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Contents

Foreword

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1 Scope

The present document specifies radiated test methods and conformance requirements for *single RAT E-UTRA operation*, *single RAT UTRA operation* (FDD and TDD) and Multi-Standard Radio (MSR) UTRA and E-UTRA Active Antenna System (AAS) Base Station (BS). These have been derived from, and are consistent with non-AAS BS specifications in TS 25.104 [2], TS 25.105 [3], TS 36.104 [4] or TS 37.104 [5]. The technical specification TS 37.145 is in 2 parts, part TS 37.145-1 [9] covers conducted requirements and part TS 37.145-2 (the present document) covers radiated requirements.

The present document does not establish radiated test methods and conformance requirements for Band 46 operation as it is not supported by AAS BS. Conducted Band 46 test requirements are still applicable for AAS BS for protection of and against Band 46 operation, as specified in TS 37.145-1 [9].

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: "Base Station (BS) radio transmission and reception (FDD)".

[3] 3GPP TS 25.105: "Base Station (BS) radio transmission and reception (TDD)".

[4] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

[5] 3GPP TS 37.104: "E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception".

[6] 3GPP TS 37.105: "Active Antenna System (AAS) Base Station (BS) transmission and reception".

[7] 3GPP TR 37.842: "E-UTRA and UTRA; Radio Frequency (RF) requirement background for Active Antenna System (AAS) Base Station (BS)".

[8] Recommendation ITU-R M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".

[9] 3GPP TS 37.145-1: "Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: Conducted conformance testing".

[10] 3GPP TS 25.141: "Base Station (BS) conformance testing (FDD)".

[11] 3GPP TS 25.142: "Base Station (BS) conformance testing (TDD)".

[12] 3GPP TS 36.141: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing".

[13] 3GPP TS 37.141: "E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing".

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].

AAS BS receiver: composite receiver function of an AAS BS receiving in an operating band

active antenna system base station: base station system which combines an Antenna Array with an Active transceiver unit array and a *Radio Distribution Network*

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*

beam: main lobe of a radiation pattern from an AAS BS

NOTE: For certain AAS antenna array, there may be more than one beam.

beam centre direction: direction equal to the geometric centre of the -3 dB EIRP contour of the beam

beam direction pair: data set consisting of the *beam centre direction* and the related *beam peak direction*

beam peak direction: direction where the maximum EIRP is supposed to be found

beamwidth: angles describing the major and minor axes of an ellipsoid closest fit to an essentially elliptic half-power contour of a beam

carrier: modulated waveform conveying the physical channels

carrier aggregation: aggregation of two or more E-UTRA component carriers in order to support wider *transmission bandwidth*s

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

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

NOTE 2: For UTRA FDD, the *channel bandwidth* is the nominal channel spacing specified in TS 25.104 [2], For UTRA TDD 1,28 Mcps, the *channel bandwidth* is the nominal channel spacing specified in TS 25.105 [3].

NOTE 3: For E-UTRA, the *channel bandwidths* are specified in TS 36.104 [4].

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

downlink operating band: part of the (FDD) operating band designated for downlink

EIRP accuracy directions set: *beam peak directions* for which the EIRP accuracy requirement is intended to be met. The *beam peak directions* are related to a corresponding contiguous range or discrete list of *beam centre directions* by the *beam direction pairs* included in the set

equivalent isotropic radiated power: equivalent power radiated from an isotropic directivity device producing the same field intensity at a point of observation as the field intensity radiated in the direction of the same point of observation by the discussed device

NOTE: Isotropic directivity is equal in all directions (0 dBi).

equivalent isotropic sensitivity: sensitivity for an isotropic directivity device equivalent to the sensitivity of the discussed device exposed to an incoming wave from a defined AoA

NOTE 1: The sensitivity is the minimum received power level at which a RAT specific requirement is met.

NOTE 2: Isotropic directivity is equal in all directions (0 dBi).

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

non-AAS BS: BS conforming to one of the RF requirement specifications TS 25.104 [2], TS 25.105 [3], TS 36.104 [4] or TS 37.104 [5]

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

OTA sensitivity directions declaration: set of manufacturer declarations comprising one or more EIS values (with related RAT and *channel bandwidth*), and the directions where it (they) applies

NOTE: All the directions apply to all the EIS values in an OSDD.

