group corresponds to the group of *TAB connectors* which are responsible for receiving a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells with reception on all *TAB connectors* supporting an *operating band*, but its existence is not limited to that condition

**TAB connector TX min cell group:** *operating band* specific declared group of *TAB connectors* to which *BS type 1-H* conducted TX requirements are applied.

NOTE: Within this definition, the group corresponds to the group of *TAB connectors* which are responsible for transmitting a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells with transmission on all *TAB connectors* supporting an *operating band*, but its existence is not limited to that condition

**transceiver array boundary:** conducted interface between the transceiver unit array and the composite antenna

**transmitter OFF period:** time period during which the BS transmitter is not allowed to transmit

**transmitter ON period:** time period during which the BS transmitter is transmitting data and/or reference symbols

**transmitter transient period:** time period during which the transmitter is changing from the OFF period to the ON period or vice versa

**upper sub-block edge:** frequency at the upper edge of one *sub-block*

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

## 3.2 Symbols

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

 Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel

BWChannel *BS channel bandwidth*

BWChannel\_CA *Aggregated BS Channel Bandwidth*, expressed in MHz. BWChannel\_CA= Fedge\_high- Fedge\_low.

BWChannel,block Sub-block bandwidth, expressed in MHz. BWChannel,block= Fedge,block,high- Fedge,block,low.

BWConfig Transmission bandwidth configuration, expressed in MHz, where BWConfig = *N*RB x SCS x 12 kHz

Δf Separation between the channel edge frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency

Δfmax f\_offsetmax minus half of the bandwidth of the measuring filter

ΔFGlobal Global frequency raster granularity

ΔfOBUE Maximum offset of the *operating band* unwanted emissions mask from the downlink *operating band* edge

ΔfOOB Maximum offset of the out-of-band boundary from the uplink *operating band* edge

ΔFRaster Channel raster granularity

ΔSUL Channel raster offset for SUL

FC *RF reference frequency* on the channel raster

FC,block, high Fc of the highest transmitted/received carrier in a sub-block

FC,block, low Fc of the lowest transmitted/received carrier in a sub-block

FC\_low The Fc of the lowest carrier, expressed in MHz

FC\_high The Fc of the highest carrier, expressed in MHz

Fedge\_low The lower edge of *Aggregated BS Channel Bandwidth*, expressed in MHz. Fedge\_low = FC\_low - Foffset\_low

Fedge\_high The upper edge of *Aggregated BS Channel Bandwidth*, expressed in MHz. Fedge\_high = FC\_high + Foffset\_high.

Fedge,block,low The lower sub-block edge, where Fedge,block,low = FC,block,low - Foffset\_low

Fedge,block,high The upper sub-block edge, where Fedge,block,high = FC,block,high + Foffset\_high

Foffset\_high Frequency offset from FC\_high to the upper *Base Station RF Bandwidth edge*, or from F C,block, high to the upper sub-block edge

Foffset\_low Frequency offset from FC\_low to the lower *Base Station RF Bandwidth edge*, or from FC,block, low to the lower sub-block edgeFDL\_low The lowest frequency of the downlink *operating band*

FDL\_high The highest frequency of the downlink *operating band*

f\_offset Separation between the channel edge frequency and the centre of the measuring filter

f\_offsetmax The offset to the frequency ΔfOBUE outside the downlink *operating band*

FREF RF reference frequency

FREF,SUL  RF reference frequency for Supplementary Uplink (SUL) bands

FDL\_low The lowest frequency of the downlink *operating band*

FDL\_high The highest frequency of the downlink *operating band*

FUL\_low The lowest frequency of the uplink *operating band*

FUL\_high The highest frequency of the uplink *operating band*

Ncells The declared number corresponding to the minimum number of cells that can be transmitted by an *BS type 1-H* in a particular *operating band*

NRB Transmission bandwidth configuration, expressed in resource blocks

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

NRXU,active The number of active receiver units. The same as the number of *demodulation branches* to which compliance is declared for chapter 8 performance requirements

NRXU,counted The number of active receiver units that are taken into account for conducted Rx spurious emission scaling, as calculated in subclause 7. 6.1

NRXU,countedpercell The number of active receiver units that are taken into account for conducted RX spurious emissions scaling per cell, as calculated in subclause 7.6.1

NTXU,counted The number of *active transmitter units* as calculated in subclause 6.1, that are taken into account for conducted TX output power limit in subclause 6.2.1, and for unwanted TX emissions scaling

NTXU,countedpercell The number of *active transmitter units* that are taken into account for conducted TX emissions scaling per cell, as calculated in subclause 6.1

Pmax,c,AC*Maximum carrier output power* measuredper *antenna connector*

Pmax,c,cell The *maximum carrier output power* per *TAB connector TX min cell group*

Pmax,c,TABC The *maximum carrier output power per TAB connector*

Prated,c,AC The *rated carrier output power per antenna connector*

Prated,c,sys The sum of Prated,c,TABC for all *TAB connectors* for a single carrier

Prated,c,TABC The *rated carrier output power per TAB connector*

Prated,t,AC The *rated total output power* declared at the antenna connector

Prated,t,TABC The *rated total output power* declared at *TAB connector*

PREFSENS Conducted Reference Sensitivity power level

SSREF SS block reference frequency position

Wgap Sub-block gap or Inter RF Bandwidth gap size

## 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].

AAS Active Antenna System

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

AWGN Additive White Gaussian Noise

BS Base Station

BW Bandwidth

CA Carrier Aggregation

CACLR Cumulative ACLR

CW Continuous Wave

E-UTRA Evolved UTRA

EVM Error Vector Magnitude

FDD Frequency Division Duplex

FR Frequency Range

GSCN Global Synchronization Channel Number

GSM Global System for Mobile communications

ITU‑R Radiocommunication Sector of the International Telecommunication Union

ICS In-Channel Selectivity

LA Local Area

LNA Low Noise Amplifier

MR Medium Range

NR New Radio

NR-ARFCN NR Absolute Radio Frequency Channel Number

OBUE Operating Band Unwanted Emissions

OTA Over The Air

RDN Radio Distribution Network

REFSENS Reference Sensitivity

RF Radio Frequency

RIB Radiated Interface Boundary

RMS Root Mean Square (value)

RX Receiver

SCS Sub-Carrier Spacing

SDL Supplementary Downlink

SUL Supplementary Uplink

TAB Transceiver Array Boundary

TAE Time Alignment Error

TDD Time division Duplex

TX Transmitter

# 4 General conducted test conditions and declarations

## 4.1 Measurement uncertainties and test requirements

Editor’s note: Detailed structure of the subclause and the ones below is TBD.

### 4.1.1 General

The requirements of this clause apply to all applicable tests in part 1 of this specification, i.e. to all conducted tests.

The minimum requirements are given in TS 38.104 [2] and the references therein. Test Tolerances for the conducted test requirements explicitly stated in the present document are given in annex C of the present document.

Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the minimum requirements to create test requirements.

When a test requirement differs from the corresponding minimum requirement, then the Test Tolerance applied for the test is non-zero. The Test Tolerance for the test and the explanation of how the minimum requirement has been relaxed by the Test Tolerance are given in annex C.

### 4.1.2 Acceptable uncertainty of Test System

#### 4.1.2.1 General

The maximum acceptable uncertainty of the Test System is specified below for each test defined explicitly in the present specification, where appropriate. The maximum acceptable uncertainty of the Test System for test requirements included by reference is defined in the respective referred test specification.

For *BS type 1-H* when a requirement is applied per *TAB connector* then the test uncertainty is applied to the measured value. When a requirement is applied for a group of *TAB connectors* then the test uncertainty is applied to sum of the measured power on each *TAB connector* in the group.

The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified tolerance and the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests, it should be noted that the uncertainties in subclause 4.1.2 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

#### 4.1.2.2 Measurement of transmitter

Table 4.1.2.2-1: Maximum Test System uncertainty for transmitter tests

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| --- | --- | --- |
| 6.2 Base Station output power | ±0.7 dB, f ≤ 3.0 GHz  ±1.0 dB, 3.0 GHz < f ≤ 4.2 GHz  ±1.5 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.3 Output power dynamics | ± 0.4 dB |  |
| 6.4.1 Transmit ON/OFF power | ±2.0 dB , f ≤ 3.0 GHz  ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.4.2 Transmitter transient period | N/A |  |
| 6.5.1 Frequency error | ± 12 Hz |  |
| 6.5.2 EVM | [± 1%] |  |
| 6.5.3 Time alignment error | [± 25ns] |  |
| 6.6.2 Occupied bandwidth | 5 MHz, 10 MHz BS Channel BW: ±100 kHz  15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz, 50 MHz BS Channel BW: ±300 kHz  60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz BS Channel BW: ±[600] kHz |  |
| 6.6.3 Adjacent Channel Leakage power Ratio (ACLR) | ACLR/ CACLR  BW ≤ 20MHz: ±0.8 dB  BW > 20MHz: ±1.2 dB  Absolute power ±2.0 dB, f ≤ 3.0 GHz  Absolute power ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  Absolute power ±3.0 dB, 4.2 GHz < f ≤ 6.0 GHz  CACLR  BW ≤ 20MHz: ±0.8 dB  BW > 20MHz: ±1.2 dB  CACLR absolute power ±2.0 dB , f ≤ 3.0 GHz  CACLR absolute power ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  CACLR absolute power ±3.0 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.6.4 Operating band unwanted emissions | ±1.5 dB , f ≤ 3.0 GHz  ±1.8 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.2 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.6. 5.2.1 Transmitter spurious emissions, Mandatory Requirements | 9 kHz < f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 19 GHz: ±4.0 dB  19 GHz < f ≤ 26 GHz: TBD |  |
|  |  |  |
| 6.6. 5.2.2 Transmitter spurious emissions, Protection of BS receiver | ±3.0 dB |  |
| 6.6. 5.2.3 Transmitter spurious emissions, Additional spurious emission requirements | ±2.0 dB for > -60 dBm , f ≤ 3.0 GHz  ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.0 dB, 4.2 GHz < f ≤ 6.0 GHz  [TBD, 6 GHz < f ≤ 26.0 GHz]  ±3.0 dB for ≤ -60 dBm , f ≤ 3.0 GHz  ±3.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±4.0 dB, 4.2 GHz < f ≤ 6.0 GHz  TBD, 6 GHz < f ≤ 26.0 GHz |  |
| 6.6. 5.2.4 Transmitter spurious emissions, Co-location | ±3.0 dB |  |
|  |  |  |
|  |  |  |
|  |  |  |
| 6.7 Transmitter intermodulation  (interferer requirements)  This tolerance applies to the stimulus and not the measurements defined in 6.6.6, 6.6.5 and 6.6.3 | The value below applies only to the interfering signal and is unrelated to the measurement uncertainty of the tests (6.6.1, 6.6.2 and 6.6.4) which have to be carried out in the presence of the interferer.  ±1.0 dB | The uncertainty of interferer has double the effect on the result due to the frequency offset |

#### 4.1.2.3 Measurement of receiver

Table 4.1.2.3-1: Maximum Test System Uncertainty for receiver tests

| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| --- | --- | --- |
| 7.2 Reference sensitivity level | ±0.7 dB, f ≤ 3.0GHz  ±1.0 dB, 3.0GHz < f ≤ 4.2GHz  ±1.5 dB, 4.2GHz < f ≤ 6.0GHz |  |
| 7.3 Dynamic range | ±0.3 dB |  |
| 7.4.1 Adjacent channel selectivity | ±1.4 dB , f ≤ 3.0 GHz  ±1.8 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.5 dB, 4.2 GHz < f ≤ 6.0 GHz | Overall system uncertainty comprises three quantities:  1. Wanted signal level error  2. Interferer signal level error  3. Additional impact of interferer leakage  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer leakage effect is systematic, and is added arithmetically.  Test System uncertainty = [SQRT (wanted\_level\_error2 + interferer\_level\_error2)] + leakage effect.  f ≤ 3.0 GHz  Wanted signal level ±0.7 dB  Interferer signal level ±0.7 dB  3.0 GHz < f ≤ 4.2 GHz  Wanted signal level ±1.0 dB  Interferer signal level ±1.0 dB  f ≤ 4.2 GHz  Impact of interferer leakage 0.4 dB |
| 7.4.2 In-band blocking (General blocking) | ±1.6 dB, f ≤ 3.0GHz  ±2.0 dB, 3.0GHz < f ≤ 4.2GHz  ±2.7 dB, 4.2GHz < f ≤ 6.0GHz |  |
| 7.4.2 In-band blocking  (Narrow band blocking) | ±1.4 dB, f ≤ 3.0GHz  ±1.8 dB, 3.0GHz < f ≤ 4.2GHz  ±2.5 dB, 4.2GHz < f ≤ 6.0GHz |  |
| 7.5 Out-of-band blocking | 1 MHz ≤ finterferer ≤ 3 GHz: ±1.3 dB  3 GHz < finterferer ≤ 12.75 GHz: ±3.2 dB | Overall system uncertainty comprises three quantities:  1. Wanted signal level error  2. Interferer signal level error  3. Interferer broadband noise  Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer Broadband noise effect is systematic, and is added arithmetically.  Test System uncertainty = [SQRT (wanted\_level\_error2 + interferer\_level\_error2)] + Broadband noise effect.  Out of band blocking, using CW interferer:  Wanted signal level:  ±0.7 dB up to 3 GHz  ±1.0 dB up to 4.2 GHz  Interferer signal level:  ±1.0 dB up to 3 GHz  ±3.0 dB up to 12.75 GHz  Impact of interferer Broadband noise 0.1 dB |
| 7.6 Receiver spurious emissions | 30 MHz ≤ f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 19 GHz: ±4.0 dB  19 GHz < f ≤ 26 GHz: TBD |  |
| 7.7 Receiver intermodulation (General requirements) | ±1.8 dB , f ≤ 3.0 GHz  ±2.4 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.3 dB, 4.2 GHz < f ≤ 6.0 GHz | Overall system uncertainty comprises four quantities:  1. Wanted signal level error  2. CW Interferer level error  3. Modulated Interferer level error  4. Impact of interferer ACLR  The effect of the closer CW signal has twice the effect.  Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals. The interferer ACLR effect is systematic, and is added arithmetically.  Test System uncertainty = SQRT [(2 x CW\_level\_error)2 +(mod interferer\_level\_error)2 +(wanted signal\_level\_error)2] + ACLR effect.  f ≤ 3.0 GHz  Wanted signal level ± 0.7dB  CW interferer level ± 0.5 dB  Mod interferer level ± 0.7 dB  3.0 GHz < f ≤ 4.2 GHz  Wanted signal level ± 1.0 dB  CW Interferer level ± 0.7 dB  Mod Interferer level ± 1.0 dB  f ≤ 4.2 GHz  Impact of interferer ACLR 0.4 dB |
| 7.7 Receiver intermodulation (Narrowband requirements) | ±1.8 dB , f ≤ 3.0 GHz  ±2.4 dB, 3.0 GHz < f ≤ 4.2 GHz  TBD, 4.2 GHz < f ≤ 6.0 GHz | Same as Receiver intermodulation (General requirements). |
| 7.8 In-channel selectivity | ±1.4 dB, f ≤ 3.0GHz  ±1.8 dB, 3.0GHz < f ≤ 4.2GHz  ±2.5 dB, 4.2GHz < f ≤ 6.0GHz |  |
| NOTE: Unless otherwise noted, only the Test System stimulus error is considered here. The effect of errors in the throughput measurements or the BER/FER due to finite test duration is not considered. | | |

### 4.1.3 Interpretation of measurement results

Square brackets on the Shared Risk text to be removed or the text to be changed once the OTA test procedures and MU for BS type 1-O and BS type 2-O are stable enough.

[The measurement results returned by the Test System are compared - without any modification - against the test requirements as defined by the Shared Risk principle.

The Shared Risk principle is defined in Recommendation ITU-R M.1545 [4].]

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in subclause 4.1.2 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in subclause 4.1.2, it is still permitted to use this apparatus provided that an adjustment is made as follows.

Any additional uncertainty in the Test System over and above that specified in subclause 4.1.2 shall be used to tighten the test requirement, making the test harder to pass. For some tests e.g. receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with subclause 4.1.2 does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with subclause 4.1.2 had been used.

## 4.2 Conducted requirement reference points

### 4.2.1 *BS type 1-C*

*BS type 1-C* requirements are applied at the BS *antenna connector* (port A) for a single transmitter or receiver with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as an amplifier, a filter or the combination of such devices is used, requirements apply at the far end *antenna connector* (port B).



Figure 4.2.1-1: *BS type 1-C* transmitter interface



Figure 4.2.1-2: *BS type 1-C* receiver interface

### 4.2.2 *BS type 1-H*

*BS type 1-H* requirements are defined for two points of reference, signified by radiated requirements and conducted requirements.

****

Figure 4.2.2-1: Radiated and conducted reference points for *BS type 1-H*

Radiated characteristics are defined over the air (OTA), where the *operating band* specific radiated interface is referred to as the *Radiated Interface Boundary* (RIB). Radiated requirements are also referred to as OTA requirements. The (spatial) characteristics in which the OTA requirements apply are detailed for each requirement.

NOTE: Radiated conformance requirements are captured in TS 38.141-2 [3] and are out of scope of this specification.

Conducted characteristics are defined at individual or groups of *TAB connectors* at the *transceiver array boundary*, which is the conducted interface between the transceiver unit array and the composite antenna.

The transceiver unit array is part of the composite transceiver functionality generating modulated transmit signal structures and performing receiver combining and demodulation.

The transceiver unit array contains an implementation specific number of transmitter units and an implementation specific number of receiver units. Transmitter units and receiver units may be combined into transceiver units. The transmitter/receiver units have the ability to transmit/receive parallel independent modulated symbol streams.

The composite antenna contains a radio distribution network (RDN) and an antenna array. The RDN is a linear passive network which distributes the RF power generated by the transceiver unit array to the antenna array, and/or distributes the radio signals collected by the antenna array to the transceiver unit array, in an implementation specific way.

How a conducted requirement is applied to the *transceiver array boundary* is detailed in the respective requirement subclause.

## 4.3 Base station classes

The requirements in this specification apply to Wide Area Base Stations, Medium Range Base Stations and Local Area Base Stations unless otherwise stated.

BS classes for *BS type 1-C* and 1-H are defined as indicated below:

- Wide Area Base Stations are characterised by requirements derived from Macro Cell scenarios with a BS to UE minimum coupling loss equal to 70 dB.

- Medium Range Base Stations are characterised by requirements derived from Micro Cell scenarios with a BS to UE minimum coupling loss equals to 53 dB.

- Local Area Base Stations are characterised by requirements derived from Pico Cell scenarios with a BS to minimum coupling loss equal to 45 dB.

## 4.4 Regional requirements

Some requirements in the present document may only apply in certain regions either as optional requirements, or as mandatory requirements set by local and regional regulation. It is normally not stated in the 3GPP specifications under what exact circumstances the regional requirements apply, since this is defined by local or regional regulation.

Table 4.4-1 lists all requirements in the present specification that may be applied differently in different regions.

Table 4.4-1: List of regional requirements

| Clause number | Requirement | Comments |
| --- | --- | --- |
|  | Operating bands | Some NR operating bands may be applied regionally. |
|  | Occupied bandwidth | The requirement may be applied regionally. There may also be regional requirements to declare the occupied bandwidth according to the definition in present specification. |
|  | Absolute ACLR | The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  | Limits in FCC Title 47 | The BS may have to comply with the additional requirements, when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer. |
|  | Operating band unwanted emissions | The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  | Tx spurious emissions | Category A or Category B spurious emission limits, as defined in ITU-R Recommendation SM.329 [2], may apply regionally.  The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  | Tx spurious emissions: additional requirements | These requirements may be applied for the protection of system operating in frequency ranges other than the BS operating band. |
|  | Rx spurious emissions | The emission limits specified as the *basic limit* + X [dB] are applicable, unless stated differently in regional regulation. |
|  |  |  |

## 4.5 BS configurations

### 4.5.1 *BS type 1-C*

#### 4.5.1.1 Transmit configurations

Further consideration needed whether to reuse subclause 4.5.7 from 36.141 (i.e. “BS using antenna arrays”).

##### 4.5.1.1.1 General

Unless otherwise stated, the transmitter characteristics in clause 6 are specified at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a TX amplifier, a filter or the combination of such devices is used, requirements apply at the far end antenna connector (test port B).



Figure 4.5.1.1.1-1: Transmitter test ports

##### 4.5.1.1.2 Transmission with multiple transmitter antenna connectors

Unless otherwise stated, for the tests in clause 6 of the present document, the requirement applies for each transmitter *antenna connector* in the case of transmission with multiple transmitter *antenna connectors*.

Transmitter requirements are tested at the *antenna connector*, with the remaining *antenna connector(s)* being terminated. If the manufacturer has declared the transmitter paths to be equivalent, it is sufficient to measure the signal at any one of the transmitter *antenna connectors*.

#### 4.5.1.2 Receive configurations

##### 4.5.1.2.1 General

Unless otherwise stated, the receiver characteristics in clause 7 are specified at the BS *antenna connector* (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a RX amplifier, a filter or the combination of such devices is used, requirements apply at the far end *antenna connector* (test port B).



Figure 4.5.1.2.1-1: Receiver test ports

##### 4.5.1.2.2 Reception with multiple receiver antenna connectors, receiver diversity

For the tests in clause 7 of the present document, the requirement applies at each receiver *antenna connector* for receivers with antenna diversity or in the case of multi-carrier reception with multiple receiver *antenna connectors*.

Receiver requirements are tested at the *antenna connector*, with the remaining receiver(s) disabled or their *antenna connector(s)* being terminated. If the manufacturer has declared the receiver paths to be equivalent, it is sufficient to apply the specified test signal at any one of the receiver *antenna connectors*.

For a *BS type 1-C* supporting multi-band operation, multi-band tests for [ACS, blocking and intermodulation] are performed with the interferer(s) applied to each *antenna connector* mapped to the receiver for the wanted signal(s), however only to one *antenna connector* at a time. *Antenna connectors* to which no signals are applied are terminated.

#### 4.5.1.3 Duplexers

The requirements of the present document shall be met with a duplexer fitted, if a duplexer is supplied as part of the BS. If the duplexer is supplied as an option by the manufacturer, sufficient tests should be repeated with and without the duplexer fitted to verify that the BS meets the requirements of the present document in both cases.

The following tests shall be performed with the duplexer fitted, and without it fitted if this is an option:

1) subclause 6.2, base station output power, for the highest static power step only, if this is measured at the antenna connector;

2) subclause 6.6, unwanted emissions; outside the BS transmit band;

3) subclause 6.6.4.5.3, protection of the BS receiver;

4) subclause 6.7, transmit intermodulation; for the testing of conformance, the carrier frequencies should be selected to minimize intermodulation products from the transmitters falling in receive channels.

The remaining tests may be performed with or without the duplexer fitted.

NOTE 1: When performing receiver tests with a duplexer fitted, it is important to ensure that the output from the transmitters does not affect the test apparatus. This can be achieved using a combination of attenuators, isolators and filters.

NOTE 2: When duplexers are used, intermodulation products will be generated, not only in the duplexer but also in the antenna system. The intermodulation products generated in the antenna system are not controlled by 3GPP specifications, and may degrade during operation (e.g. due to moisture ingress). Therefore, to ensure continued satisfactory operation of a BS, an operator will normally select NR-ARFCNs to minimize intermodulation products falling on receive channels. For testing of complete conformance, an operator may specify the NR-ARFCNs to be used.

#### 4.5.1.4 Power supply options

If the BS is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

This applies particularly if a BS contains a DC rail which can be supplied either externally or from an internal mains power supply. In this case, the conditions of extreme power supply for the mains power supply options can be tested by testing only the external DC supply option. The range of DC input voltages for the test should be sufficient to verify the performance with any of the power supplies, over its range of operating conditions within the BS, including variation of mains input voltage, temperature and output current.

#### 4.5.1.5 Ancillary RF amplifiers

The requirements of the present document shall be met with the ancillary RF amplifier fitted. At tests according to clauses 6 and 7 for TX and RX respectively, the ancillary amplifier is connected to the BS by a connecting network (including any cable(s), attenuator(s), etc.) with applicable loss to make sure the appropriate operating conditions of the ancillary amplifier and the BS. The applicable connecting network loss range is declared by the manufacturer. Other characteristics and the temperature dependence of the attenuation of the connecting network are neglected. The actual attenuation value of the connecting network is chosen for each test as one of the applicable extreme values. The lowest value is used unless otherwise stated.

Sufficient tests should be repeated with the ancillary amplifier fitted and, if it is optional, without the ancillary RF amplifier to verify that the BS meets the requirements of the present document in both cases.

When testing, the following tests shall be repeated with the optional ancillary amplifier fitted according to the table below, where x denotes that the test is applicable:

Table 4.5.1.5-1: Tests applicable to Ancillary RF Amplifiers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Receiver Tests | Subclause | TX amplifier only | RX amplifier only | TX/RX amplifiers combined (Note) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Transmitter Tests |  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

NOTE: Combining can be by duplex filters or any other network. The amplifiers can either be in RX or TX branch or in both. Either one of these amplifiers could be a passive network.

In test according to subclauses 6.2 and 7.2 highest applicable attenuation value is applied.

### 4.5.2 *BS type 1-H*

#### 4.5.2.1 Transmit configurations

Unless otherwise stated, the conducted transmitter characteristics in clause 6 are specified at the *transceiver array boundary* at the *TAB connector(s)* antenna connector with a full complement of transceiver units for the configuration in normal operating conditions.



Figure 4.5.2.1-1: Transmitter test ports

Unless otherwise stated, for the tests in clause 6 of the present document, the requirement applies for each transmit *TAB connector.*

#### 4.5.2.2 Receive configurations

Unless otherwise stated, the conducted receiver characteristics in clause 7 are specified at the *TAB connector* with a full complement of transceiver units for the configuration in normal operating conditions.



