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| **Program / Project Name:** | CA5G TM |
| **Checklist / Template Completed by:** | TBD |
| **Date Completed:** | Click here to enter a date. |

**3GPP TS 38.104**

V15.7.0 (2019-09)

Base Station(BS) radio transmission and reception

(Release 15)

**Detailed Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Editor(s)** | **Description of change** |
| 0.1 | 14-JAN-2020 | Sang-Gu Kang | Initial Draft |
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# Scope

본 문서는 NR 기지국 (BS)의 최소 RF 특성 및 최소 성능 요구 사항을 설정한다.

# References

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| [1] | 3GPP TR 21.905: “Vocabulary for 3GPP Specifications”. |
| [2] | ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain". |
| [3] | Recommendation ITU-R SM.328: "Spectra and bandwidth of emissions". |
| [4] | 3GPP TR 25.942: "RF system scenarios". |
| [5] | 3GPP TS 38.141-1: "NR; Base Station (BS) conformance testing; Part 1: Conducted conformance testing". |
| [6] | 3GPP TS 38.141-2: "NR; Base Station (BS) conformance testing; Part 2: Radiated conformance testing". |
| [7] | Recommendation ITU-R M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000". |
| [8] | "Title 47 of the Code of Federal Regulations (CFR)", Federal Communications Commission. |
| [9] | 3GPP TS 38.211: "NR; Physical channels and modulation". |
| [10] | 3GPP TS 38.213: "NR; Physical layer procedures for control". |
| [11] | 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification". |
| [12] | ECC/DEC/(17)06: "The harmonised use of the frequency bands 1427-1452 MHz and 1492-1518 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)" |
| [13] | 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception". |
| [14] | 3GPP TS 37.105: "Active Antenna System (AAS) Base Station (BS) transmission and reception". |
| [15] | 3GPP TS 38.212: "NR; Multiplexing and channel coding". |
| [16] | 3GPP TR 38.901: "Study on channel model for frequencies from 0.5 to 100 GHz" |
| [17] | 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone". |
| [18] | 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone" |
| [19] | ERC Recommendation 74-01, "Unwanted emissions in the spurious domain". |

# Definitions, symbols and abbreviations

## Definitions

본 문서의 목적 상, 3GPP TR 21.905 [1] 및 다음에 주어진 용어와 정의가 적용된다. 본 문서에서 정의 된 용어는 3GPP TR 21.905에서 동일한 용어의 정의보다 우선한다 [1].

**Aggregated BS Channel Bandwidth**: 기지국이 여러 개의 연속 집계된 반송파를 송수신하는 RF 대역폭. 집계된 BS 채널 대역폭은 MHz로 측정된다.

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

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

**Base Station RF Bandwidth**: 기지국이 지원되는 동작 대역 내에서 단일 또는 다중 반송파를 전송 또는 수신하는 RF 대역폭  
NOTE: 단일 캐리어 작동에서, 기지국 RF 대역폭은 BS 채널 대역폭과 같다.

**Base Station RF Bandwidth edge**: 기지국 RF 대역폭의 에지 중 하나의 주파수.

**basic limit**: emissions limit relating to the power supplied by a single transmitter to a single antenna transmission line in ITU-R SM.329 [5] used for the formulation of unwanted emission requirements for FR1

**beam**: (안테나의) 빔은 안테나 배열의 방사 패턴의 메인 로브이다.  
NOTE: 특정 BS 안테나 배열의 경우 둘 이상의 빔이있을 수 있다.

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

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

**beam peak direction**: 최대 EIRP가있는 방향

**beamwidth**: beam which has a half-power contour that is essentially elliptical, the half-power beamwidths in the two pattern cuts that respectively contain the major and minor axis of the ellipse

**BS channel bandwidth**: 업 링크 또는 다운 링크에 구성된 전송 대역폭으로 단일 NR RF 캐리어를 지원하는 RF 대역폭  
NOTE 1: BS channel bandwidth는 MHz 단위로 측정되며 송신기 및 수신기 RF 요구 사항에 대한 참조로 사용된다.  
NOTE 2: It is possible for the BS to transmit to and/or receive from one or more UE bandwidth parts that are smaller than or equal to the BS transmission bandwidth configuration, in any part of the BS transmission bandwidth configuration.

