



TECHNICAL SPECIFICATION

**5G;  
NR;**  
**User Equipment (UE) radio transmission and reception;**  
**Part 5: Satellite access Radio Frequency (RF)**  
**and performance requirements**  
**(3GPP TS 38.101-5 version 17.14.0 Release 17)**



---

**Reference**

RTS/TSGR-0438101-5vhe0

---

**Keywords**

5G

**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 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

The present document can be downloaded from the  
[ETSI Search & Browse Standards](#) application.

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 on [ETSI deliver](#) repository.

Users should be aware that the present document may be revised or have its status changed, this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our [Coordinated Vulnerability Disclosure \(CVD\)](#) program.

---

**Notice of disclaimer & limitation of liability**

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**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 2026.  
All rights reserved.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 IPR online database](#).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo 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.

---

# 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 at [3GPP to ETSI numbering cross-referencing](#).

---

# 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.....	7
1 Scope .....	9
2 References .....	9
3 Definitions of terms, symbols and abbreviations .....	10
3.1 Terms.....	10
3.2 Symbols.....	10
3.3 Abbreviations .....	11
4 General .....	12
4.1 Relationship between minimum requirements and test requirements .....	12
4.2 Applicability of minimum requirements .....	12
4.3 Specification suffix information.....	12
4.4 Relationship with other core specifications.....	12
5 Operating bands and channel arrangement.....	12
5.1 General .....	12
5.2 Operating bands.....	13
5.2.1 General.....	13
5.2.2 Operating bands with conducted requirements .....	13
5.2.3 reserved (for radiated requirements).....	13
5.3 UE channel bandwidth .....	13
5.3.1 General.....	13
5.3.2 Maximum transmission bandwidth configuration .....	14
5.3.3 Minimum guardband and transmission bandwidth configuration.....	14
5.3.4 RB alignment .....	15
5.3.5 UE channel bandwidth per operating band .....	15
5.4 Channel arrangement.....	16
5.4.1 Channel spacing.....	16
5.4.1.1 Channel spacing for adjacent NTN satellite carriers .....	16
5.4.2 Channel raster .....	16
5.4.2.1 NR-ARFCN and channel raster.....	16
5.4.2.2 Channel raster to resource element mapping.....	17
5.4.2.3 Channel raster entries for each operating band .....	17
5.4.3 Synchronization raster .....	17
5.4.3.1 Synchronization raster and numbering.....	17
5.4.3.2 Synchronization raster to synchronization block resource element mapping.....	17
5.4.3.3 Synchronization raster entries for each operating band.....	17
5.4.4 TX–RX frequency separation .....	18
6 Conducted transmitter characteristics .....	18
6.1 General .....	18
6.2 Transmitter power .....	18
6.2.1 UE maximum output power.....	18
6.2.2 UE maximum output power reduction.....	19
6.2.3 UE additional maximum output power reduction .....	19
6.2.3.1 General .....	19
6.2.4 Configured transmitted power .....	20
6.3 Output power dynamics.....	20
6.3.1 Minimum output power .....	20
6.3.2 Transmit OFF power.....	20
6.3.3 Transmit ON/OFF time mask .....	20
6.3.4 Power control.....	20