Figure 4.5.2.2-1: Receiver test ports

For the tests in clause 7 of the present document, the requirement applies at each receive *TAB connector*.

Conducted receive requirements are tested at the *TAB connector*, with the remaining receiver units(s) disabled or their *TAB connector*(s) being terminated.

#### 4.5.2.3 Power supply options

If the *BS type 1-H* is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

## 4.6 Manufacturer declarations

The following BS declarations listed in table 4.6-1 are required to be provided by the manufacturer for the conducted requirements testing of the *BS type 1-C* and *BS type 1-H*.

For the *BS type 1-H* declarations required for the radiated requirements testing, refer to 3GPP TS 38.141-2 [3].

Table 4.6-1 Manufacturer declarations for *BS type 1-C* and *BS type 1-H* conducted test requirements

| Declaration identifier | Declaration | Description | Applicability | |
| --- | --- | --- | --- | --- |
| *BS type 1-C* | *BS type 1-H* |
| D6.2 | BS requirements set | Declaration of one of the NR base station *requirement’s set* as defined for *BS type 1-C*, or *BS type 1-H*. | x | x |
| D6.71 | BS class | BS class of the BS, declared as Wide Area BS, Medium Range BS, or Local Area BS. | x | x |
| D6.1 | NR operating bands | NR operating bands supported. Declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
|  |  |  |  |  |
| D6.3 | Spurious emission category | Declare the BS spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [5]. | x | x |
| D6.4 | Geographic area support | The manufacturer shall declare the regions the BS may operate in. e.g. CEPT. | x | x |
| [D6.5] | [Band n20 support, operating in geographical areas allocated to broadcasting (DTT)] | *Editor’s note: this declaration is subject to technical discussion on the applicability of the DTT protection from NR BS.*  [If the BS has *single band connector(s)* or *multi-band connector(s)* declared to support Band n20 the manufacturer shall declare if the BS may operate in geographical areas allocated to broadcasting (DTT).] | [x] | [x] |
| [D6.6] | [Band n20 support, emission level for channel N (PEM,N)] | *Editor’s note: this declaration is subject to technical discussion on the applicability of the DTT protection from NR BS.*  [If the BS has *sin single band connector(s)* or *multi-band connector(s)* declared to support Band n20 and has been declared to operate in geographical areas allocated to broadcasting (DTT), the emission level for channel N (Annex G of 3GPP TS 36.104 [x]) shall be declared.] | [x] | [x] |
| [D6.7] | [Band n20 support, Maximum output Power in [10] MHz (P10MHz)] | *Editor’s note: this declaration is subject to technical discussion on the applicability of the DTT protection from NR BS.*  [If the BS has *single band connector(s)* or *multi-band connector(s)* declared to support Band n20 and has been declared to operate in geographical areas allocated to broadcasting (DTT), the maximum output power in [10] MHz (Annex G of 3GPP TS 36.104 [11]) shall be declared.] | [x] | [x] |
| D6.10 | Co-existence with other systems | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA, PHS and/or NR operating in another band are deployed. | x | x |
| D6.11 | Co-location with other base stations | The manufacturer shall declare whether the BS under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or NR operating in another band. | x | x |
|  |  |  |  |  |
| D6.13 | *Single band connector* or *multi-band connector* | Declaration of the single band or multi-band capability of *single band connector(s)* or *multi-band connector(s),* declared for every connector. | x | x |
| [D6.14] | [Contiguous or non-contiguous spectrum] | [Ability to support contiguous or non-contiguous (or both) frequency distribution of carriers when operating multi-carrier, per *single band connector* or *multi-band connector*, per *operating band*.] | [x] | [x] |
| D6.15 | Contiguous and non-contiguous parameters identical | If contiguous and non-contiguous operation is possible then parameters are the same. | x | x |
| D6.16 | Maximum *Radio Bandwidth* | Maximum *radio bandwidth* that can be supported by the *multi-band connector*. May be different for transmit and receive.  Declared for each supported *operating band* and operating bands combination (D6.41) supported for every *multi-band connector.* | x | x |
| D6.17 | Maximum *Base Station RF Bandwidth* | Maximum *Base Station RF Bandwidth* in the *operating band*. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.18 | Maximum *Base Station RF Bandwidth* for contiguous operation | Maximum *Base Station RF Bandwidth* for contiguous spectrum operation. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.19 | Maximum *Base Station RF Bandwidth* for non- contiguous operation | Maximum *Base Station RF Bandwidth* for non-contiguous spectrum operation. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.20 | NR supported channel bandwidths and SCS | NR *channel bandwidth* and SCS supported. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.21 | *Single band connector* / *multi-band connector* supported *operating bands* | List of *operating bands* and band combinations supported by each *single band connector* or *multi-band connector*. | x | x |
| D6.22 | CA only operation | Declaration of CA-only operation, declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D6.23 | Single or multiple carrier | Capable of operating with a single carrier (only) or multiple carriers. Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.24 | Maximum number of supported carriers per operating band | Maximum number of supported carriers per supported *operation band.* Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.25 | Total maximum number of supported carriers | Maximum number of supported carriers for all supported *operating bands. D*eclared for all connectors (D6.21)*.* | x | x |
|  |  |  |  |  |
|  |  |  |  |  |
| [D6.28] | [Other band combination multi-band restrictions] | *Editor’s note: this declaration applicability to NR is FFS.*  [Declare any other limitations under simultaneous operation in the declared band combinations (D6.41) for each *multi-band connector* which have any impact on the test configuration generation.  Declared for every *multi-band connector*.] | x | x |
| D6.30 | Rated carrier output power(Prated,c,AC, or Prated,c,TABC) | Conducted rated carrier output power, per *single band connector* or *multi-band connector.*  Declared per supported *operating band*, per supported RAT, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D6.31 | Rated carrier output power for contiguous spectrum operation | Conducted rated carrier output power for contiguous spectrum operation*.*  Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.32 | Rated carrier output power for non-contiguous spectrum operation | Conducted rated carrier output power for non-contiguous spectrum operation*.*  Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
|  |  |  |  |  |
| D6.34 | R*ated total output power* (Prated,t,AC, or Prated,t,TABC) | Conducted total rated output power*.*  Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.*  For *multi-band connectors* declared for each supported *operating band* in each supported band combination. | x | x |
| D6.35 | R*ated total output power* for contiguous spectrum operation | Conducted total rated output power for contiguous spectrum operation*.*  Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.36 | R*ated total output power* for non-contiguous spectrum operation | Conducted total rated output power for non-contiguous spectrum operation*.*  Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| [D6.37] | [Rated multi-band total output power, Prated,MB,TABC] | *Editor’s note: FFS until the needs for Prated,MB,TABC in the specification is confirmed.*  [Conducted multi-band rated total output power*.*  Declared per supported operating band combinations, per *multi-band connector*.] | [x] | [x] |
| D6.38 | Ncells | Number corresponding to the minimum number of cells that can be transmitted by a BS in a particular operating band with transmission on all *TAB connectors* supporting the *operating band*. |  | x |
| D6.39 | Maximum supported power difference between carriers | Maximum supported power difference between carriers. Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D6.40 | Maximum supported power difference between carriers is different *operating bands* | Supported power difference between any two carriers in any two different supported *operating bands.* Declared per supported operating band combination, per *multi-band connector.* | x | x |
| D6.41 | Operating band combination support | List of operating bands combinations supported by the BS. | x | x |
| D6.42 | Total number of supported carriers for the declared band combinations of BS | Total number of supported carriers for the declared band combinations (D6.41) of the BS. | x | x |
| D6.43 | Intra-system interfering signal declaration list | List of *single band connector(s)* or *multi-band connector(s)* for which an intra-system interfering signal level is required to be declared. Declaration is required if the intra-system interfering signal level is larger than the co-location interfering signal level. | x | x |
| D6.44 | Intra-system interfering signal level | The interfering signal level in dBm. Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H* covered by D6.43. | x | x |
| D6.54 | [DL RS transmission groups] | [Groups of *single band connector(s)* or *multi-band connector(s)* which are declared to transmit DL RS. Declared per supported *operating band*.] | x | x |
| D6.58 | TAE groups | Set of declared *TAB connector beam forming groups* on which the TAE requirements apply.  *All TAB connectors* belong to at least one *TAB connector beam forming group* (even if it's a *TAB connector beam forming group* consisting of one connector).  The smallest possible number of *TAB connector beam forming groups* need to be declared such that there is no *TAB connector* not contained in at least one of the declared *TAB connector beam forming groups*.  Declared per supported *operating band*. |  | x |
| D6.59 | Inter-band CA | Band combinations declared to support inter-band CA (per CA capable *multi-band connector(s)*, as in D6.22).  Declared for every *multi-band connector* which support CA. | x | x |
| D6.60 | Intra-band contiguous CA | Bands declared to support intra-band contiguous CA (per CA capable *single band connector(s)* or *multi-band connector(s)*, as in D6.22).  Declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D6.61 | Intra-band non-contiguous | Bands declared to support intra-band non-contiguous CA (per CA capable *single band connector(s)* or *multi-band connector(s)*, as in D6.22).  Declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D6.70 | Equivalent connectors | List of *antenna connectors* of *BS type 1-C*, or *TAB connector* of *BS type 1-H*, which have been declared equivalent.  Equivalent connectors imply that the *antenna connector* of *BS type 1-C*, or *TAB connector* of *BS type 1-H*, are expected to behave in the same way when presented with identical signals under the same operating conditions. All declarations made for the *antenna connector* of *BS type 1-C*, or *TAB connector* of *BS type 1-H* are identical and the transmitter unit and/or receiver unit driving the *antenna connector* of *BS type 1-C* or *TAB connector* of *BS type 1-H* are of identical design. | x | x |
|  |  |  |  |  |
| D6.72 | *TAB connector RX min cell group* | Declared as a group of *TAB connectors* to which RX requirements are applied. This declaration corresponds to group of *TAB connectors* which are responsible for receiving a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells (Ncells) with transmission on all *TAB connectors* supporting an *operating band*. |  | x |
| D6.73 | *TAB connector TX min cell group* | Declared group of *TAB connectors* to which TX requirements are applied. This declaration corresponds to group of *TAB connectors* which are responsible for transmitting a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells (Ncells) with transmission on all *TAB connectors* supporting an *operating band*. |  | x |

## 4.7 Test configurations

### 4.7.1 General

The test configurations shall be constructed using the methods defined below, subject to the parameters declared by the manufacturer for the supported RF configurations as listed in subclause 4.6.x. The test configurations to use for conformance testing are defined for each supported RF configuration in subclauses 4.8.3 and 4.8.4.

The applicable test models for generation of the carrier transmit test signal are defined in subclause 4.9.

NOTE: In case, carriers are shifted to align with the channel raster Foffset.

### 4.7.2 Test signal used to build Test Configurations

The signal’s Channel Bandwidth and Subcarrier spacing used to build NR Test Configurations shall be selected according to table 4.7.2-1.

Table 4.7.2-1: Signal to be used to build NR TCs

|  |  |  |  |
| --- | --- | --- | --- |
| Operating Band characteristics | | <100 MHz | ≥ 100 MHz |
| TC signal characteristics | BWchannel | 5 MHz (Note 1) | 20 MHz (Note 1) |
| Subcarrier spacing | Smallest supported subcarrier spacing | |
| Note 1: If this channel bandwidth is not supported, the narrowest supported channel bandwidth shall be used. | | | |

### 4.7.3 NRTC1: Contiguous spectrum operation

The purpose of test configuration NRTC1 is to test all BS requirements excluding CA occupied bandwidth.

For NRTC1 used in receiver tests only the two outermost carriers within each supported operating band need to be generated by the test equipment;

#### 4.7.3.1 NRTC1 generation

NRTC1 shall be constructed on a per band basis using the following method:

- Declared maximum Base Station RF Bandwidth supported for contiguous spectrum operation shall be used;

- Select the carrier to be tested according to 4.7.2 and place it adjacent to the lower Base Station RF Bandwidth edge. Place same signal adjacent to the upper Base Station RF Bandwidth edge.

- For transmitter tests, select as many carriers (according to 4.7.2) that the BS supports within a band and fit in the rest of the declared maximum Base Station RF Bandwidth. Place the carriers adjacent to each other starting from the upper Base Station RF Bandwidth edge. The nominal carrier spacing defined in subclause 5.x shall apply.

The test configuration should be constructed sequentially on a per band basis for all component carriers of the inter-band CA bands declared to be supported by the BS and are transmitted using the same antenna port. All configured component carriers are transmitted simultaneously in the tests where the transmitter should be on.

#### 4.7.3.2 NRTC1 power allocation

Set the power spectral density of each carrier to the same level so that the sum of the carrier powers equals the rated total output power Prated,t,AC (or Prated,t,TABC) according to the manufacturer’s declaration in subclause 4.6.x.

### 4.7.4 NRTC2: Contiguous CA occupied bandwidth

NRTC2 in this subclause is used to test CA occupied bandwidth.

#### 4.7.4.1 NRTC2 generation

The CA specific test configuration should be constructed on a per band basis using the following method:

- All component carrier combinations supported by the BS, which have different sum of channel bandwidth of component carrier, shall be tested. For all component carrier combinations which have the same sum of channel bandwidth of component carriers, only one of the component carrier combinations shall be tested.

- Of all component carrier combinations which have same sum of channel bandwidth of component carrier, select those with the narrowest carrier at the lower Base Station RF Bandwidth edge.

- Of the combinations selected in the previous step, select one with the narrowest carrier at the upper Base Station RF Bandwidth edge.

- If there are multiple combinations fulfilling previous steps, select the one with the smallest number of component carrier.

- If there are multiple combinations fulfilling previous steps, select the one with the widest carrier being adjacent to the lowest carrier.

- If there are multiple combinations fulfilling previous steps, select the one with the widest carrier being adjacent to the highest carrier

- If there are multiple combinations fulfilling previous steps, select the one with the widest carrier being adjacent to the carrier which has been selected in the previous step.

- If there are multiple combinations fulfilling previous steps, repeat the previous step until there is only one combination left.

- The nominal carrier spacing defined in subclause 5.x shall apply.

#### 4.7.4.2 NRTC2 power allocation

Set the power spectral density of each carrier to be the same level so that the sum of the carrier powers equals the rated total output power Prated,t,AC (or Prated,t,TABC) for NR according to the manufacturer’s declaration in subclause 4.6.x.

### 4.7.5 NRTC3: Non-contiguous spectrum operation

The purpose of NRTC3 is to test all BS requirements excluding CA occupied bandwidth.

For NRTC3 used in receiver tests, outermost carriers for each sub-block need to be generated by the test equipment; other supported carriers are optional to be generated.

#### 4.7.5.1 NRTC3 generation

NRTC3 is constructed on a per band basis using the following method:

- The Base Station RF Bandwidth shall be the maximum Base Station RF Bandwidth supported for non-contiguous spectrum operation. The Base Station RF Bandwidth consists of one sub-block gap and two sub-blocks located at the edges of the declared maximum supported Base Station RF Bandwidth.

- Select the carrier to be tested according to 4.7.2. Place it adjacent to the upper Base Station RF Bandwidth edge and another carrier (as described in 4.7.2) adjacent to the lower Base Station RF Bandwidth edge.

- For single-band operation receiver tests, if the remaining gap is at least 15 MHz (or 60 MHz if channel bandwidth of the carrier to be tested is 20 MHz) plus two times the channel BW used in the previous step and the BS supports at least 4 carriers, place a carrier of this BW adjacent to each already placed carrier for each sub-block. The nominal carrier spacing defined in subclause 5.x shall apply.

- The sub-block edges adjacent to the sub-block gap shall be determined using the specified FOffset for the carriers adjacent to the sub-block gap.

#### 4.7.5.2 NRTC3 power allocation

Set the power of each carrier to the same level so that the sum of the carrier powers equals the rated total output power Prated,t,AC (or Prated,t,TABC) according to the manufacturer’s declaration in subclause 4.6.x.

### 4.7.6 NRTC4: Multi-band test configuration for full carrier allocation

The purpose of NRTC4 is to test multi-band operation aspects considering maximum supported number of carriers.

#### 4.7.6.1 NRTC4 generation

NRTC4 is based on re-using the previously specified test configurations (NRTC1, NRTC2 and NRTC3) applicable per band involved in multi-band operation. It is constructed using the following method:

- The Base Station RF Bandwidth of each supported operating band shall be the declared maximum Base Station RF Bandwidth in multi-band operation.

- The number of carriers of each supported operating band shall be the declared maximum number of supported carriers in multi-band operation. Carriers shall be selected according to 4.7.2 and shall first be placed at the outermost edges of the declared maximum Radio Bandwidth. Additional carriers shall next be placed at the Base Station RF Bandwidths edges, if possible.

- The allocated Base Station RF Bandwidth of the outermost bands shall be located at the outermost edges of the declared maximum Radio Bandwidth.

- Each concerned band shall be considered as an independent band and the carrier placement in each band shall be according to NRTC1, where the declared parameters for multi-band operation shall apply. The mirror image of the single-band test configuration shall be used in each alternate band(s) and in the highest band being.

-- If only three carriers are supported, two carriers shall be placed in one band according to the relevant test configuration while the remaining carrier shall be placed at the edge of the maximum *Radio Bandwidth* in the other band.

- If the sum of the maximum Base Station RF Bandwidths of each supported operating bands is larger than the declared Total RF Bandwidth of transmitter and receiver for the declared band combinations of the BS, repeat the steps above for test configurations where the Base Station RF Bandwidth of one of the operating band shall be reduced so that the Total RF Bandwidth BWtot of transmitter and receiver is not exceeded and vice versa.

- If the sum of the maximum number of supported carrier of each supported operating bands in multi-band operation is larger than the declared total number of supported carriers for the declared band combinations of the BS, repeat the steps above for test configurations where in each test configuration the number of carriers of one of the operating band shall be reduced so that the total number of supported carriers is not exceeded and vice versa.

#### 4.7.6.2 NRTC4 power allocation

Unless otherwise stated, set the power of each carrier in all supported operating bands to the same power so that the sum of the carrier powers equals the total output power according to the manufacturer’s declaration.

If the allocated power of a supported operating band(s) exceeds the declared rated total output power Prated,t,AC (or Prated,t,TABC) of the operating band(s) in multi-band operation, the exceeded part shall, if possible, be reallocated into the other band(s). If the power allocated for a carrier exceeds the rated output power declared for that carrier, the exceeded power shall, if possible, be reallocated into the other carriers.

### 4.7.7 NRTC5: Multi-band test configuration with high PSD per carrier

The purpose of NRTC5 is to test multi-band operation aspects considering higher PSD cases with reduced number of carriers and non-contiguous operation (if supported) in multi-band mode.

#### 4.7.7.1 NRTC5 generation

NRTC5 is based on re-using the existing test configuration applicable per band involved in multi-band operation. It is constructed using the following method:

- The Base Station RF Bandwidth of each supported operating band shall be the declared maximum Base Station RF Bandwidth in multi-band operation.

- The allocated Base Station RF Bandwidth of the outermost bands shall be located at the outermost edges of the declared Maximum Radio Bandwidth.

- The maximum number of carriers is limited to two per band. Carriers shall be selected according to 4.7.2 and shall first be placed at the outermost edges of the declared Maximum Radio Bandwidth for outermost bands and at the Base Station RF Bandwidths edges for middle band(s) if any. Additional carriers shall next be placed at the Base Station RF Bandwidths edges, if possible.

- Each concerned band shall be considered as an independent band and the carrier placement in each band shall be according to NRTC3, where the declared parameters for multi-band operation shall apply. [Narrowest supported NR channel bandwidth and smallest subcarrier spacing shall be used in the test configuration].

- If only one carrier can be placed for the concerned band(s), the carrier(s) shall be placed at the outermost edges of the declared maximum radio bandwidth for outermost band(s) and at one of the outermost edges of the supported frequency range within the Base Station RF Bandwidths for middle band(s) if any.

- If the sum of the maximum Base Station RF Bandwidth of each supported operating bands is larger than the declared Total RF Bandwidth BWtot of transmitter and receiver for the declared band combinations of the BS, repeat the steps above for test configurations where the Base Station RF Bandwidth of one of the operating band shall be reduced so that the Total RF Bandwidth BWtot of transmitter and receiver is not exceeded and vice versa.

#### 4.7.7.2 NRTC5 power allocation

Unless otherwise stated, set the power of each carrier in all supported operating bands to the same power so that the sum of the carrier powers equals the total output power according to the manufacturer’s declaration.

If the allocated power of a supported operating band(s) exceeds the declared rated total output power Prated,t,AC (or Prated,t,TABC) of the operating band(s) in multi-band operation, the exceeded part shall, if possible, be reallocated into the other band(s). If the power allocated for a carrier exceeds the rated output power declared for that carrier, the exceeded power shall, if possible, be reallocated into the other carriers.

## 4.8 Applicability of requirements

*Editor’s note: this section contains the tables which show which test configurations are applied to each of the test requirements.*

*These tables could be expanded to also capture which TM and which channels are to be tested.*

### 4.8.1 General

### 4.8.2 Requirement set applicability

*Editor’s note: this section contains the tables which show which is applicable for which BS type.*

In table 4.8.2-1, the requirement applicability for each requirement set is defined. For each requirement, the applicable requirement subclause in the specification is identified.

**Table 4.8.2-1: Requirement set applicability**

| **Requirement** | **Requirement set** | | |
| --- | --- | --- | --- |
|  | **1-C** | **1-H** |
| BS output power | 6.2.2.5.1 | 6.2.2.5.2 |
| Output power dynamics | 6.3 | 6.3 |
| Transmit ON/OFF power | 6.4 | 6.4 |
| Transmitted signal quality | 6.5 | 6.5 |
| Occupied bandwidth | 6.6.2 | 6.6.2 |
| ACLR | 6.6.3.5.3 | 6.6.3.5.4 |
| Operating band unwanted  emissions | 6.6.4.5.3 | 6.6.4.5.4 |
| Transmitter spurious emissions | 6.6.5.5.3 | 6.6.5.5.4 |
| Transmitter intermodulation | 6.7.5.1 | 6.7.5.2 |
| Reference sensitivity level | 7.2 | 7.2 |
| Dynamic range | 7.3 | 7.3 |
| In-band selectivity and blocking | 7.4 | 7.4 |
| Out-of-band blocking | 7.5 | 7.5 |
| Receiver spurious emissions | 7.6.5.2 | 7.6.5.3 |
| Receiver intermodulation | 7.7 | 7.7 |
| In-channel selectivity | 7.8 | 7.8 |
| Performance requirements | 8 | 8 |

### 4.8.3 Applicability of test configurations for *single-band connector*

The applicable test configurations are specified in the tables below for each the supported RF configuration, which shall be declared according to subclause 4.6. The generation and power allocation for each test configuration is defined in subclause 4.7. This subclause contains the test configurations for *single-band connector*.

For a NR BS declared to be capable of single carrier operation only, a single carrier (SC) shall be used for testing.

For a *single-band connector* declared to support multi-carrier and/or CA operation in contiguous spectrum operation, the test configurations in the second column of table 4.8.3-1 shall be used for testing.

For a *single-band connector* declared to support multi-carrier and/or CA operation in contiguous and non-contiguous spectrum and where the parameters in the manufacture's declaration according to subclause 4.6 are identical for contiguous (C) and non-contiguous (NC) spectrum operation, the test configurations in the third column of table 4.8.3-1 shall be used for testing.

For a *single-band connector* declared to support multi-carrier and/or CA in contiguous and non-contiguous spectrum and where the parameters in the manufacture's declaration according to subclause 4.6 are not identical for contiguous and non-contiguous spectrum operation, the test configurations in the fourth column of table 4.8.3-1 shall be used for testing.

Table 4.8.3-1: Test configurations for a *single-band connector*

|  |  |  |  |
| --- | --- | --- | --- |
| BS test case | Contiguous spectrum capable BS | C and NC capable BS with identical parameters | C and NC capable BS with different parameters |
| Base station output power | NRTC1 | [NRTC1] | NRTC1, NRTC3 |
| RE Power control dynamic range | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude |
| Total power dynamic range | SC | SC | SC |
| Transmit ON/OFF power (only applied for NR TDD BS) | NRTC1 | [NRTC1] | NRTC1, NRTC3 |
| Frequency error | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude |
| Error Vector Magnitude | NRTC1 | [NRTC1] | NRTC1, NRTC3 |
| Time alignment error | NRTC1 | [NRTC1] | NRTC1, NRTC3 |
| Occupied bandwidth | SC, NRTC2 (Note 1) | SC, NRTC2 (Note 1) | SC, NRTC2 (Note 1) |
| Adjacent Channel Leakage power Ratio (ACLR) | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| Cumulative ACLR requirement in non-contiguous spectrum | - | NRTC3 | NRTC3 |
| Operating band unwanted emissions | NRTC1, [SC (Note 2)] | NRTC1, NRTC3, [SC (Note 2)] | NRTC1, NRTC3, [SC (Note 2)] |
| Transmitter spurious emissions | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| Transmitter intermodulation | NRTC1 | NRTC1, NRTC3 | NRTC1, NRTC3 |
| Reference sensitivity level | SC | SC | SC |
| Dynamic range | SC | SC | SC |
| Adjacent Channel Selectivity (ACS) | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| In-band blocking | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| Out-of-band blocking | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| Receiver spurious emissions | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| Receiver intermodulation | NRTC1 | NRTC3 | NRTC1, NRTC3 |
| In-channel selectivity | SC | SC | SC |
| Note 1: NRTC2 is only applicable when contiguous CA is supported.  [Note 2:  OBUE SC shall be tested using the widest supported Channel Bandwidth and the highest supported sub-carrier spacing.] | | | |

*Editor’s note: The applicability of test configuration for multi-band operation using single-band connector is FFS.*

### 4.8.4 Applicability of test configurations for *multi-band connector*

For a *multi-band connector*, the test configuration in Table 4.8.4-1 shall be used for testing.

