

# ETSI TS 137 104 V15.8.0 (2019-10)



**Digital cellular telecommunications system (Phase 2+) (GSM);  
Universal Mobile Telecommunications System (UMTS);**

**LTE;  
5G;**

**NR, E-UTRA, UTRA and GSM/EDGE;  
Multi-Standard Radio (MSR) Base Station (BS)  
radio transmission and reception  
(3GPP TS 37.104 version 15.8.0 Release 15)**



---

Reference

RTS/TSGR-0437104vf80

---

Keywords

5G,GSM,LTE,UMTS

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

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

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

The present document can be downloaded from:  
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at <https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:  
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2019.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

**GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

## Intellectual Property Rights

### Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

### Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

---

## Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

---

## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

# Contents

Intellectual Property Rights .....	2
Legal Notice .....	2
Modal verbs terminology.....	2
Foreword.....	6
1 Scope .....	7
2 References .....	7
3 Definitions, symbols and abbreviations .....	8
3.1 Definitions .....	8
3.2 Symbols.....	11
3.3 Abbreviations .....	13
4 General .....	14
4.1 Relation between the MSR specification and the single-RAT specifications .....	14
4.2 Relationship between minimum requirements and test requirements .....	15
4.3 Base station classes .....	15
4.4 Regional requirements.....	15
4.5 Operating bands and Band Categories.....	16
4.5.1 Band category 1 aspects (BC1).....	21
4.5.2 Band category 2 aspects (BC2).....	21
4.5.3 Band category 3 aspects (BC3).....	22
4.6 Channel arrangement.....	22
4.6.1 Channel spacing.....	22
4.6.1A CA Channel spacing .....	23
4.6.2 Channel raster .....	23
4.6.3 Carrier frequencies and numbering.....	24
4.7 Requirements for contiguous and non-contiguous spectrum.....	24
4.8 Requirements for BS capable of multi-band operation .....	24
5 Applicability of requirements.....	25
5.1 Band category 1.....	25
5.2 Band category 2.....	28
5.3 Band category 3.....	31
5.4 Inclusion of requirements by reference .....	34
6 Transmitter characteristics .....	34
6.1 General .....	34
6.2 Base station output power .....	35
6.2.1 Minimum requirement .....	35
6.2.2 Additional requirement (regional) .....	35
6.2.3 E-UTRA minimum requirement for DL RS power .....	36
6.2.4 UTRA FDD minimum requirement for primary CPICH power .....	36
6.2.4A UTRA FDD minimum requirement for secondary CPICH power.....	36
6.2.5 UTRA TDD minimum requirement for primary CCPCH power .....	36
6.2.6 NB-IoT minimum requirement for DL NRS power .....	36
6.3 Output power dynamics.....	36
6.3.1 E-UTRA minimum requirement .....	36
6.3.2 UTRA FDD minimum requirement.....	36
6.3.3 UTRA TDD minimum requirement.....	37
6.3.4 GSM/EDGE minimum requirement .....	37
6.3.5 NB-IoT minimum requirement .....	37
6.3.6 NR minimum requirement .....	37
6.4 Transmit ON/OFF power .....	37
6.4.1 Transmitter OFF power .....	37
6.4.1.1 Minimum Requirement .....	37
6.4.2 Transmitter transient period.....	37