**BS transmission bandwith configuration**: set of resource blocks located within the BS channel bandwidth which may be used for transmitting or receiving by the BS

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

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

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

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

**channel edge**: BS 채널 대역폭으로 분리된 NR 캐리어의 최저 또는 최고 주파수.

**carrier aggregation**: 더 넓은 전송 대역폭을 지원하기 위한 둘 이상의 컴포넌트 캐리어의 집합

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

**co-location reference antenna**: a passive antenna used as reference for base station to base station co-location requirements

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

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

**directional requirement**: requirement which is applied in a specific direction within the OTA coverage range for the Tx and when the AoA of the incident wave of a received signal is within the OTA REFSENS RoAoA or the minSENS RoAoA as appropriate for the receiver

**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 specific requirement is met.  
NOTE 2: Isotropic directivity is equal in all directions (i.e. 0 dBi).

**fractional bandwidth**: fractional bandwidth FBW is defined as FBW = 200 ∙ (FFBWhigh - FFBWlow) / (FFBWhigh+FFBWlow ) %

**Highest Carrier**: 지정된 주파수 대역에서 송/수신되는 반송파 주파수가 가장 높은 반송파.

**inter-band carrier aggregation**: carrier aggregation of component carriers in different operating bands  
NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

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

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

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

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

**Lowest carrier**: 지정된 주파수 대역에서 송/수신 된 반송파 주파수가 가장 낮은 반송파

**Lower sub-block edge**: frequency at the lower edge of one sub-block  
NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

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

**maximum carrier TRP output power**: mean power level measured per RIB during the transmitter ON period for a specific carrier in a specified reference condition and corresponding to the declared rated carrier TRP output power (Prated,c,TRP)

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

**maximum total TRP output power**: mean power level measured per RIB during the transmitter ON period in a specified reference condition and corresponding to the declared rated total TRP output power (Prated,t,TRP)

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

**minSENS**:

**minSENS RoAoA**:

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

**multi-band RIB**:

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

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

**operating band**: frequency range in which NR operates (paired or unpaired), that is defined with a specific set of technical requirements  
NOTE: The operating band(s) for a BS is declared by the manufacturer according to the designations in TS 38.104 [2], tables 5.2-1 and 5.2-2.

**OTA coverage range**:

**OTA peak directions set**:

**OTA REFSENS RoAoA**:

**OTA sensitivity directions declaration**:

**polarization match**:

**radiated interface boundary**:

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

**rated beam EIRP**: For a declared beam and beam direction pair, the rated beam EIRP level is the maximum power that the base station is declared to radiate at the associated beam peak direction during the transmitter ON period

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

**rated carrier TRP output power**:

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

**rated total TRP output power**:

**reference beam direction pair**:

**receiver target**:

**receiver target redirection range**:

**receiver target reference direction**:

**reference RoAoA**:

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

**sensitivity RoAoA**:

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

**single-band RIB**:

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

**sub-block bandwidth**:

**sub-block**: one contiguous allocated block of spectrum for transmission and reception by the same base station  
NOTE: There may be multiple instances of sub-blocks within a Base Station RF Bandwidth.