Table 4.8.4-1: Test configuration for a *multi-band connector*

|  |  |
| --- | --- |
| BS test case | Test configuration |
| Base station output power | NRTC1/3 (Note 1), NRTC4 |
| RE Power control dynamic range | Tested with Error Vector Magnitude |
| Total power dynamic range | SC |
| Transmit ON/OFF power (only applied for NR TDD BS) | NRTC4 |
| Frequency error | Tested with Error Vector Magnitude |
| Error Vector Magnitude | NRTC1/3 (Note 1), NRTC4 |
| Time alignment error | NRTC1/3 (Note 1), NRTC5 (Note 2) |
| Occupied bandwidth | SC, NRTC2 (Note 3) |
| Adjacent Channel Leakage power Ratio (ACLR) | NRTC1/3 (Note 1), NRTC5 (Note 4) |
| Cumulative ACLR requirement in non-contiguous spectrum | NRTC3 (Note 1), NRTC5 (Note 4) |
| Operating band unwanted emissions | NRTC1/3 (Note 1), NRTC5,  [SC (Note 5)] |
| Transmitter spurious emissions | NRTC1/3 (Note 1), NRTC5 |
| Transmitter intermodulation | NRTC1/3 (Note 1) |
| Reference sensitivity level | SC |
| Dynamic range | SC |
| Adjacent Channel Selectivity(ACS) | NRTC5 |
| In-band blocking | NRTC5 |
| Out-of-band blocking | NRTC5 |
| Receiver spurious emissions | NRTC1/3 (Note 1), NRTC5 |
| Receiver intermodulation | NRTC5 |
| In-channel selectivity | SC |
| Note 1: NRTC1 and/or NRTC3 shall be applied in each supported operating band.  Note 2: NRTC5 is only applicable when inter-band CA is supported.  Note 3: NRTC2 is only applicable when contiguous CA is supported.  Note 4: NRTC5 may be applied for Inter RF Bandwidth gap only.  [Note 5: OBUE SC shall be tested using the widest supported Channel Bandwidth and the highest supported sub-carrier spacing.] | |

## 4.9 RF channels and test models

*Editor’s note: to capture multi-carrier/CA operation, contiguous/non-contiguous operation*

## [4.10 Relationship between SR and MSR]

*Editor’s note: whether this subclause is needed will depend on the MSR specification work*

## 4.11 Requirements for BS capable of multi-band operation

For *multi-band connector* the conducted test requirements in clause 6 and 7 apply separately to each supported *operating band* unless otherwise stated. For some conducted test requirements, it is explicitly stated that specific additions or exclusions to the requirement apply at *multi-band connector(s)* as detailed in the requirement subclause. For *BS type 1-C* capable of multi-band operation, various structures in terms of combinations of different transmitter and receiver implementations (multi-band or single band) with mapping of transceivers to one or more *antenna* *connectors* for *BS type 1-C* or *TAB connectors* for *BS type 1-H* in different ways are possible. For *multi-band connector(s)* the exclusions or provisions for multi-band apply. For *single-band antenna connector(s)*, the following applies:

- Single-band transmitter spurious emissions, *operating band* unwanted emissions, ACLR, transmitter intermodulation and receiver spurious emissions requirements apply to this *antenna connector* that is mapped to single-band.

- If the BS is configured for single-band operation, single-band requirements shall apply to this *antenna connector* configured for single-band operation and no exclusions or provisions for multi-band capable BS are applicable. Single-band requirements are tested separately at the *antenna connector* configured for single-band operation, with all other *antenna connectors* terminated.

A *BS type 1-H* may be capable of supporting operation in multiple *operating bands* with one of the following implementations of *TAB connectors* in the *transceiver array boundary*:

- All *TAB connectors* are *single-band connectors*.

- Different sets of *single-band connectors* support different *operating bands*, but each *TAB connector* supports only operation in one single *operating band*.

- Sets of *single-band connectors* support operation in multiple *operating bands* with some *single-band connectors* supporting more than one *operating band*.

- All *TAB connectors* are multi-band *connectors*.

- A combination of single-band sets and multi-band sets of *TAB connectors* provides support of the type *BS type 1-H* capability of operation in multiple *operating bands*.

Unless otherwise stated all conducted test requirements specified for an *operating band* apply only to the set of *TAB connectors* supporting that *operating band*.

In the case of an *operating band* being supported only by *single-band connectors* in a *TAB connector TX min cell group* or a *TAB connector RX min cell group*, *single-band requirements* apply to that set of *TAB connectors*.

In the case of an *operating band* being supported only by *multi-band connector*s supporting the same *operating band* combination in a *TAB connector TX min cell group* or a *TAB connector RX min cell group*, *multi-band requirements* apply to that set of *TAB connectors*.

The case of an *operating band* being supported by both *multi-band connectors* and *single-band connectors* in a *TAB connector TX min cell group* or a *TAB connector RX min cell group* is FFS and is not covered by the present release of this specification.

The case of an *operating band* being supported by *multi-band connectors* which are not all supporting the same *operating band* combination in a *TAB connector TX min cell group* or a *TAB connector RX min cell group* is FFS and is not covered by the present release of this specification.

For *multi-band connectors* supporting the bands for TDD, the RF requirements in the present specification assume no simultaneous uplink and downlink occur between the bands.

The conducted test requirements for *multi-band connectors* supporting bands for both FDD and TDD are FFS and are not covered by the present release of this specification.

# 5 Operating bands and channel arrangement

Detailed structure of the subclause is TBD.

# 6 Conducted transmitter characteristics

## 6.1 General

### 6.1.1 BS type 1-C

General test conditions for conducted transmitter tests are given in clause 4, including interpretation of measurement results and configurations for testing. BS configurations for the tests are defined in subclause 4.5.

If a number of *single-band connectors*, or *multi-band connectors* have been declared equivalent (see table 4.10-1, D6.70), only a representative one is necessary to demonstrate conformance.

### 6.1.2 BS type 1-H

General test conditions for conducted transmitter tests are given in clause 4, including interpretation of measurement results and configurations for testing. BS configurations for the tests are defined in subclause 4.5.

If a number of *single-band connectors*, or *multi-band connectors* have been declared equivalent (see table 4.10-1, D6.70), only a representative one is necessary to demonstrate conformance.

In subclause 6.6, if representative *TAB connectors* are used then per connector criteria (i.e. option 2 in TS 38.104 [2], subclause 6.6.3.4) shall be applied.

The manufacturer shall declare the minimum number of supported geographical cells (i.e. geographical areas). The minimum number of supported geographical cells (Ncells) relates to the BS setting with the minimum amount of cell splitting supported with transmission on all *TAB connectors* supporting the *operating band*. The manufacturer shall also declare *TAB connector TX min cell groups*. Every *TAB connector* supporting transmission in an *operating band* shall map to one *TAB connector TX min cell group* supporting the same*.* The mapping of *TAB connector*s to cells is implementation dependent.

The number of *active transmitter units* that are considered when calculating the emissions limit (NTXU, counted) for *BS type 1-H* is calculated as follows:

NTXU, counted = *min(NTXU,active, 8·Ncells)*

Further:

NTXU,countedpercell = NTXU,counted/Ncells

NTXU,countedpercell is used for scaling the *basic limits* as described in subclause 6.6.

NOTE: NTXU,active depends on the actual number of *active transmitter unit*s and is independent to the declaration of Ncells.

## 6.2 Base station output power

### 6.2.1 Definition and applicability

The conducted BS output power requirements are specified at *single-band connector*, or at *multi-band connector*.

The *rated carrier output power* of the *BS type 1-C* shall be as specified in table 6.2.1-1.

Table 6.2.1-1: *Rated carrier output power* limits for *BS type 1-C*

|  |  |
| --- | --- |
| BS class | Prated,c,AC |
| Wide Area BS | (Note) |
| Medium Range BS | < 38 dBm |
| Local Area BS | < 24 dBm |
| NOTE: There is no upper limit for the Prated,c,AC rated output power of the Wide Area Base Station. | |

The *rated carrier output power* of the *BS type 1-H* shall be as specified in table 6.2.1-2.

Table 6.2.1-2: *Rated carrier output power* limits for *BS type 1-H*

| BS class | Prated,c,sys | Prated,c,TABC |
| --- | --- | --- |
| Wide Area BS | (Note) | (Note) |
| Medium Range BS | ≤ 38 dBm +10log(NTXU,counted) | ≤ 38 dBm |
| Local Area BS | ≤ 24 dBm +10log(NTXU,counted) | ≤ 24 dBm |
| NOTE: There is no upper limit for the PRated,c,sys or PRated,c,TABC of the Wide Area Base Station. | | |

The *maximum carrier output power* (Pmax,c,AC, or Pmax,c,TABC) for the respective BS shall be compared to the *rated carrier output power* (i.e. Prated,c,AC, Prated,c,TABC, or Prated,c,sys) limits in tables 6.2.1-1 and 6.2.1-2 for the declared BS class (see table 4.6-1, D6.71). The absolute value of the *maximum carrier output power* is not subject to testing, while its output power accuracy relative to the declared value is.

### 6.2.2 Minimum requirement

The minimum requirement applies per *single-band connector*, or per *multi-band connector* supporting transmission in the *operating band*.

The minimum requirement for *BS type 1-C* is defined in TS 38.104 [2], subclause 6.2.2.

The minimum requirement for *BS type 1-H* is defined in TS 38.104 [2], subclause 6.2.3.

### 6.2.3 Test purpose

The test purpose is to verify the accuracy of the *maximum carrier output power* across the frequency range and under normal and extreme conditions.

### 6.2.4 Method of test

##### 6.2.4.1 Initial conditions

Test environment:

* Normal, see annex B.2,
* Extreme, see annex B.3.

RF channels to be tested for single carrier: B, M and T; see subclause 4.9.1

*Base Station RF Bandwidth* positions to be tested for multi-carrier and/or CA:

* BRFBW, MRFBW and TRFBW for *single-band connector(s)*, see subclause 4.9.1.
* BRFBW\_T'RFBW and B'RFBW\_TRFBW for *multi-band connector(s)*, see subclause 4.9.1.

In case of extreme test environment, it is sufficient to test on a single combination of one NR-ARFCN, one RF bandwidth position and with only one applicable test configuration defined in subclause 4.7.

NOTE: Tests under extreme power supply also test extreme temperature.

##### 6.2.4.2 Procedure

For *BS type 1-H* where there may be multiple *TAB connectors*, they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex X.x. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1) Connect the power measuring equipment to *single-band connector(s)* or to *multi-band connector(s)* under test as shown in annex X.x. All connectors not under test shall be terminated.

2) Set each connector under test to output according to the applicable test configuration in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.2. For single carrier set the connector under test to transmit at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30).

3) Measure the *maximum carrier output power* (Pmax,c,AC for *BS type 1-C* and Pmax,c,TABC for *BS type 1-H*) for each carrier at each connector under test.

In addition, for *multi-band connectors*, the following steps shall apply:

4) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

### 6.2.5 Test requirement

For each *single-band connector* or *multi-band connector* under test, the power measured in subclause 6.2.4.2 in step 3 shall remain within the values provided in table 6.2.5-1 for normal and extreme test environments, relative to the manufacturer's declared PRated,c,AC for *BS type 1-C*, or relative to the manufacturer's declared PRated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30):

Table 6.2.5-1: Test requirement for conducted BS output power

|  |  |  |
| --- | --- | --- |
|  | Normal test environment | Extreme test environment |
| *BS type 1-C*,  *BS type 1-H* | f  ≤ 3.0 GHz: ± 2.7 dB | f  ≤ 3.0 GHz: ± 3.2 dB |
| 3.0 GHz < f ≤ 4.2 GHz: ± 3.0 dB | 3.0 GHz < f ≤ 4.2 GHz: ± 3.5 dB |
| 4.2 GHz < f ≤ 6.0 GHz: ± 3.5 dB | 4.2 GHz < f ≤ 6.0 GHz: ± 4.0 dB |

## 6.3 Output power dynamics

### 6.3.1 General

The requirements in subclause 6.3 apply during the *transmitter ON period*. Transmit signal quality requirements (as specified in subclause 6.5) shall be maintained for the output power dynamics requirements of this subclause.

### 6.3.2 RE power control dynamic range

#### 6.3.2.1 Definition and applicability

The RE power control dynamic range is the difference between the power of an RE and the average RE power for a BS at *maximum carrier output power* (PRated,c,AC, or PRated,c,TABC) for a specified reference condition.

#### 6.3.2.2 Minimum requirement

The minimum requirement applies per *single-band connector*, or per *multi-band connector* supporting transmission in the *operating band*.

The minimum requirement for *BS type 1-C* and for *BS type 1-H* is defined in TS 38.104 [2], subclause 6.3.2.2.

#### 6.3.2.3 Test purpose

No specific test or test requirements are defined for conducted RE power control dynamic range. The Error Vector Magnitude (EVM) test, as described in subclause 6.5.4 provides sufficient test coverage for this requirement.

### 6.3.3 Total power dynamic range

#### 6.3.3.1 Definition and applicability

The BS total power dynamic range is the difference between the maximum and the minimum transmit power of an OFDM symbol for a specified reference condition.

NOTE: The upper limit of the dynamic range is the OFDM symbol power for a BS at maximum output power. The lower limit of the total power dynamic range is the average power for single RB transmission. The OFDM symbol shall carry PDSCH and not contain RS, PBCH or synchronisation signals.

#### 6.3.4.2 Minimum requirement

The minimum requirement applies per *single-band connector*, or per *multi-band connector*.

The minimum requirement for *BS type 1-C* and for *BS type 1-H* is in TS 38.104 [2], subclause 6.3.3.2.

#### 6.3.4.3 Test purpose

The test purpose is to verify that the total power dynamic range is within the limits specified by the minimum requirement.

#### 6.3.4.4 Method of test

##### 6.3.4.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested: B, M and T; see subclause 4.9.1.

Set the channel set-up of the connector under test transmitted signal according to N-TM x.x.

##### 6.3.4.4.2 Procedure

For *BS type 1-H* where there may be multiple *TAB connectors*, they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex X.x. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1) Connect the *single-band connector(s)* or *multi-band connector(s)* under test as shown in annex X.x. All connectors not under test shall be terminated.

2) Set each connector under test to transmit at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30).

3) Measure the average OFDM symbol power as defined in annex X.x

4) Set the connector under test to transmit a signal according to N-TM x.x.

5) Measure the average OFDM symbol power as defined in annex F. The measured OFDM symbols shall not contain RS, PBCH or synchronisation signals.

6) For BS supporting 256QAM, set the channel set-up of the connector under test transmitted signal according to N-TM x.x and repeat step 3. Set the connector under test to transmit a signal according to N-TM x.x and repeat step 5.

In addition, for *multi-band connectors*, the following steps shall apply:

7) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

#### 6.3.4.5 Test requirements

The downlink (DL) total power dynamic range for each NR carrier shall be larger than or equal to the level in table 6.3.4.5-1.

Table 6.3.4.5-1: BS total power dynamic range

|  |  |  |  |
| --- | --- | --- | --- |
| NR channel bandwidth [MHz] | Total power dynamic range  [dB] | | |
| 15 kHz SCS | 30 kHz SCS | 60 kHz SCS |
| 5 | 13.5 | 10 | N/A |
| 10 | 16.7 | 13.4 | 10 |
| 15 | 18.5 | 15.3 | 12.1 |
| 20 | 19.8 | 16.6 | 13.4 |
| 25 | 20.8 | 17.7 | 14.5 |
| 30 | 21.6 | 18.5 | 15.3 |
| 40 | 22.9 | 19.8 | 16.6 |
| 50 | 23.9 | 20.8 | 17.7 |
| 60 | N/A | 21.6 | 18.5 |
| 70 | N/A | 22.3 | 19.2 |
| 80 | N/A | 22.9 | 19.8 |
| 90 | N/A | 23.4 | 20.4 |
| 100 | N/A | 23.9 | 20.9 |

NOTE 1: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex X.x.

NOTE 2: Additional test requirements for the EVM at the lower limit of the dynamic range are defined in subclause 6.5.4.

## 6.4 Transmit ON/OFF power

### 6.4.1 Transmitter OFF power

#### 6.4.1.1 Definition and applicability

Transmit OFF power requirements apply only to TDD operation of NR BS.

Transmitter OFF power is defined as the mean power measured over 70/N us filtered with a square filter of bandwidth equal to the transmission bandwidth configuration of the BS (BWConfig) centred on the assigned channel frequency during the *transmitter OFF period*. N = SCS/15, where SCS is Sub Carrier Spacing in kHz.

For *multi-band connectors*, the requirement is only applicable during the *transmitter OFF period* in all supported operating bands.

For *single band* *connectors* supporting transmission in multiple operating bands, the requirement is applicable per supported operating band.

For BS supporting intra-band contiguous CA, the transmitter OFF power is defined as the mean power measured over 70/N us filtered with a square filter of bandwidth equal to the *Aggregated BS Channel Bandwidth* BWChannel\_CA centred on (Fedge\_high+Fedge\_low)/2 during the *transmitter OFF period*. N = SCS/15, where SCS is Sub Carrier Spacing in kHz.

#### 6.4.1.2 Minimum requirement

The minimum requirement for *BS type 1-C* is in 3GPP TS 38.104 [2], subclause 6.4.1.2.

The minimum requirement for *BS type 1-H* is in 3GPP TS 38.104 [2], subclause 6.4.1.3.

#### 6.4.1.3 Test purpose

The purpose of this test is to verify the transmitter OFF power is within the limits of the minimum requirements.

#### 6.4.1.4 Method of test

Requirement is tested together with transmitter transient period, as described in subclause 6.4.2.4.

#### 6.4.1.5 Test requirements

The conformance testing of transmit OFF power is included in the conformance testing of transmitter transient period; therefore, see subclause 6.4.2.5 for test requirements.

### 6.4.2 Transmitter transient period

#### 6.4.2.1 Definition and applicability

*Transmitter transient period* requirements apply only to TDD operation of NR BS.

The *transmitter transient period* is the time period during which the transmitter unit is changing from the OFF period to the ON period or vice versa. The *transmitter transient period* is illustrated in figure 6.4.2.1-1.

Transmitter output power

Time

Transmitter ON period

(DL transmission)

Transmitter OFF

period

Transmitter OFF

period

Transmitter transient

period

OFF power level

ON power level

UL transmission

GP or UL transmission

Figure 6.4.2.1-1: Illustration of the relations of transmitter ON period,  
transmitter OFF period and transmitter transient period

This requirement applies at each *antenna connector* or *TAB connector* supporting transmission in the operating band.

#### 6.4.2.2 Minimum requirement

The minimum requirement for *BS type 1-C* and *BS type 1-H* is in 3GPP TS 38.104 [2], subclause 6.4.2.2.

#### 6.4.2.3 Test purpose

The purpose of this test is to verify the transmitter transient periods are within the limits of the minimum requirements.

#### 6.4.2.4 Method of test

##### 6.4.2.4.1 Initial conditions

Test environment:

- normal; see clause B.2.

RF channels to be tested for single carrier:

- M; see subclause 4.9.1.

RF bandwidth positions to be tested for multi-carrier and/or CA:

- MRFBW in single-band operation, see subclause 4.9.1;

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

##### 6.4.2.4.2 Procedure

The minimum requirement is applied to all *antenna connectors* or *TAB connectors*, they may be tested one at a time or multiple *antenna connectors* or *TAB connectors* may be tested in parallel as shown in subclause D.1.1. Whichever method is used the procedure is repeated until all *antenna connectors* or *TAB connectors* necessary to demonstrate conformance have been tested.

1) Connect *antenna connector* or *TAB connector* to measurement equipment as shown in subclause D.1.1. All *antenna connectors* or *TAB connectors* not under test shall be terminated.

As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity, efficiency and avoiding e.g. carrier leakage, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

2) For a Set each *antenna connector* or *TAB connector* to output according to the applicable test configuration in clause 5 using the corresponding test models or set of physical channels in subclause 4.9.2. For single carrier set the *antenna connector* or *TAB connector* to transmit at manufacturers declared *rated carrier output power per antenna connector* (PRated,c,AC)or *TAB connector* (PRated,c,TABC).

3) Measure the mean power spectral density over 70/N μs filtered with a square filter of bandwidth equal to the RF bandwidth of the *antenna connector* or *TAB connector* centred on the central frequency of the RF bandwidth. 70/N μs average window centre is set from 35/N μs after end of one transmitter ON period + 10 μs to 35/N μs before start of next transmitter ON period – 10 μs. N = SCS/15, where SCS is Sub Carrier Spacing in kHz.

4) For an *antenna connector* or *TAB connector* supporting contiguous CA, measure the mean power spectral density over 70/N μs filtered with a square filter of bandwidth equal to the Aggregated Channel Bandwidth BWChannel\_CA centred on (Fedge\_high+Fedge\_low)/2. 70/N μs average window centre is set from 35/N μs after end of one transmitter ON period + 10 μs to 35/N μs before start of next transmitter ON period – 10 μs.

In addition, for *multi-band connector(s)*, the following steps shall apply:

5) For *multi-band connectors* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

#### 6.4.2.5 Test requirements

The measured mean power spectral density according to subclause 6.4.2.4.2 shall be less than -83 dBm/MHz for carrier frequency f ≤ 3.0 GHz.

The measured mean power spectral density according to subclause 6.4.2.4.2 shall be less than -82.5 dBm/MHz for carrier frequency 3.0 GHz < f ≤ 4.2 GHz.

The measured mean power spectral density according to subclause 6.4.2.4.2 shall be less than -82 dBm/MHz for carrier frequency 4.2 GHz < f ≤ 6.0 GHz.

For *multi-band connector*, the requirement is only applicable during the transmitter OFF period in all supported operating bands.

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 4.1.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

## 6.5 Transmitted signal quality

### 6.5.1 General

Unless otherwise stated, the requirements in clause 6.5 apply during the *transmitter ON period*.

### 6.5.2 Frequency error

#### 6.5.2.1 Definition and applicability

Frequency error is the measure of the difference between the actual NR BS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

It is not possible to verify by testing that the data clock is derived from the same frequency source as used for RF generation. This may be confirmed by the manufacturer's declaration.

For *BS type 1-C* this requirement shall be applied at the *antenna connector* supporting transmission in the *operating band*.

For *BS type 1-H* this requirement shall be applied at each *TAB connector* supporting transmission in the *operating band.*

#### 6.5.2.2 Minimum Requirement

The minimum requirement is in 3GPP TS 38.104 [2], subclause 6.5.1.2.

#### 6.5.2.3 Test purpose

The test purpose is to verify that frequency error is within the limit specified by the minimum requirement.

#### 6.5.2.4 Method of test

Requirement is tested together with modulation quality test, as described in subclause 6.5.3.

#### 6.5.2.5 Test Requirements

The modulated carrier frequency of each NR carrier configured by the BS shall be accurate to within the accuracy range given in table 6.5.2.5-1 observed over 1 ms.

Table 6.5.2.5-1: Frequency error test requirement

|  |  |
| --- | --- |
| BS class | Accuracy |
| Wide Area BS | ±(0.05 ppm + 12 Hz) |
| Medium Range BS | ±(0.1 ppm + 12 Hz) |
| Local Area BS | ±(0.1 ppm + 12 Hz) |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 4.1.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

### 6.5.3 Modulation quality

#### 6.5.3.1 Definition and applicability

Modulation quality is defined by the difference between the measured carrier signal and a reference signal. Modulation quality can e.g. be expressed as Error Vector Magnitude (EVM). The Error Vector Magnitude is a measure of the difference between the ideal symbols and the measured symbols after the equalization. This difference is called the error vector.

For *BS type 1-C* this requirement shall be applied at the *antenna connector* supporting transmission in the *operating band*.

For *BS type 1-H* this requirement shall be applied at each *TAB connector* supporting transmission in the *operating band.*

#### 6.5.3.2 Minimum Requirement

The minimum requirement is in 3GPP TS 38.104 [2], subclause 6.5.2.2.

#### 6.5.3.3 Test purpose

The test purpose is to verify that modulation quality is within the limit specified by the minimum requirement.

#### 6.5.3.4 Method of test

##### 6.5.3.4.1 Initial conditions

Test environment:

- normal; see clause B.2.

RF channels to be tested for single carrier:

- B, M and T; see subclause 4.9.1.

RF bandwidth positions to be tested for multi-carrier and/or CA:

- BRFBW, MRFBW and TRFBW in single-band operation, see subclause 4.9.1; BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

##### 6.5.3.4.2 Procedure

The minimum requirement is applied to all *antenna connectors* or *TAB connectors*, they may be tested one at a time or multiple *antenna connectors* or *TAB connectors* may be tested in parallel as shown in subclause D.1.1. Whichever method is used the procedure is repeated until all *antenna connectors* or *TAB connectors* necessary to demonstrate conformance have been tested.

1) For an *antenna connector* or *TAB connector* declared to be capable of single carrier operation only, set the *antenna connector* or the *TAB connector* to transmit a signal according to NR-TM 3.1 if 256QAM is not supported by BS or according to NR-TM 3.1a if 256QAM is supported by BS, at manufacturer's declared rated output power.

For an *antenna connector* or *TAB connector* declared to be capable of multi-carrier and/or CA operation, set the *antenna connector* or the *TAB connector* to transmit according to NR-TM 3.1 if 256QAM is not supported by BS or according to NR-TM 3.1a if 256QAM is supported by BS, on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 and 4.x.

For NR-TM 3.1 and NR-TM 3.1a, power back-off shall be applied if it is declared.

