**Socialist Republic of Viet Nam**

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# QUY CHUẨN KỸ THUẬT QUỐC GIA VỀ THIẾT BỊ TRẠM GỐC THÔNG TIN DI ĐỘNG W-CDMA FDD

***National technical regulation on base stations for W-CDMA FDD***

***(for information only)***

**HA NOI - 2010**

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**Foreword**

QCVN 16:2010/BTTTT is based on ETSI EN 301 908-3 V2.2.1 (2003-10), ETSI EN 301 908-1 V2.2.1 (2003-10) and TS 125 141 V6.4.0 (2003-12) of European Telecommunications Standards Institute (ETSI).

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# QUY CHUẨN KỸ THUẬT QUỐC GIA
# VỀ THIẾT BỊ TRẠM GỐC THÔNG TIN DI ĐỘNG W-CDMA FDD

***National technical regulation on base stations for W-CDMA FDD***

## 1. GENERAL

### 1.1. Scope

The technical standard applies to the following radio equipment type: Base Stations for IMT-2000 CDMA Direct Spread (UTRA FDD).

This radio equipment type is capable of operating in all or any part of the frequency bands given in table 1.

*Table 1: CDMA Direct Spread base station frequency bands*

| Direction of transmission | CDMA Direct Spread base station frequency bands |
|---|---|
| Transmit | 2110 MHz to 2170 MHz |
| Receive | 1920 MHz to 1980 MHz |

The technical standard applies to UTRA FDD base stations, including base stations supporting HS-PDSCH transmission using QPSK and 16QAM modulation. It also applies to the wide area base stations, medium range base stations and local area base stations.

Technical requirements of this technical standard ensure that the radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference.

### 1.2. Objective

This technical standard is used as the basis for type approval of Base Stations for IMT-2000 CDMA Direct Spread (UTRA FDD).

### 1.3. Normative References

1. ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

2. ETSI TS 125 141 V6.4.0 (2003-12): "Universal Mobile Telecommunications System (UMTS); Base Station conformance testing (FDD) (3GPP TS 25.141 version 6.4.0 Release 6)".

3. ITU-R Recommendation SM.329-10 (2003): "Unwanted emissions in spurious domain".

4. ITU-R Recommendation SM.1539-1 (2002): “Variation of the boundary between the out-of-band and spurious domains required for the application of Recommendations ITU-R SM.1541 and ITU-R SM.329”.

5. ITU-R Recommendation O.153:"Basic parameters for the measurement of error performance at bit rates below the primary rate".

6. IEC 60721-3-3 (1994-12): "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities -Section 3: Stationary use at weather protected locations".

7. IEC 60721-3-4 (1995-01): "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities -Section 4: Stationary use at non-weather protected locations".

8. IEC 60068-2-1 (1990-05): "Environmental testing -Part 2: Tests. Tests A: Cold".

9. IEC 60068-2-2 (1974-01): "Environmental testing -Part 2: Tests. TestsB: Dry heat".

10. IEC 60068-2-6 (1995-03): "Environmental testing -Part 2: Tests. Tests Fc: Vibration (sinusoidal)".

11. ETSI TS 125 141 (V6.2.0): "Hệ thống viễn thông di động toàn cầu (UMTS); Đo kiểm tính hợp chuẩn của trạm gốc (FDD) (3GPP TS 25.141 version 6.2.0 Release 6)".

## 1.4. Definitions

### *1.4.1. Ancillary equipment*

Equipment (apparatus) used in connection with a Base Station, which is considered as an ancillary equipment (apparatus) if:

- The equipment is intended for use in conjunction with a BS to provide additional operational and/or control features to the radio equipment, (e.g. to extend control to another position or location);

- The equipment cannot be used on a stand alone basis to provide user functions independently of a BS; and

- The BS to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

### *1.4.2. Chip rate*

Rate of "chips" (modulated symbols after spreading) per second.

Note: The UTRA FDD chip rate is 3.84 Mchip/s.

### *1.4.3. Environmental profile*

Range of environmental conditions under which equipment within the scope of the technical standard is required to comply with the provisions of the technical standard.

### *1.4.4. Local area base station*

Base stations characterized by requirements derived from picocell scenarios with a BS to UE minimum coupling loss equal to 45 dB.