6.4	Transmit signal quality .....	20
6.4.1	Frequency error .....	20
6.4.2	Transmit modulation quality .....	21
6.5	Output RF spectrum emissions .....	21
6.5.1	Occupied bandwidth .....	21
6.5.2	Out of band emission .....	21
6.5.2.1	General .....	21
6.5.2.2	Spectrum emission mask .....	21
6.5.2.3	Additional spectrum emission mask .....	22
6.5.2.3.0	Requirements for network signalling value "NS_02N" .....	22
6.5.2.4	Adjacent channel leakage ratio .....	22
6.5.2.4.1	NR ACLR .....	22
6.5.2.4.2	UTRA ACLR .....	23
6.5.3	Spurious emission .....	23
6.5.3.1	General spurious emissions .....	23
6.5.3.2	Spurious emissions for UE co-existence .....	24
6.5.3.3	Additional spurious emissions .....	24
6.5.3.3.1	General .....	24
6.5.3.3.2	Requirement for network signalling value "NS_02N" .....	24
6.5.4	Transmit intermodulation .....	25
7	Conducted receiver characteristics .....	25
7.1	General .....	25
7.2	Diversity characteristics .....	26
7.3	Reference sensitivity .....	26
7.3.1	General .....	26
7.3.2	Reference sensitivity power level .....	26
7.4	Maximum input level .....	27
7.5	Adjacent channel selectivity .....	27
7.6	Blocking characteristics .....	29
7.6.1	General .....	29
7.6.2	In-band blocking .....	29
7.6.3	Out-of-band blocking .....	30
7.6.4	Narrow band blocking .....	30
7.7	Spurious response .....	31
7.8	Intermodulation characteristics .....	31
7.9	Spurious emissions .....	32
8	Conducted performance requirements .....	32
8.1	General .....	32
8.1.1	Relationship between minimum requirements and test requirements .....	32
8.1.2	Applicability of minimum requirements .....	32
8.1.3	Conducted requirements .....	32
8.1.3.1	Introduction .....	32
8.1.3.2	Reference point .....	33
8.1.3.3	SNR definition .....	33
8.1.3.4	Noc .....	33
8.1.3.4.1	Introduction .....	33
8.1.3.4.2	Noc for NR operating bands in FR1 .....	33
8.2	Demodulation performance requirements .....	34
8.2.1	General .....	34
8.2.1.1	Applicability of requirements .....	34
8.2.1.1.1	General .....	34
8.2.1.1.2	Applicability of requirements for optional UE features .....	34
8.2.1.2	PDSCH demodulation requirements .....	34
8.2.1.2.1	1RX requirements .....	37
8.2.1.2.2	2RX requirements .....	37
8.2.1.2.2.1.1	Minimum requirements for PDSCH Mapping Type A .....	37
8.3	CSI reporting requirements .....	39
<b>Annex A (normative): Measurement channels .....</b>		<b>40</b>
A.1	General .....	40

A.1.1	Throughput definition.....	40
A.2	UL reference measurement channels .....	40
A.2.1	General .....	40
A.2.2	Reference measurement channels for FDD .....	41
A.2.2.1	DFT-s-OFDM Pi/2-BPSK .....	41
A.2.2.2	DFT-s-OFDM QPSK.....	42
A.2.2.3	DFT-s-OFDM 16QAM.....	43
A.2.2.4	DFT-s-OFDM 64QAM.....	44
A.2.2.5	Void .....	45
A.2.2.6	CP-OFDM QPSK .....	45
A.2.2.7	CP-OFDM 16QAM .....	46
A.2.2.8	CP-OFDM 64QAM .....	47
A.2.2.9	Void .....	47
A.3	DL reference measurement channels .....	47
A.3.1	General .....	47
A.3.2	Reference measurement channels for PDSCH performance requirements .....	48
A.3.2.1	FDD .....	48
A.3.2.1.1	Reference measurement channels for SCS 15 kHz FR1 .....	48
A.3.4	Reference measurement channels for receiver requirements .....	50
A.3.4.1	FDD .....	50
A.3.4.1.1	Fixed reference channels for SCS 15kHz FR1-NTN .....	50
A.3.4.1.1A	Fixed reference channels for SCS 30kHz FR1-NTN .....	53
A.3.4.1.1B	Fixed reference channels for SCS 60kHz FR1-NTN .....	57
A.4	Testing related to Satellite Access.....	57
A.4.1	General .....	57
A.4.2	Test condition for transmitter characteristics .....	58
A.4.3	Test condition for receiver characteristics.....	58
A.4.4	Test condition for performance requirements.....	58
<b>Annex B (normative): Propagation conditions .....</b>		<b>59</b>
B.1	Static propagation condition.....	59
B.1.1	UE Receiver with 1Rx.....	59
B.1.2	UE Receiver with 2Rx.....	59
B.2.1	Delay profiles .....	59
B.2.2	Combinations of channel model parameters .....	60
B.2.3	MIMO Channel Correlation Matrices .....	60
B.2.3.1	MIMO Correlation Matrices using Uniform Linear Array (ULA) .....	60
B.2.3.1.1	Definition of MIMO Correlation Matrices.....	60
B.2.3.1.2	MIMO Correlation Matrices at High, Medium and Low Level .....	61
<b>Annex C (normative): Downlink physical channels .....</b>		<b>62</b>
C.1	General .....	62
C.2	Setup (Conducted).....	62
C.3	Connection (Conducted).....	62
C.3.1	Measurement of Performance requirements.....	62
<b>Annex D (informative): Void .....</b>		<b>64</b>
<b>Annex E (normative): Environmental conditions.....</b>		<b>65</b>
E.1	General .....	65
E.2	Environmental (Conducted) .....	65
E.2.1	Temperature .....	65
E.2.2	Voltage .....	65
E.2.3	Vibration.....	66
<b>Annex F (informative): Change history.....</b>		<b>67</b>

History .....69

# Sample Document

get full document from [standards.iteh.ai](https://standards.iteh.ai)

---

# 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.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# Sample Document

get full document from [standards.iteh.ai](https://standards.iteh.ai)

---

# 1 Scope

The present document establishes the minimum RF and performance requirements for NR User Equipment (UE) supporting satellite access operation.