2) Measure the EVM and frequency error as defined in annex F.

3) Repeat steps 1 and 2 for NR-TM 2 if 256QAM is not supported by BS or for NR-TM 2a if 256QAM is supported by BS. For NR-TM 2 and NR-TM 2a the OFDM symbol power shall be at the lower limit of the dynamic range according to the test procedure in subclause 6.3.2.4 and test requirements in subclause 6.3.2.5.

In addition, for *multi-band connector(s)*, the following steps shall apply:

4) For *multi-band connectors* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

#### 6.4.3.5 Test requirements

The EVM of each NR carrier for different modulation schemes on PDSCH shall be less than the limits in table 6.4.3.5-1.

Table 6.4.3.5-1 EVM requirements for *BS type 1-C* and *BS type 1-H*

|  |  |
| --- | --- |
| Modulation scheme for PDSCH | Required EVM (%) |
| QPSK | [18.5] % |
| 16QAM | [13.5] % |
| 64QAM | [9] % |
| 256QAM | [4.5] % |

EVM shall be evaluated for each NR carrier over all allocated resource blocks and downlink subframes and with RS density configuration of DM-RS of comb 2 (every other subcarrier) in symbol 3 and 11. Different modulation schemes listed in table 6.4.3.5-1 shall be considered for rank 1.

For NR, for all bandwidths, the EVM measurement shall be performed for each NR carrier over all allocated resource blocks and downlink subframes within 10 ms measurement periods. The boundaries of the EVM measurement periods need not be aligned with radio frame boundaries.

Table 6.4.3.5-2, 6.4.3.5-3, 6.4.3.5-4 below specify EVM window length (W) for normal CP, the cyclic prefix length for each corresponding bandwidth and subcarrier spacing for *BS type 1-C* and *BS type 1-H*.

Table 6.4.3.5-2 EVM window length for normal CP for FR1 and 15 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth MHz | FFT size | Cyclic prefix length for symbols 1‑6 in FFT samples | EVM window length *W* | Ratio of *W* to total CP for symbols 1‑6(Note 1) [%] |
| 5 | 512 | 36 | 14 | 40 |
| 10 | 1024 | 72 | 28 | 40 |
| 15 | 1536 | 108 | 44 | 40 |
| 20 | 2048 | 144 | 58 | 40 |
| 25 | 2048 | 144 | 72 | 50 |
| 30 | 3072 | 216 | 108 | 50 |
| 40 | 4096 | 288 | 144 | 50 |
| 50 | 4096 | 288 | 144 | 50 |

Table 6.4.3.5-3 EVM window length for normal CP for FR1 and 30 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth MHz | FFT size | Cyclic prefix length for symbols 1‑13 in FFT samples | EVM window length *W* | Ratio of *W* to total CP for symbols 1‑6(Note 1) [%] |
| 5 | 256 | 18 | 8 | 40 |
| 10 | 512 | 36 | 14 | 40 |
| 15 | 768 | 54 | 22 | 40 |
| 20 | 1024 | 72 | 28 | 40 |
| 25 | 1024 | 72 | 36 | 50 |
| 30 | 1536 | 108 | 54 | 50 |
| 40 | 2048 | 144 | 72 | 50 |
| 50 | 2048 | 144 | 72 | 50 |
| 60 | 3072 | 216 | 130 | 60 |
| 70 | 3072 | 216 | 130 | 60 |
| 80 | 4096 | 288 | 172 | 60 |
| 90 | 4096 | 288 | 172 | 60 |
| 100 | 4096 | 288 | 172 | 60 |

Table 6.4.3.5-4 EVM window length for normal CP for FR1 and 60 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth MHz | FFT size | Cyclic prefix length for symbols 1‑27 in FFT samples | EVM window length *W* | Ratio of *W* to total CP for symbols 1‑6(Note 1) [%] |
| 10 | 256 | 18 | 8 | 40 |
| 15 | 384 | 27 | 11 | 40 |
| 20 | 512 | 36 | 14 | 40 |
| 25 | 512 | 36 | 18 | 50 |
| 30 | 768 | 54 | 26 | 50 |
| 40 | 1024 | 72 | 36 | 50 |
| 50 | 1024 | 72 | 36 | 50 |
| 60 | 1536 | 108 | 64 | 60 |
| 70 | 1536 | 108 | 64 | 60 |
| 80 | 2048 | 144 | 86 | 60 |
| 90 | 2048 | 144 | 86 | 60 |
| 100 | 2048 | 144 | 86 | 60 |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 4.1.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

### 6.5.4 Time alignment error

#### 6.5.4.1 Definition and applicability

This requirement applies to frame timing in TX diversity, MIMO transmission, carrier aggregation and their combinations.

Frames of the NR signals present at the BS transmitter *antenna connectors* or *TAB connectors* are not perfectly aligned in time and may experience certain timing differences in relation to each other.

For *BS type 1-C*, the TAE is defined as the largest timing difference between any two signals belonging to different *antenna connectors* for a specific set of signals/transmitter configuration/transmission mode.

For *BS type 1-H*, the TAE is defined as the largest timing difference between any two signals belonging to *TAB connectors* belonging to different transmitter groups at the *transceiver array boundary*, where transmitter groups are associated with the *TAB connectors* in the transceiver unit array corresponding to TX diversity, MIMO transmission, *carrier aggregation* for a specific set of signals/transmitter configuration/transmission mode.

#### 6.5.4.2 Minimum requirement

The minimum requirements for *BS type 1-C* and *BS type 1-H* are in TS 38.104 [2], subclause 6.5.3.2.

#### 6.5.4.3 Test purpose

To verify that the time alignment error is within the limit specified by the minimum requirement.

#### 6.5.4.4 Method of test

##### 6.5.4.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see subclause 4.9.1.

RF bandwidth positions to be tested for multi-carrier and/or CA:

- MRFBW in single-band operation, see subclause 4.9.1.

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see subclause 4.11.

##### 6.5.4.4.2 Procedure

For *BS type 1-C* *antenna connectors* to be tested are for a specific set of signals/transmitter configuration/transmission mode.

For *BS type 1-H* *TAB connectors* to be tested are identified from the declared sets of *TAB connector beam forming groups* in the TAE groups declaration (see table 4.6-1, D6.58).

Compliance is to be demonstrated between all pairs of *single-band connectors and/or multi-band connectors*, however it is not required to exhaustively measure TAE between every combination of pairs of representative connectors. Compliance can be demonstrated by comparison of a reduced set of representative measurement results.

1) Conducted measurement setup:

- For *BS type 1-C*: Connect two *antenna connectors* to the measurement equipment according to annex x. Terminate any unused *antenna connector(s)*.

- For *BS type 1-H*: Connect two representative *TAB connectors* one from separate TAE group (see table 4.6-1, D6.58) to the measurement equipment according to annex x. Terminate any unused *TAB connector(s).*

2) Set the connectors under test to transmit N-TM x.x or any DL signal using TX diversity, MIMO transmission or carrier aggregation.

NOTE: For TX diversity and MIMO transmission, different ports may be configured in N-TM x.x.

3) For a connectors declared to be capable of single carrier operation only, set the representative connectors under test to transmit at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30).

If the connector under test supports intra band contiguous or non-contiguous CA, set the representative connectors to transmit using the applicable test configuration and corresponding power setting specified in subclause 4.7.

If the BS supports inter band CA, set the representative connectors to transmit, for each band, a single carrier or all carriers, using the applicable test configuration and corresponding power setting specified in subclause 4.7.

4) Measure the time alignment error between the reference symbols on the carrier(s) from the representative connectors under test.

5) Repeat step 1 - 4 for any other configuration of connectors, which could be required to demonstrate compliance.

In addition, for *multi-band connectors*, the following steps shall apply:

6) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

#### 6.5.4.5 Test requirement

For MIMO or TX diversity transmissions, at each carrier frequency, TAE shall not exceed [90] ns.

For intra-band contiguous CA, with or without MIMO or TX diversity, TAE shall not exceed [285] ns.

For intra-band non-contiguous CA, with or without MIMO or TX diversity, TAE shall not exceed [3.025µs].

For inter-band CA, with or without MIMO or TX diversity, TAE shall not exceed [3.025µs].

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex X.x.

## 6.6 Unwanted emissions

### 6.6.1 General

Unwanted emissions consist of out-of-band emissions and spurious emissions according to ITU definitions [5]. In ITU terminology, out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The out-of-band emissions requirement for the BS transmitter is specified both in terms of Adjacent Channel Leakage power Ratio (ACLR) and operating band unwanted emissions (OBUE).

The maximum offset of the operating band unwanted emissions mask from the operating band edge is ΔfOBUE. The operating band unwanted emissions define all unwanted emissions in each supported downlink *operating band* plus the frequency ranges ΔfOBUE above and ΔfOBUE below each band. Unwanted emissions outside of this frequency range are limited by a spurious emissions requirement.

The values of ΔfOBUE are defined in table 6.6.1-1 for the NR *operating bands*.

Table 6.6.1-1: Maximum offset of OBUE outside the downlink *operating band*

|  |  |  |
| --- | --- | --- |
| BS type | Operating band characteristics | ΔfOBUE [MHz] |
| *BS type 1-C* | FDL\_high – FDL\_low ≤ 200 MHz | 10 |
| 200 MHz < FDL\_high – FDL\_low ≤ 900 MHz | 40 |
| *BS type 1-H* | FDL\_high – FDL\_low < 100 MHz | 10 |
| 100 MHz ≤ FDL\_high – FDL\_low ≤ 900 MHz | 40 |

For *BS type 1-H* the unwanted emission requirements are applied per the *TAB connector TX min cell groups* for all the configurations supported by the BS. The *basic limits* and corresponding emissions scaling are defined in each relevant subclause.

There is in addition a requirement for occupied bandwidth.

### 6.6.2 Occupied bandwidth

#### 6.6.2.1 Definition and applicability

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage /2 of the total mean transmitted power.

The value of /2 shall be taken as 0.5%.

The occupied bandwidth requirement shall apply during the *transmitter ON period* for a single transmitted carrier. The minimum requirement below may be applied regionally. There may also be regional requirements to declare the occupied bandwidth according to the definition in the present clause.

For *BS type 1-C* this requirement shall be applied at the *antenna connector* supporting transmission in the *operating band*.

For *BS type 1-H* this requirement shall be appliedat each *TAB connector* supporting transmission in the *operating band.*

#### 6.6.2.2 Minimum Requirements

The minimum requirement for 1-C and 1-H is in TS 38.104 [2] subclause 6.6.2

#### 6.6.2.3 Test purpose

The test purpose is to verify that the emission at the *antenna connector or* *TAB connector* does not occupy an excessive bandwidth for the service to be provided and is, therefore, not likely to create interference to other users of the spectrum beyond undue limits.

#### 6.6.2.4 Method of test

##### 6.6.2.4.1 Initial conditions

Test environment: normal; see Annex B.2.

RF channels to be tested for single carrier: B, M and T; see subclause 4.9.1.

Aggregated BS Channel Bandwidth positions to be tested for contiguous carrier aggregation: BBW Channel CA, MBW Channel CA and TBW Channel CA; see subclause 4.9.1.

For a BS declared to be capable of single carrier operation, start transmission according to [E-TM1.1], subclause X.X

For a BS declared to be capable of contiguous carrier aggregation operation, set the base station to transmit according to [E- TM1.1] on all carriers configured using the applicable test configuration and corresponding power setting specified in annex X.

For a BS declared to be capable of multi-carrier and/or CA operation use the applicable test signal configuration and corresponding power setting specified in annex X.

1) Connect the Measurement device to the BS antenna connector or TAB connector as shown in Annex X.

2) For a BS declared to be capable of single carrier operation, start transmission according to E-TM1.1 at manufacturer’s declared rated output power.

For a BS declared to be capable of contiguous carrier aggregation operation, set the base station to transmit according to E-TM1.1 on all carriers configured using the applicable test configuration and corresponding power setting specified in Annex X.

For a BS declared to be capable of multi-carrier and/or CA operation use the applicable test signal configuration and corresponding power setting specified in Annex X.

##### 6.6.2.4.2 Procedure

1) Measure the spectrum emission of the transmitted signal using at least the number of measurement points, and across a span, as listed in Table 6.6.2.4.2-1. The selected resolution bandwidth (RBW) filter of the analyser shall be 30 kHz or less.

Table 6.6.2.4.2-1: Span and number of measurement points for OBW measurements

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bandwidth | BS channel bandwidth  BWChannel (MHz) | | | | | Aggregated BS channel bandwidth BWChannel\_CA（MHz） |
| 5 | 10 | 15 | 20 | > 20 | > 20 |
| Span (MHz) | 10 | 20 | 30 | 40 |  |  |
| Minimum number of measurement points | 400 | 400 | 400 | 400 | [] | [] |
| [ NOTE 1: T = 200 kHz, when the BS channel bandwidth of outermost carriers are both larger than 50 MHz; Otherwise, T = 100 kHz.] | | | | | | |

NOTE: The detection mode of the spectrum analyzer will not have any effect on the result if the statistical properties of the out-of-OBW power are the same as those of the inside-OBW power. Both are expected to have the Rayleigh distribution of the amplitude of Gaussian noise. In any case where the statistics are not the same, though, the detection mode must be power responding. The analyser may be set to respond to the average of the power (root-mean-square of the voltage) across the measurement cell.

2) Compute the total of the power, P0, (in power units, not decibel units) of all the measurement cells in the measurement span. Compute P1, the power outside the occupied bandwidth on each side. P1 is half of the total power outside the bandwidth. P1 is half of (100 % - (occupied percentage)) of P0. For the occupied percentage of 99 %, P1 is 0.005 times P0.

3) Determine the lowest frequency, f1, for which the sum of all power in the measurement cells from the beginning of the span to f1 exceeds P1.

4) Determine the highest frequency, f2, for which the sum of all power in the measurement cells from f2 to the end of the span exceeds P1.

5) Compute the occupied bandwidth as f2 - f1.

In addition, for a multi-band capable BS, the following step shall apply:

1. For multi-band capable BS and single band tests, repeat the steps above per involved band where single carrier test models shall apply, with no carrier activated in the other band. In addition, when contiguous CA is supported, single band test configurations and test models shall apply with no carrier activated in the other band.

#### 6.6.2.5 Test requirements

For NR, the occupied bandwidth for each carrier shall be less than the channel bandwidth as defined in Table X for BS type 1-C and 1-H. For contiguous CA, the occupied bandwidth shall be less than or equal to the Aggregated BS Channel Bandwidth as defined in subclause X.

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 4.1.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

### 6.6.3 Adjacent Channel Leakage Power Ratio (ACLR)

#### 6.6.3.1 Definition and applicability

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.

The requirements shall apply outside the Base Station RF Bandwidth or Radio Bandwidth whatever the type of transmitter considered (single carrier or multi-carrier) and for all transmission modes foreseen by the manufacturer’s specification.

For a BS operating in non-contiguous spectrum, the ACLR requirement in subclause 6.6.3.2 shall apply in *sub block gaps* for the frequency ranges defined in table 6.6.3.5.2-3, while the CACLR requirement in subclause 6.6.3.2 shall apply in *sub block gaps* for the frequency ranges defined in table 6.6.3.2-4.

For a *multi-band connector*, the ACLR requirement in subclause 6.6.3.2 shall apply in *Inter RF Bandwidth gaps* for the frequency ranges defined in table 6.6.3.5.2-3, while the CACLR requirement in subclause 6.6.3.2 shall apply in *Inter RF Bandwidth gaps* for the frequency ranges defined in table 6.6.3.2-4.

The requirement applies during the *transmitter ON period*.

#### 6.6.3.2 Minimum requirement

The minimum requirement applies per *single-band connector*, or per *multi-band connector* supporting transmission in the *operating band*.

The minimum requirement for *BS type 1-C* is defined in 3GPP TS 38.104 [2], subclause 6.6.3.3.

The minimum requirement for *BS type 1-H* is defined in 3GPP TS 38.104 [2], subclause 6.6.3.4.

#### 6.6.3.3 Test purpose

To verify that the adjacent channel leakage power ratio requirement shall be met as specified by the minimum requirement.

#### 6.6.3.4 Method of test

##### 6.6.3.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: B, M and T; see subclause 4.9.1.

*Base Station RF Bandwidth* positions to be tested for multi-carrier and/or CA:

- BRFBW, MRFBW and TRFBW in single-band operation; see subclause 4.9.1.

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see subclause 4.11.

For a connector declared to be capable of single carrier operation only set to transmit a signal according to N‑TM x.x in subclause 4.9.2.

For a connector declared to be capable of multi-carrier and/or CA operation, set to transmit according to N‑TM x.x on all carriers configured.

##### 6.6.3.4.2 Procedure

For *BS type 1-H* where there may be multiple *TAB connectors*, they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex X.x. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1) Connect the *single-band connector* or *multi-band connector* under test to measurement equipment as shown in annex X.x. All connectors not under test shall be terminated.

The measurement device characteristics shall be:

- Measurement filter bandwidth: defined in subclause 6.6.3.5.

- Detection mode: true RMS voltage or true average power.

2) For a connectors declared to be capable of single carrier operation only, set the representative connectors under test to transmit at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30).

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.

3) Measure ACLR for the frequency offsets both side of channel frequency as specified in table 6.6.3.5.2‑1. In multiple carrier case only offset frequencies below the lowest and above the highest carrier frequency used shall be measured.

4) For the ACLR requirement applied inside sub-block gap for non-contiguous spectrum operation, or inside *Inter RF Bandwidth gap* for multi-band operation:

a) Measure ACLR inside sub-block gap or *Inter RF Bandwidth gap* as specified in subclause 6.6.3.5.2, if applicable.

b) Measure CACLR inside sub-block gap or *Inter RF Bandwidth gap* as specified in subclause 6.6.3.5.2, if applicable.

5) Repeat the test with the channel set-up according to N-TM x.x in subclause 4.9.2.

In addition, for *multi-band connectors*, the following steps shall apply:

6) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

#### 6.6.3.5 Test requirements

##### 6.6.3.5.1 General requirements

For the ACLR requirement either the ACLR limits in subclauses 6.6.3.5.3 and 6.6.3.5.4, or the *basic limit* in subclause 6.6.3.5.2 shall apply, whichever is less stringent.

##### 6.6.3.5.2 Basic limits

The ACLR is defined with a square filter of bandwidth equal to the transmission bandwidth configuration of the transmitted signal (BWConfig) centred on the assigned channel frequency and a filter centred on the adjacent channel frequency according to the tables below.

For operation in paired and unpaired spectrum, the ACLR shall be higher than the value specified in table 6.6.3.5.2‑1.

Table 6.6.3.5.2-1: Base station ACLR limit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel [MHz] | BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted | Assumed adjacent channel carrier (informative) | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| 5, 10, 15, 20 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44.2 dB |
| 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44.2 dB |
| BWChannel /2 + 2.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44.2 dB (NOTE 3) |
| BWChannel /2 + 7.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44.2 dB (NOTE 3) |
| 25, 30, 40, 50, 60, 70, 80,90, 100 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 43.8 dB |
| 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 43.8 dB |
| BWChannel /2 + 2.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 43.8 dB (NOTE 3) |
| BWChannel /2 + 7.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 43.8 dB (NOTE 3) |
| NOTE 1: BWChannel and BWConfig are the *BS channel bandwidth* and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: The requirements are applicable when the band is also defined for E-UTRA or UTRA. | | | | |

The ACLR absolute value shall be lower than the value specified in table 6.6.3.5.2‑2.

Table 6.6.3.5.2-2: Base station ACLR absolute limit

|  |  |
| --- | --- |
| BS category / BS class | ACLR absolute *basic limit* |
| Category A Wide Area BS | -13 dBm/MHz |
| Category B Wide Area BS | -15 dBm/MHz |
| Medium Range BS | -25 dBm/MHz |
| Local Area BS | -32 dBm/MHz |

For operation in non-contiguous spectrum or multiple bands, the ACLR shall be higher than the value specified in table 6.6.3.5.2-3.

Table 6.6.3.5.2-3: Base Station ACLR limit in non-contiguous spectrum or multiple bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel [MHz] | Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies [MHz] | BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap) | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| 5, 10, 15, 20 | Wgap ≥ 15 (Note 3)  Wgap ≥ 45 (Note 4) | 2.5 MHz | 5 MHz NR  (Note 2) | Square (BWConfig) | 44.2 dB |
| Wgap ≥ 20 (Note 3)  Wgap ≥ 50 (Note 4) | 7.5 MHz | 5 MHz NR  (Note 2) |
| 25, 30, 40, 50, 60, 70, 80, 90, 100 | Wgap ≥ 60 (Note 4)  Wgap ≥ 30 (Note 3) | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 43.8 dB |
| Wgap ≥ 80 (Note 4)  Wgap ≥ 50 (Note 3) | 30 MHz | 20 MHz NR (Note 2) |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.  NOTE 4: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz. | | | | | |

The Cumulative Adjacent Channel Leakage power Ratio (CACLR) in a sub-block gap or the Inter RF Bandwidth gap is the ratio of:

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the sub-block gap or the Inter RF Bandwidth gap, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective sub-block edges or Base Station RF Bandwidth edges.

The assumed filter for the adjacent channel frequency is defined in table 6.6.3.5.2-4 and the filters on the assigned channels are defined in table 6.6.3.5.2-6.

For operation in non-contiguous spectrum or multiple bands, the CACLR for NR carriers located on either side of the sub-block gap or the Inter RF Bandwidth gap shall be higher than the value specified in table 6.6.3.5.2-4.

Table 6.6.3.5.2-4: Base station CACLR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel [MHz] | Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies [MHz] | BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap) | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | CACLR limit |
| 5, 10, 15, 20 | 5 ≤ Wgap < 15 (Note 3)  5 ≤ Wgap < 45 (Note 4) | 2.5 MHz | 5 MHz NR  (Note 2) | Square (BWConfig) | 44.2 dB |
| 10 < Wgap < 20 (Note 3)  10 ≤ Wgap < 50 (Note 4) | 7.5 MHz | 5 MHz NR  (Note 2) |
| 25, 30, 40, 50, 60, 70, 80,90, 100 | 20 ≤ Wgap < 60 (Note 4)  20 ≤ Wgap < 30 (Note 3) | 10 MHz | 20 MHz NR  (Note 2) | Square (BWConfig) | 43.8 dB |
| 40 < Wgap < 80 (Note 4)  40 ≤ Wgap < 50 (Note 3) | 30 MHz | 20 MHz NR  (Note 2) |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.  NOTE 4: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz. | | | | | |

The CACLR absolute *basic limit* is specified in table 6.6.3.5.2-5.

Table 6.6.3.5.2-5: Base station CACLR absolute *basic limit*

|  |  |
| --- | --- |
| BS category / BS class | CACLR absolute *basic limit* |
| Category A Wide Area BS | -13 dBm/MHz |
| Category B Wide Area BS | -15 dBm/MHz |
| Medium Range BS | -25 dBm/MHz |
| Local Area BS | -32 dBm/MHz |

Table 6.6.3.5.2-6: Filter parameters for the assigned channel

|  |  |
| --- | --- |
| RAT of the carrier adjacent to the sub-block or Inter RF Bandwidth gap | Filter on the assigned channel frequency and corresponding filter bandwidth |
| NR | NR of same BW with SCS that provides largest transmission bandwidth configuration |

##### 6.6.3.5.3 *BS type 1-C*

The ACLR test requirements for *BS type 1-C* are given in table 6.6.3.5.2-1 or 6.6.3.5.2-3 applies per *antenna connector*. Conformance can be shown by meeting the ALCR limit in table 6.6.3.5.2-1 or 6.6.3.5.2-3, or the absolute *basic limits* in table 6.6.3.5.2-2, whichever is less stringent.

The CACLR test requirements for *BS type 1-C* are given in table 6.6.3.5.2-4 applies per *antenna connector*. Conformance can be shown by meeting the CALCR limit in table 6.6.3.5.2-4 or the absolute *basic limits* in table 6.6.3.5.2-5, whichever is less stringent.

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex X.x.

##### 6.6.3.5.4 *BS type 1-H*

The ACLR absolute *basic limits* in table 6.6.3.5.2-2+ X, + X (where X = 10log10(NTXU,countedpercell), unless stated differently in regional regulation) or the ACLR *limits* in table 6.6.3.5.2-1, or 6.6.3.5.2-3, whichever is less stringent, shall apply for each *TAB connector*.

The CACLR absolute *basic limits* in table 6.6.3.5.2-5 + X, (where X = 10log10(NTXU,countedpercell), unless stated differently in regional regulation) or the CACLR *limits* in table 6.6.3.5.2-4, whichever is less stringent, shall apply for each *TAB connector*.

Conformance to the *BS type 1-H* ACLR requirement can be demonstrated by meeting at least one of the following criteria as determined by the manufacturer:

1) The ratio of the sum of the filtered mean power measured on each *TAB connector* in the *TAB connector TX min cell group* at the assigned channel frequency to the sum of the filtered mean power measured on each *TAB connector* in the *TAB connector TX min cell group* at the adjacent channel frequency shall be greater than or equal to the ACLR *basic limit* of the BS. This shall apply for each *TAB connector TX min cell group*.

Or

2) The ratio of the filtered mean power at the *TAB connector* centred on the assigned channel frequency to the filtered mean power at this *TAB connector* centred on the adjacent channel frequency shall be greater than or equal to the ACLR *basic limit* of the BS for every *TAB connector* in the *TAB connector TX min cell group*, for each *TAB connector TX min cell group*.