### *1.4.5. Maximum output power*

Mean power level per carrier of the base station measured at the antenna connector in a specified reference condition.

#### *1.4.6. Mean power*

This is the power (transmitted or received) in a bandwidth of at least (1 + $\alpha$) times the chip rate of the radio access mode, when applied to a WCDMA-modulated signal.

Note 1: The period of measurement shall be at least one timeslot unless otherwise stated.

Note 2: $\alpha$ = 0.22 is the roll-off factor of the WCDMA signal.

#### *1.4.7. Medium range base station*

Base stations characterized by requirements derived from microcell scenarios with a BS to UE minimum coupling loss equal to 53 dB.

#### *1.4.8. Output power*

Mean power of one carrier of the base station, delivered to a load with resistance equal to the nominal load impedance of the transmitter.

#### *1.4.9. Rated output power*

Rated output power of the base station is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

#### *1.4.10. RRC filtered mean power*

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

Note: The RRC filtered mean power of a perfectly modulated WCDMA signal is 0.246 dB lower than the mean power of the same signal.

#### *1.4.11. Wide area base station*

Base stations characterized by requirements derived from Macro Cell scenarios with a BS to UE minimum coupling loss equal to 70 dB.

#### *1.4.12. Enclosure port*

Physical boundary of the apparatus through which electromagnetic fields may radiate or impinge.

Note: In the case of integral antenna equipment, this port is inseparable from the antenna port.

#### *1.4.13. IMT-2000*

IMT-2000s are third generation mobile systems which are scheduled to start service around the year 2000 subject to market considerations.

#### *1.4.14. Port*

Particular interface, of the specified equipment (apparatus), with the electromagnetic environment.

### 1.5. Abbreviations

| | |
|---|---|
| 16QAM | 16-Quadrature Amplitude Modulation |
| ACLR | Adjacent Channel Leakage power Ratio |
| ACS | Adjacent Channel Selectivity |
| B | Appropriate frequency in the Bottom of the operating frequency band of the BS |

| | |
|---|---|
| BER | Bit Error Ratio |
| BS | Base Station |
| BTS | Base Transceiver Station |
| CDMA | Code Division Multiple Access |
| CPICH | Common Pilot Channel |
| CW | Continuous Wave (unmodulated signal) |
| DCH | Dedicated Channel, which is mapped into Dedicated Physical Channel. DCH contains the data |
| DCS | Digital Communication System |
| DPCCH | Dedicated Physical Control Channel |
| DPCH | Dedicated Physical Channel |
| DPDCH | Dedicated Physical Data Channel |
| E.I.R.P. | Equivalent isotropically Radiated Power |
| EN | European Standard |
| EMC | Electro-Magnetic Compatibility |
| E.R.P. | Effective Radiated Power |
| EUT | Equipment Under Test |
| FDD | Frequency Division Duplexing |
| $F_{uw}$ | Frequency of unwanted signal |
| GSM | Global System for Mobile communications |
| HS-PDSCH | High Speed Physical Downlink Shared Channel |
| IPDL | Idle Period on the Down Link |
| LV | Low Voltage |
| M | Appropriate frequency in the Middle of the operating frequency band of the BS |
| MS | Mobile Station |
| PAR | Peak to Average Ratio |
| PCCPCH | Primary Common Control Physical Channel |
| PCH | Paging Channel |
| PICH | Pilot Channel |
| QPSK | Quadrature Phase Shift Keying |
| R&TTE | Radio and Telecommunications Terminal Equipment |
| RE | Radio Equipment |
| RF | Radio Frequency |

| | |
|---|---|
| RMS | Root Mean Square |
| RRC | Root - Raised Cosine |
| RX | Receiver |
| SCCPCH | Secondary Common Control Physical Channel |
| SCH | Sync Channel |
| SF | Spreading Factor |
| T | Appropriate frequency in the Top of the operating frequency band of the BS |
| TDD | Time Division Duplexing |
| TS | Technical Specification |
| TTE | Telecommunications Terminal Equipment |
| TX | Transmitter |
| UARFCN | UTRA Absolute Radio Frequency Channel Number |
| UE | User Equipment |
| UL | Up Link (reverse link) |
| UMTS | Universal Mobile Telecommunications System |
| UTRA | Universal Terrestrial Radio Access |
| WCDMA | Wideband Code Division Multiple Access |

# 2. TECHNICAL REQUIREMENTS

## 2.1. Environmental profile

The technical requirements of the technical standard apply under the environmental profile for operation of the equipment, which shall be declared by the supplier. The equipment shall comply with all the technical requirements of the technical standard at all times when operating within the boundary limits of the declared operational environmental profile.