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

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

**TAB connector**: transceiver array boundary connector

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

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

**total radiated power**:

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

**transmission bandwidth**:

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

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

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

**UE transmission bandwidth configuration**:

**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.

## Symbols

|  |  |
| --- | --- |
| β | Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel |
| BeWθ,REFSENS |  |
| BeWφ,REFSENS |  |
| BWChannel | BS channel bandwidth |
| BWChannel\_CA | Aggregated BS channel bandwidth, expressed in MHz. BWChannel\_CA= Fedge\_high- Fedge\_low |
| BWChannel\_block | Sub-block bandwidth, expressed in MHz. BWChannel\_block = Fedge\_block\_high- Fedge\_block\_low |
| BWConfig | Transmission bandwidth configuration, expressed in MHz, where BWConfig = NRB x SCS x 12kHz |
| BWContiguous |  |
| BWGB, low |  |
| BWGB, high |  |
| BWtot | Total RF bandwidth |
| ∆f | Separation between the channel edge frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency |
| ∆fmax | f\_offsetmax minus half of the bandwidth of the measuring filter |
| ∆FGlobal | Global frequency raster granularity |
| ∆fOBUE | Maximum offset of the operating band unwanted emissions mask from the downlink operating band edge |
| ∆fOOB | Maximum offset of the out-of-band boundary from the uplink operating band edge |
| ΔFR2\_REFSENS |  |
| ΔminSENS |  |
| ΔOTAREFSENS |  |
| ∆FRaster | Channel raster granularity |
| Δshift | Channel raster offset for SUL |
| EISminSENS |  |
| EISREFSENS |  |
| EISREFSENS\_50M |  |
| FFBWhigh |  |
| FFBWlow |  |
| FC | RF reference frequency on the channel raster, given in table 5.4.2.2-1 |
| FC\_block\_high |  |
| FC\_block\_low |  |
| FC\_low |  |
| FC\_high |  |
| FDL,low |  |
| FDL,high |  |
| Fedge\_low |  |
| Fedge\_high |  |
| Fedge\_block\_low |  |
| Fedge\_block\_high |  |
| Ffilter |  |
| Foffset\_high |  |
| Foffset\_low |  |
| f\_offset |  |
| F\_offsetmax |  |
| FREF |  |
| FREF\_Offs |  |
| Fstep\_X |  |
| FUL\_low |  |
| FUL\_high |  |
| GBChannel |  |
| Ncells |  |
|  |  |
| NRB |  |
| NRB\_high |  |
| NRB\_low |  |
| NREF |  |
| NREF\_Offs |  |
| NRXU\_active |  |
| NRXU\_counted |  |
| NRXU\_countedpercell |  |
| NTXU\_counted |  |
| NTXU\_countedpercell |  |
| PEM\_n50\_n75\_ind |  |
| Pmax\_c\_AC |  |
| Pmax\_c\_cell |  |
| Pmax\_c\_TABC |  |
| Pmax\_c\_TRP Pmax\_c\_EIRP |  |
| Prated\_c\_AC |  |
| Prated\_c\_cell |  |
| Prated\_c\_FBWhigh |  |
| Prated\_c\_FBWlow |  |
| Prated\_c\_sys |  |
| Prated\_c\_TABC |  |
| Prated\_c\_TRP |  |
| Prated\_t\_AC |  |
| Prated\_t\_TABC |  |
| Prated\_t\_TRP |  |
| PREFSENS |  |
| SCSlow |  |
| SCShigh |  |
| SSREF |  |
| Wgap |  |

## Abbreviations

|  |  |
| --- | --- |
| AA | Antenna Array |
| AAS | Active Antenna System |
| ACLR | Adjacent Channel Leakage Ratio |
| ACS | Adjacent Channel Selectivity |
| AoA | Angle of Arrival |
| AWGN | Additive White Gaussian Noise |
| BS | Base Station |
| BW | Bandwidth |
| CA | Carrier Aggregation |
| CACLR | Cumulative ACLR |
| CPE | Common Phase Error |
| CP-OFDM | Cyclic Prefix-OFDM |
| CW | Continuous Wave |
| DFT-s-OFMD | Discrete Fourier Transform-spread-OFDM |
| DM-RS | Demodulation Reference Signal |
| EIS | Equivalent Isotropic Sensitivity |
| EIRP | Effective Isotropic Radiated Power |
| E-UTRA | Evolved UTRA |
| EVM | Error Vector Manitude |
| FBW | Fractional Bandwidth |
| FDD | Frequency Division Duplex |
| FR | Frequency Range |
| FRC | Fixed Reference Channel |
| GSCN | Global Synchronization Channel Number |
| GSM | Global System for Mobile communications |
| ICS | In-Channel Selectivity |
| LA | Local Area |
| LNA | Low Noise Amplifier |
| MCS | Modulation and Coding Scheme |
| MR | Medium Range |
| NR | New Radio |
| NR-ARFCN | NR Absolute Radio Frequency Channel Number |
| OBUE | Operating Band Unwanted Emissions |
| OOB | Out-of-band |
| OSDD | OTA Sensitivity Directions Declaration |
| OTA | Over-The-Air |
| PRB | Physical Resouorce Block |
| PT-RS | Phase Tracking Reference Signal |
| QAM | Quadrature Amplitude Modulation |
| RDN | Radio Distribution Network |
| RE | Resource Element |
| REFSENS | Reference Sensitivity |
| RF | Radio Frequency |
| RIB | Radiated Interface Boundary |
| RMS | Root Mean Square (value) |
| RoAoA | Range of Angles of Arrival |
| RS | Reference Signal |
| RX | Receiver |
| SCS | Sub-Carrier Spacing |
| SDL | Supplementary Downlink |
| SS | Synchronization Symbol |
| SSB | Synchronization Signal Block |
| SUL | Supplementary Uplink |
| TAB | Transceiver Array Boundary |
| TAE | Time Alignment Error |
| TDD | Time Division Duplex |
| TX | Transmitter |
| TRP | Total Radiated Power |
| UEM | Unwanted Emissions Mask |
| UTRA | Univaersal Terrestrial Radio Access |
| WA | Wide Area |
| ZF | Zero Forcing |