6.4.2.1	Minimum requirements .....	38
6.5	Transmitted signal quality .....	38
6.5.1	Modulation quality .....	38
6.5.1.1	E-UTRA minimum requirement .....	38
6.5.1.2	UTRA FDD minimum requirement .....	39
6.5.1.3	UTRA TDD minimum requirement .....	39
6.5.1.4	GSM/EDGE minimum requirement .....	39
6.5.1.5	NB-IoT minimum requirement .....	39
6.5.1.6	NR minimum requirement .....	39
6.5.2	Frequency error .....	39
6.5.2.1	E-UTRA minimum requirement .....	39
6.5.2.2	UTRA FDD minimum requirement .....	39
6.5.2.3	UTRA TDD minimum requirement .....	39
6.5.2.4	GSM/EDGE minimum requirement .....	39
6.5.2.5	NB-IoT minimum requirement .....	39
6.5.2.6	NR minimum requirement .....	39
6.5.3	Time alignment error .....	39
6.5.3.1	E-UTRA minimum Requirement .....	40
6.5.3.2	UTRA FDD minimum requirement .....	40
6.5.3.3	UTRA TDD minimum requirement .....	40
6.5.3.4	NB-IoT minimum Requirement .....	40
6.5.3.5	NR minimum Requirement .....	40
6.6	Unwanted emissions .....	40
6.6.1	Transmitter spurious emissions .....	41
6.6.1.1	Mandatory Requirements .....	41
6.6.1.1.1	Minimum requirement (Category A) .....	41
6.6.1.1.2	Minimum requirement (Category B) .....	42
6.6.1.1.3	Additional minimum requirement for BC2 (Category B) .....	42
6.6.1.2	Protection of the BS receiver of own or different BS .....	42
6.6.1.2.1	Minimum Requirement .....	43
6.6.1.3	Additional spurious emissions requirements .....	43
6.6.1.3.1	Minimum Requirement .....	43
6.6.1.4	Co-location with other base stations .....	52
6.6.1.4.1	Minimum Requirement .....	52
6.6.2	Operating band unwanted emissions .....	57
6.6.2.1	General minimum requirement for Band Categories 1 and 3 .....	58
6.6.2.2	General minimum requirement for Band Category 2 .....	65
6.6.2.3	GSM/EDGE single-RAT requirements .....	74
6.6.2.4	Additional requirements .....	74
6.6.2.4.1	Limits in FCC Title 47 .....	74
6.6.2.4.2	Unsynchronized operation for BC3 .....	74
6.6.2.4.3	Protection of DTT .....	74
6.6.2.4.4	Co-existence with services in adjacent frequency bands .....	75
6.6.2.4.5	Co-existence with RNSS/GPS services in North America .....	75
6.6.2.4.6	Additional requirements for band 41 .....	76
6.6.2.4.7	Additional band 32, 50, 51, 74, 75 and 76 unwanted emissions .....	76
6.6.2.4.8	Additional requirements for band 45 .....	77
6.6.2.4.9	Additional requirements for band 48 .....	78
6.6.3	Occupied bandwidth .....	78
6.6.3.1	Minimum requirement .....	78
6.6.4	Adjacent Channel Leakage Power Ratio (ACLR) .....	78
6.6.4.1	E-UTRA minimum requirement .....	78
6.6.4.2	UTRA FDD minimum requirement .....	80
6.6.4.3	UTRA TDD minimum requirement .....	81
6.6.4.4	Cumulative ACLR requirement in non-contiguous spectrum .....	81
6.6.4.5	NB-IoT minimum requirement .....	82
6.6.4.6	NR minimum requirement .....	83
6.7	Transmitter intermodulation .....	84
6.7.1	General minimum requirement .....	84
6.7.2	Additional minimum requirement (BC1 and BC2) .....	85
6.7.3	Additional minimum requirement (BC3) .....	86
6.7.4	Additional requirements .....	86