For guidance on how a supplier can declare the environmental profile, see annex B.

## 2.2. Conformance requirements

### *2.2.1 Essential parameters and the corresponding technical requirements*

This technical standard identifies eight essential parameters for IMT-2000 base station equipment (BS). Table 2 provides a cross reference between these eight essential parameters and the corresponding ten technical requirements for equipment within the scope of the technical standard.

*Table 2: Cross references*

| Essential parameter | Corresponding technical requirements |
|---|---|

| | |
|---|---|
| Spectrum emissions mask | 2.2.2 Spectrum emissions mask |
| | 2.2.3 Adjacent Channel Leakage power Ratio (ACLR) |
| Conducted spurious emissions from the transmitter antenna connector | 2.2.4 Transmitter spurious emissions |
| Accuracy of maximum output power | 2.2.5 Base station maximum output power |
| Intermodulation attenuation of the transmitter | 2.2.6 Transmit intermodulation |
| Conducted spurious emissions from the receiver antenna connector | 2.2.7 Receiver spurious emissions |
| Impact of interference on receiver performance | 2.2.8 Blocking characteristics |
| | 2.2.9 Receiver intermodulation characteristics |
| Receiver adjacent channel selectivity | 2.2.10 Receiver Adjacent Channel Selectivity (ACS) |
| Radiated emissions | 2.2.11 Radiated emissions |

The technical requirements also apply to the BS configurations described in annex A.

### *2.2.2 Spectrum emissions mask*

2.2.2.1 Definition

Out-of-band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out-of-band emission limit is specified in terms of a spectrum emission mask and adjacent channel leakage power ratio for the transmitter.

2.2.2.2 Limit

The requirement shall be met by a base station transmitting on a single RF carrier configured in accordance with the manufacturer's specification. Emissions shall not exceed the maximum level specified in tables 3 to 6 for the appropriate BS maximum output power, in the frequency range from $\Delta f$ = 2.5 MHz to $\Delta f_{max}$ from the carrier frequency, where:

- $\Delta f$ is the separation between the carrier frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency;
- f_offset is the separation between the carrier frequency and the centre of the measurement filter;
- $f\_offset_{max}$ is either 12.5 MHz or the offset to the UMTS TX band edge as defined in clause 1.1, whichever is the greater;
- $\Delta f_{max}$ is equal to $f\_offset_{max}$ minus half of the bandwidth of the measuring filter.

*Table 3: Spectrum emission mask values, BS maximum output power P ≥ 43 dBm*

| Frequency offset of measurement filter | Frequency offset of measurement filter centre | Maximum level | Measurement bandwidth |
|---|---|---|---|

| -3dB point, Δf | frequency, f_offset | | |
|---|---|---|---|
| 2.5 MHz ≤ Δf < 2.7 MHz | 2.515 MHz ≤ f _offset < 2.715 MHz | -12.5 dBm | 30 kHz |
| 2.7 MHz ≤ Δf < 3.5 MHz | 2.715 MHz ≤ f _offset < 3.515 MHz | -12.5 dBm - 15 x $\frac{\text{f\_offset}}{\text{MHz}}$ 2,715 dB | 30 kHz |
| | 3.515 MHz ≤ f _offset < 4.0 MHz | -24.5 dBm | 30 kHz |
| 3.5 MHz ≤ Δf ≤ $\Delta f_{max}$ | 4.0 MHz ≤ f _offset < $f\_offset_{max}$ | -11.5 dBm | 1 MHz |