---

# 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 38.521-5: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements".
- [3] Recommendation ITU-R M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [4] 3GPP TS 38.108: "NR; Satellite Node radio transmission and reception"
- [5] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
- [6] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".
- [7] 3GPP TS 38.213: "NR; Physical layer procedures for control"
- [8] 3GPP TS 38.331: " Radio Resource Control (RRC) protocol specification".
- [9] 3GPP TS 38.300: "NR; NR and NG-RAN Overall description; Stage-2".
- [10] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".
- [11] 3GPP TS 38.306: "User Equipment (UE) radio access capabilities".
- [12] 3GPP TR 38.811: "Study on New Radio (NR) to support non-terrestrial networks".
- [13] 3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment".
- [14] 3GPP TS 38.214: "NR; Physical layer procedures for data".

## 3 Definitions of terms, symbols and abbreviations

### 3.1 Terms

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

**Geostationary satellite:** A geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator and which thus remains fixed relative to the Earth; by extension, a geosynchronous satellite which remains approximately fixed relative to the Earth.

**Geostationary-Satellite Orbit:** The orbit of a geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator.

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

**Geosynchronous satellite:** An earth satellite whose period of revolution is equal to the period of rotation of the Earth about its axis.

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

**Non-terrestrial networks:** Networks, or segments of networks, using an airborne or space-borne vehicle to embark a transmission equipment relay node or SAN.

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

**Satellite Access Node:** node providing NR user plane and control plane protocol terminations towards NTN satellite capable UE, and connected via the NG interface to the 5GC. It encompasses a transparent payload on board a NTN platform, with satellite-gateway and gNB functions.

**UE transmission bandwidth configuration:** Set of resource blocks located within the UE channel bandwidth which may be used for transmitting or receiving by the UE.

### 3.2 Symbols

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

$\Delta F_{\text{Global}}$	Granularity of the global frequency raster
$\Delta F_{\text{Raster}}$	Band dependent channel raster granularity
$BW_{\text{Channel}}$	Channel bandwidth
$BW_{\text{interferer}}$	Bandwidth of the interferer
$F_{\text{DL\_low}}$	The lowest frequency of the downlink <i>operating band</i>
$F_{\text{DL\_high}}$	The highest frequency of the downlink <i>operating band</i>
$F_{\text{UL\_low}}$	The lowest frequency of the uplink <i>operating band</i>
$F_{\text{UL\_high}}$	The highest frequency of the uplink <i>operating band</i>
$F_{\text{Interferer}}$	Frequency of the interferer
$F_{\text{Interferer (offset)}}$	Frequency offset of the interferer (between the center frequency of the interferer and the carrier frequency of the carrier measured)
$F_{\text{Ioffset}}$	Frequency offset of the interferer (between the center frequency of the interferer and the closest edge of the carrier measured)
$F_{\text{OOB}}$	The boundary between the NR out of band emission and spurious emission domains
$F_{\text{REF}}$	RF reference frequency
$F_{\text{REF-Offs}}$	Offset used for calculating $F_{\text{REF}}$
$F_{\text{uw (offset)}}$	The frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer
$N_{\text{RB}}$	Transmission bandwidth configuration, expressed in units of resource blocks
$N_{\text{REF}}$	NR Absolute Radio Frequency Channel Number (NR-ARFCN)
$N_{\text{REF-Offs}}$	Offset used for calculating $N_{\text{REF}}$

$P_{\text{Interferer}}$	Modulated mean power of the interferer
$P_{\text{uw}}$	Power of an unwanted DL signal