7	Receiver characteristics .....	87
7.1	General .....	87
7.2	Reference sensitivity level.....	87
7.2.1	E-UTRA minimum requirement .....	87
7.2.2	UTRA FDD minimum requirement.....	87
7.2.3	UTRA TDD minimum requirement.....	88
7.2.4	GSM/EDGE minimum requirement .....	88
7.2.5	NB-IoT minimum requirement .....	88
7.2.6	NR minimum requirement .....	88
7.2.7	Void .....	88
7.3	Dynamic range .....	88
7.3.1	E-UTRA minimum requirement .....	88
7.3.2	UTRA FDD minimum requirement.....	88
7.3.3	UTRA TDD minimum requirement.....	88
7.3.4	GSM/EDGE minimum requirement .....	88
7.3.5	NB-IoT minimum requirement .....	88
7.3.6	NR minimum requirement .....	88
7.4	In-band selectivity and blocking .....	89
7.4.1	General blocking minimum requirement .....	89
7.4.2	General narrowband blocking minimum requirement .....	90
7.4.3	Additional Narrowband blocking minimum requirement for GSM/EDGE .....	92
7.4.4	GSM/EDGE requirements for AM suppression .....	92
7.4.5	Additional BC3 blocking minimum requirement .....	92
7.5	Out-of-band blocking .....	92
7.5.1	General minimum requirement .....	92
7.5.2	Co-location minimum requirement.....	93
7.6	Receiver spurious emissions.....	98
7.6.1	General minimum requirement .....	98
7.6.2	Additional minimum requirement for BC2 (Category B).....	99
7.7	Receiver intermodulation .....	99
7.7.1	General intermodulation minimum requirement.....	99
7.7.2	General narrowband intermodulation minimum requirement.....	102
7.7.3	Additional narrowband intermodulation minimum requirement for GSM/EDGE .....	106
7.8	In-channel selectivity .....	106
7.8.1	E-UTRA minimum requirement .....	106
7.8.2	NR minimum requirement .....	106
8	Performance requirements.....	106
8.1	E-UTRA minimum requirement.....	106
8.2	UTRA FDD minimum requirement .....	106
8.3	UTRA TDD minimum requirement .....	107
8.4	GSM/EDGE minimum requirement.....	107
8.5	NR minimum requirement.....	107
<b>Annex A (normative): Characteristics of interfering signals .....</b>		<b>108</b>
A.1	UTRA FDD interfering signal.....	108
A.2	UTRA TDD interfering signal .....	108
A.3	E-UTRA interfering signal.....	108
<b>Annex B (normative): Environmental requirements for the BS equipment .....</b>		<b>109</b>
<b>Annex C (informative): Change history .....</b>		<b>110</b>
History .....		117

---

# Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> 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.

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/ab005251-ec84-41ce-9e85-f7f261a017a2/etsi-ts-137-104-v15.8.0-2019-10>

---

# 1 Scope

The present document establishes the minimum RF characteristics of NR, E-UTRA, UTRA, GSM/EDGE and NB-IoT Multi-Standard Radio (MSR) Base Station (BS). Requirements for multi-RAT and single-RAT operation of MSR BS are covered in the present document. The requirements in the present document for E-UTRA, UTRA and NB-IoT single-RAT operation of MSR BS are also applicable to E-UTRA, UTRA and NB-IoT multi-carrier capable single-RAT BS. Requirements for GSM BS that are only single-RAT capable in all supported operating bands are not covered.

---

# 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 25.104, Technical Specification, "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) radio transmission and reception (FDD)"
- [3] 3GPP TS 25.105, Technical Specification, "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) radio transmission and reception (TDD)"
- [4] 3GPP TS 36.104, Technical Specification, "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception"
- [5] 3GPP TS 45.005, Technical Specification, "3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Radio transmission and reception"
- [6] ITU-R Recommendation SM.329-10, "Unwanted emissions in the spurious domain".
- [7] 3GPP TR 25.942, "Technical Report 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; Radio Frequency (RF) system scenarios"
- [8] "Title 47 of the Code of Federal Regulations (CFR)", Federal Communications Commission.
- [9] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [10] 3GPP TS 37.141, Technical Specification, "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR, E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing"
- [11] IEC 60721-3-3: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations".
- [12] IEC 60721-3-4: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weather protected locations".