*Table 4: Spectrum emission mask values, BS maximum output power 39 dBm ≤ P < 43 dBm*

| Frequency offset of measurement filter -3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Maximum level | Measurement bandwidth |
|---|---|---|---|
| 2.5 MHz ≤ Δf < 2.7 MHz | 2.515 MHz ≤ f _offset < 2.715 MHz | -12.5 dBm | 30 kHz |
| 2.7 MHz ≤ Δf < 3.5 MHz | 2.715 MHz ≤ f_offset < 3.515 MHz | -12.5 dBm - 15 x $\frac{\text{f\_offset}}{\text{MHz}}$ 2,715 dB | 30 kHz |
| | 3.515 MHz ≤ f_offset < 4.0 MHz | -24.5 dBm | 30 kHz |
| 3.5 MHz ≤ Δf < 7.5 MHz | 4.0 MHz ≤ f_offset < 8.0 MHz | -11.5 dBm | 1 MHz |
| 7.5 MHz ≤ Δf ≤$\Delta f_{max}$ | 8.0 MHz ≤ f _offset < $f\_offset_{max}$ | P - 54.5 dB | 1 MHz |

*Table 5: Spectrum emission mask values, BS maximum output power 31 dBm ≤ P < 39 dBm*

| Frequency offset of measurement filter -3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Maximum level | Measurement bandwidth |
|---|---|---|---|
| 2.5 MHz ≤ Δf < 2.7 MHz | 2.515 MHz ≤ f _offset < 2.715 MHz | P - 51.5 dB | 30 kHz |
| 2.7 MHz ≤ Δf < 3.5 MHz | 2.715 MHz ≤ f_offset < 3.515 MHz | P -51.5 dB - 15 x $\frac{\text{f\_offset}}{\text{MHz}}$ 2,715 dB | 30 kHz |
| | 3.515 MHz ≤ f_offset < 4.0 MHz | P - 63.5 dB | 30 kHz |
| 3.5 MHz ≤ Δf < 7.5 MHz | 4.0 MHz ≤ f_offset < 8.0 MHz | P - 50.5 dB | 1 MHz |
| 7.5 MHz ≤ Δf ≤$\Delta f_{max}$ | 8.0 MHz ≤ f _offset < $f\_offset_{max}$ | P - 54.5 dB | 1 MHz |

*Table 6: Spectrum emission mask values, BS maximum output power P < 31 dBm*

| Frequency offset of measurement filter -3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Maximum level | Measurement bandwidth |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 2.5 MHz ≤ ∆f < 2.7 MHz | 2.515 MHz ≤ f _offset < 2.715 MHz | -20.5 dBm | 30 kHz |
| 2.7 MHz ≤ ∆f < 3.5 MHz | 2.715 MHz ≤ f_offset < 3.515 MHz | $-20.5\ \text{dBm} - 15 \times \frac{f\_offset}{MHz} - 2{,}715\ \text{dB}$ | 30 kHz |
| | 3.515 MHz ≤ f_offset < 4.0 MHz | -32.5 dBm | 30 kHz |
| 3.5 MHz ≤ ∆f < 7.5 MHz | 4.0 MHz ≤ f_offset < 8.0 MHz | -19.5 dBm | 1 MHz |
| 7.5 MHz ≤ ∆f ≤$\Delta f_{max}$ | 8.0 MHz ≤ f _offset < f_$offset_{max}$ | -23.5 dBm | 1 MHz |

2.2.2.3 Conformance

Conformance tests described in clause 3.3.1 shall be carried out.

### *2.2.3 Adjacent channel leakage power ratio (ACLR)*

2.2.3.1 Definition

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean power centred on the assigned channel frequency to the RRC filtered mean power centred on an adjacent channel frequency.

2.2.3.2 Limits

The limit for ACLR shall be as specified in table 7.

*Table 7: BS ACLR limits*

| **BS channel offset below the first or above the last carrier frequency used** | **ACLR limit** |
|---|---|
| 5 MHz | 44.2 dB |
| 10 MHz | 49.2 dB |

2.2.3.3 Conformance

Conformance tests described in clause 3.3.2 shall be carried out.

### *2.2.4 Transmitter spurious emissions*

2.2.4.1 Definition

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out-of-band emissions. This is measured at the base station RF output port.

The requirement applies at frequencies within the specified frequency ranges, which are more than 12.5 MHz under the first carrier frequency used or more than 12.5 MHz above the last carrier frequency used.

The requirements of clause 2.2.4.2 shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

Unless otherwise stated, all requirements are measured as mean power.

### 2.2.4.2 Limits

#### 2.2.4.2.1 Spurious emissions

The power of any spurious emission shall not exceed the limit specified in table 8.