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

radio distribution network: passive network which distributes radio signals 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

NOTE: In the case when the active transceiver units are physically integrated with the array elements of the antenna array, the radio distribution network is a one-to-one mapping.

rated beam EIRP: EIRP that is declared as being achieved in the *beam peak direction* associated with a particular *beam direction pair*

receiver target: angles of arrival in which reception is performed

receiver target redirection range: union of all the *sensitivity RoAoA* achievable through redirecting the *receiver target* related to the OSDD

receiver target reference direction: direction inside the *receiver target redirection range* declared by the manufacturer for conformance testing.

NOTE For an OSDD without *receiver target redirection range*, this is a direction inside the *sensitivity RoAoA*.

reference beam direction: declared *beam direction pair*, including reference *beam centre direction* and reference *beam peak direction* where the reference *beam peak direction* is the direction for the intended maximum EIRP within the EIRP accuracy compliance directions set

sensitivity RoAoA: RoAoA within which the declared EIS(s) of an OSDD is intended to be achieved at any instance of time for a specific AAS BS direction setting

single RAT E-UTRA operation: operation of AAS BS declared to be single RAT E-UTRA in the *operating band*

NOTE: *Single RAT E-UTRA operation* does not cover in-band NB-IoT, nor guardband NB-IoT operation.

single RAT UTRA operation: operation of AAS BS declared to be single RAT UTRA in 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-block*s within a *Base Station RF Bandwidth*.

sub-block gap: frequency gap between two consecutive *sub-block*s within an *Base 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

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

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

transmission bandwidth: bandwidth of an instantaneous E-UTRA transmission from a UE or BS, measured in Resource Block units

uplink operating band: part of the (FDD) operating band designated for uplink

3.2 Symbols

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

BeW_{θ}	The Beam width in θ
BeW_{ϕ}	The Beam width in ϕ
$BW_{Channel}$	Channel bandwidth (for E-UTRA)
$BW_{Channel\_CA}$	Aggregated channel bandwidth, expressed in MHz. $BW_{Channel\_CA} = F_{edge\_high} - F_{edge\_low}$.
BW_{Config}	Transmission bandwidth configuration (for E-UTRA), expressed in MHz, where $BW_{Config} = N_{RB}$ x 180 kHz in the uplink and BW_{Config} = 15 kHz + N_{RB} x 180 kHz in the downlink.
DwPTS	Downlink part of the special subframe (for E-UTRA TDD operation
f	Frequency
Δf	Separation between the Base Station RF bandwidth edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency
Δf_{max}	The largest value of Δf used for defining the requirement
F_C	Carrier centre frequency
F_{filter}	Filter centre frequency
f_offset	Separation between the Base Station RF bandwidth edge frequency and the centre of the measuring filter
f_offset_{max}	The maximum value of f_offset used for defining the requirement
$F_{BW\ RF,high}$	Upper RF bandwidth edge, where $F_{BW\ RF,high} = F_{C,high} + F_{offset,\ RAT}$
$F_{BW\ RF,low}$	Lower RF bandwidth edge, where $F_{BW\ RF,low} = F_{C,low} - F_{offset,\ RAT}$
$F_{C,high}$	Centre frequency of the highest transmitted/received carrier.
$F_{C,low}$	Centre frequency of the lowest transmitted/received carrier.
F_{edge_low}	The lower edge of aggregated channel bandwidth, expressed in MHz. $F_{edge\_low} = F_{C\_low} - F_{offset}$.
F_{edge_high}	The upper edge of aggregated channel bandwidth, expressed in MHz. $F_{edge\_high} = F_{C\_high} + F_{offset}$.
$F_{offset,\ RAT}$	Frequency offset from the centre frequency of the *highest* transmitted/received carrier to the *upper* RF bandwidth edge, sub-block edge or inter-RF bandwidth edge, or from the centre frequency of the *lowest* transmitted/received carrier to the *lower* RF bandwidth edge, sub-block edge or inter-RF bandwidth edge for a specific RAT.
F_{UL_low}	The lowest frequency of the *uplink operating band*
F_{UL_high}	The highest frequency of the *uplink operating band*
F_{uw}	Frequency offset of unwanted signal
N_{RB}	Transmission bandwidth configuration, expressed in units of resource blocks (for E-UTRA)
W_{gap}	*Sub-block gap* size or *Inter RF Bandwidth gap* size
θ	The angle in the reference coordinate system between the projection of the x/y plane and the radiation vector defined between -90° and 90°. 0° represents the direction perpendicular to the y/z plane. The angle is aligned with the down-tilt angle.
ϕ	The angle in the reference coordinate system between the x-axis and the projection of the radiation vector onto the x/y plane defined between -180° and 180°.