- [13] ETSI EN 300 019-1-3, *European Standard (Telecommunications series)*, "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weather protected locations"
- [14] ETSI EN 300 019-1-4, *European Standard (Telecommunications series)*, "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weather protected locations".
- [15] CEPT ECC Decision (13)03, "The harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)".
- [16] CEPT ECC Decision (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)".
- [17] 3GPP TS 38.104, Technical Specification, "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) radio transmission and reception"

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**Band category:** group of operating bands for which the same MSR scenarios apply

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

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

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

**Carrier:** modulated waveform conveying the NR, E-UTRA, UTRA or GSM/EDGE physical channels

**Carrier aggregation:** aggregation of two or more NR or E-UTRA component carriers in order to support wider transmission bandwidths

**Carrier aggregation band:** set of one or more operating bands across which multiple E-UTRA carriers are aggregated with a specific set of technical requirements.

NOTE: Carrier aggregation band(s) for an E-UTRA BS is declared by the manufacturer according to the designations in Tables 5.5-2 to 5.5-4 of TS 36.104 [4]

**Channel bandwidth:** RF bandwidth supporting a single NR, E-UTRA, UTRA or GSM/EDGE RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell.

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

NOTE: The term channel bandwidth is referred to as BS channel bandwidth in the NR specifications, since for NR the BS and UE may operate with differing bandwidths.

**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.

**Carrier power:** power at the antenna connector in the channel bandwidth of the carrier averaged over at least one subframe for NR or E-UTRA, at least one slot for UTRA and the useful part of the burst for GSM/EDGE.

**Configured carrier power:** target maximum power for a specific carrier for the operating mode set in the base station

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

**Downlink operating band:** part of the operating band designated for downlink.

**Highest Carrier:** carrier with the highest carrier centre frequency transmitted/received in the specified operating band(s).

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

**Inter-band carrier aggregation:** carrier aggregation of NR or E-UTRA component carriers in different operating bands.

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

**Inter-band gap:** The frequency gap between two supported consecutive operating bands.

**Intra-band contiguous carrier aggregation:** contiguous NR or E-UTRA carriers aggregated in the same operating band.

**Intra-band non-contiguous carrier aggregation:** non-contiguous NR or E-UTRA carriers aggregated in the same operating band.

**Lowest Carrier:** carrier with the lowest carrier centre frequency transmitted/received in the specified operating band(s).

**Lower Base Station RF Bandwidth edge:** frequency of the lower edge of the Base Station RF bandwidth, used as a frequency reference point for transmitter and receiver requirements.

**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 Base Station RF Bandwidth:** maximum RF bandwidth supported by a BS within each supported operating band.

NOTE: The maximum Base Station RF Bandwidth for BS configured for contiguous and non-contiguous operation within each supported operating band is declared separately.

**Maximum carrier output power:** carrier power available at the antenna connector for a specified reference condition.

**Maximum RAT output power:** sum of the power of all carriers of the same RAT available at the antenna connector for a specified reference condition.

**Maximum throughput:** maximum achievable throughput for a reference measurement channel.

**Maximum total output power:** sum of the power of all carriers available at the antenna connector for a specified reference condition.

**MB-MSR Base Station:** MSR Base Station characterized by the ability of its transmitter and/or receiver to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

**Measurement bandwidth:** RF bandwidth in which an emission level is specified.

**MSR Base station:** base station characterized by the ability of its receiver and transmitter to process two or more carriers in common active RF components simultaneously in a declared Base Station RF Bandwidth, where at least one carrier is of a different RAT than the other carrier(s).

**Multi-band transmitter:** transmitter 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 (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

**Multi-band receiver:** receiver 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 (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

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

**NB-IoT In-band operation:** NB-IoT is operating in-band when it utilizes the resource block(s) within a normal E-UTRA carrier.

**NB-IoT guard band operation:** NB-IoT is operating in guard band when it utilizes the unused resource block(s) within a E-UTRA carrier's guard-band.