# General

## Relationship with other core specifications

본 문서는 RF 특성 및 최소 성능 요구 사항을 다루는 BS에 대한 single-RAT 사양이다. 전도 및 방사 핵심 요건은 4.3 절에 정의 된 BS 구조 및 BS 유형에 대해 정의된다.

각 요구 사항의 적용은 5 절에 기술되어있다.

## Relationship between minimum requirements and test requirements

본 표준에 대한 적합성은 적합성 사양 TS 38.141-1 [5] 및 TS 38.141-2 [6]에 지정된 시험 요구 사항을 충족함으로써 입증된다.

이 사양에 제시된 최소 요구 사항은 측정 불확실성을 허용하지 않는다. 테스트 사양 TS 38.141-1 [5] 및 TS 38.141-2 [6]은 테스트 공차를 정의한다. 이러한 테스트 공차는 각 테스트마다 개별적으로 계산된다. 테스트 공차는 이 사양에서 최소 요구 사항을 완화하여 테스트 요구 사항을 생성하는 데 사용된다. 규제 요구 사항을 포함한 일부 요구 사항의 경우 테스트 허용 오차가 0으로 설정된다.

테스트 시스템에 의해 반환된 측정 결과는 수정 없이 공유 위험 원칙에 의해 정의된 테스트 요구 사항과 비교된다.

공유 위험 원칙은 권고 ITU-R M.1545 [7]에 정의되어있다.

## Conducted and radiated requirement reference points

## Todo

## BS configurations

### BS type 1-C

#### Transmit configurations

##### General

달리 명시되지 않는 한, 6절의 송신기 특성은 정상적인 작동 조건에서의 구성을 위한 트랜시버의 전체 보완 기능을 갖춘 BS 안테나 커넥터 (test port A)에 지정된다. TX 앰프, 필터 또는 이러한 장치의 조합과 같은 외부 장치를 사용하는 경우에는 파 엔드 안테나 커넥터 (테스트 포트 B)에 요구 사항이 적용됩니다.

##### Transmission with multiple transmitter antenna connectors

달리 언급되지 않는 한, 본 문서의 6절에있는 시험에 대하여, 다수의 송신기 안테나 커넥터로 전송하는 경우 각 송신기 안테나 커넥터에 대한 요구 사항이 적용된다.  
송신기 요구 사항은 안테나 커넥터에서 테스트되며 나머지 안테나 커넥터는 종료(being terminated)된다. 제조업체가 송신기 경로를 동등한 것으로 선언 한 경우 (D.32) 송신기 안테나 커넥터 중 하나에서 신호를 측정하는 것으로 충분하다.

#### Receive configurations

##### General

달리 명시되지 않는 한, 7 항의 수신기 특성은 정상적인 작동 조건에서의 구성을위한 트랜시버의 전체 보완 기능을 갖춘 BS 안테나 커넥터 (테스트 포트 A)에 지정된다. RX 앰프, 필터 또는 이러한 장치의 조합과 같은 외부 장치를 사용하는 경우에는 파 엔드 안테나 커넥터 (테스트 포트 B)에 요구 사항이 적용된다.

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

본 문서의 7 절에 대한 시험의 경우, 안테나 다이버 시티를 갖는 수신기에 대한 또는 복수의 수신기 안테나 커넥터를 갖는 다중 반송파 수신의 경우, 각 수신기 안테나 커넥터에 요건이 적용된다.

수신기 요구 사항은 안테나 커넥터에서 테스트되며 나머지 수신기는 비활성화되거나 안테나 커넥터는 종료된다. 제조업체가 수신기 경로를 동등한 것으로 선언 한 경우 (D.32) 수신기 안테나 커넥터 중 하나에 지정된 테스트 신호를 적용하는 것으로 충분하다.

다중 대역 동작을 지원하는 BS type 1-C의 경우, ACS에 대한 다중 대역 테스트, 차단 및 상호 변조는 원하는 신호 (들)에 대해 수신기에 매핑 된 각 안테나 커넥터에 적용된 간섭 자로 수행된다. 한 번에 하나의 안테나 커넥터에 연결하라. 신호가 적용되지 않는 안테나 커넥터가 종료된다.