*Table 8: BS Mandatory spurious emissions limits*

| Band | Maximum level | Measurement bandwidth | Note |
|---|---|---|---|
| 9 kHz to 150 kHz | -36 dBm | 1 kHz | see note 1 |
| 150 kHz to 30 MHz | -36 dBm | 10 kHz | see note 1 |
| 30 MHz to1 GHz | -36 dBm | 100 kHz | see note 1 |
| 1 GHz<br>to<br>Fc1 - 60 MHz or 2 100 MHz<br>whichever is the higher | -30 dBm | 1 MHz | see note 1 |
| Fc1 - 60 MHz or 2 100 MHz<br>whichever is the higher<br>to Fc1 - 50 MHz or 2 100 MHz<br>whichever is the higher | -25 dBm | 1 MHz | see note 2 |
| Fc1 - 50 MHz or 2 100 MHz<br>whichever is the higher<br>to Fc2 + 50 MHz or 2 180 MHz<br>whichever is the lower | -15 dBm | 1 MHz | see note 2 |
| Fc2 + 50 MHz or 2 180 MHz<br>whichever is the lower<br>to Fc2 + 60 MHz or 2 180 MHz<br>whichever is the lower | -25 dBm | 1 MHz | see note 2 |
| Fc2 + 60 MHz or 2 180 MHz<br>whichever is the lower<br>to 12.75 GHz | -30 dBm | 1 MHz | see note 3 |
| *Note 1: Bandwidth as in ITU-R Recommendation SM.329-10 , clause 4.1.*<br>*Note 2: Specification in accordance with ITU-R Recommendation SM.329-10, clause 4.3 and annex 7.*<br>*Note 3: Bandwidth as in ITU-R Recommendation SM.329-10, clause*<br>*4.1. Upper frequency as in ITU-R Recommendation SM.329-10 , clause 2.5, table 1.* | | | |

Key:

Fc1: Centre frequency of first carrier frequency used by the BS.

Fc2: Centre frequency of last carrier frequency used by the BS.

2.2.4.2.2 Co-existence with GSM 900

This requirement shall be applied for the protection of GSM 900 MS and GSM 900 BTS receivers.

The power of any spurious emission shall not exceed the limit specified in table 9.

*Table 9: Spurious emissions limits for protection of GSM 900 MS receiver*

| Band | Maximum level | Measurement bandwidth |
|---|---|---|
| 876 MHz to 915 MHz | -61 dBm | 100 kHz |
| 921 MHz to 960 MHz | -57 dBm | 100 kHz |

2.2.4.2.3 Co-existence with DCS 1800

This requirement shall be applied for the protection of DCS 1800 MS and DCS 1800 BTS receivers.

The power of any spurious emission shall not exceed the limit specified in table 10.

*Table 10: Spurious emissions limits for protection of DCS 1800 MS receiver*

| Band | Maximum level | Measurement bandwidth |
|---|---|---|
| 1710 MHz to 1785 MHz | -61 dBm | 100 kHz |
| 1805 MHz to 1880 MHz | -47 dBm | 100 kHz |

2.2.4.2.4 Co-existence with services in adjacent frequency bands

This requirement shall be applied for the protection in bands adjacent to the frequency band 2110 MHz to 2170 MHz.

The power of any spurious emission shall not exceed the limits specified in table 11.

*Table 11: Spurious emissions limits for protection of adjacent band services*

| Band (f) | Maximum level | Measurement bandwidth |
|---|---|---|
| 2100 MHz to 2105 MHz | -30 + 3.4 (f - 2100 MHz) dBm | 1 MHz |
| 2175 MHz to 2180 MHz | -30 + 3.4 (2180 MHz - f) dBm | 1 MHz |

2.2.4.2.5 Co-existence with UTRA-TDD

This requirement shall be applied for the protection of UTRA-TDD.

The power of any spurious emission shall not exceed the limit specified in table 12.

*Table 12: Spurious emissions limits for protection of UTRA-TDD receiver*

| Band | Maximum level | Measurement bandwidth |
|---|---|---|

| | | |
|---|---|---|
| 1900 MHz to 1920 MHz | -52 dBm | 1 MHz |
| 2010 MHz to 2025 MHz | -52 dBm | 1 MHz |

2.2.4.2.6 Protection of the BS receiver of own or different BS

This requirement shall be applied in order to prevent the receivers of the BSs being desensitized by emissions from a BS transmitter.