**NB-IoT standalone operation:** NB-IoT is operating standalone when it utilizes its own spectrum, for example the spectrum currently being used by GERAN systems as a replacement of one or more GSM carriers, as well as scattered spectrum for potential IoT deployment.

**Occupied bandwidth:** 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  $\beta/2$  of the total mean power of a given emission.

**Operating band:** frequency range in which NR, E-UTRA, UTRA or GSM/EDGE 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.

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

**Rated total output power:** The total power level that the manufacturer has declared to be available at the antenna connector.

**RRC filtered mean power:** The mean power of a UTRA carrier as measured through a root raised cosine filter with roll-off factor  $\alpha$  and a bandwidth equal to the chip rate of the radio access mode.

NOTE: The RRC filtered mean power of a perfectly modulated UTRA signal is 0.246 dB lower than the mean power of the same signal

**Single-RAT operation:** operation of a base station in an operating band with only one RAT configured in that operating band.

**Sub-band:** A sub-band of an operating band contains a part of the uplink and downlink frequency range of the operating band.

**Sub-block:** one contiguous allocated block of spectrum for use by the same base station.

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

**Sub-block bandwidth:** RF bandwidth of one sub-block.

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

**Superseding-band:** A superseding-band of an operating band includes the whole of the uplink and downlink frequency range of the operating band.

**Synchronized operation:** operation of TDD in two different systems, where no simultaneous uplink and downlink occur.

**Throughput:** number of payload bits successfully received per second for a reference measurement channel in a specified reference condition.

**Transmission bandwidth:** RF bandwidth of an instantaneous E-UTRA or NR transmission from a UE or BS, measured in resource block units.

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

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

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

**Unsynchronized operation:** operation of TDD in two different systems, where the conditions for synchronized operation are not met.

**Uplink operating band:** part of the operating band designated for uplink.

**Upper Base Station RF Bandwidth edge:** frequency of the upper edge of the Base Station RF Bandwidth, used as a frequency reference point for transmitter and receiver requirements