#### Duplexers

듀플렉서가 BS의 일부로 제공되는 경우, 본 문서의 요구 사항은 듀플렉서가 장착 된 상태로 충족되어야 한다. 듀플렉서를 제조업체가 옵션으로 제공하는 경우 BS가 두 경우 모두 본 문서의 요구 사항을 충족하는지 확인하기 위해 듀플렉서를 장착하거나 장착하지 않고 충분한 테스트를 반복해야한다.

다음 테스트는 듀플렉서를 장착 한 상태에서 수행해야하며 옵션인 경우 장착하지 않은 상태에서 수행해야 한다.

1) 안테나 출력단에서 측정 된 경우, 최고 정 전력 단계에 대해서만 6.2항의 기지국 출력 전력

2) 6.6항, unwanted emissions; BS 송신 대역 외부;

3) 6.6.5.5.1.2항, BS 수신기의 보호;

4) 6.7항, transmit intermodulation; 적합성 테스트를 위해, 수신 채널에 속하는 송신기로부터의 상호 변조 제품을 최소화하기 위해 반송파 주파수를 선택해야 한다.

나머지 테스트는 듀플렉서를 장착하거나 장착하지 않고 수행 할 수 있다.

NOTE 1: 듀플렉서가 장착된 수신기 테스트를 수행 할 때 트랜스미터의 출력이 테스트 장치에 영향을 미치지 않는지 확인해야 한다. 이것은 감쇠기, 절연기 및 필터의 조합을 사용하여 달성 할 수 있다.

NOTE2: 듀플렉서를 사용하면 듀플렉서뿐만 아니라 안테나 시스템에서도 상호 변조 제품이 생성된다. 안테나 시스템에서 생성 된 혼 변조 제품은 3GPP 사양으로 제어되지 않으며 작동 중 (예 : 습기 유입으로 인해) 저하 될 수 있다. 따라서, BS의 만족스러운 동작을 계속 보장하기 위해, 오퍼레이터는 일반적으로 수신 채널 상에 떨어지는 상호 변조 제품을 최소화하기 위해 NR-ARFCN을 선택할 것이다. 완전한 적합성 테스트를 위해 운영자는 사용할 NR-ARFCN을 지정할 수 있다.

#### Power supply options

BS에 여러 가지 전원 공급 장치 구성이 제공되는 경우 장비를 테스트하는 조건 범위가 전원 공급 장치 구성으로 인한 조건 범위만큼 크지 않다.

이것은 특히 BS에 외부 또는 내부 주 전원 공급 장치에서 공급할 수있는 DC 레일이 포함 된 경우에 적용된다. 이 경우 주 전원 공급 장치 옵션의 극한 전원 공급 조건은 외부 DC 공급 옵션만 테스트하여 테스트 할 수 있다. 테스트를위한 DC 입력 전압의 범위는 주 입력 전압, 온도 및 출력 전류의 변화를 포함하여 BS 내의 작동 조건 범위에서 전원 공급 장치의 성능을 검증하기에 충분해야 한다.

#### Ancillary RF amplifiers

본 문서의 BS type 1-C 요구 사항은 부속 RF 증폭기와 함께 충족되어야 한다. TX 및 RX에 대한 6 및 7 조에 따른 테스트에서 보조 증폭기는 연결 네트워크 (케이블, 감쇠기 등 포함)를 통해 BS에 연결되어 적절한 손실을 보장한다. 보조 증폭기 및 BS의 동작 조건. 적용 가능한 연결 네트워크 손실 범위는 제조업체에서 선언한다 (D.35). 연결 네트워크의 감쇠에 대한 다른 특성 및 온도 의존성은 무시된다. 연결 네트워크의 실제 감쇠 값은 각 테스트마다 해당하는 극한값 중 하나로 선택된다. 달리 명시되지 않는 한 가장 낮은 값이 사용된다.

보조 증폭기를 장착하고 보조 RF 증폭기가 없는 경우 충분한 테스트를 반복하여 BS가 두 경우 모두 본 문서의 요구 사항을 충족하는지 확인해야 한다.

시험 할 때, 아래 표에 따라 선택 사양인 보조 증폭기를 사용하여 다음 시험을 반복해야 한다. 여기서 "x"는 시험이 적용 가능함을 나타낸다.