In case the ACLR (CACLR) absolute *basic limit* of *BS type 1-H* are applied, the conformance can be demonstrated by meeting at least one of the following criteria as determined by the manufacturer:

1) The sum of the filtered mean power measured on each *TAB connector* in the *TAB connector TX min cell group* at the adjacent channel frequency shall be less than or equal to the ACLR (CACLR) absolute ba*sic limit* + X (where X = 10log10(NTXU,countedpercell), unless stated differently in regional regulation) of the BS. This shall apply to each *TAB* connector *TX min cell group.*

Or

2) The filtered mean power at each *TAB connector* centred on the adjacent channel frequency shall be less than or equal to the ACLR (CACLR) absolute *basic limit* of the BS scaled by X -10log10(*n*) for every *TAB connector* in the *TAB connector TX min cell group*, for each *TAB connector TX min cell group*, where *n* is the number of *TAB connectors* in the *TAB connector TX min cell group.*

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex X.x.

### 6.6.4 Operating band unwanted emissions

Detailed structure of the subclause is TBD.

### 6.6.5 Transmitter spurious emissions

#### 6.6.5.1 Definition and applicability

The transmitter spurious emission limits shall apply from 9 kHz to 12.75 GHz, excluding the frequency range from ΔfOBUE below the lowest frequency of each supported downlink *operating band*, up to ΔfOBUE above the highest frequency of each supported downlink *operating band*, where the ΔfOBUE is defined in table 6.6.1. For some *operating bands*, the upper limit is higher than 12.75 GHz in order to comply with the 5th harmonic limit of the downlink *operating band*, as specified in ITU-R recommendation SM.329 [5].

For a *multi-band connector*, this exclusion applies for each supported *operating band*.

The requirements shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer’s specification.

Unless otherwise stated, all requirements are measured as mean power (RMS).

[For operation in region 2, where the FCC guidance for MIMO systems in [x] is applicable, NTXU,countedpercell shall be equal to one for the purposes of calculating the spurious emissions limits in subclauses 6.6.5. For all other unwanted emissions requirements, NTXU,countedpercell shall be the value calculated according to subclause 6.1.]

#### 6.6.5.2 Minimum requirement

The minimum requirement applies per *single-band connector*, or per *multi-band connector* supporting transmission in the *operating band*.

The minimum requirement for *BS type 1-C* is defined in TS 38.104 [2], subclause 6.6.5.3.

The minimum requirement for *BS type 1-H* is defined in TS 38.104 [2], subclause 6.6.5.4.

#### 6.6.5.3 Test purpose

This test measures conducted spurious while the transmitter is in operation.

#### 6.6.5.4 Method of test

##### 6.6.5.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: [B, M and T]; see subclause 4.9.1.

*Base Station RF Bandwidth* positions to be tested for multi-carrier and/or CA:

- [BRFBW, MRFBW and TRFBW] in single-band operation; see subclause 4.9.1.

- [BRFBW\_T'RFBW and B'RFBW\_TRFBW]in multi-band operation, see subclause 4.11.

##### 6.6.5.4.2 Procedure

For *BS type 1-H* where there may be multiple *TAB connectors*, they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex X.x. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1. Connect the *single-band connector* or *multi-band connector* under test to measurement equipment as shown in annex X.x. All connectors not under test shall be terminated.

2) Measurements shall use a measurement bandwidth in accordance to the conditions in subclause 6.6.5.5.

The measurement device characteristics shall be:

- Detection mode: True RMS.

3) For a connectors declared to be capable of single carrier operation only, set the representative connectors under test to transmit at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30). Channel set-up shall be according to N-TM x.x.

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.

4) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the test requirement in subclause 6.6.6.5.

In addition, for *multi-band connectors*, the following steps shall apply:

5) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

#### 6.6.5.5 Test requirements

##### 6.6.5.5.1 Basic limits

###### 6.6.5.5.1.1 Tx spurious emissions

The limits of either table 6.6.5.5.1.1-1 (Category A limits) or table 6.6.5.5.1.1-2 (Category B limits) shall apply. The application of either Category A or Category B limits shall be the same as for operating band unwanted emissions in subclause 6.6.4, and as declared by the manufacturer (see table 4.6-1, D6.3).

Table 6.6.5.5.1.1-1: BS spurious emission limits in FR1, Category A

|  |  |  |  |
| --- | --- | --- | --- |
| Spurious frequency range | *Basic limit* | Measurement bandwidth | Notes |
| 9 kHz – 150 kHz | -13 dBm | 1 kHz | Note 1, Note 4 |
| 150 kHz – 30 MHz | 10 kHz | Note 1, Note 4 |
| 30 MHz – 1 GHz | 100 kHz | Note 1 |
| 1 GHz 12.75 GHz | 1 MHz | Note 1, Note 2 |
| 12.75 GHz – 5th harmonic of the upper frequency edge of the *operating band* in GHz | 1 MHz | Note 1, Note 2, Note 3 |
| NOTE 1: Measurement bandwidths as in ITU-R SM.329 [2], s4.1.  NOTE 2: Upper frequency as in ITU-R SM.329 [2], s2.5 table 1.  NOTE 3: Applies only for *operating bands* for which the 5th harmonic of the upper frequency edge is reaching beyond 12.75 GHz.  NOTE 4: This spurious frequency range applies only to *BS type 1-C* and *BS type 1-H*. | | | |

Table 6.6.5.5.1.1-2: BS spurious emission limits in FR1, Category B

|  |  |  |  |
| --- | --- | --- | --- |
| Spurious frequency range | *Basic limit* | Measurement bandwidth | Notes |
| 9 kHz – 150 kHz | -36 dBm | 1 kHz | Note 1, Note 4 |
| 150 kHz – 30 MHz | 10 kHz | Note 1, Note 4 |
| 30 MHz – 1 GHz | 100 kHz | Note 1 |
| 1 GHz – 12.75 GHz | -30 dBm | 1 MHz | Note 1, Note 2 |
| 12.75 GHz – 5th harmonic of the upper frequency edge of the *operating band* in GHz | 1 MHz | Note 1, Note 2, Note 3 |
| NOTE 1: Measurement bandwidths as in ITU-R SM.329 [2], s4.1.  NOTE 2: Upper frequency as in ITU-R SM.329 [2], s2.5 table 1.  NOTE 3: Applies only for *operating bands* for which the 5th harmonic of the upper frequency edge is reaching beyond 12.75 GHz.  NOTE 4: This spurious frequency range applies only to *BS type 1-C* and *BS type 1-H*. | | | |

###### 6.6.5.5.1.2 Protection of the BS receiver of own or different BS

This requirement shall be applied for NR FDD operation in order to prevent the receivers of the BSs being desensitised by emissions from a BS transmitter. It is measured at the transmit *antenna connector* for *BS type 1-C* or at the *TAB connector* for *BS type 1-H* for any type of BS which has common or separate Tx/Rx *antenna* *connectors* / *TAB connectors*.

The power of any spurious emission shall not exceed the *basic limits* in table 6.6.5.5.1.2-1.

Table 6.6.5.5.1.2-1: BS spurious emissions limits for protection of the BS receiver

|  |  |  |  |
| --- | --- | --- | --- |
| BS class | Frequency range | Basic limit | Measurement bandwidth |
| Wide Area BS | FUL\_low – FUL\_high | -96 dBm | 100 kHz |
| Medium Range BS | -91 dBm |
| Local Area BS | -88 dBm |

###### 6.6.5.5.1.3 Additional spurious emissions requirements

These requirements may be applied for the protection of system operating in frequency ranges other than the BS downlink *operating band*. The limits may apply as an optional protection of such systems that are deployed in the same geographical area as the BS, or they may be set by local or regional regulation as a mandatory requirement for an NR *operating band*. It is in some cases not stated in the present document whether a requirement is mandatory or under what exact circumstances that a limit applies, since this is set by local or regional regulation. An overview of regional requirements in the present document is given in subclause 4.5.

Some requirements may apply for the protection of specific equipment (UE, MS and/or BS) or equipment operating in specific systems (GSM, CDMA, UTRA, E-UTRA, etc.) as listed below.

The power of any spurious emission shall not exceed the *basic limits* of table 6.6.5.5.1.3-1 for a BS where requirements for co-existence with the system listed in the first column apply. For a *multi-band connector*, the exclusions and conditions in the Note column of table 6.6.5.5.1.3-1 apply for each supported *operating band*.

Table 6.6.5.5.1.3-1: BS spurious emissions limits for BS for co-existence with systems operating in other frequency bands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| System type for NR to co-exist with | Frequency range for co-existence requirement | Basic limit | Measurement bandwidth | Note |
| GSM900 | 921 – 960 MHz | -57 dBm | 100 kHz | This requirement does not apply to BS operating in band n8 |
| 876 – 915 MHz | -61 dBm | 100 kHz | For the frequency range 880-915 MHz, this requirement does not apply to BS operating in band n8, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| DCS1800 | 1805 – 1880 MHz | -47 dBm | 100 kHz | This requirement does not apply to BS operating in band n3. |
| 1710 – 1785 MHz | -61 dBm | 100 kHz | This requirement does not apply to BS operating in band n3, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| PCS1900 | 1930 1990 MHz | -47 dBm | 100 kHz | This requirement does not apply to BS operating in band n2, n25 or band n70. |
| 1850 – 1910 MHz | -61 dBm | 100 kHz | This requirement does not apply to BS operating in band n2 or n25 since it is already covered by the requirement in subclause 6.6.5.1.3. |
| GSM850 or CDMA850 | 869 – 894 MHz | -57 dBm | 100 kHz | This requirement does not apply to BS operating in band n5. |
| 824 – 849 MHz | -61 dBm | 100 kHz | This requirement does not apply to BS operating in band n5, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band I or  E-UTRA Band 1 or NR Band n1 | 2110 – 2170 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n1 |
| 1920 – 1980 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n1, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band II or  E-UTRA Band 2 or NR Band n2 | 1930 – 1990 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n2 or n70. |
| 1850 – 1910 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n2, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band III or  E-UTRA Band 3 or NR Band n3 | 1805 – 1880 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n3. |
| 1710 – 1785 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n3, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band IV or  E-UTRA Band 4 | 2110 – 2155 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n66 |
| 1710 – 1755 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n66, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band V or  E-UTRA Band 5 or NR Band n5 | 869 – 894 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n5. |
| 824 – 849 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n5, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band VI, XIX or  E-UTRA Band 6, 18, 19 | 860 – 890 MHz | -52 dBm | 1 MHz |  |
| 815 – 830 MHz | -49 dBm | 1 MHz |  |
| 830 – 845 MHz | -49 dBm | 1 MHz |  |
| UTRA FDD Band VII or  E-UTRA Band 7 or NR Band n7 | 2620 – 2690 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n7. |
| 2500 – 2570 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n7, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band VIII or  E-UTRA Band 8 or NR Band n8 | 925 – 960 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n8. |
| 880 – 915 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n8, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band IX or  E-UTRA Band 9 | 1844.9 – 1879.9 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n3. |
| 1749.9 – 1784.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n3, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band X or  E-UTRA Band 10 | 2110 – 2170 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n66 |
| 1710 – 1770 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n66, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band XI or XXI or  E-UTRA Band 11 or 21 | 1475.9 – 1510.9 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n75. |
| 1427.9 – 1447.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n51, n75 or n76. |
| 1447.9 – 1462.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n75. |
| UTRA FDD Band XII or  E-UTRA Band 12 or NR Band n12 | 729 – 746 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n12. |
| 699 – 716 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n12, since it is already covered by the requirement in sub-clause 6.6.5.1.3. |
| UTRA FDD Band XIII or  E-UTRA Band 13 | 746 – 756 MHz | -52 dBm | 1 MHz |  |
| 777 – 787 MHz | -49 dBm | 1 MHz |  |
| UTRA FDD Band XIV or  E-UTRA Band 14 | 758 – 768 MHz | -52 dBm | 1 MHz |  |
| 788 – 798 MHz | -49 dBm | 1 MHz |  |
| E-UTRA Band 17 | 734 – 746 MHz | -52 dBm | 1 MHz |  |
| 704 – 716 MHz | -49 dBm | 1 MHz |  |
| UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20 | 791 – 821 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n20 or n28. |
| 832 – 862 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n20, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| UTRA FDD Band XXII or E-UTRA Band 22 | 3510 – 3590 MHz | -52 dBm | 1 MHz |  |
| 3410 – 3490 MHz | -49 dBm | 1 MHz |  |
| E-UTRA Band 24 | 1525 – 1559 MHz | -52 dBm | 1 MHz |  |
| 1626.5 – 1660.5 MHz | -49 dBm | 1 MHz |  |
| UTRA FDD Band XXV or  E-UTRA Band 25 or NR band n25 | 1930 – 1995 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n2, n25 or n70. |
| 1850 – 1915 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n25 since it is already covered by the requirement in subclause 6.6.5.1.3. For BS operating in Band n2, it applies for 1910 MHz to 1915 MHz, while the rest is covered in subclause 6.6.5.1.3. |
| UTRA FDD Band XXVI or  E-UTRA Band 26 | 859 – 894 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n5. |
| 814 – 849 MHz | -49 dBm | 1 MHz | For BS operating in Band n5, it applies for 814 MHz to 824 MHz, while the rest is covered in subclause 6.6.5.1.3. |
| E-UTRA Band 27 | 852 – 869 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n5. |
| 807 – 824 MHz | -49 dBm | 1 MHz | This requirement also applies to BS operating in Band n28, starting 4 MHz above the Band n28 downlink *operating band* (Note 5). |
| E-UTRA Band 28 or NR Band n28 | 758 – 803 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n20 or n28. |
| 703 – 748 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n28, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| E-UTRA Band 29 | 717 – 728 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 30 | 2350 – 2360 MHz | -52 dBm | 1 MHz |  |
| 2305 – 2315 MHz | -49 dBm | 1 MHz |  |
| E-UTRA Band 31 | 462.5 -467.5 MHz | -52 dBm | 1 MHz |  |
| 452.5 -457.5 MHz | -49 dBm | 1 MHz |  |
| UTRA FDD band XXXII or E-UTRA band 32 | 1452 – 1496 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n75. |
| UTRA TDD Band a) or E-UTRA Band 33 | 1900 – 1920 MHz | -52 dBm | 1 MHz |  |
| UTRA TDD Band a) or E-UTRA Band 34 or NR band n34 | 2010 – 2025 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n34. |
| UTRA TDD Band b) or E-UTRA Band 35 | 1850 – 1910 MHz | -52 dBm | 1 MHz |  |
| UTRA TDD Band b) or E-UTRA Band 36 | 1930 – 1990 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n2 or n25. |
| UTRA TDD Band c) or E-UTRA Band 37 | 1910 – 1930 MHz | -52 dBm | 1 MHz |  |
| UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570 – 2620 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n38. |
| UTRA TDD Band f) or E-UTRA Band 39 or NR band n39 | 1880 – 1920MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n39. |
| UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40 | 2300 – 2400MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n40. |
| E-UTRA Band 41 or NR Band n41 | 2496 – 2690 MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band n41. |
| E-UTRA Band 42 | 3400 – 3600 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 43 | 3600 – 3800 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 44 | 703 – 803 MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band n28. |
| E-UTRA Band 45 | 1447 – 1467 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 46 | 5150 – 5925 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 47 | 5855 – 5925 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 48 | 3550 – 3700 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 50 | 1432 – 1517 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n51, n75 or n76. |
| E-UTRA Band 51 or NR Band n51 | 1427 – 1432 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n51, n75 or n76. |
| E-UTRA Band 65 | 2110 – 2200 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n1, |
| 1920 – 2010 MHz | -49 dBm | 1 MHz | For BS operating in Band n1, it applies for 1980 MHz to 2010 MHz, while the rest is covered in subclause 6.6.5.1.3. |
| E-UTRA Band 66 or NR Band n66 | 2110 – 2200 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n66. |
| 1710 – 1780 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n66, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| E-UTRA Band 67 | 738 – 758 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n28. |
| E-UTRA Band 68 | 753 -783 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n28. |
| 698-728 MHz | -49 dBm | 1 MHz | For BS operating in Band n28, this requirement applies between 698 MHz and 703 MHz, while the rest is covered in subclause 6.6.5.1.3. |
| E-UTRA Band 69 | 2570 – 2620 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n38. |
| E-UTRA Band 70 or NR Band n70 | 1995 – 2020 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n2, n25 or n70 |
| 1695 – 1710 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n70, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| E-UTRA Band 71 or NR Band n71 | 617 – 652 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n71 |
| 663 – 698 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n71, since it is already covered by the requirement in subclause 6.6.5.1.3. |
| E-UTRA Band 72 | 461 – 466 MHz | -52 dBm | 1 MHz |  |
| 451 – 456 MHz | -49 dBm | 1 MHz |  |
| E-UTRA Band 74 | 1475 – 1518 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n75. |
| 1427 – 1470 MHz | -49 dBm | 1MHz | This requirement does not apply to BS operating in band n51, n75 or n76. |
| E-UTRA Band 75 or NR Band n75 | 1432 – 1517 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n51, n75 or n76. |
| E-UTRA Band 76 or NR Band n76 | 1427 – 1432 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n51, n75 or n76. |
| NR Band n77 | 3.3 – 4.2 GHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n77 and n 78 |
| NR Band n78 | 3.3 – 3.8 GHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n77 and n78 |
| NR Band n79 | 4.4 – 5.0 GHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band n79 |

NOTE 1: As defined in the scope for spurious emissions in this subclause, except for the cases where the noted requirements apply to a BS operating in Band n28, the co-existence requirements in table 6.6.5.5.1.3-1do not apply for the 10 MHz frequency range immediately outside the downlink *operating band* (see table 5.2-1). Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2: Table 6.6.5.5.1.3-1 assumes that two *operating bands*, where the frequency ranges in table 5.2-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by the 3GPP specifications.

NOTE 3: TDD base stations deployed in the same geographical area, that are synchronized and use the same or adjacent *operating bands* can transmit without additional co-existence requirements. For unsynchronized base stations, special co-existence requirements may apply that are not covered by the 3GPP specifications.

NOTE 4: For NR Band n28 BS, specific solutions may be required to fulfil the spurious emissions limits for BS for co-existence with E-UTRA Band 27 UL *operating band*.

The following requirement may be applied for the protection of PHS. This requirement is also applicable at specified frequencies falling between 10 MHz below the lowest BS transmitter frequency of the downlink *operating band* and 10 MHz above the highest BS transmitter frequency of the downlink *operating band*.

The power of any spurious emission shall not exceed:

Table 6.6.5.5.1.3-2: BS spurious emissions limits for BS for co-existence with PHS

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Basic limit | Measurement bandwidth | Note |
| 1884.5 – 1915.7 MHz | -41 dBm | 300 kHz | Applicable when co-existence with PHS system operating in 1884.5 - 1915.7MHz |

The following requirement may apply to NR BS operating in Band n41 in certain regions. This requirement is also applicable at the frequency range from 10 MHz below the lowest frequency of the BS downlink *operating band* up to 10 MHz above the highest frequency of the BS downlink *operating band*.

The power of any spurious emission shall not exceed:

Table 6.6.5.5.1.3-3: Additional BS spurious emissions limits for Band n41

|  |  |  |
| --- | --- | --- |
| Frequency range | Basic limit | Measurement bandwidth |
| 2200 – 2345 MHz | -45 dBm | 1 MHz |
| 2362.5 – 2365 MHz | -25 dBm |
| 2365 – 2367.5 MHz | -40 dBm |
| 2367.5 – 2370 MHz | -42 dBm |
| 2370 – 2395 MHz | -45 dBm |

In certain regions, the following requirement may apply to NR BS operating in Band n51. Emissions shall not exceed the maximum levels specified in table 6.6.5.5.1.3-4.

Table 6.6.5.5.1.3-4: Additional operating band unwanted emission limits for NR BS operating in Band n51

|  |  |  |
| --- | --- | --- |
| Filter centre frequency, filter | Basic limit | Measurement bandwidth |
| Ffilter = 1413.5 MHz | -42 dBm | 27 MHz |

NOTE: The regional requirement, included in [14], is defined in terms of EIRP, which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement. The assessment of the EIRP level is described in annex E.

###### 6.6.5.5.1.4 Co-location with other base stations

These requirements may be applied for the protection of other BS receivers when GSM900, DCS1800, PCS1900, GSM850, CDMA850, UTRA FDD, UTRA TDD, E-UTRA and/or NR BS are co-located with a BS.

The requirements assume a 30 dB coupling loss between transmitter and receiver and are based on co-location with base stations of the same class.

The power of any spurious emission shall not exceed the *basic limits* of table 6.6.5.5.1.4-1 for a BS where requirements for co-location with a BS type listed in the first column apply, depending on the declared BS class. For a *multi-band connector*, the exclusions and conditions in the Note column of table 6.6.5.5.1.4-1 shall apply for each supported *operating band*.

Table 6.6.5.5.1.4-1: BS spurious emissions limits for BS co-located with another BS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type of co-located BS | Frequency range for co-location requirement | Basic limit | | | Measurement bandwidth | Note |
| WA BS | MR BS | LA BS |
| Macro GSM900 | 876-915 MHz | -98 dBm | -91 dBm | -70 dBm | 100 kHz |  |
| Macro DCS1800 | 1710 – 1785 MHz | -98 dBm | -91 dBm | -80 dBm | 100 kHz |  |
| Macro PCS1900 | 1850 – 1910 MHz | -98 dBm | -91 dBm | -80 dBm | 100 kHz |  |
| Macro GSM850 or CDMA850 | 824 – 849 MHz | -98 dBm | -91 dBm | -70 dBm | 100 kHz |  |
| WA UTRA FDD Band I or E-UTRA Band 1 or NR Band n1 | 1920 – 1980 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band II or E-UTRA Band 2 or NR Band n2 | 1850 – 1910 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band III or E-UTRA Band 3 or NR Band n3 | 1710 – 1785 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band IV or E-UTRA Band 4 | 1710 – 1755 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band V or E-UTRA Band 5 or NR Band n5 | 824 – 849 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band VI, XIX or E-UTRA Band 6, 19 | 830 – 845 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7 | 2500 – 2570 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band VIII or E-UTRA Band 8 or NR Band n8 | 880 – 915 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band IX or E-UTRA Band 9 | 1749.9 – 1784.9 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band X or E-UTRA Band 10 | 1710 – 1770 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XI or E-UTRA Band 11 | 1427.9 –1447.9 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n75 |
| WA UTRA FDD Band XII or  E-UTRA Band 12 or NR Band n12 | 699 – 716 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XIII or  E-UTRA Band 13 | 777 – 787 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XIV or  E-UTRA Band 14 | 788 – 798 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 17 | 704 – 716 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 18 | 815 – 830 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20 | 832 – 862 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XXI or E-UTRA Band 21 | 1447.9 – 1462.9 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n75 |
| WA UTRA FDD Band XXII or E-UTRA Band 22 | 3410 – 3490 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 23 | 2000 – 2020 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 24 | 1626.5 – 1660.5 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XXV or  E-UTRA Band 25 or NR Band n25 | 1850 – 1915 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA FDD Band XXVI or  E-UTRA Band 26 | 814 – 849 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 27 | 807 – 824 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 28 or NR Band n28 | 703 – 748 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 30 | 2305 – 2315 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 31 | 452.5 -457.5 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA TDD Band a) or E-UTRA Band 33 | 1900 – 1920 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA TDD Band a) or E-UTRA Band 34 or NR band n34 | 2010 – 2025 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n34 |
| WA UTRA TDD Band b) or E-UTRA Band 35 | 1850 – 1910 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA TDD Band b) or E-UTRA Band 36 | 1930 – 1990 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n2 or band n25 |
| WA UTRA TDD Band c) or E-UTRA Band 37 | 1910 – 1930 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570 – 2620 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n38. |
| WA UTRA TDD Band f) or E-UTRA Band 39 or NR band n39 | 1880 – 1920MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n39 |
| WA UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40 | 2300 – 2400MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n40. |
| WA E-UTRA Band 41 or NR Band n41 | 2496 – 2690 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n41 |
| WA E-UTRA Band 42 | 3400 – 3600 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 43 | 3600 – 3800 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 44 | 703 – 803 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n28 |
| WA E-UTRA Band 45 | 1447 – 1467 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| E-UTRA Band 46 | 5150 – 5925 MHz | N/A | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 48 | 3550 – 3700 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 50 | 1432 – 1517 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n75 |
| E-UTRA Band 51 or NR Band n51 | 1427 – 1432 MHz | N/A | N/A | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n75 or n76 |
| WA E-UTRA Band 65 | 1920 – 2010 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 66 or NR Band n66 | 1710 – 1780 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 68 | 698 – 728 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 70 or NR Band n70 | 1695 – 1710 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 71 or NR Band n71 | 663 – 698 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 72 | 451 – 456 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA E-UTRA Band 74 | 1427 – 1470 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band n51 |
| WA NR Band n77 | 3.3 – 4.2 GHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA NR Band n78 | 3.3 – 3.8 GHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| WA NR Band n79 | 4.4 – 5.0 GHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |

NOTE 1: As defined in the scope for spurious emissions in this subclause, the co-location requirements in table 6.6.5.5.1.4-1 do not apply for the 10 MHz frequency range immediately outside the BS transmit frequency range of a downlink *operating band* (see table 5.2-1). The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in 3GPP TR 25.942 [15].

NOTE 2: Table 6.6.5.5.1.4-1 assumes that two *operating bands*, where the corresponding BS transmit and receive frequency ranges in table 5.2-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-location requirements may apply that are not covered by the 3GPP specifications.

NOTE 3: Co-located TDD base stations that are synchronized and using the same or adjacent *operating band* can transmit without special co-locations requirements. For unsynchronized base stations, special co-location requirements may apply that are not covered by the 3GPP specifications.

##### 6.6.5.5.3 *BS type 1-C*

The Tx spurious emissions for *BS type 1-C* for each *antenna connector* shall not exceed the *basic limits* specified in subclause 6.6.5.5.1.