### 3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
A-MPR	Additional Maximum Power Reduction
BW	Bandwidth
BWP	Bandwidth Part
CP-OFDM	Cyclic Prefix-OFDM
CW	Continuous Wave
DFT-s-OFDM	Discrete Fourier Transform-spread-OFDM
DM-RS	Demodulation Reference Signal
DTX	Discontinuous Transmission
EIRP	Equivalent Isotropically Radiated Power
EVM	Error Vector Magnitude
FR	Frequency Range
FRC	Fixed Reference Channel
GEO	Geosynchronous Earth Orbit
GSCN	Global Synchronization Channel Number
GSO	Geostationary-Satellite Orbit
IBB	In-band Blocking
ITU-R	Radiocommunication Sector of the International Telecommunication Union
LEO	Low Earth Orbiting
MBW	Measurement bandwidth defined for the protected band
MOP	Maximum Output Power
MPR	Allowed maximum power reduction
MSD	Maximum Sensitivity Degradation
NGEO	Non-Geostationary Earth Orbiting
NGSO	Non-Geostationary-Satellite Orbit
NR	New Radio
NR-ARFCN	NR Absolute Radio Frequency Channel Number
NS	Network Signalling
NTN	Non-Terrestrial Network
OCNG	OFDMA Channel Noise Generator
OOB	Out-of-band
PRB	Physical Resource Block
QAM	Quadrature Amplitude Modulation
RAN	Radio Access Network
RE	Resource Element
REFSENS	REFerence SENSitivity
RF	Radio Frequency
RMS	Root Mean Square (value)
RSRP	Reference Signal Receive Power
RSRQ	Reference Signal Receive Quality
RX	Receiver
SAN	Satellite Access Node
SC	Single Carrier
SCS	Subcarrier spacing
SEM	Spectrum Emission Mask
SNR	Signal-to-Noise Ratio
SRS	Sounding Reference Symbol
SS	Synchronization Symbol
TN	Terrestrial Network
TX	Transmitter
TxD	Tx Diversity

UE User Equipment

---

## 4 General

### 4.1 Relationship between minimum requirements and test requirements

The present document is a Single-RAT specification for satellite NR UE, covering RF characteristics and minimum performance requirements. Conformance to the present specification is demonstrated by fulfilling the test requirements specified in the conformance specification 3GPP TS 38.521-5 [2].

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification 3GPP TS 38.521-5 [2] defines test tolerances. These test tolerances are individually calculated for each test. The test tolerances are used to relax the minimum requirements in this specification to create test requirements. For some requirements, including regulatory requirements, the test tolerance is set to zero.

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 [3].

### 4.2 Applicability of minimum requirements

- a) In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios
- b) For specific scenarios for which an additional requirement is specified, in addition to meeting the general requirement, the UE is mandated to meet the additional requirements.
- c) The spurious emissions power requirements are for the long-term average of the power. For the purpose of reducing measurement uncertainty, it is acceptable to average the measured power over a period of time sufficient to reduce the uncertainty due to the statistical nature of the signal.

### 4.3 Specification suffix information

Specification suffix information is not defined for the time being in this release of specification.

### 4.4 Relationship with other core specifications

The present document establishes the minimum RF and performance requirements for NR User Equipment (UE) operating in a Non-Terrestrial Network. The present document for the single-RAT specification of a satellite NR UE side is used together with the technical specification 3GPP TS 38.108 [4] specifying the Satellite Access Node (SAN).

---

## 5 Operating bands and channel arrangement

### 5.1 General

The channel arrangements presented in this clause are based on the operating bands and channel bandwidths defined in the present Release of specifications.

NOTE: Other operating bands and channel bandwidths may be considered in future Releases.

Requirements throughout the RF specifications are in many cases defined separately for different frequency ranges (FR). The frequency ranges in which NTN satellite can operate according to this version of the specification are identified as described in Table 5.1-1.

**Table 5.1-1: Definition of NTN frequency ranges**

Frequency range designation	Corresponding frequency range
FR1-NTN (Note 1)	410 MHz – 7125 MHz
NOTE 1: [NTN bands within this frequency range are regarded as a FR1 band when references from other specifications.]	

The present specification covers FR1-NTN operating bands.

## 5.2 Operating bands

### 5.2.1 General

NTN satellite covers FR1-NTN operating bands in the present specification.

### 5.2.2 Operating bands with conducted requirements

NTN satellite is designed to operate in the operating bands defined in Table 5.2.2-1.

**Table 5.2.2-1: NTN satellite bands in FR1-NTN**

NTN satellite operating band	Uplink (UL) operating band Satellite Access Node receive / UE transmit $F_{UL,low} - F_{UL,high}$	Downlink (DL) operating band Satellite Access Node transmit / UE receive $F_{DL,low} - F_{DL,high}$	Duplex mode
n256	1980MHz – 2010 MHz	2170 MHz – 2200 MHz	FDD
n255	1626.5 MHz – 1660.5 MHz	1525 MHz – 1559 MHz	FDD
NOTE: NTN satellite bands are numbered in descending order from n256.			