NOTE 1: 조합은 이중 필터 또는 다른 네트워크에 의해 이루어질 수 있다. 앰프는 RX 또는 TX 분기 또는 둘 다에있을 수 있다. 이 증폭기 중 하나는 수동 네트워크 일 수 있다.

NOTE 2: 별도의 언급이 없는 한, TX 및 RX 앰프가 있는 BS는 각 테스트마다 두 개의 앰프가 활성화 된 상태에서 한 번 테스트된다.

기지국 출력 전력 테스트 (6.2 절) 및 기준 감도 레벨 테스트 (7.2 절)에는 적용 가능한 최대 감쇠 값이 적용된다.

### BS type 1-H

#### Transmit configurations

달리 언급되지 않는 한, 6항의 전도된 송신기 특성은 정상 작동 조건에서의 구성을 위한 완전한 송수신기 유닛과 함께 TAB 커넥터 (들) 안테나 커넥터의 송수신기 어레이 경계에 명시되어 있다.

달리 언급되지 않는 한, 본 문서의 6 항에있는 시험에 대한 요구 사항은 각 전송 TAB 커넥터에 적용된다.

#### Receive configurations

별도의 언급이 없는한, 7 항의 전도 수신기 특성은 정상 작동 조건에서의 구성을 위한 트랜시버 장치의 전체 보완을 통해 TAB 커넥터에 지정된다.

본 문서의 7 항에 있는 시험에 대한 요구 사항은 각 수신 TAB 커넥터에 적용된다.

수행된 수신 요구 사항은 나머지 수신기 장치가 비활성화되거나 해당 TAB 커넥터가 종료된 상태에서 TAB 커넥터에서 테스트 된다.

#### Power supply options

BS type 1-H에 여러 가지 전원 공급 장치 구성이 제공되는 경우 장비가 사용하는 조건의 범위를 입증 할 수있는 경우 각 전원 공급 장치 옵션에 대해 RF 매개 변수를 테스트 할 필요가 없다. 테스트는 모든 전원 공급 장치 구성으로 인한 조건의 범위 이상이다.

### BS with integrated Iuant BS modem

달리 명시되지 않는 한, 본 문서의 테스트에 대해 통합 Iuant BS 모뎀은 꺼야 한다. 6.6.5 및 7.6 항에 따른 스퓨리어스 방출은 통합 Iuant BS 모뎀이 켜진 상태에서 20 MHz 이상의 주파수에 대해서만 측정되어야 한다.

## Manufacturer declarations

테스트중인 BS에 적용 가능한 경우 표 4.6-1에 나열된 다음 BS 선언은 BS type 1-C 및 BS type 1-H의 수행 요구 사항 테스트를 위해 제조업체에서 제공해야한다.