The power of any spurious emission shall not exceed the limit specified in table 12a.

*Table 12a: Spurious emissions limits for protection of the BS receiver*

| Band | Maximum level | Measurement bandwidth |
|---|---|---|
| 1920 MHz to 1980 MHz | -96 dBm | 100 kHz |

2.2.4.3 Conformance

Conformance tests described in clause 3.3.3 shall be carried out.

### *2.2.5 Base station maximum output power*

2.2.5.1 Definition

Maximum output power, $P_{max}$, of the base station is the mean power level per carrier measured at the antenna connector in specified reference condition.

2.2.5.2 Limit

In normal conditions, the Base station maximum output power shall remain within +2.7 dB and -2.7 dB of the manufacturer's rated output power.

In extreme conditions, the Base station maximum output power shall remain within +3.2 dB and -3.2 dB of the manufacturer's rated output power.

2.2.5.3 Conformance

Conformance tests described in clause 3.3.4 shall be carried out.

### *2.2.6 Transmit intermodulation*

2.2.6.1 Definition

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non-linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

The transmit intermodulation level is the power of the intermodulation products when a WCDMA-modulated interference signal is injected into an antenna connector at a mean power level of 30 dB lower than that of the mean power of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz

offset from the subject signal carrier frequency, but excluding interference frequencies that are outside of the allocated frequency band for UTRA-FDD downlink specified in clause 1.1.

The requirements are applicable for a single carrier.

2.2.6.2 Limit

In the frequency range relevant for this test, the transmit intermodulation level shall not exceed the out-of-band emission or the spurious emission requirements of clauses 2.2.2.2, 2.2.3.2 and 2.2.4.2 in the presence of a WCDMA-modulated interference signal with a mean power level 30 dB lower than the mean power of the wanted signal.

2.2.6.3 Conformance

Conformance tests described in clause 3.3.5 shall be carried out.

### *2.2.7 Receiver spurious emissions*

2.2.7.1 Definition

The spurious emission power is the power of the emissions generated or amplified in a receiver that appears at the BS antenna connector. The requirements apply to all BS with separate RX and TX antenna port. The test shall be performed when both TX and RX are on with the TX port terminated.

For all BS with common RX and TX antenna port the transmitter spurious emission as specified in clause 2.2.4 is valid.

2.2.7.2 Limit

The power of any spurious emission shall not exceed the limit specified in table 13.

*Table 13: Spurious emission minimum requirement*

| Band | Maximum level | Measurement bandwidth | Note |
|---|---|---|---|
| 1900 MHz to 1980 MHz<br>and<br>2010 MHz to 2025 MHz | -78 dBm | 3.84 MHz | |
| 30 MHz to 1 GHz | -57 dBm | 100 kHz | |
| 1 GHz to 12.75 GHz | -47 dBm | 1 MHz | With the exception of frequencies between 12.5 MHz below the first carrier frequency and 12.5 MHz above the last carrier frequency used by the BS transmitter. |

2.2.7.3 Conformance

Conformance tests described in clause 3.3.6 shall be carried out.

### *2.2.8 Blocking characteristics*

2.2.8.1 Definition

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the adjacent channels. The blocking performance requirement applies as specified in table 14, 14a and 14b.

2.2.8.2 Limit

The BER shall not exceed 0.001 for the parameters specified in tables 14, 14a and 14b depending on the declared base station class.

*Table 14: Blocking characteristics for Wide Area BS*

| Centre Frequency of Interfering Signal | Interfering Signal Mean Power | Wanted Signal Mean Power | Minimum Offset of Interfering Signal | Type of interfering Signal |
|---|---|---|---|---|
| 1920 MHz to 1980 MHz | -40 dBm | -115 dBm | 10 MHz | WCDMA signal (see note) |
| 1900 MHz to 1920 MHz<br>1980 MHz to 2000 MHz | -40 dBm | -115 dBm | 10 MHz | WCDMA signal (see note) |
| 1 MHz to 1900 MHz and<br>2000 MHz to 12750 MHz | -15 dBm | -115 dBm | - | CW carrier |
| *Note: The characteristics of the WCDMA interference signal are specified in annex E.* | | | | |