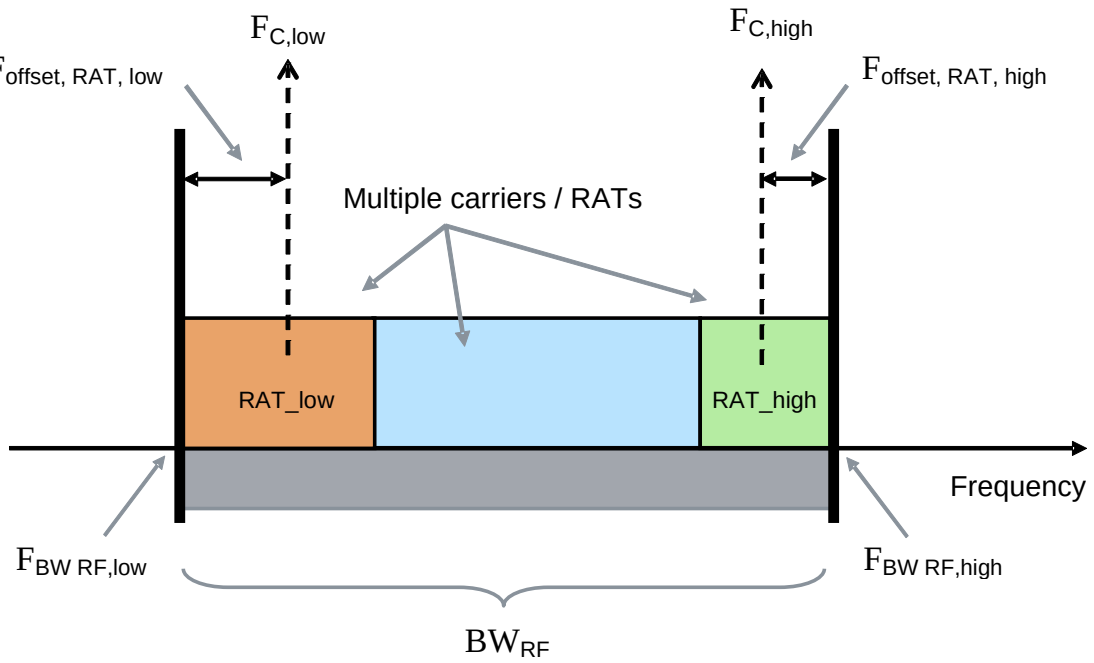

Figure 3.2-1: Illustration of RF bandwidth related symbols and definitions for Multi-standard Radio