방사성 요구 사항 테스트에 필요한 BS type 1-H 선언에 대해서는 TS 38.141-2 [3]을 참조하시오.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Declaration identifier** | **Declaration** | **Description** | **Applicability** | |
| **BS type 1-C** | **BS type 1-H** |
| D.1 | BS requirements set | Declaration of one of the NR base station requirement’s set as defined for BS type 1-C, or BS type 1-H. | X | X |
| D.2 | BS class | BS class of the BS, declared as Wide Area BS, Medium Range BS, or Local Area BS. | X | X |
| D.3 | Operating bands and frequency ranges | List of NR operating band(s) supported by single-band connector(s) and/or multi-band connector(s) of the BS and if applicable, frequency range(s) within the operating band(s) that the BS can operate in.  Declarations shall be made per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.4 | Spurious emission category | Declare the BS spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [5]. | X | X |
| D.5 | Additional operating band unwanted emissions | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where the additional operating band unwanted emission limits defined in subclause 6.6.4.5.6 apply. (Note 3). | X | X |
| D.6 | Co-existence with other systems | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA, PHS and/or NR operating in another band are deployed. | X | X |
| D.7 | Co-location with other base stations | The manufacturer shall declare whether the BS under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or NR operating in another band. | X | X |
| D.8 | Single band connector or multi-band connector | Declaration of the single band or multi-band capability of single band connector(s) or multi-band connector(s), declared for every connector. | X | X |
| D.9 | Contiguous or non-contiguous spectrum operation support | Ability to support contiguous or non-contiguous (or both) frequency distribution of carriers when operating multi-carrier. Declared per single band connector or multi-band connector, per operating band. | X | X |
| D.10 | Maximum Radio Bandwidth | Maximum radio bandwidth that can be supported by the multi-band connector. May be different for transmit and receive.  Declared for each supported operating band and operating bands combination (D.27) supported for every multi-band connector. | X | X |
| D.11 | Maximum Base Station RF Bandwidth | Maximum Base Station RF Bandwidth in the operating band for single-band operation. Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. (Note 2) | X | X |
| D.12 | Maximum Base Station RF Bandwidth for multi-band operation | Maximum Base Station RF Bandwidth for multi-band operation. Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.13 | Total RF bandwidth (BWtot) | Total RF bandwidth BWtot of transmitter and receiver, declared per the band combinations (D.27). | X | X |
| D.14 | NR supported channel bandwidths and SCS | NR supported SCS and channel bandwidths per supported SCS. Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.15 | CA only operation | Declaration of CA-only operation (with equal power spectral density among carriers) but not multiple carriers, declared per operating band per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.16 | Single or multiple carrier | Capable of operating with a single carrier (only) or multiple carriers. Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.17 | Maximum number of supported carriers per operating band | Maximum number of supported carriers per supported operation band. Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. (Note 2) | X | X |
| D.18 | Maximum number of supported carriers in multi-band operation | Maximum number of supported carriers in multi-band operation. | X | X |
| D.19 | Total maximum number of supported carriers | Maximum number of supported carriers for all supported operating bands. Declared for all connectors (D.18). | X | X |
| D.20 | Other band combination multi-band restrictions | Declare any other limitations under simultaneous operation in the declared band combinations (D.35) for each multi-band connector which have any impact on the test configuration generation.  Declared for every multi-band connector. | X | X |
| D.21 | Rated carrier output power (Prated,c,AC, or Prated,c,TABC) | Conducted rated carrier output power, per single band connector or multi-band connector.  Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. (Note 1, 2) | X | X |
| D.22 | Rated total output power (Prated,c,AC, or Prated,c,TABC) | Conducted total rated output power.  Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H.  For multi-band connectors declared for each supported operating band in each supported band combination. (Note 1, 2) | X | X |
| D.23 | Rated multi-band total output power, Prated,MB,TABC | Conducted multi-band rated total output power.  Declared per supported operating band combinations, per multi-band connector. (Note 1) | X | X |
| D.24 | Ncells | Number corresponding to the minimum number of cells that can be transmitted by a BS in a particular operating band with transmission on all TAB connectors supporting the operating band. |  | X |
| D.25 | Maximum supported power difference between carriers | Maximum supported power difference between carriers. Declared per supported operating band, per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.26 | Maximum supported power difference between carriers is different operating bands | Supported power difference between any two carriers in any two different supported operating bands. Declared per supported operating band combination, per multi-band connector. | X | X |
| D.27 | Operating band combination support | List of operating bands combinations supported by single-band connector(s) and/or multi-band connector(s) of the BS. Declared per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.28 | Total number of supported carriers for the declared band combinations | Total number of supported carriers for the declared band combinations (D.27). | X | X |