**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:

$\beta$	Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel
$BW_{\text{Channel}}$	Channel bandwidth (for E-UTRA and NR)
$BW_{\text{Config}}$	Transmission bandwidth configuration (for E-UTRA), where $BW_{\text{Config}} = N_{\text{RB}} \times 180 \text{ kHz}$ in the uplink and $BW_{\text{Config}} = 15 \text{ kHz} + N_{\text{RB}} \times 180 \text{ kHz}$ in the downlink. Transmission bandwidth configuration (for NR), where $BW_{\text{Config}} = N_{\text{RB}} \times \text{SCS} \times 12$ .
$BW_{\text{RF}}$	Base Station RF Bandwidth, where $BW_{\text{RF}} = F_{\text{BW RF,high}} - F_{\text{BW RF,low}}$
$BW_{\text{RF,max}}$	Maximum Base Station RF Bandwidth
$DwPTS$	Downlink part of the special subframe (for E-UTRA TDD operation)
$f$	Frequency
$\Delta f$	Separation between the Base Station RF Bandwidth edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency
$\Delta f_{\text{max}}$	The largest value of $\Delta f$ used for defining the requirement
$\Delta f_{\text{OBUE}}$	Maximum offset of the <i>operating band</i> unwanted emissions mask from the <i>downlink operating band edge</i>
$\Delta f_{\text{OOB}}$	Maximum offset of the out-of-band boundary from the <i>uplink operating band edge</i>
$F_{\text{C}}$	Carrier centre frequency
$F_{\text{filter}}$	Filter centre frequency
$f_{\text{offset}}$	Separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter
$f_{\text{offset,max}}$	The maximum value of $f_{\text{offset}}$ used for defining the requirement
$F_{\text{block,high}}$	Upper sub-block edge, where $F_{\text{block,high}} = F_{\text{C,block,high}} + F_{\text{offset, RAT}}$
$F_{\text{block,low}}$	Lower sub-block edge, where $F_{\text{block,low}} = F_{\text{C,block,low}} - F_{\text{offset, RAT}}$
$F_{\text{BW RF,high}}$	Upper Base Station RF Bandwidth edge, where $F_{\text{BW RF,high}} = F_{\text{C,high}} + F_{\text{offset, RAT}}$
$F_{\text{BW RF,low}}$	Lower Base Station RF Bandwidth edge, where $F_{\text{BW RF,low}} = F_{\text{C,low}} - F_{\text{offset, RAT}}$
$F_{\text{C band, high}}$	Center frequency of the highest transmitted/received carrier in a band.
$F_{\text{C band, low}}$	Center frequency of the lowest transmitted/received carrier in a band.
$F_{\text{C,block, high}}$	Centre frequency of the highest transmitted/received carrier in a sub-block.
$F_{\text{C,block, low}}$	Centre frequency of the lowest transmitted/received carrier in a sub-block.
$F_{\text{C,high}}$	Centre frequency of the highest transmitted/received carrier.
$F_{\text{C,low}}$	Centre frequency of the lowest transmitted/received carrier.
$F_{\text{offset, RAT}}$	Frequency offset from the centre frequency of the <i>highest</i> transmitted/received carrier to the <i>upper</i> Base Station RF Bandwidth edge, sub-block edge or Inter-RF Bandwidth edge, or from the centre frequency of the <i>lowest</i> transmitted/received to the <i>lower</i> Base Station RF Bandwidth edge, sub-block edge or Inter-RF Bandwidth edge for a specific RAT.
$F_{\text{DL,low}}$	The lowest frequency of the downlink operating band
$F_{\text{DL,high}}$	The highest frequency of the downlink operating band
$F_{\text{UL,low}}$	The lowest frequency of the uplink operating band
$F_{\text{UL,high}}$	The highest frequency of the uplink operating band
$P_{\text{EM,N}}$	Declared emission level for channel N
$P_{\text{EM,B32,B75,B76,ind}}$	Declared emission level in Band 32, Band 75 and Band 76, ind=a, b, c
$P_{\text{EM,B32,ind}}$	Declared emission level in Band 32, ind= d, e
$P_{\text{EM,B50,B74,B75,ind}}$	Declared emission level for Band 50, Band 74 and Band 75, ind=a,b

- $P_{max}$  Maximum total output power
- $P_{max,RAT}$  Maximum RAT output power
- $P_{max,c}$  Maximum carrier output power
- $P_{Rated,c}$  Rated carrier output power
- $P_{REFSENS}$  Reference Sensitivity power level
- $W_{gap}$  Sub-block gap or Inter RF Bandwidth gap size