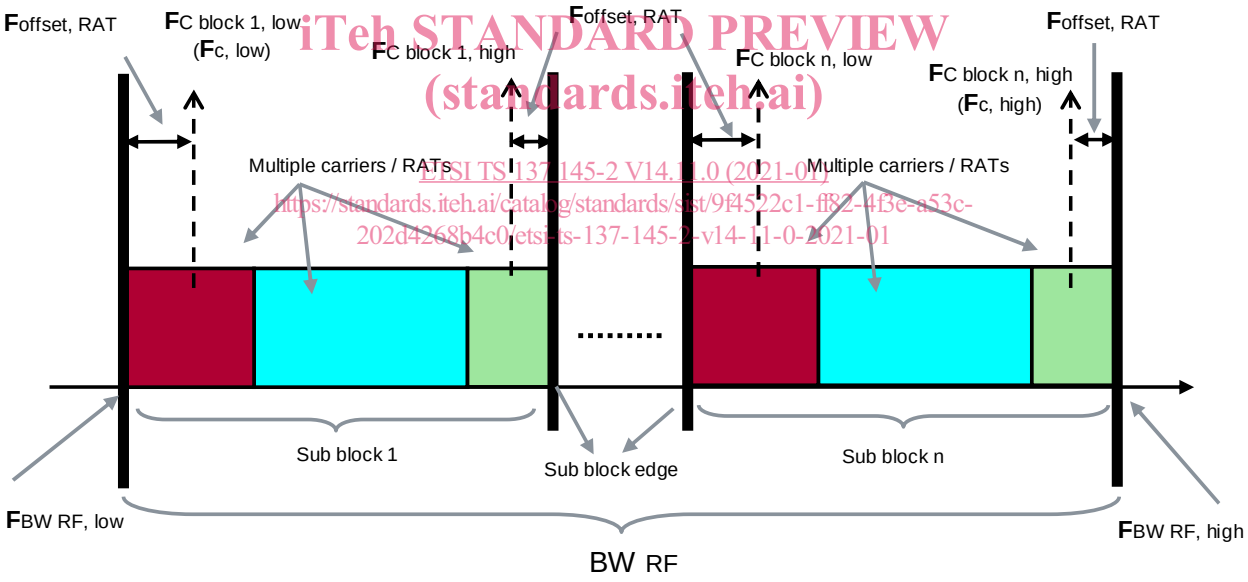

Figure 3.2-2: Illustration of RF bandwidth related symbols and definitions for non-contiguous Multi-standard Radio

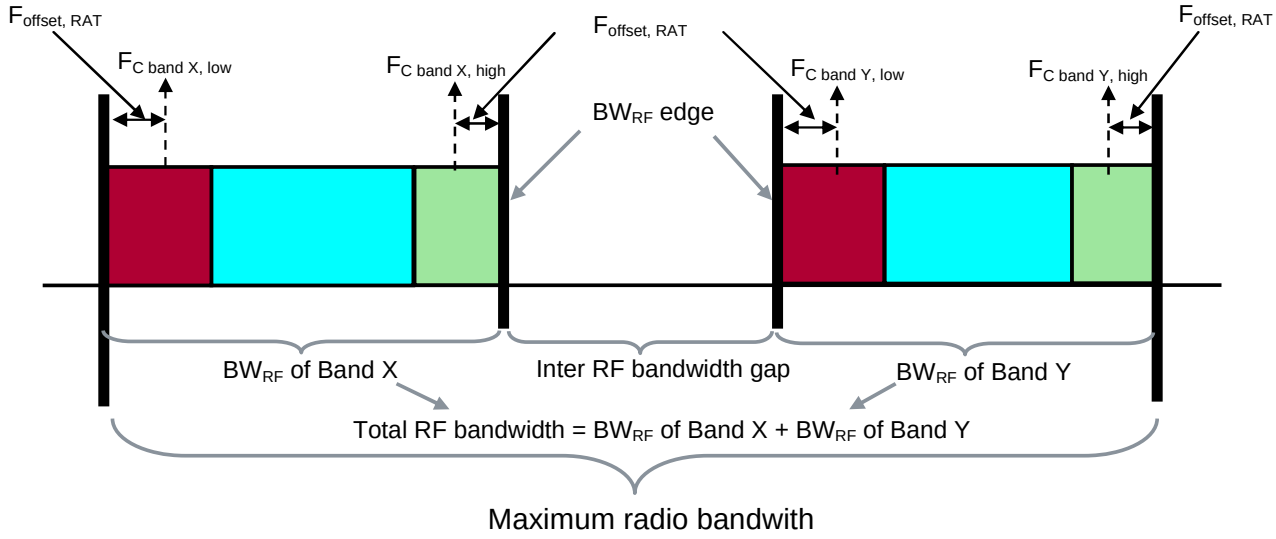

Figure 3.2-3: Illustration of maximum radio bandwidth and Total RF bandwidth for Multi-band Multi-standard Radio

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

AAS BS	Active Antenna System Base Station
AoA	Angle of Arrival
BC	Band Category
BER	Bit Error Rate
CA	Carrier Aggregation
EIRP	Equivalent Isotropic Radiated Power
EIS	Equivalent Isotropic Sensitivity
FDD	Frequency Division Duplex
FRC	Fixed Reference Channel
ITU	International Telecommunication Union
ITU-R	Radio communication Sector of the ITU
MB-MSR	Multi-Band Multi-Standard Radio
MBT	Multi-Band Testing
MC	Multi-Carrier in a Single RAT
OSDD	OTA Sensitivity Directions Declaration
OTA	Over The Air
RAT	Radio Access Technology
RB	Resource Block (for E-UTRA)
RDN	Radio Distribution Network
RF	Radio Frequency
RoAoA	Range of Angles of Arrival
SBT	Single Band Testing
SC	Single-Carrier
TAB	Tranceiver Array Boundary
TDD	Time Division Duplex
UE	User Equipment