| D.29 | Intra-system interfering signal declaration list | List of single band connector(s) or multi-band connector(s) for which an intra-system interfering signal level is required to be declared. Declaration is required if the intra-system interfering signal level is larger than the co-location interfering signal level. |  | X |
| D.30 | Intra-system interfering signal level | The interfering signal level in dBm. Declared per supported operating band, per TAB connector for BS type 1-H covered by D.29. |  | X |
| D.31 | TAE groups | Set of declared TAB connector beam forming groups on which the TAE requirements apply.  All TAB connectors belong to at least one TAB connector beam forming group (even if it's a TAB connector beam forming group consisting of one connector).  The smallest possible number of TAB connector beam forming groups need to be declared such that there is no TAB connector not contained in at least one of the declared TAB connector beam forming groups.  Declared per supported operating band. |  | X |
| D.32 | Equivalent connectors | List of antenna connectors of BS type 1-C, or TAB connector of BS type 1-H, which have been declared equivalent.  Equivalent connectors imply that the antenna connector of BS type 1-C, or TAB connector of BS type 1-H, are expected to behave in the same way when presented with identical signals under the same operating conditions. All declarations made for the antenna connector of BS type 1-C, or TAB connector of BS type 1-H are identical and the transmitter unit and/or receiver unit driving the antenna connector of BS type 1-C or TAB connector of BS type 1-H are of identical design. | X | X |
| D.33 | TAB connector RX min cell group | Declared as a group of TAB connectors to which RX requirements are applied. This declaration corresponds to group of TAB connectors which are responsible for receiving a cell when the BS type 1-H setting corresponding to the declared minimum number of cells (Ncells) with transmission on all TAB connectors supporting an operating band. |  | X |
| D.34 | TAB connector TX min cell group | Declared group of TAB connectors to which TX requirements are applied. This declaration corresponds to group of TAB connectors which are responsible for transmitting a cell when the BS type 1-H setting corresponding to the declared minimum number of cells (Ncells) with transmission on all TAB connectors supporting an operating band. |  | X |
| D.35 | Connecting network loss range for BS testing with ancillary RF amplifiers | Declaration of the range of connecting network losses (in dB) for BS type 1-C testing with ancillary Tx RF amplifier only, or with Rx RF amplifier only, or with combined Tx/Rx RF amplifiers. (Note 4) | X |  |
| D.36 | Relation between supported maximum RF bandwidth, number of carriers and Rated total output power | If the rated total output power and total number of supported carriers are not simultaneously supported, the manufacturer shall declare the following additional parameters:  - The reduced number of supported carriers at the rated total output power;  - The reduced total output power at the maximum number of supported carriers. | X | X |
| D.37 | TAB connectors used for performance requirement testing | To reduce test complexity, declaration of a representative (sub)set of TAB connectors to be used for performance requirement test purposes. At least one TAB connector mapped to each demodulation branch is declared. |  | X |
| D.38 | Inter-band CA | Band combinations declared to support inter-band CA (per CA capable multi-band connector(s), as in D.15).  Declared for every multi-band connector which support CA. | X | X |
| D.39 | Intra-band contiguous CA | Bands declared to support intra-band contiguous CA (per CA capable single band connector(s) or multi-band connector(s), as in D.15).  Declared per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.40 | Intra-band non-contiguous CA | Bands declared to support intra-band non-contiguous CA (per CA capable single band connector(s) or multi-band connector(s), as in D.15).  Declared per antenna connector for BS type 1-C, or TAB connector for BS type 1-H. | X | X |
| D.100 | PUSCH mapping type | Declaration of the supported PUSCH mapping type as specified in TS 38.211 [17], i.e., type A, type B or both. | X | X |
| D.101 | PUSCH additional DM-RS positions | Declaration of the supported additional DM-RS position(s), i.e., pos0, pos1 or both. | X | X |
| D.102 | PUCCH format | Declaration of the supported PUCCH format(s) as specified in TS 38.211 [17], i.e., format 0, format 1, format 2, format 3, format 4. | X | X |
| D.103 | PRACH format and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: 0, A1, A2, A3, B4, C0, C2.  Declaration of the supported SCS(s) per supported PRACH format with short sequence, as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. | X | X |
| D.104 | Additional DM-RS for PUCCH format 3 | Declaration of the supported additional DM-RS for PUCCH format 3: without additional DM-RS, with additional DM-RS or both. | X | X |
| D.105 | Additional DM-RS for PUCCH format 4 | Declaration of the supported additional DM-RS for PUCCH format 4: without additional DM-RS, with additional DM-RS or both. | X | X |
| D.106 | PUCCH multi-slot | Declaration of multi-slot PUCCH support. | X | X |
| NOTE 1: If a BS is capable of 256QAM DL operation then two rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions and the other declaration is applicable when not configured for 256QAM transmissions.  NOTE 2: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared.  NOTE 3: If BS is declared to support Band n20 (D.3), the manufacturer shall declare if the BS may operate in geographical areas allocated to broadcasting (DTT). Additionally, related declarations of the emission levels and maximum output power shall be declared.  NOTE 4: This manufacturer declaration is optional. | | | | |

## Test Configurations

### General

테스트 구성은 4.6 절에 나열된 지원되는 RF 구성에 대해 제조업체가 선언한 파라미터에 따라 아래 정의된 방법을 사용하여 구성해야한다. 적합성 시험(conformance testing)에 사용되는 시험 구성은 4.8.3 및 4.8.4의 각 지원되는 RF 구성에 대해 정의된다.

Carrier transmit test signal 생성에 적용 가능한 테스트 모델은 4.9에 정의되어 있다.

NOTE: 캐리어가 channel raster Foffset에 맞춰 이동한다.

### Test signal used to build Test Configurations