##### 6.6.5.5.4 *BS type 1-H*

The Tx spurious emissions requirements for *BS type 1-H* are that for each *TAB connector TX min cell group* and each applicable *basic limit* in subclause 6.6.5.5.1, the power summation emissions at the *TAB connectors* of the *TAB connector TX min cell group* shall not exceed an OTA limit specified as the *basic limit* + X, where X = 10log10(NTXU,countedpercell), unless stated differently in regional regulation.

NOTE: Conformance to the *BS type 1-H* spurious emission requirement can be demonstrated by meeting at least one of the following criteria as determined by the manufacturer:

1) The sum of the emissions power measured on each *TAB connector* in the *TAB connector TX min cell group* shall be less than or equal to the limit as defined in this subclause for the respective frequency span.

Or

2) The unwanted emissions power at each *TAB connector* shall be less than or equal to the *BS type 1-H* limit as defined in this subclause for the respective frequency span, scaled by -10log10(n), where n is the number of *TAB connectors* in the *TAB connector TX min cell group*.

## 6.7 Transmitter intermodulation

### 6.7.1 Definition and applicability

The transmitter intermodulation requirement is a measure of the capability of the transmitter unit to inhibit the generation of signals in its non-linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter unit via the antenna, RDN and antenna array. The requirement shall apply during the transmitter ON period and the *transmitter transient period*.

For *BS type 1-C*, the transmitter intermodulation level is the power of the intermodulation products when an interfering signal is injected into the *antenna connector*.

For *BS type 1-H*, the transmitter intermodulation level is the power of the intermodulation products when an interfering signal is injected into the *TAB connector*.

For *BS type 1-H*, there are two types of transmitter intermodulation cases captured by the transmitter intermodulation requirement:

1) Co-location transmitter intermodulation in which the interfering signal is from a co-located base station.

2) Intra-system transmitter intermodulation in which the interfering signal is from other transmitter units within the *BS type 1-H*.

For *BS type 1-H*, the co-location transmitter intermodulation requirement is considered sufficient if the interference signal for the co-location requirement is higher than the declared interference signal for intra-system transmitter intermodulation requirement.

### 6.7.2 Minimum requirement

The minimum requirement applies per *single-band connector*, or per *multi-band connector* supporting transmission in the *operating band*.

The minimum requirement for *BS type 1-C* is defined in TS 38.104 [2], subclause 6.7.2.

The minimum requirement for *BS type 1-H* is defined in TS 38.104 [2], subclause 6.7.3.

### 6.7.3 Test purpose

The test purpose is to verify the ability of the transmitter units associated with the *single-band connectors* or *multi-band connector* under test to restrict the generation of intermodulation products in its nonlinear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna to below specified levels.

### 6.7.4 Method of test

#### 6.7.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: [B, M and T]; see subclause 4.9.1.

*Base Station RF Bandwidth* positions to be tested for multi-carrier:

- [BRFBW, MRFBW and TRFBW] in single-band operation; see subclause 4.9.1.

- [BRFBW\_T'RFBW and B'RFBW\_TRFBW]in multi-band operation, see subclause 4.11.

#### 6.7.4.2 Procedure

For *BS type 1-H* where there may be multiple *TAB connectors*, they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex X.x. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1. Connect the *single-band connector* or *multi-band connector* under test to measurement equipment as shown in annex X.x. All connectors not under test shall be terminated.

2) The measurement device characteristics shall be:

- Detection mode: True RMS.

3) For a connectors declared to be capable of single carrier operation only, set the representative connectors under test to transmit at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (see table 4.6-1, D6.30). Channel set-up shall be according to N-TM x.x.

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.

4) Generate the interfering signal according to N-TM x.x, as defined in subclause 4.9.2, with the supported minimum channel bandwidth (BWChannel) with 15 kHz SCS of the band and a centre frequency offset from the lower/upper edge of the wanted signal or edge of sub-block inside a sub-block gap , for n = 1, 2, but exclude interfering frequencies that are outside of the allocated downlink operating band or interfering frequencies that are not completely within the sub-block gap or within the *Inter RF Bandwidth gap*.

5) Adjust ATT attenuator (as in the test setup in annex X.x) so that level of the interfering signal is as defined in subclause 6.7.5.

6) Perform the unwanted emission tests specified in subclauses 6.6.3 and 6.6.4 for all third and fifth order intermodulation products which appear in the frequency ranges defined in subclauses 6.6.3 and 6.6.4. The width of the intermodulation products shall be taken into account.

7) Perform the transmitter spurious emissions test as specified in subclause 6.6.5, for all third and fifth order intermodulation products which appear in the frequency ranges defined in subclause 6.6.5. The width of the intermodulation products shall be taken into account.

8) Verify that the emission level does not exceed the required level in subclause 6.7.5 with the exception of interfering signal frequencies.

9) Repeat the test for the remaining interfering signal centre frequency offsets according to step 4.

10) Repeat the test for the remaining test signals defined in subclause 6.7.5 for additional requirements and for *BS type 1-H* intra-system requirements.

In addition, for *multi-band connectors*, the following steps shall apply:

5) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

NOTE: The third order intermodulation products are centred at 2F1±F2 and 2F2±F1. The fifth order intermodulation products are centred at 3F1±2F2, 3F2±2F1, 4F1±F2, and 4F2±F1 where F1 represents the test signal centre frequency or centre frequency of each sub-block and F2 represents the interfering signal centre frequency. The widths of intermodulation products are:

- (n\*BWF1 + m\*1.6MHz) for the nF1±mF2 products;

- (n\*1.6MHz + m\* BWF1) for the nF2±mF1 products;

where BWF1 represents the test signal RF bandwidth or channel bandwidth in case of single carrier, or sub-block bandwidth.

### 6.7.5 Test requirements

#### 6.7.5.1 BS type 1-C

##### 6.7.5.1.1 Co-location minimum requirements

For *BS type 1-C*, the wanted signal and interfering signal centre frequency is specified in table 6.7.5.1.1-1, where interfering signal level is *rated total output power* (Prated,t,AC) at *antenna connector* in the *operating band* – 30 dB.

The requirement is applicable outside the Base Station RF Bandwidth or Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Radio Bandwidth edges.

For a BS operating in non-contiguous spectrum, the requirement is also applicable inside a sub-block gap for interfering signal offsets where the interfering signal falls completely within the sub-block gap. The interfering signal offset is defined relative to the sub-block edges.

For a *multi-band connector*, the requirement shall apply relative to the Base Station RF Bandwidth edges of each supported operating band. In case the Inter RF Bandwidth gap is less than 3\*Bi MHz (where Bi is the minimal *BS channel bandwidth* of the band), the requirement in the gap shall apply only for interfering signal offsets where the interfering signal falls completely within the Inter RF Bandwidth gap.

The transmitter intermodulation level shall not exceed the unwanted emission limits in subclauses 6.6.3, 6.6.4 and 6.6.5 in the presence of an NR interfering signal according to table 6.7.5.1.1-1.

Table 6.7.5.1.1-1: Interfering and wanted signals for the co-location transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal type | NR single carrier, or multi-carrier, or multiple intra-band contiguously or non-contiguously aggregated carriers |
| Interfering signal type | NR signal, the supported minimum *BS channel bandwidth* (BWChannel) with 15 kHz SCS of the band |
| Interfering signal level | Rated total output power (Prated,t,AC) in the *operating band* – 30 dB |
| Interfering signal centre frequency offset from the lower/upper edge of the wanted signal or edge of sub-block inside a sub-block gap | , for n=1, 2 and 3 |
| NOTE: Interfering signal positions that are partially or completely outside of any downlink *operating band* of the BS are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink *operating bands* in the same geographical area. | |

##### 6.7.5.1.2 Additional requirements

TBD

#### 6.7.5.2 *BS type 1-H*

##### 6.7.5.2.1 Co-location minimum requirements

The transmitter intermodulation level shall not exceed the unwanted emission limits in subclauses 6.6.3, 6.6.4 and 6.6.5 in the presence of an NR interfering signal according to table 6.7.5.2.1-1.

The requirement is applicable outside the *Base Station RF Bandwidth edges*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth* *edges* or *Radio Bandwidth* edges.

For *TAB connectors* supporting operation in *non-contiguous spectrum*, the requirement is also applicable inside a *sub-block gap* for interfering signal offsets where the interfering signal falls completely within the *sub-block gap*. The interfering signal offset is defined relative to the *sub-block* edges.

For *multi-band connector*, the requirement shall apply relative to the *Base Station RF Bandwidth* *edges* of each operating band. In case the inter *Base Station RF Bandwidth* gap is less than 3\*BWChannel MHz(where BWChannel is the minimal *BS channel bandwidth* of the band) , the requirement in the gap shall apply only for interfering signal offsets where the interfering signal falls completely within the inter *Base Station RF Bandwidth* gap.

Table 6.7.5.2.1-1: Interfering and wanted signals for the co-location transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal type | NR single carrier, or multi-carrier, or multiple intra-band contiguously or non-contiguously aggregated carriers |
| Interfering signal type | NR signal, the minimum supported *BS channel bandwidth* (BWChannel) with 15 kHz SCS of the band |
| Interfering signal level | Rated total output power per *TAB connector* (Prated,t,TABC) in the *operating band* – 30 dB |
| Interfering signal centre frequency offset from the lower/upper edge of the wanted signal or edge of *sub-block* inside a gap | , for n=1, 2 and 3 |
| NOTE: Interfering signal positions that are partially or completely outside of any downlink *operating band* of the TAB connector are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink *operating bands* in the same geographical area. | |

##### 6.7.5.2.2 Intra-system minimum requirements

The transmitter intermodulation level shall not exceed the unwanted emission limits in subclauses 6.6.3 and 6.6.4 in the presence of an NR interfering signal according to table 6.7.5.2.2-1.

Table 6.7.5.2.2-1: Interfering and wanted signals for intra-system transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal type | NR signal |
| Interfering signal type | NR signal of the same *BS channel bandwidth* and SCS as the wanted signal (Note 1). |
| Interfering signal level | Power level declared by the base station manufacturer (Note 2). |
| Frequency offset between interfering signal and wanted signal | 0 MHz |
| NOTE 1: The interfering signal shall be incoherent with the wanted signal.  NOTE 2: The declared interfering signal power level at each *TAB connector* is the sum of the co-channel leakage power coupled via the combined RDN and Antenna Array from all the other *TAB connectors*, but does not comprise power radiated from the Antenna Array and reflected back from the environment. The power at each of the interfering *TAB connectors* is Prated,c,TABC. | |

##### 6.7.5.2.3 Additional requirements

TBD

# 7 Conducted receiver characteristics

## 7.1 General

Conducted receiver characteristics are specified at the *antenna connector* for *BS type 1-C* and at the *TAB connector* for *BS type 1-H*, with full complement of transceivers for the configuration in normal operating condition.

Unless otherwise stated, the following arrangements apply for conducted receiver characteristics requirements in clause 7:

- Requirements apply during the BS receive period.

- Requirements shall be met for any transmitter setting.

- For FDD operation the requirements shall be met with the transmitter unit(s) ON.

- Throughput requirements defined for the radiated receiver characteristics do not assume HARQ retransmissions.

- When BS is configured to receive multiple carriers, all the throughput requirements are applicable for each received carrier.

- For ACS, blocking and intermodulation characteristics, the negative offsets of the interfering signal apply relative to the lower edge and positive offsets of the interfering signal apply relative to the higher edge.

NOTE 1: In normal operating condition the BS in FDD operation is configured to transmit and receive at the same time.

NOTE 2: In normal operating condition the BS in TDD operation is configured to TX OFF power during *receive period*.

For BS type 1-H if a number of *TAB connectors* have been declared equivalent (see subclause 4.6), only a representative one is necessary to demonstrate conformance.

In subclause 7.6.5.3, if representative *TAB connectors* are used then per connector criteria (option 2) shall be applied.

## 7.2 Reference sensitivity level

7.2.1 Definition and applicability

The reference sensitivity power level PREFSENS is the minimum mean power received at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* at which a throughput requirement shall be met for a specified reference measurement channel.

7.2.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.2.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.2.2.

7.2.3 Test purpose

To verify that for the BS type 1-C receiver and each BS type 1-H *TAB connector* at the Reference sensitivity level the throughput requirement shall be met for a specified reference measurement channel.

7.2.4 Method of test

7.2.4.1 Initial conditions

Test environment:

- normal; see annex clause B.2.

RF channels to be tested for single carrier:

- B, M and T; see subclause 4.9.1.

On each of B, M and T, the test shall be performed under extreme power supply as defined in annex B.5.

NOTE: Tests under extreme power supply also test extreme temperature.

7.2.4.2 Procedure

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1) Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.

2) Set the BS to transmit a signal according to subclause 4.9.2, for BS type 1-C set the *antenna connector* to the manufacturers declared rated output power PRated,c,AC, for BS type 1-H set all *TAB connectors* declared in the same RAT and operating band to at the manufacturers declared rated output power PRated,c,TABC.

3) Start the signal generator for the wanted signal to transmit the Fixed Reference Channels for reference sensitivity according to annex X

4) Set the signal generator for the wanted signal power as specified in subclause 7.2.5.

5) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

6) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.2.5 Test requirements

For NR, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A with parameters specified in table 7.2.5-1 for Wide Area BS, in table 7.2.5-2 for Medium Range BS and in table 7.2.5-3 for Local Area BS.

**Table 7.2.5-1: NR Wide Area BS reference sensitivity levels**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* [MHz] | Sub-carrier spacing [kHz] | Reference measurement channel | Reference sensitivity power level, PREFSENS  [dBm] | | |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| 5, 10, 15 | 15 | G-FR1-A1-1 | -101 | -100.7 | -100.2 |
| 10, 15 | 30 | G- FR1-A1-2 | -101.1 | -100.8 | -100.3 |
| 10, 15 | 60 | G- FR1-A1-3 | -98.2 | -97.9 | -97.4 |
| 20, 25, 30, 40, 50 | 15 | G- FR1-A1-4 | -94.6 | -94.3 | -93.8 |
| 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 30 | G- FR1-A1-5 | -94.9 | -94.6 | -94.1 |
| 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 60 | G- FR1-A1-6 | -95 | -94.7 | -94.2 |
| NOTE: PREFSENS is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *BS channel bandwidth*. | | | | | |

**Table 7.2.5-2: NR Medium Area BS reference sensitivity levels**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* [MHz] | Sub-carrier spacing [kHz] | Reference measurement channel | Reference sensitivity power level, PREFSENS  [dBm] | | |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| 5, 10, 15 | 15 | G-FR1-A1-1 | -96 | -95.7 | -95.2 |
| 10, 15 | 30 | G- FR1-A1-2 | -96.1 | -95.8 | -95.3 |
| 10, 15 | 60 | G- FR1-A1-3 | -93.2 | -92.9 | -92.4 |
| 20, 25, 30, 40, 50 | 15 | G- FR1-A1-4 | -89.6 | -89.3 | -88.8 |
| 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 30 | G- FR1-A1-5 | -89.9 | -89.6 | -89.1 |
| 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 60 | G- FR1-A1-6 | -90 | -89.7 | -89.2 |
| NOTE: PREFSENS is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *BS channel bandwidth*. | | | | | |

**Table 7.2.5-3: NR Local Area BS reference sensitivity levels**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* [MHz] | Sub-carrier spacing [kHz] | Reference measurement channel | Reference sensitivity power level, PREFSENS  [dBm] | | |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| 5, 10, 15 | 15 | G-FR1-A1-1 | -93 | -92.7 | -92.2 |
| 10, 15 | 30 | G- FR1-A1-2 | -93.1 | -92.8 | -92.3 |
| 10, 15 | 60 | G- FR1-A1-3 | -90.2 | -89.9 | -89.4 |
| 20, 25, 30, 40, 50 | 15 | G- FR1-A1-4 | -86.6 | -86.3 | -85.8 |
| 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 30 | G- FR1-A1-5 | -86.9 | -86.6 | -86.1 |
| 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 60 | G- FR1-A1-6 | -87 | -86.7 | -86.2 |
| NOTE: PREFSENS is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *BS channel bandwidth*. | | | | | |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The relationship between Minimum Requirements and Test Requirements is defined in subclause 4.1 and the explanation of how the Minimum Requirement has been adjusted by the Test Tolerance is given in Annex C.

## 7.3 Dynamic range

### 7.3.1 Definition and applicability

The dynamic range is specified as a measure of the capability of the receiver to receive a wanted signal in the presence of an interfering signal at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* inside the received *BS channel bandwidth*. In this condition, a throughput requirement shall be met for a specified reference measurement channel. The interfering signal for the dynamic range requirement is an AWGN signal.

### 7.3.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.3.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.3.2.

### 7.3.3 Test purpose

To verify that the BS type 1-C receiver and each BS type 1-H *TAB connector* receiver dynamic range, the relative throughput shall fulfil the specified limit.

### 7.3.4 Method of test

#### 7.3.4.1 Initial conditions

Test environment:

- normal; see annex clause X.x.

RF channels to be tested for single carrier:

- B, M and T; see subclause 4.9.1.

#### 7.3.4.2 Procedure

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. Set the signal generator for the wanted signal to transmit as specified in table 7.3.5-1 to table 7.3.5-3 according to the appropriate BS class.
3. Set the Signal generator for the AWGN interfering signal at the same frequency as the wanted signal to transmit as specified in table 7.3.5-1 to table 7.3.5-3 according to the appropriate BS class.
4. Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

1. For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

### 7.3.5 Test requirements

For NR, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A with parameters specified in table 7.3.2-1 for Wide Area BS, in table 7.3.2-2 for Medium Range BS and in table 7.3.2-3 for Local Area BS.

Table 7.3.5-1: Wide Area BS dynamic range

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* [MHz] | Subcarrier spacing [kHz] | Reference measurement channel | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] / BWConfig | Type of interfering signal |
| 5 | 15 | G-FR1-A2-1 | -70.4 | -82.5 | AWGN |
| 30 | G- FR1-A2-2 | -71.1 |
| 10 | 15 | G-FR1-A2-1 | -70.4 | -79.3 | AWGN |
| 30 | G- FR1-A2-2 | -71.1 |
| 60 | G- FR1-A2-3 | -68.1 |
| 15 | 15 | G-FR1-A2-1 | -70.4 | -77.5 | AWGN |
| 30 | G- FR1-A2-2 | -71.1 |
| 60 | G- FR1-A2-3 | -68.1 |
| 20 | 15 | G- FR1-A2-4 | -64.2 | -76.2 | AWGN |
| 30 | G- FR1-A2-5 | -64.2 |
| 60 | G- FR1-A2-6 | -64.5 |
| 25 | 15 | G- FR1-A2-4 | -64.2 | -75.2 | AWGN |
| 30 | G- FR1-A2-5 | -64.2 |
| 60 | G- FR1-A2-6 | -64.5 |
| 30 | 15 | G- FR1-A2-4 | -64.2 | -74.4 | AWGN |
| 30 | G- FR1-A2-5 | -64.2 |
| 60 | G- FR1-A2-6 | -64.5 |
| 40 | 15 | G- FR1-A2-4 | -64.2 | -73.1 | AWGN |
| 30 | G- FR1-A2-5 | -64.2 |
| 60 | G- FR1-A2-6 | -64.5 |
| 50 | 15 | G- FR1-A2-4 | -64.2 | -72.2 | AWGN |
| 30 | G- FR1-A2-5 | -64.2 |
| 60 | G- FR1-A2-6 | -64.5 |
| 60 | 30 | G- FR1-A2-5 | -64.2 | -71.4 | AWGN |
| 60 | G- FR1-A2-6 | -64.5 |
| 70 | 30 | G- FR1-A2-5 | -64.2 | -70.8 | AWGN |
| 60 | G- FR1-A2-6 | -64.5 |
| 80 | 30 | G- FR1-A2-5 | -64.2 | -70.1 | AWGN |
| 60 | G- FR1-A2-6 | -64.5 |
| 90 | 30 | G- FR1-A2-5 | -64.2 | -69.6 | AWGN |
| 60 | G- FR1-A2-6 | -64.5 |
| 100 | 30 | G- FR1-A2-5 | -64.2 | -69.1 | AWGN |
| 60 | G- FR1-A2-6 | -64.5 |
| NOTE: The wanted signal mean power is the power level of a single instance of the corresponding reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *BS channel bandwidth*. | | | | | |

Table 7.3.5-2: Medium Range BS dynamic range

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* [MHz] | Subcarrier spacing [kHz] | Reference measurement channel | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] / BWConfig | Type of interfering signal |
| 5 | 15 | G-FR1-A2-1 | -65.4 | -77.5 | AWGN |
| 30 | G- FR1-A2-2 | -66.1 |
| 10 | 15 | G-FR1-A2-1 | -65.4 | -74.3 | AWGN |
| 30 | G- FR1-A2-2 | -66.1 |
| 60 | G- FR1-A2-3 | -63.1 |
| 15 | 15 | G-FR1-A2-1 | -65.4 | -72.5 | AWGN |
| 30 | G- FR1-A2-2 | -66.1 |
| 60 | G- FR1-A2-3 | -63.1 |
| 20 | 15 | G- FR1-A2-4 | -59.2 | -71.2 | AWGN |
| 30 | G- FR1-A2-5 | -59.2 |
| 60 | G- FR1-A2-6 | -59.5 |
| 25 | 15 | G- FR1-A2-4 | -59.2 | -70.2 | AWGN |
| 30 | G- FR1-A2-5 | -59.2 |
| 60 | G- FR1-A2-6 | -59.5 |
| 30 | 15 | G- FR1-A2-4 | -59.2 | -69.4 | AWGN |
| 30 | G- FR1-A2-5 | -59.2 |
| 60 | G- FR1-A2-6 | -59.5 |
| 40 | 15 | G- FR1-A2-4 | -59.2 | -68.1 | AWGN |
| 30 | G- FR1-A2-5 | -59.2 |
| 60 | G- FR1-A2-6 | -59.5 |
| 50 | 15 | G- FR1-A2-4 | -59.2 | -67.2 | AWGN |
| 30 | G- FR1-A2-5 | 59.8 |
| 60 | G- FR1-A2-6 | -59.5 |
| 60 | 30 | G- FR1-A2-5 | -59.2 | -66.4 | AWGN |
| 60 | G- FR1-A2-6 | -59.5 |
| 70 | 30 | G- FR1-A2-5 | -59.2 | -65.8 | AWGN |
| 60 | G- FR1-A2-6 | -59.5 |
| 80 | 30 | G- FR1-A2-5 | -59.2 | -65.1 | AWGN |
| 60 | G- FR1-A2-6 | -59.5 |
| 90 | 30 | G- FR1-A2-5 | -59.2 | -64.6 | AWGN |
| 60 | G- FR1-A2-6 | -59.5 |
| 100 | 30 | G- FR1-A2-5 | -59.2 | -64.1 | AWGN |
| 60 | G- FR1-A2-6 | -59.5 |
| NOTE: The wanted signal mean power is the power level of a single instance of the corresponding reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *BS channel bandwidth*. | | | | | |

Table 7.3.5-3: Local Area BS dynamic range

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* [MHz] | Subcarrier spacing [kHz] | Reference measurement channel | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] / BWConfig | Type of interfering signal |
| 5 | 15 | G-FR1-A2-1 | -62.4 | -74.5 | AWGN |
| 30 | G- FR1-A2-2 | -63.1 |
| 10 | 15 | G-FR1-A2-1 | -62.4 | -71.3 | AWGN |
| 30 | G- FR1-A2-2 | -63.1 |
| 60 | G- FR1-A2-3 | -60.1 |
| 15 | 15 | G-FR1-A2-1 | -62.4 | -69.5 | AWGN |
| 30 | G- FR1-A2-2 | -63.1 |
| 60 | G- FR1-A2-3 | -60.1 |
| 20 | 15 | G- FR1-A2-4 | -56.2 | -68.2 | AWGN |
| 30 | G- FR1-A2-5 | -56.2 |
| 60 | G- FR1-A2-6 | -56.5 |
| 25 | 15 | G- FR1-A2-4 | -56.2 | -67.2 | AWGN |
| 30 | G- FR1-A2-5 | -56.2 |
| 60 | G- FR1-A2-6 | -56.5 |
| 30 | 15 | G- FR1-A2-4 | -56.2 | -66.4 | AWGN |
| 30 | G- FR1-A2-5 | -56.2 |
| 60 | G- FR1-A2-6 | -56.5 |
| 40 | 15 | G- FR1-A2-4 | -56.2 | -65.1 | AWGN |
| 30 | G- FR1-A2-5 | -56.2 |
| 60 | G- FR1-A2-6 | -56.5 |
| 50 | 15 | G- FR1-A2-4 | -56.2 | -64.2 | AWGN |
| 30 | G- FR1-A2-5 | -56.2 |
| 60 | G- FR1-A2-6 | -56.5 |
| 60 | 30 | G- FR1-A2-5 | -56.2 | -63.4 | AWGN |
| 60 | G- FR1-A2-6 | -56.5 |
| 70 | 30 | G- FR1-A2-5 | -56.2 | -62.8 | AWGN |
| 60 | G- FR1-A2-6 | -56.5 |
| 80 | 30 | G- FR1-A2-5 | -56.2 | -62.1 | AWGN |
| 60 | G- FR1-A2-6 | -56.5 |
| 90 | 30 | G- FR1-A2-5 | -56.2 | -61.6 | AWGN |
| 60 | G- FR1-A2-6 | -56.5 |
| 100 | 30 | G- FR1-A2-5 | -56.2 | -61.1 | AWGN |
| 60 | G- FR1-A2-6 | -56.5 |
| NOTE: The wanted signal mean power is the power level of a single instance of the corresponding reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *BS channel bandwidth*. | | | | | |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The relationship between Minimum Requirements and Test Requirements is defined in subclause 4.1 and the explanation of how the Minimum Requirement has been adjusted by the Test Tolerance is given in Annex C.