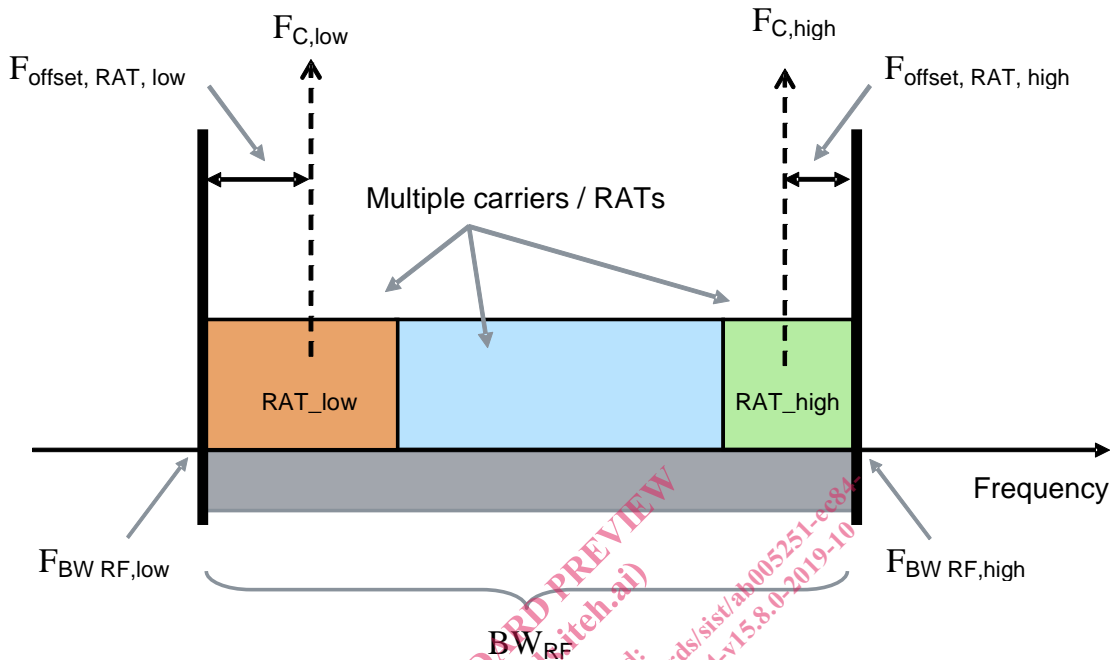


Figure 3.2-1: Illustration of Base Station RF Bandwidth related symbols and definitions for Multi-Standard Radio.

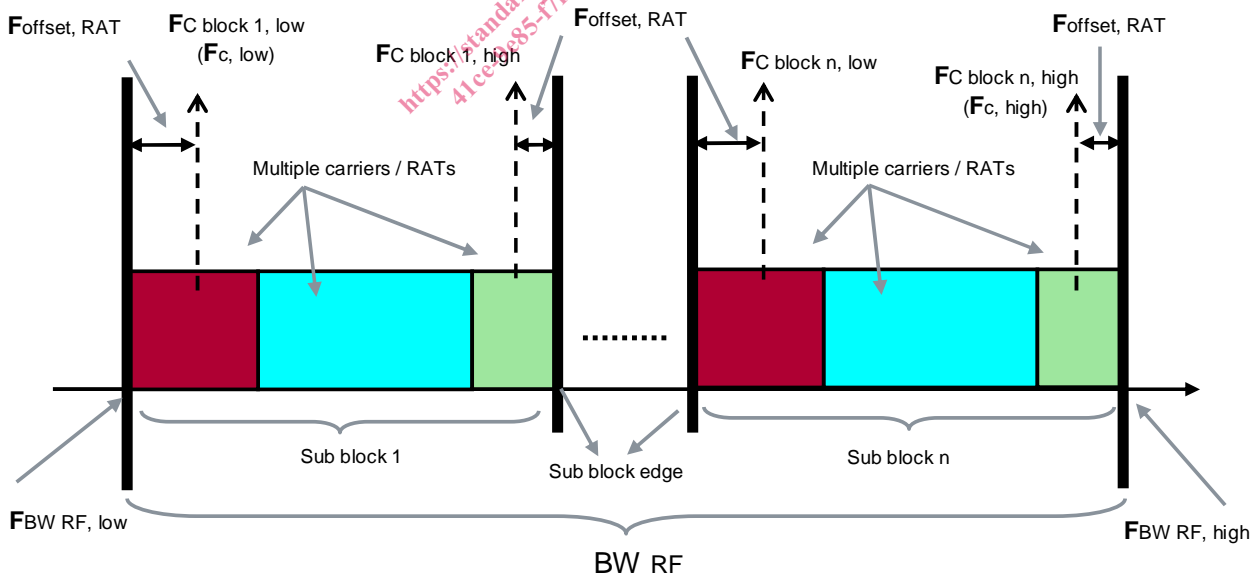


Figure 3.2-2: Illustration of Base Station RF Bandwidth related symbols and definitions for non-contiguous Multi-Standard Radio.