

ETSI TS 137 105 V14.8.0 (2022-03)



**Universal Mobile Telecommunications System (UMTS);
LTE;
5G;
Active Antenna System (AAS) Base Station (BS)
transmission and reception
(3GPP TS 37 105 version 14.8.0 Release 14)**

ETSI TS 137 105 V14.8.0 (2022-03)
<https://standards.iteh.ai/catalog/standards/etsi/etsi-ts-137-105-v14-8-0-09c3-4783-804c-12fbc67f6291/etsi-ts-137-105-v14-8-0-2022-03>



ReferenceRTS/TSGR-0437105ve80

Keywords5G,LTE,UMTS

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- [15] "Title 47 of the Code of Federal Regulations (CFR)", Federal Communications Commission.
- [16] 3GPP TS 25.331 (V14.3.0): "Radio Resource Control (RRC); Protocol specification (Release 14)".
- [17] Recommendation ITU-R SM.328-11: "Spectra and bandwidth of emissions".
- [18] FCC publication number 662911: "Emissions Testing of Transmitters with Multiple Outputs in the Same Band".
- [19] 3GPP TS 37.141: "E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing".
- [20] 3GPP TS 36.141: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing".
- [21] 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".
- [22] 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".
- [23] ETSI EN 300 019-1-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weather protected locations".
- [24] ETSI EN 300 019-1-4: "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".
- [25] CEPT ECC Decision (13)03, "The harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)".
- [26] 3GPP TS 37.145-1: "Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: Conducted conformance testing".
- [27] 3GPP TS 37.145-2: "Active Antenna System (AAS) Base Station (BS) conformance testing; Part 2: Radiated conformance testing".

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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].

NOTE: Multi-word definitions are treated as linguistic expressions and printed in italic font throughout this requirement specification. Linguistic expressions may not be split and are to be printed in their entirety.

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

active antenna system base station: base station system which combines an antenna array with a transceiver unit array and a *radio distribution network*

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 one or more *TAB connectors* at the *transceiver array boundary*

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*

basic limit: emissions limit taken from the non-AAS BS specifications that is converted into a per *TAB connector TX min cell group AAS BS emissions limit*, or into a per *TAB connector RX min cell group AAS BS emissions limit* by scaling, depending on the context

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

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

beam centre direction: direction equal to the geometric centre of the half-power 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 elliptical half-power EIRP contour of the beam

carrier: modulated waveform conveying the E-UTRA or UTRA physical channels

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

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

NOTE 3: For E-UTRA, the *channel bandwidths* are specified in 3GPP TS 36.104 [4]. Standalone NB-IoT channel bandwidths specified in 3GPP TS 36.104 [4] are not applicable to AAS BS.

code domain power: part of the mean power which correlates with a particular (OVSF) code channel in a UTRA signal

NOTE: The sum of all powers in the code domain equals the mean power in a bandwidth of $(1+\alpha)$ times the chip rate of the radio access mode.

demodulation branch: single input of the AAS BS *receiver* to the demodulation algorithms.

NOTE 1: For UTRA *non-AAS BS* a *demodulation branch* is referred to as a receive diversity branch or an UL MIMO branch. For E-UTRA *non-AAS BS* a *demodulation branch* is referred to as an RX antenna in the performance requirement tables.

NOTE 2: The term "RX antenna" in chapter 8 (i.e. Performance requirements) of the E-UTRA specification 3GPP TS 36.104 [4] does not refer to physical receiver antennas.

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

EIRP accuracy directions set: *beam peak directions* for which the EIRP accuracy requirement is intended to be met.

NOTE: 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 (i.e. 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 (i.e. 0 dBi).

inter-band gap: frequency gap between two supported consecutive operating bands

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

maximum carrier output power per TAB connector: mean power level measured on a particular carrier at the *TAB connector(s)*, during the *transmitter ON period* in a specified reference condition

maximum throughput: maximum achievable throughput for a reference measurement channel

MSR operation: operation of AAS BS declared to be MSR in particular *operating band(s)*

multi-band requirements: requirements applying per one single *operating band* with exclusion bands or other multi-band provisions as defined for each requirement

multi-band TAB connector: *TAB connector* supporting operation in multiple *operating bands* through common active electronic component(s)

NOTE: For common TX and RX *TAB connectors*, the definition applies where common active electronic components are in the transmit path and/or in the receive path.