### 5.2.3 reserved (for radiated requirements)

## 5.3 UE channel bandwidth

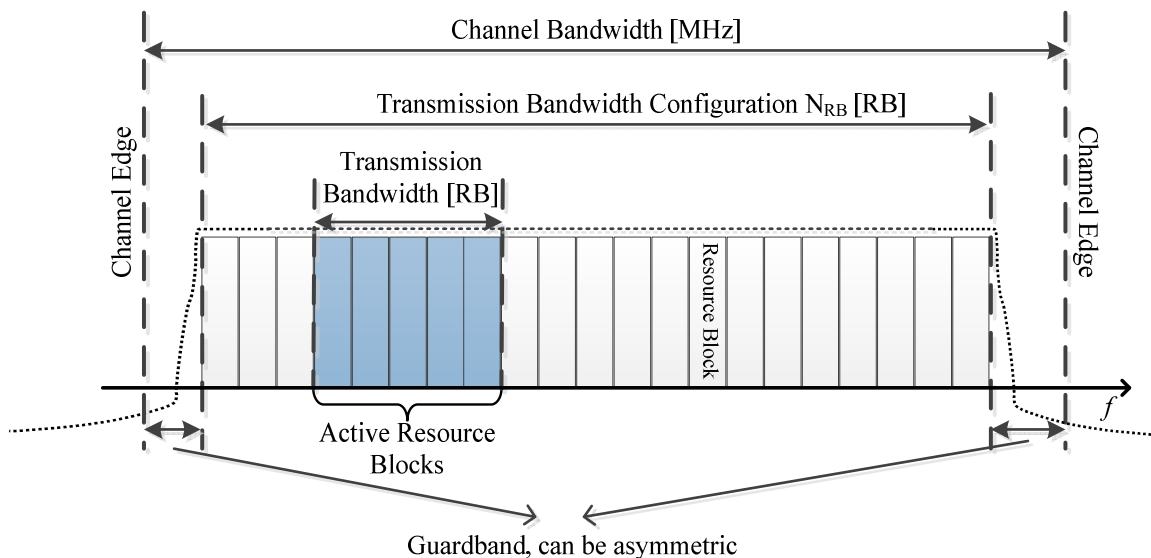
### 5.3.1 General

The UE channel bandwidth supports a single RF carrier in the uplink or downlink at the UE. From a SAN perspective, different UE channel bandwidths may be supported within the same spectrum for transmitting to and receiving from UEs connected to the SAN.

From a UE perspective, the UE is configured with one or more BWP / carriers, each with its own UE channel bandwidth. The UE does not need to be aware of the SAN channel bandwidth or how the SAN allocates bandwidth to different UEs.

The placement of the UE channel bandwidth for each UE carrier is flexible but can only be completely within the SAN channel bandwidth.

The relationship between the channel bandwidth, the guardband and the maximum transmission bandwidth configuration is shown in Figure 5.3.1-1.



**Figure 5.3.1-1: Definition of the channel bandwidth and the maximum transmission bandwidth configuration for one channel**

### 5.3.2 Maximum transmission bandwidth configuration

The maximum transmission bandwidth configuration  $N_{RB}$  for each UE channel bandwidth and subcarrier spacing is specified in Table 5.3.2-1.

**Table 5.3.2-1: Maximum transmission bandwidth configuration  $N_{RB}$**

SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz
	$N_{RB}$	$N_{RB}$	$N_{RB}$	$N_{RB}$
15	25	52	79	106
30	11	24	38	51
60	N/A	11	18	24

### 5.3.3 Minimum guardband and transmission bandwidth configuration

The minimum guardband for each UE channel bandwidth and SCS is specified in Table 5.3.3-1,

**Table 5.3.3-1: Minimum guardband for each UE channel bandwidth and SCS (kHz)**

SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz
15	242.5	312.5	382.5	452.5
30	505	665	645	805
60	N/A	1010	990	1330

NOTE: The minimum guardbands have been calculated using the following equation:  $(BW_{Channel} \times 1000 \text{ (kHz)} - N_{RB} \times SCS \times 12) / 2 - SCS/2$ , where  $N_{RB}$  are from Table 5.3.2-1.

**Figure 5.3.3-1: Void**

The number of RBs configured in any channel bandwidth shall ensure that the minimum guardband specified in this clause is met.