## 7.4 In-band selectivity and blocking

Detailed structure of the subclause is TBD.

7.4.1 Adjacent Channel Selectivity (ACS)

7.4.1.1 Definition and applicability

Adjacent channel selectivity (ACS) is a measure of the receiver’s ability to receive a wanted signal at its assigned channel frequency at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* in the presence of an adjacent channel signal with a specified centre frequency offset of the interfering signal to the band edge of a victim system.

7.4.1.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.4.1.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.4.1.2.

7.4.1.3 Test purpose

The test purpose is to verify the ability of the BS receiver filter to suppress interfering signals in the channels adjacent to the wanted channel.

7.4.1.4 Method of test

7.4.1.4.1 Initial conditions

Test environment:

- Normal; see clause B.2.

RF channels to be tested for single carrier (SC):

- B, M and T; see subclause 4.9.1

*Base Station RF Bandwidth p*ositions to be tested for multi-carrier (MC):

- MRFBW for *single-band TAB connector(s)*, see subclause 4.9.1,

- BRFBW\_T'RFBW and B'RFBW\_TRFBW for *multi-band TAB connector(s),* see subclause 4.9.1.

7.4.1.4.2 Procedure

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. Set the BS to transmit

For single carrier operation set the connector under test to transmit at manufacturers declared rated carrier output power (Prated,t,AC for BS type 1-C and Prated,t,TABC for BS type 1-H).

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.2

2) Set the signal generator for the wanted signal to transmit as specified in table 7.4.1.5-1.

3) Set the Signal generator for the interfering signal to transmit at the frequency offset and as specified in table 7.4.1.5-1 and 7.4.1.5-2.

4) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

5) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.4.1.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel.

For BS, the wanted and the interfering signal coupled to the *BS* *type 1-C* *antenna connector* or *BS type 1-H* *TAB connector* are specified in table 7.4.1.5-1 and the frequency offset between the wanted and interfering signal in table 7.4.1.5-2 for ACS. The reference measurement channel for the wanted signal is identified in table 7.2.5-1, 7.2.5-2 and 7.2.5-3 for each channel bandwidth and further specified in annex X. The characteristics of the interfering signal is further specified in annex A.

The ACS requirement is applicable outside the Base Station RF Bandwidth or Radio Bandwidth. The interfering signal offset is defined relative to the Base station RF Bandwidth edges or Radio Bandwidth edges.

For a BS operating in non-contiguous spectrum within any *operating band*, the ACS requirement shall apply in addition inside any sub-block gap, in case the sub-block gap size is at least as wide as the NR interfering signal in table 7.4.1.5-1. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For a *multi-band connector*, the ACS requirement shall apply in addition inside any Inter RF Bandwidth gap, in case the Inter RF Bandwidth gap size is at least as wide as the NR interfering signal in table 7.4.1.5‑2. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap

Conducted requirement is defined at the *antenna connector* for *BS type 1-C* and at the *TAB connector* for *BS type 1-H.*

**Table 7.4.1.5-1: Base station ACS requirement**

|  |  |  |
| --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] |
| 5, 10, 15, 20,  25, 30, 40, 50, 60, 70, 80, 90, 100  (Note 1) | PREFSENS + 6dB | Wide Area: -52  Medium Range: -47  Local Area: -44 |
| NOTE 1: The SCS for the lowest/highest carrier received is the lowest SCS supported by the BS for that bandwidth.  NOTE 2: PREFSENS depends on the *BS channel bandwidth* as specified in tables 7.2.5-1, 7.2.5-2, 7.2.5-3 | | |

**Table 7.4.1.5-2: Base Station ACS interferer frequency offset values**

|  |  |  |
| --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Interfering signal centre frequency offset from the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [MHz] | Type of interfering signal |
| 5 | ±2.5025 | 5 MHz DFT-s-OFDM NR signal  SCS: 15kHz, 25 RB |
| 10 | ±2.5075 |
| 15 | ±2.5125 |
| 20 | ±2.5025 |
| 25 | ±9.535 | 20 MHz DFT-s-OFDM NR signal  SCS: 15kHz, 100 RB |
| 30 | ±9.585 |
| 40 | ±9.535 |
| 50 | ±9.485 |
| 60 | ±9.585 |
| 70 | ±9.535 |
| 80 | ±9.485 |
| 90 | ±9.585 |
| 100 | ±9.535 |

[NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The relationship between Minimum Requirements and Test Requirements is defined in subclause 4.1 and the explanation of how the Minimum Requirement has been adjusted by the Test Tolerance is given in Annex C.]

7.4.2 In-band blocking

7.4.2.1 Definition and applicability

The in-band blocking characteristics is a measure of the receiver’s ability to receive a wanted signal at its assigned channel at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* in the presence of an unwanted interferer, which is an NR signal for general blocking or an NR signal with one resource block for narrowband blocking.

7.4.2.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.4.2.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.4.2.2.

7.4.2.3 Test purpose

The test purpose is to verify the ability of the BS receiver to withstand high-levels of in-band interference from unwanted signals at specified frequency offsets without undue degradation of its sensitivity.

7.4.1.4 Method of test

7.4.1.4.1 Initial conditions

Test environment:

- Normal; see clause B.2.

RF channels to be tested for single carrier (SC):

- [B, M and T]; see subclause 4.9.1

*Base Station RF Bandwidth p*ositions to be tested for multi-carrier (MC):

- [MRFBW] for *single-band TAB connector(s)*, see subclause 4.9.1,

- [BRFBW\_T'RFBW and B'RFBW\_TRFBW] for *multi-band TAB connector(s),* see subclause 4.9.1.

7.4.1.4.2 Procedure for general blocking

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. Set the BS to transmit

For single carrier operation set the connector under test to transmit at manufacturers declared rated carrier output power (Prated,t,AC for BS type 1-C and Prated,t,TABC for BS type 1-H).

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.2

3) Set the signal generator for the wanted signal as defined in subclause 7.2.5 to transmit as specified in table 7.4.2.5-1.

4) Set the Signal generator for the interfering signal to transmit at the frequency offset and as specified in table 7.4.5-1. The interfering signal shall be swept with a step size of [1 MHz] starting from the minimum offset to the channel edges of the wanted signals as specified in table 7.4.2.5.1-1.

5) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

6) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.4.1.4.2 Procedure for Narrow band blocking

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. Set the BS to transmit

For single carrier operation set the connector under test to transmit at manufacturers declared rated carrier output power (Prated,t,AC for BS type 1-C and Prated,t,TABC for BS type 1-H).

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.2

3) Set the signal generator for the wanted signal as defined in subclause 7.2.5 to transmit as specified in table 7.4.2.5-2.

4) Set the Signal generator for the interfering signal to transmit at the frequency offset and as specified in table 7.4.5-2 and 7.3.5-3. Set-up and sweep the interfering RB centre frequency offset to the channel edge of the wanted signal according to Table 74.2.5-3.

5) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

6) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.4.2.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted and an interfering signal coupled to *BS type 1-C* *antenna connector* or *BS type 1‑H* *TAB connector* using the parameters in tables 7.4.2.5-1, 7.4.2.5-2 and 7.4.2.5-3 for general blocking and narrowband blocking requirements. The reference measurement channel for the wanted signal is identified in subclause 7.2.5 for each channel bandwidth and further specified in annex A. The characteristics of the interfering signal is further specified in annex D.

The in-band blocking requirements apply outside the Base Station RF Bandwidth or Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Radio Bandwidth edges.

For *BS type 1-C* and *BS type 1-H,* the in-band blocking requirement applies from FUL\_low - ΔfOOB to FUL\_high + ΔfOOB, excluing the downlink frequency range of the *operating band*. The ΔfOOB for *BS type 1-C* and *BS type 1-H* is defined in table 7.4.2.5-0.

Minimum conducted requirement is defined at the *antenna connector* for *BS type 1-C* and at the *TAB connector* for *BS type 1-H.*

**Table 7.4.2.5-0: ΔfOOB offset for NR *operating bands***

|  |  |  |
| --- | --- | --- |
| BS type | *Operating band* characteristics | ΔfOOB [MHz] |
| *BS type 1-C* | FUL\_high – FUL\_low ≤ 200 MHz | 20 |
| 200 MHz < FUL\_high – FUL\_low ≤ 900 MHz | 60 |
| *BS type 1-H* | FUL\_high – FUL\_low < 100 MHz | 20 |
| 100 MHz ≤ FUL\_high – FUL\_low ≤ 900 MHz | 60 |

For a BS operating in non-contiguous spectrum within any *operating band*, the in-band blocking requirements apply in addition inside any sub-block gap, in case the sub-block gap size is at least as wide as twice the interfering signal minimum offset in tables 7.4.2.5-1. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For a BS capable of multi-band operation, the blocking requirements apply in the in-band blocking frequency ranges for each supported *operating band*. The requirement applies in addition inside any Inter RF Bandwidth gap, in case the Inter RF Bandwidth gap size is at least as wide as twice the interfering signal minimum offset in tables 7.4.2.5-1.

For a BS operating in non-contiguous spectrum within any operating band, the narrowband blocking requirement applies in addition inside any sub-block gap, in case the sub-block gap size is at least as wide as the channel bandwidth of the NR interfering signal in Table 7.4.2.5-3. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For a BS capable of multi-band operation, the narrowband blocking requirement applies in addition inside any Inter RF Bandwidth gap, in case the Inter RF Bandwidth gap size is at least as wide as the NR interfering signal in Table 7.4.2.5-3. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.

**Table 7.4.2.5-1: Base station general blocking requirement**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] | Interfering signal centre frequency minimum offset from the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [MHz] | Type of interfering signal |
| 5, 10, 15, 20 | PREFSENS + 6 dB | Wide Area: -43  Medium Range: -38  Local Area: -35 | ±7.5 | 5 MHz DFT-s-OFDM NR signal  SCS: 15 kHz, 25 RB |
| 25, 30, 40, 50, 60, 70, 80, 90, 100 | PREFSENS + 6 dB | Wide Area: -43  Medium Range: -38  Local Area: -35 | ±30 | 20 MHz DFT-s-OFDM NR signal  SCS: 15 kHz, 100 RB |
| NOTE: PREFSENS depends on the *BS channel bandwidth* as specified in tables 7.2.5-1, 7.2.5-2 and 7.2.5-3. | | | | |

**Table 7.4.2.5-2: Base Station narrowband blocking requirement**

|  |  |  |
| --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] |
| 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80,90, 100 (Note 1) | PREFSENS + 6 dB | Wide Area: -49  Medium Range: -44  Local Area: -41 |
| NOTE 1: The SCS for the lowest/highest carrier received is the lowest SCS supported by the BS for that *BS channel bandwidth*  NOTE 2: PREFSENS depends on the *BS channel bandwidth* as specified in tables 7.2.5-1, 7.2.5-2 and 7.2.5-3. | | |

**Table 7.4.2.5-3: Base Station narrowband blocking interferer frequency offsets**

|  |  |  |
| --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Interfering RB centre frequency offset to the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [kHz] | Type of interfering signal |
| 5 | ±([342.5]+m\*180),  m=0, 1, 2, 3, 4, 9, 14, 19, 24 | 5 MHz DFT-s-OFDM NR signal, 1 RB  SCS: 15 kHz, 25 RB |
| 10 | ±([347.5]+m\*180),  m=0, 1, 2, 3, 4, 9, 14, 19, 24 |
| 15 | ±([352.5]+m\*180),  m=0, 1, 2, 3, 4, 9, 14, 19, 24 |
| 20 | ±([342.5]+m\*180),  m=0, 1, 2, 3, 4, 9, 14, 19, 24 |
| 25 | ±([557.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 | 20 MHz DFT-s-OFDM NR signal, 1 RB  SCS: 15 kHz, 100 RB |
| 30 | ±([562.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 40 | ±([557.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 50 | ±([552.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 60 | ±([562.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 70 | ±([557.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 80 | ±([552.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 90 | ±([562.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| 100 | ±([557.5]+m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 104 |
| NOTE: Interfering signal consisting of one resource block positioned at the stated offset, the *channel bandwidth* of the interfering signal is located adjacently to the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap. | | |

[NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The relationship between Minimum Requirements and Test Requirements is defined in subclause 4.1 and the explanation of how the Minimum Requirement has been adjusted by the Test Tolerance is given in Annex C.]

## 7.5 Out-of-band blocking

7.5.1 Definition and applicability

The out-of-band blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* in the presence of an unwanted interferer out of the *operating band*, which is a CW signal for out-of-band blocking.

7.5.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.5.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.5.2.

7.5.3 Test purpose

To verify that the BS type 1-C receiver and each BS type 1-H *TAB connector* receiver dynamic range, the relative throughput shall fulfil the specified limit.

7.5.4 Method of test

7.5.4.1 Initial conditions

Test environment:

- Normal; see clause B.2.

RF channels to be tested for single carrier (SC):

- M; see subclause 4.9.1

*Base Station RF Bandwidth p*ositions to be tested for multi-carrier (MC):

- MRFBW for *single-band TAB connector(s)*, see subclause 4.9.1,

- BRFBW\_T'RFBW and B'RFBW\_TRFBW for *multi-band TAB connector(s),* see subclause 4.9.1.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H,:

- For BRFBW\_T'RFBW, out-of-band blocking testing above the highest operating band may be omitted.

- For B'RFBW\_TRFBW, out-of-band blocking testing below the lowest operating band may be omitted.

7.5.4.2 Procedure

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. Set the BS to transmit a signal according to subclause 4.9.2, connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7.

The transmitter may be turned off for the out-of-band blocker tests when the frequency of the blocker is such that no IM2 or IM3 products fall inside the bandwidth of the wanted signal.

3) Set the signal generator for the wanted signal as defined in subclause 7.5.5 to transmit as specified in table 7.5.5.1-1 and 7.5.5.2-1.

4) Set the Signal generator for the interfering signal to transmit at the frequency offset and as specified in table 7.5.5.1-1 and 7.5.5.2-1. The CW interfering signal shall be swept with a step size of [1 MHz] over than range 1 MHz to (FUL\_low - ΔfOOB) MHz and (FUL\_high + ΔfOOB) MHz to 12750 MHz.

4) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

5) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.5.5 Test requirements

7.5.5.1 General requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted and an interfering signal coupled to *BS type 1-C* *antenna connector* or *BS type 1-H* *TAB connector* using the parameters in table 7.5.2-1. The reference measurement channel for the wanted signal is identified in subclause 7.2.2 for each channel bandwidth and further specified in annex X. The characteristics of the interfering signal is further specified in annex A.

For *BS type 1-C* and *BS type 1-H* the out-of-band blocking requirement apply from 1 MHz to FUL\_low - ΔfOOB and from FUL\_high + ΔfOOB up to 12750 MHz, including the downlink frequency range of the *operating band*. The ΔfOOB for or *BS type 1-C* and *BS type 1-H* is defined in table 7.4.2.5-0.

Minimum conducted requirement is defined at the *antenna connector* for *BS type 1-C* and at the *TAB connector* for *BS type 1-H.*

[For a BS capable of multi-band operation, the requirement in the out-of-band blocking frequency ranges apply for each *operating band*, with the exception that the in-band blocking frequency ranges of all supported *operating bands* according to subclause 7.4.2.5 shall be excluded from the out-of-band blocking requirement.]

**Table 7.5.5.1-1: Out-of-band blocking performance requirement for NR**

|  |  |  |
| --- | --- | --- |
| Wanted Signal mean power [dBm] | Interfering Signal mean power [dBm] | Type of Interfering Signal |
| PREFSENS +6 dB (Note) | -15 | CW carrier |
| NOTE: PREFSENS depends on the *BS channel bandwidth* as specified in Table 7.2.5-1, 7.2.5-2, and 7.2.5-3. | | |

7.5.5.2 Co-location requirements

This additional blocking requirement may be applied for the protection of NR BS receivers when GSM, CDMA, UTRA, E-UTRA BS or NR BS operating in a different frequency band are co-located with a NR BS. The requirement is applicable to all channel bandwidths supported by the NR BS.

The requirements in this clause assume a 30 dB coupling loss between interfering transmitter and NR BS receiver and are based on co-location with base stations of the same class.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted and an interfering signal coupled to BS antenna input using the parameters in Table 7.5.5.2-1 for all the BS classes. The reference measurement channel for the wanted signal is identified in Tables 7.2.5-1, 7.2.5-2 and 7.2.5-3 for each channel bandwidth and further specified in Annex X. The characteristics of the interfering signal is further specified in annex D.

For *BS type 1-C* and *BS type 1-H* blocking requirement for co-location with BS in other bands is applied for all operating bands for which co-location protection is provided.

Minimum conducted requirement is defined at the *antenna connector* for *BS type 1-C* and at the *TAB connector* for *BS type 1-H.*

**Table 7.5.5.2-1: Blocking performance requirement for NR BS when co-located with BS in other frequency bands.**

| Frequency range of interfering signal | Wanted signal mean power for WA BS [dBm] | Interfering signal mean power for WA BS [dBm] | Interfering signal mean power for MR BS [dBm] | Interfering signal mean power for LA BS [dBm] | Type of interfering signal |
| --- | --- | --- | --- | --- | --- |
| Frequency range of co-located downlink operating band | PREFSENS +6dB (Note 1) | +16 | +8 | x (Note 2) | CW carrier |
| NOTE 1: PREFSENS depends on the *BS channel bandwidth* as specified in Table 7.2.5-1, 7.2.5-2, and 7.2.5-3.  NOTE 2: x = -7 dBm for NR BS co-located with Pico GSM850 or Pico CDMA850 x = -4 dBm for NR BS co-located with Pico DCS1800 or Pico PCS1900 x = -6 dBm for NR BS co-located with UTRA bands or E-UTRA bands or NR bands | | | | | |

## 7.6 Receiver spurious emissions

7.6.1 Definition and applicability

The receiver spurious emissions power is the power of emissions generated or amplified in a receiver unit that appear at the *antenna connector* (for *BS type 1-C*) or at the *TAB connector* (for *BS type 1-H*). The requirements apply to all BS with separate RX and TX *antenna connectors* / *TAB connectors*.

NOTE: In this case for FDD operation the test is performed when both TX and RX are ON, with the TX *antenna connectors* / *TAB connectors* terminated.

For a*ntenna connectors* / *TAB connectors* supporting both RX and TX in TDD, the requirements apply during the *transmitter OFF period*. For *antenna connectors* / *TAB connectors* supporting both RX and TX in FDD, the RX spurious emissions requirements are superseded by the TX spurious emissions requirements, as specified in subclause 6.6.5.

For RX-only *multi-band* *connectors*, the spurious emissions requirements are subject to exclusion zones in each supported *operating band*. For *multi-band* *connectors* that both transmit and receive in *operating band* supporting TDD, RX spurious emissions requirements are applicable during the *TX OFF period*, and are subject to exclusion zones in each supported *operating band*.

For *BS type 1-H* manufacturer shall declare *TAB connector RX min cell groups*. Every *TAB connector* of *BS type 1‑H* supporting reception in an *operating band* shall map to one *TAB connector RX min cell group*, where mapping of *TAB connectors* to cells/beams is implementation dependent.

The number of active receiver units that are considered when calculating the conducted RX spurious emission limits (NRXU,counted) for *BS type 1-H* is calculated as follows:

NRXU,counted = *min(NRXU,active , 8* *× Ncells)*

NRXU,countedpercell is used for scaling of *basic limits* and is derived as NRXU,countedpercell = NRXU,counted / Ncells, where Ncells is defined in subclause 6.1.

NOTE: NRXU,active is the number of actually active receiver units and is independent to the declaration of Ncells.

7.6.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.6.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.6.2.

7.6.3 Test purpose

The test purpose is to verify the ability of the BS to limit the interference caused by receiver spurious emissions to other systems.

7.6.4 Method of test

7.6.4.1 Initial conditions

Test environment:

- normal; see annex clause X.x

RF channels to be tested for single carrier:

- M; see subclause 4.9.1.

*Base Station RF Bandwidth* positions to be tested for multi-carrier:

- MRFBW in single-band operation, see subclause 4.9.1,

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

7.6.4.2 Procedure

The minimum requirement is applied to all connectors under test,

For BS type 1-H where there may be multiple *TAB connectors* they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex subclause X.x. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. For separate RX only connectors with single carrier operation set the connector under test to transmit at manufacturers declared rated carrier output power (Prated,t,AC for BS type 1-C and Prated,t,TABC for BS type 1-H). Channel set-up shall be according to N-TM x.x

For separate RX only connectors declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.

For TDD connectors capable of transmit and receive ensure the transmitter is OFF.

3) Set the measurement equipment parameters as specified in table 7.6.5.1-1.

4) Measure the spurious emissions over each frequency range described in subclause 7.6.5.1-1.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

5) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.6.5 Test requirements

7.6.5.1 Basic limits

The receiver spurious emissions limits are provided in table 7.6.5.1-1.

**Table 7.6.5.1-1: General RX spurious emissions limits**

| Frequency range | Basic limits | Measurement bandwidth | Note |
| --- | --- | --- | --- |
| 30 MHz – 1 GHz | -57 dBm | 100 kHz |  |
| 1 GHz – 12.75 GHz | -47 dBm | 1 MHz |  |
| 12.75 GHz – 5th harmonic of the upper frequency edge of the UL *operating band* in GHz | -47 dBm | 1 MHz | Applies only for bands which have 5th harmonic of the upper frequency edge of the UL *operating band* reaching beyond 12.75 GHz.  Applies only for Bands TBD. |
| NOTE 1: The frequency range from ΔfOBUE below the lowest frequency of the BS transmitter operating band to ΔfOBUE above the highest frequency of the BS transmitter *operating band*, may be excluded from the requirement. ΔfOBUE is defined in subclause 6.6.1.  NOTE 2: For *multi-band* *connectors*, the exclusion applies for all supported *operating bands* for those a*ntenna connectors* / *TAB connectors*. | | | |

7.6.5.2 BS type 1-C

The RX spurious emissions requirements for *BS type 1-C* are that for each *antenna connector,* the power of emissions shall not exceed *basic limits* specified in table 7.6.5.1-1.

7.6.5.3 BS type 1-H

The RX spurious emissions requirements for *BS type 1-H* are that for each applicable *basic limit* specified in table 7.6.2-1 for each *TAB connector RX min cell group,* the power sum of emissions at respective *TAB connectors* shall not exceed the BS limits specified as the *basic limit*s + X, where X = 10log10(NRXU,countedpercell), unless stated differently in regional regulation.

The RX spurious emission requirements are applied per the *TAB connector RX min cell group* for all the configurations supported by the BS.

NOTE: Conformance to the BS receiver spurious emissions requirement can be demonstrated by meeting at least one of the following criteria as determined by the manufacturer:

1) The sum of the spurious emissions power measured on each *TAB connector* in the *TAB connector RX min cell group* shall be less than or equal to the BS limit above for the respective frequency span.

Or

2) The spurious emissions power at each *TAB connector* shall be less than or equal to the BS limit as defined above for the respective frequency span, scaled by -10log10(*n*), where *n* is the number of *TAB connectors* in the *TAB connector RX min cell group*.

## 7.7 Receiver intermodulation

7.7.1 Definition and applicability

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* in the presence of two interfering signals which have a specific frequency relationship to the wanted signal.

7.7.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.7.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.7.2.

7.7.3 Test purpose

To verify that the BS type 1-C receiver and each BS type 1-H *TAB connector* receiver dynamic range, the relative throughput shall fulfil the specified limit.

7.7.4 Method of test

7.7.4.1 Initial conditions

Test environment:

- Normal; see clause B.2.

RF channels to be tested for single carrier (SC):

- [B, M and T]; see subclause 4.9.1

*Base Station RF Bandwidth p*ositions to be tested for multi-carrier (MC):

- [MRFBW] for *single-band TAB connector(s)*, see subclause 4.9.1,

- [BRFBW\_T'RFBW and B'RFBW\_TRFBW]for *multi-band TAB connector(s),* see subclause 4.9.1.

7.7.4.2 Procedure

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1. Connect the connector under test to measurement equipment as shown in annex subclause X.x. All connectors not under test shall be terminated.
2. Set the BS to transmit

For single carrier operation set the connector under test to transmit at manufacturers declared rated carrier output power (Prated,t,AC for BS type 1-C and Prated,t,TABC for BS type 1-H).

For a connector under test declared to be capable of multi-carrier and/or CA operation set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in subclause 4.7 using the corresponding test models or set of physical channels in subclause 4.9.2

3) Set the signal generator for the wanted signal to transmit as specified in table 7.7.5-1 and 7.7.5-3

3) Set the Signal generator for the interfering signal to transmit at the frequency offset and as specified in table 7.75-2 and 7.7.5-4.

4) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

5) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.7.5 Test requirements

For NR, the throughputshall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted signal at the assigned channel frequency and two interfering signals coupled to the *BS type 1-C antenna connector* or *BS type 1-H* *TAB connector*, with the conditions specified in tables 7.7.5-1 and 7.7.5-2 for intermodulation performance and in tables 7.7.5-3, and 7.7.5-4 for narrowband intermodulation performance. The reference measurement channel for the wanted signal is identified in table 7.2.5-1 and table 7.2.5-3 for each channel bandwidth and further specified in annex X. The characteristics of the interfering signal is further specified in annex A.

The subcarrier spacing for the modulated interfering signal shall in general be the same as the subcarrier spacing for the wanted signal, except for the case of wanted signal subcarrier spacing 60 kHz and BS channel bandwidth <=20MHz, for which the subcarrier spacing of the interfering signal should be 30 kHz.

The receiver intermodulation requirement is applicable outside the Base Station RF Bandwidth or Radio Bandwidth edges. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Radio Bandwidth edges.