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

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

NOTE: For AAS BS in *single RAT E-UTRA operation* or in *MSR operation* using E-UTRA, the NB-IoT operation (including in-band, guard band and standalone operation) is excluded from the consideration in the performance comparison among AAS BS and *non-AAS BS* in this specification.

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 at least one set of declared minimum EIS values (with related RAT and *channel bandwidth*), and related directions over which the EIS applies

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

output power at a TAB connector: mean power delivered to a load with resistance equal to the nominal load impedance of the *TAB connector*

polarization match: condition that exists when a plane wave, incident upon an antenna from a given direction, has a polarization that is the same as the receiving polarization of the antenna in that direction

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: 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

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*

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

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

receive period: time during which the AAS BS is receiving data sub-frames (or UpPTS in case of E-UTRA frame Type2) on a (TDD) carrier

receiver target: AoA in which reception is performed by AAS BS

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

receiver target reference direction: direction inside the *OTA sensitivity directions declaration* declared by the manufacturer for conformance testing. For an OSDD without *receiver target redirection range*, this is a direction inside the *sensitivity RoAoA*

reference beam direction pair: 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 directions set* compliance

sensitivity RoAoA: RoAoA within the *OTA sensitivity directions declaration*, 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 band requirements: requirements applying per one single *operating band* without exclusion bands or other multi-band provisions

single band TAB connector: *TAB connector* supporting operation either in a single *operating band* only, or in multiple *operating bands* but without any common active electronic component(s)

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-blocks* within a Base Station RF Bandwidth.

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

TAB connector: *transceiver array boundary* connector

TAB connector RX min cell group: *operating band* specific declared group of *TAB connectors* to which 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 AAS BS 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.

TAB connector TX min cell group: *operating band* specific declared group of *TAB connectors* to which 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 AAS BS 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.

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

transmitter OFF period: time period during which the transmitter is scheduled not to transmit

NOTE: For AAS BS, this definition applies per *TAB connector* and *operating band*.

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

NOTE: For AAS BS, this definition applies per *TAB connector* and *operating band*.

transmitter transient period: time period during which the transmitter unit belonging to the transceiver unit array is changing from the OFF period to the ON period or vice versa

NOTE: For AAS BS, this definition applies per *TAB connector* and *operating band*.

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

3.2 Symbols

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

N_{cells}	The declared number corresponding to the minimum number of cells that can be transmitted by an AAS BS in a particular band with transmission on all <i>TAB connectors</i> supporting the operating band.
$N_{\text{RXU,active}}$	The number of active receiver units. The same as the number of <i>demodulation branches</i> to which compliance is declared for chapter 8 performance requirements.
$N_{\text{RXU,counted}}$	The number of active receiver units that are taken into account for unwanted emission scaling, as calculated in subclause 7.1.
$N_{\text{RXU,countedpercell}}$	The number of active receiver units that are taken into account for unwanted emissions scaling per cell, as calculated in subclause 7.6. The number is defined in subclause 7.1.
$N_{\text{TXU, active}}$	The number of <i>active transmitter units</i> .
$N_{\text{TXU,counted}}$	The number of <i>active transmitter units</i> , as calculated in subclause 6.1, that are taken into account or conducted TX power limit in subclause 6.2, and for unwanted emissions scaling.
$N_{\text{TXU,countedpercell}}$	The number of <i>active transmitter units</i> that are taken into account for emissions scaling per cell, as calculated in subclause 6.6. The number is defined in subclause 6.1.
$P_{\text{max,c,cell}}$	The <i>maximum carrier output power per TAB connector TX min cell group</i>
$P_{\text{max,c,TABC}}$	The <i>maximum carrier output power per TAB connector</i>
$P_{\text{Rated,c,TABC}}$	The <i>rated carrier output power per TAB connector</i>
$P_{\text{Rated,c,sys}}$	The sum of $P_{\text{Rated,c,TABC}}$ for all <i>TAB connectors</i> for a single carrier
$P_{\text{Rated,t,group}}$	The sum of $P_{\text{Rated,t,TABC}}$ for all <i>TAB connectors</i> belonging to a specified group
$P_{\text{Rated,t,TABC}}$	The <i>rated total output power per TAB connector</i>
P_{REFSENS}	Reference Sensitivity power level

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 BS	Active Antenna System Base Station
ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AoA	Angle of Arrival
BC	Band Category
BER	Bit Error Rate
BLER	Block Error Rate
CACLR	Cumulative ACLR
CW	Continuous Wave (unmodulated signal)
D-CPICH	Demodulation Common Pilot Channel