For a BS operating in non-contiguous spectrum within any *operating band*, the narrowband intermodulation requirement applies in addition inside any sub-block gap in case the sub-block gap is at least as wide as the channel bandwidth of the NR interfering signal in table 7.7.5-2 or 7.7.5-4. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

[For a BS capable of multi-band operation or *multi-band TAB connectors*, the intermodulation requirement applies in addition inside any Inter RF Bandwidth gap, in case the gap size is at least twice as wide as the NR interfering signal centre frequency offset from the Base Station RF Bandwidth edge.]

[For a BS capable of multi-band operation or *multi-band TAB connectors*, the narrowband intermodulation requirement applies in addition inside any Inter RF Bandwidth gap in case the gap size is at least as wide as the NR interfering signal in tables 7.7.5-2 and 7.7.5-4. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.]

**Table 7.7.5-1: General intermodulation requirement**

|  |  |  |  |
| --- | --- | --- | --- |
| Base Station Type | Wanted Signal mean power [dBm] | Mean power of interfering signals [dBm] | Type of interfering signal |
| Wide Area BS | PREFSENS +6 dB | -52 | See Table 7.7.5-2 |
| Medium Range BS | PREFSENS +6 dB | -47 |
| Local Area BS | PREFSENS +6 dB | -44 |
| NOTE 1: PREFSENS depends on the BS class and on the *BS channel bandwidth*, see subclause 7.2. | | | |

**Table 7.7.5-2: Interfering signals for intermodulation requirement**

|  |  |  |
| --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Interfering signal centre frequency offset from the lower/upper Base Station RF Bandwidth edge [MHz] | Type of interfering signal |
| 5 | ±7.5 | CW |
| ±17.5 | 5 MHz DFT-s-OFDM NR signal, 25 RB |
| 10 | ±7.45 | CW |
| ±17.5 | 5 MHz DFT-s-OFDM NR signal, 25 RB |
| 15 | ±7.43 | CW |
| ±17.5 | 5 MHz DFT-s-OFDM NR signal, 25 RB |
| 20 | ±7.38 | CW |
| ±17.5 | 5 MHz DFT-s-OFDM NR signal, 25 RB |
| 25 | ±7.45 | CW |
| ±25 | 20MHz DFT-s-OFDM NR signal, 100 RB |
| 30 | ±7.43 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 40 | ±7.45 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 50 | ±7.35 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 60 | ±7.49 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 70 | ±7.42 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 80 | ±7.44 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 90 | ±7.43 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |
| 100 | ±7.45 | CW |
| ±25 | 20 MHz DFT-s-OFDM NR signal, 100 RB |

**Table 7.7.5-3: Narrowband intermodulation performance requirement in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| BS type | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] | Type of interfering signal |
| Wide Area BS | PREFSENS + 6dB  (Note 1) | -52 | See Table 7.7.5-4 |
| Medium Range BS | PREFSENS + 6dB  (Note 2) | -47 |
| Local Area BS | PREFSENS + 6dB  (Note 3) | -44 |
| NOTE 1: PREFSENS depends on the *BS channel bandwidth* as specified in table 7.2.5-1.  NOTE 2: PREFSENS depends on the *BS channel bandwidth* as specified in table 7.2.5-2.  NOTE 3: PREFSENS depends on the *BS channel bandwidth* as specified in table 7.2.5-3. | | | |

**Table 7.7.5-4: Interfering signals for narrowband intermodulation requirement in FR1**

|  |  |  |
| --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received [MHz] | Interfering RB centre frequency offset from the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [kHz] | Type of interfering signal |
| 5 | ±360 | CW |
| ±1420 | 5 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 10 | ±325 | CW |
| ±1780 | 5 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 15 (Note 2) | ±380 | CW |
| ±1600 | 5 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 20 (Note 2) | ±345 | CW |
| ±1780 | 5 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 25 (Note 2) | ±325 | CW |
| ±1990 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 30 (Note 2) | ±320 | CW |
| ±1990 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 40 (Note 2) | ±310 | CW |
| ±2710 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 50 (Note 2) | ±330 | CW |
| ±3250 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 60 (Note 2) | ±350 | CW |
| ±3790 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 70 (Note 2) | ±400 | CW |
| ±4870 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 80 (Note 2) | ±390 | CW |
| ±4870 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 90 (Note 2) | ±340 | CW |
| ±5770 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| 100 (Note 2) | ±340 | CW |
| ±5770 | 20 MHz DFT-s-OFDM NR signal, 1 RB (Note 1) |
| NOTE 1: Interfering signal consisting of one resource block positioned at the stated offset, the *BS channel bandwidth* of the interfering signal is located adjacently to the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap.  NOTE 2: This requirement shall apply only for a G-FRC mapped to the frequency range at the channel edge adjacent to the interfering signals. | | |

[NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The relationship between Minimum Requirements and Test Requirements is defined in subclause 4.1 and the explanation of how the Minimum Requirement has been adjusted by the Test Tolerance is given in Annex C.]

## 7.8 In-channel selectivity

### 7.8.1 Definition and applicability

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations at the *antenna connector* for *BS type 1-C* or *TAB connector* for *BS type 1-H* in the presence of an interfering signal received at a larger power spectral density. In this condition a throughput requirement shall be met for a specified reference measurement channel. The interfering signal shall be an NR signal which is time aligned with the wanted signal.

7.8.2 Minimum requirement

The minimum requirement for BS type 1-C is in 3GPP TS 38.104 [2], subclause 7.8.2.

The minimum requirement for BS type 1-H is in 3GPP TS 38.104 [2], subclause 7.8.2.

7.8.3 Test purpose

The purpose of this test is to verify the BS receiver ability to suppress the IQ leakage.

7.8.4 Method of test

7.8.4.1 Initial conditions

Test environment:

- normal; see annex subclause X.x

RF channels to be tested for single carrier:

- B, M and T; see subclause 4.9.1.

7.8.4.2 Procedure

The minimum requirement is applied to all connectors under test.

For BS type 1-H the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; see subclause 7.1.

1) Set the signal generator for the wanted signal to transmit as specified from table 7.8.5-1 to 7.8.5-3.

2) Set the Signal generator for the interfering signal to transmit at the frequency offset and as specified from table 7.8.5-1 to 7.8.5-3.

3) Measure the throughput according to annex X.

In addition, for a multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H, the following steps shall apply:

4) For multi-band capable BS type 1-C or a *multi-band* *TAB connector* from a BS type 1-H and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

7.8.5 Test requirements

For *BS type 1-C* and 1-H, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in annex A with parameters specified in Table 7.8.5-1 for Wide Area BS, in Table 7.8.5-2 for Medium Range BS and in Table7.8.5-3 for Local Area BS. The reference measurement channel for the wanted signal is identified in tables 7.8.2-1, 7.8.2-2 and 7.8.2-3 for each *BS channel bandwidth* and further specified in annex X. The characteristics of the interfering signal is further specified in annex A.

**Table 7.8.5-1: Wide Area BS in-channel selectivity**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR channel bandwidth [MHz]** | **Subcarrier spacing**  **[KHz]** | **Reference measurement channel** | **Wanted signal mean power [dBm]** | | | **Interfering signal mean power [dBm]** | **Type of interfering signal** |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| 5 | 15 | G-FR1-A1-7 | -99.2 | -98.8 | -98.1 | -81.4 | DFT-s-OFDM NR signal, SCS 15 kHz,  10 PRB |
| 10,15,20,25,30 | 15 | G-FR1-A1-1 | -97.3 | -96.9 | -96.2 | -77.4 | DFT-s-OFDM NR signal, SCS 15 kHz,  25 PRB |
| 40,50 | 15 | G-FR1-A1-4 | -90.9 | -90.5 | -89.8 | -71.4 | NR signal, SCS 15 kHz, 100 PRB |
| 5 | 30 | G-FR1-A1-8 | -99.9 | -99.5 | -98.8 | -81.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  5 PRB |
| 10,15,20,25,30 | 30 | G-FR1-A1-2 | -97.4 | -97 | -96.3 | -78.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  10 PRB |
| 40,50,60,70,80,90,100 | 30 | G-FR1-A1-5 | -91.2 | -90.8 | -90.1 | -71.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  50 PRB |
| 10,15,20,25,30 | 60 | G-FR1-A1-9 | -96.8 | -96.4 | -95.7 | -78.4 | DFT-s-OFDM NR signal, SCS 60 kHz,  5 PRB |
| 40,50,60,70,80,90,100 | 60 | G-FR1-A1-6 | -91.3 | -90.9 | -90.2 | -71.6 | DFT-s-OFDM NR signal, SCS 60 kHz,  24 PRB |
| NOTE: Wanted and interfering signal are placed adjacently around Fc, | | | | | | | |

**Table 7.8.5-2: Medium Range BS in-channel selectivity**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR channel bandwidth [MHz]** | **Subcarrier spacing**  **[KHz]** | **Reference measurement channel** | **Wanted signal mean power [dBm]** | | | **Interfering signal mean power [dBm]** | **Type of interfering signal** |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| 5 | 15 | G-FR1-A1-7 | -94.2 | -93.8 | -93.1 | -76.4 | DFT-s-OFDM NR signal, SCS 15 kHz,  10 PRB |
| 10,15,20,25,30 | 15 | G-FR1-A1-1 | -92.3 | -91.9 | -91.2 | -72.4 | DFT-s-OFDM NR signal, SCS 15 kHz,  25 PRB |
| 40,50 | 15 | G-FR1-A1-4 | -85.9 | -85.5 | -84.8 | -66.4 | DFT-s-OFDM NR signal, SCS 15 kHz, 100 PRB |
| 5 | 30 | G-FR1-A1-8 | -94.9 | -94.5 | -93.8 | -76.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  5 PRB |
| 10,15,20,25,30 | 30 | G-FR1-A1-2 | -92.4 | -92 | -91.3 | -73.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  10 PRB |
| 40,50,60,70,80,90,100 | 30 | G-FR1-A1-5 | -86.2 | -85.8 | -85.1 | -66.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  50 PRB |
| 10,15,20,25,30 | 60 | G-FR1-A1-9 | -91.8 | -91.4 | -90.7 | -73.4 | DFT-s-OFDM NR signal, SCS 60 kHz,  5 PRB |
| 40,50,60,70,80,90,100 | 60 | G-FR1-A1-6 | -86.3 | -85.9 | -85.2 | -66.6 | DFT-s-OFDM NR signal, SCS 60 kHz,  24 PRB |
| NOTE: Wanted and interfering signal are placed adjacently around Fc | | | | | | | |

**Table 7.8.5-3: Local area BS in-channel selectivity**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR channel bandwidth [MHz]** | **Subcarrier spacing**  **[KHz]** | **Reference measurement channel** | **Wanted signal mean power [dBm]** | | | **Interfering signal mean power [dBm]** | **Type of interfering signal** |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| 5 | 15 | G-FR1-A1-7 | -91.2 | -90.8 | -90.1 | -73.4 | DFT-s-OFDM NR signal, SCS 15 kHz,  10 PRB |
| 10,15,20,25,30 | 15 | G-FR1-A1-1 | -89.3 | -88.9 | -88.2 | -69.4 | DFT-s-OFDM NR signal, SCS 15 kHz,  25 PRB |
| 40,50 | 15 | G-FR1-A1-4 | -82.9 | -82.5 | -81.8 | -63.4 | DFT-s-OFDM NR signal, SCS 15 kHz, 100 PRB |
| 5 | 30 | G-FR1-A1-8 | -91.9 | -91.5 | -90.8 | -73.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  5 PRB |
| 10,15,20,25,30 | 30 | G-FR1-A1-2 | -89.4 | -89 | -88.3 | -70.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  10 PRB |
| 40,50,60,70,80,90,100 | 30 | G-FR1-A1-5 | -83.2 | -82.8 | -82.1 | -63.4 | DFT-s-OFDM NR signal, SCS 30 kHz,  50 PRB |
| 10,15,20,25,30 | 60 | G-FR1-A1-9 | -88.8 | -88.4 | -87.7 | -70.4 | DFT-s-OFDM NR signal, SCS 60 kHz,  5 PRB |
| 40,50,60,70,80,90,100 | 60 | G-FR1-A1-6 | -83.3 | -82.9 | -82.2 | -63.6 | DFT-s-OFDM NR signal, SCS 60 kHz,  24 PRB |
| NOTE: Wanted and interfering signal are placed adjacently around Fc | | | | | | | |

# 8 Conducted performance requirements

Detailed structure of the subclause is TBD.

Annex A (normative):  
Characteristics of interfering signals

Annex B (normative):  
Environmental requirements for the BS equipment

# B.1 General

For each test in the present document, the environmental conditions under which the BS is to be tested are defined.

# B.2 Normal test environment

When a normal test environment is specified for a test, the test should be performed within the minimum and maximum limits of the conditions stated in table B.1.

Table B.1: Limits of conditions for normal test environment

|  |  |  |
| --- | --- | --- |
| Condition | Minimum | Maximum |
| Barometric pressure | 86 kPa | 106 kPa |
| Temperature | 15 °C | 30 °C |
| Relative humidity | 20 % | 85 % |
| Power supply | Nominal, as declared by the manufacturer | |
| Vibration | Negligible | |

The ranges of barometric pressure, temperature and humidity represent the maximum variation expected in the uncontrolled environment of a test laboratory. If it is not possible to maintain these parameters within the specified limits, the actual values shall be recorded in the test report.

NOTE: This may, for instance, be the case for measurements of radiated emissions performed on an open field test site.

# B.3 Extreme test environment

The manufacturer shall declare one of the following:

1) The equipment class for the equipment under test, as defined in the IEC 60 721-3-3 [x];

2) The equipment class for the equipment under test, as defined in the IEC 60 721-3-4 [x];

3) The equipment that does not comply with the mentioned classes, the relevant classes from IEC 60 721 [x] documentation for temperature, humidity and vibration shall be declared.

NOTE: Reduced functionality for conditions that fall outside of the standard operational conditions is not tested in the present document. These may be stated and tested separately.

## B.3.1 Extreme temperature

When an extreme temperature test environment is specified for a test, the test shall be performed at the standard minimum and maximum operating temperatures defined by the manufacturer's declaration for the equipment under test.

**Minimum temperature:**

The test shall be performed with the environment test equipment and methods including the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60 068-2-1 [x].

**Maximum temperature:**

The test shall be performed with the environmental test equipment and methods including the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60 068-2-2 [x].

NOTE: It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

# B.4 Vibration

When vibration conditions are specified for a test, the test shall be performed while the equipment is subjected to a vibration sequence as defined by the manufacturer’s declaration for the equipment under test. This shall use the environmental test equipment and methods of inducing the required environmental phenomena in to the equipment, conforming to the test procedure of IEC 60 068-2-6 [x]. Other environmental conditions shall be within the ranges specified in annex B.2.

NOTE: The higher levels of vibration may induce undue physical stress in to equipment after a prolonged series of tests. The testing body should only vibrate the equipment during the RF measurement process.

# B.5 Power supply

When extreme power supply conditions are specified for a test, the test shall be performed at the standard upper and lower limits of operating voltage defined by manufacturer's declaration for the equipment under test.

**Upper voltage limit:**

The equipment shall be supplied with a voltage equal to the upper limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 [x] Test Ab/Ad and IEC 60 068-2-2 [11] Test Bb/Bd: Dry heat.

**Lower voltage limit:**

The equipment shall be supplied with a voltage equal to the lower limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 [x] Test Ab/Ad and IEC 60 068-2-2 [11] Test Bb/Bd: Dry heat.

# B.6 Measurement of test environments

The measurement accuracy of the BS test environments defined in annex B shall be:

Pressure: 5 kPa

Temperature: 2 degrees

Relative humidity: 5 %

DC voltage: 1.0 %

AC voltage: 1.5 %

Vibration: 10 %

Vibration frequency: 0.1 Hz

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

Annex C (informative):  
Test tolerances and derivation of test requirements

# C.1 Measurement of transmitter

Table C.1-1: Derivation of test requirements (Transmitter tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum requirement in 3GPP TS 38.104 [2] | Test Tolerance (TT) | Test requirement in the present document |
| 6.2 Base station output power | See 3GPP TS 38.104 [2], subclause 6.2 | Normal condition:  0.7 dB, f ≤ 3.0 GHz  1.0 dB, 3.0 GHz < f ≤ 4.2 GHz  1.5 dB, 4.2 GHz < f ≤ 6 GHz  Extreme condition:  0.7 dB, f ≤ 3.0 GHz  1.0 dB, 3.0 GHz < f ≤ 4.2 GHz  TBD dB, 4.2 GHz < f ≤ 6 GHz | Formula:  Upper limit + TT, Lower limit - TT |
| 6.3 Output power dynamics | See 3GPP TS 38.104 [2], subclause 6.3 | 0.4 dB | Formula:  Total power dynamic range – TT (dB) |
| 6.4.1 Transmitter OFF power | See 3GPP TS 38.104 [2], subclause 6.4.1 | 2.0 dB , f ≤ 3.0 GHz  2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  3 dB, 4.2 GHz < f ≤ 6.0 GHz | Formula:  Minimum Requirement + TT |
| 6.5.2 Transient period | See 3GPP TS 38.104 [2], subclause 6.4.2 | N/A |  |
| 6.5.1 Frequency Error | See 3GPP TS 38.104 [2], subclause 6.5.1 | 12 Hz | Formula:  Frequency Error limit + TT |
| 6.5.2 Time alignment error | See 3GPP TS 38.104 [2], subclause 6.5.2 | [1%] | Formula:  EVM limit + TT |
| 6.5.3 Modulation quality (EVM) | See 3GPP TS 38.104 [2], subclause 6.5.3 | [25ns] | Formula:  Time alignment error limit + TT |
| 6.6.2 Occupied bandwidth | See 3GPP TS 38.104 [2], subclause 6.6.2 | 0 Hz | Formula:  Minimum Requirement + TT |
| 6.6.3 Adjacent Channel Leakage Power Ratio (ACLR) | See 3GPP TS 38.104 [2], subclause 6.6.3 | ACLR/CACLR:  BW ≤ 20MHz:  0.8dB  BW > 20MHz:  1.2 dB  Absolute ACLR/CACLR:  0 dB | Formula:  ACLR Minimum Requirement - TT  Absolute limit +TT |
| 6.6.4 Operating band unwanted emissions | See 3GPP TS 38.104 [2], subclause 6.7.4 | Offsets < 10MHz  1.5 dB, f ≤ 3.0GHz  1.8 dB, 3.0GHz < f ≤ 4.2GHz  2.2 dB, 4.2GHz < f ≤ 6.0GHz  Offsets ≥ 10MHz  0dB | Formula:  Minimum Requirement + TT |
| 6.6.5.2.1 General transmitter spurious emissions requirements  Category A | See 3GPP TS 38.104 [2], subclause 6.7.5.2.1 | 0dB | Formula:  Minimum Requirement + TT |
| 6.6.5.2.1 General transmitter spurious emissions requirements  Category B | See 3GPP TS 38.104 [2], subclause 6.7.5.2.1 | 0dB | Formula:  Minimum Requirement + TT |
| 6.6.5.2.2 Protection of the BS receiver of own or different BS | See 3GPP TS 38.104 [2], subclause 6.7.5.2.2 | 0dB | Formula:  Minimum Requirement + TT |
| 6.6.5.2.3 Additional spurious emissions requirements | See 3GPP TS 38.104 [2], subclause 6.7.5.2.3 | 0dB | Formula:  Minimum Requirement + TT |
| 6.6.5.2.4 Co-location with other base stations | See 3GPP TS 38.104 [2], subclause 6.7.5.2.4 | 0dB | Formula:  Minimum Requirement + TT |
| 6.7 Transmitter intermodulation | See 3GPP TS 38.104 [2], subclause 6.7 | 0dB | Formula: Ratio + TT |

# C.2 Measurement of receiver

Table C.2-1: Derivation of test requirements (Receiver tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum requirement in 3GPP TS 38.104 [2] | Test Tolerance  (TT) | Test requirement in the present document |
| 7.2 Reference sensitivity level | See 3GPP TS 38.104 [2], subclause 7.2 | 0.7 dB, f ≤ 3.0 GHz  1.0 dB, 3.0 GHz < f ≤ 4.2 GHz  1.5 dB, 4.2 GHz < f ≤ 6.0 GHz | Formula: Reference sensitivity power level + TT |
| 7.3 Dynamic range | See 3GPP TS 38.104 [2], subclause 7.3 | 0.3 dB | Formula: Wanted signal power + TT |
| 7.4 In-band selectivity and blocking | See 3GPP TS 38.104 [2], subclause 7.4 | 0dB | Formula: Wanted signal power + TT |
| 7.5 Out-of-band blocking | See 3GPP TS 38.104 [2], subclause 7.5 | 0dB | Formula: Wanted signal power + TT |
| 7.6 Receiver spurious emissions | See 3GPP TS 38.104 [2], subclause 7.6 | 0dB | Formula:  Minimum Requirement + TT |
| 7.7 Receiver intermodulation | See 3GPP TS 38.104 [2], subclause 7.7 | 0dB | Formula: Wanted signal power + TT |
| 7.8 In-channel selectivity | See 3GPP TS 38.104 [2], subclause 7.8 | 1.4 dB, f ≤ 3.0GHz  1.8 dB, 3.0GHz < f ≤ 4.2GHz  2.5 dB, 4.2GHz < f ≤ 6.0GHz | Formula: Wanted signal power + TT |

Annex D (informative):  
Measurement system set-up

Annex E (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2017/11 | R4-84bis | R4-1711982 | - | - | - | TS skeleton | 0.0.1 |
| 2018/04 | R4-86bis | R4-1803913 | - | - | - | R4-1803410 Draft CR to TS 38.141-1: Addition of applicability table in sub-clause 4.7  R4-1803411 TP to TS 38.141-1 Applicability of requirements sub-clause (4.7) | 0.1.0 |
| 2018/04 | R4-86bis | R4-1805424, R4-1806022 | - | - | - | Implementation of TPs agreed during RAN4#86bis, on top of the agreed R4-1803913:  - R4-1805424 TP to TS 38.141-1 v0.1.0 Sections 1-3  - R4-1806022 TP to TS 38.141-1 v0.1.0 Section 4 | 0.2.0 |
| 2018/06 | R4-87 | R4-1808321, R4-1808322, R4-1808324, R4-1808326, R4-1808482 | - | - | - | Implementation of TPs agreed during RAN4#87, on top of R4-1807254:  - R4-1808321 TP to TS 38.141-1: conducted manufacturers declarations for NR BS (4.6)  - R4-1808322 TP to TS 38.141-1: removal of OTA terms and definitions  - R4-1808324 TP to TS 38.141-1: NR channel numbering correction  - R4-1808326 TP to TS 38.141-1: Correction of the BS type 1-H architecture figure  - R4-1808482 TP to TS 38.141-1: multi-band operation | 0.3.0 |
| 2018/07 | R4-AH-1807 | R4-1808980,  R4-1808981,  R4-1808987,  R4-1808991,  R4-1808992,  R4-1808994,  R4-1808995,  R4-1808997,  R4-1809464,  R4-1809469,  R4-1809470,  R4-1809471,  R4-1809472,  R4-1809474,  R4-1809475,  R4-1809476,  R4-1809478,  R4-1809479,  R4-1809481,  R4-1809482,  R4-1809483,  R4-1809484,  R4-1809558,  R4-1809560,  R4-1809563,  R4-1809564 | - | - | - | Implementation of TPs approved during RAN4-AH-1807, on top of R4-1809264 (TS 38.141-1, v0.3.0):  - R4-1808980 TP to TS 38.141-1: Conducted TAE requirements (6.5.4)  - R4-1808981 TP to TS 38.141-1: General section for unwanted emission requirements (6.6.1)  - R4-1808987 TP to TS 38.141-1: General (7.1)  - R4-1808991 TP to TS 38.141-1: Out-of-band blocking (7.5)  - R4-1808992 TP to TS 38.141-1: Receiver spurious emissions (7.6)  - R4-1808994 TP to TS 38.141-1: In-channel selectivity (7.8)  - R4-1808995 TP to TS 38.141-1: Environmental requirements for the BS equipment (Annex B)  - R4-1808997 TP to TS 38.141-1: General sections (1-5)  - R4-1809464 TP to TS 38 141-1 - 4.7 Test Configurations  - R4-1809469 TP to TS 38.141-1: MU and TT for NR BS  - R4-1809470 TP to TS 38.141-1:Applicability of test configurations  - R4-1809471 TP to TS 38.141-1: Conducted BS output power requirements (6.2)  - R4-1809472 TP to TS 38.141-1: Conducted output power dynamics requirements (6.3)  - R4-1809474 TP to TS38.141-1: Frequency error (6.5.2)  - R4-1809475 TP to TS38.141-1: Modulation quality (6.5.3)  - R4-1809476 TP to TS 38.141-1: Conducted ACLR requirements (6.6.3)  - R4-1809478 TP to TS 38.141-1: Conducted Tx spurious emission requirements (6.6.5)  - R4-1809479 TP to TS 38.141-1: Conducted Tx IMD requirements (6.7)  - R4-1809481 TP to TS 38.141-1: Reference sensitivity level (7.2)  - R4-1809482 TP to TS 38.141-1: Dynamic range (7.3)  - R4-1809483 TP to TS 38.141-1: In-band selectivity and blocking (7.4)  - R4-1809484 TP to TS 38.141-1: Receiver intermodulation (7.7)  - R4-1809558 TP to TS 38.141-1: General section for conducted Tx requirements (6.1)  - R4-1809560 TP to TS38.141-1: Transmit ON/OFF power (6.4)  - R4-1809563 TP to TS 38.141-1: NR BS conducted declarations corrections  - R4-1809564 TP for TS38.141-1: Occupied bandwidth (section 4.1.2 and 6.7.2) | 0.4.0 |
|  |  |  |  |  |  |  |  |