*Table 14a: Blocking characteristics for Medium Range BS*

| Centre Frequency of Interfering Signal | Interfering Signal Mean Power | Wanted Signal Mean Power | Minimum Offset of Interfering Signal | Type of interfering Signal |
|---|---|---|---|---|
| 1920 MHz to 1980 MHz | -35 dBm | -105 dBm | 10 MHz | WCDMA signal (see note) |
| 1900 MHz to 1920 MHz<br>1980 MHz to 2000 MHz | -35 dBm | -105 dBm | 10 MHz | WCDMA signal (see note) |
| 1 MHz to 1900 MHz and<br>2000 MHz to 12750 MHz | -15 dBm | -105 dBm | - | CW carrier |
| *Note: The characteristics of the WCDMA interference signal are specified in annex E.* | | | | |

*Table 14b: Blocking characteristics for Local Area BS*

| Centre Frequency of Interfering Signal | Interfering Signal Mean Power | Wanted Signal Mean Power | Minimum Offset of Interfering Signal | Type of interfering Signal |
|---|---|---|---|---|
| 1920 MHz to 1980 MHz | -30 dBm | -101 dBm | 10 MHz | WCDMA signal (see note) |
| 1900 MHz to 1920 MHz | -30 dBm | -101 dBm | 10 MHz | WCDMA signal |

| | | | | |
|---|---|---|---|---|
| 1980 MHz to 2000 MHz | | | | (see note) |
| 1 MHz to 1900 MHz and 2000 MHz to 12750 MHz | -15 dBm | -101 dBm | - | CW carrier |
| *Note: The characteristics of the WCDMA interference signal are specified in annex E.* | | | | |

2.2.8.3 Conformance

Conformance tests described in clause 3.3.7 shall be carried out.

### *2.2.9 Receiver intermodulation characteristics*

2.2.9.1 Definition

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

2.2.9.2 Limit

The intermodulation performance should be met when the signals are applied to the receiver according to table 15, 15a or 15b depending on the declared base station class.

*Table 15: Interferer signals for Wide Area BS intermodulation performance requirement*

| Type of signal | Offset | Signal mean power |
|---|---|---|
| Wanted signal | - | -115 dBm |
| CW signal | 10 MHz | -48 dBm |
| WCDMA signal (see note) | 20 MHz | -48 dBm |
| *Note: The characteristics of the WCDMA interference signal are specified in annex E.* | | |

*Table 15a: Interferer signals for Medium Range BS intermodulation performance requirement*

| Type of signal | Offset | Signal mean power |
|---|---|---|
| Wanted signal | - | -105 dBm |
| CW signal | 10 MHz | -44 dBm |
| WCDMA signal (see note) | 20 MHz | -44 dBm |
| *Note: The characteristics of the WCDMA interference signal are specified in annex E.* | | |

*Table 15b: Interferer signals for Local Area BS intermodulation performance requirement*

| Type of signal | Offset | Signal mean power |
|---|---|---|

| | | |
|---|---|---|
| Wanted signal | - | -101 dBm |
| CW signal | 10 MHz | -38 dBm |
| WCDMA signal (see note) | 20 MHz | -38 dBm |
| *Note: The characteristics of the WCDMA interference signal are specified in annex E.* | | |

*The BER for the wanted signal shall not exceed 0.001 for the parameters specified in table 15.*

2.2.9.3 Conformance

Conformance tests described in clause 3.3.8 shall be carried out.

### *2.2.10 Receiver adjacent channel selectivity*

2.2.10.1 Definition

Adjacent Channel Selectivity (ACS) is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receiver filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The interference signal is offset from the wanted signal by the frequency offset $F_{uw}$. The interference signal shall be a WCDMA signal as specified in annex E.

2.2.10.2 Limit

The BER shall not exceed 0.001 for the parameters specified in tables 16, 16a or 16b depending on the declared base station class.

*Table 16: Adjacent channel selectivity for Wide Area BS*

| Parameter | Level | Unit |
|---|---|---|
| Reference measurement channel data rate | 12.2 | kbit/s |
| Wanted signal mean power | -115 | dBm |
| Interfering signal mean power | -52 | dBm |
| $F_{uw}$ offset (modulated) | ±5 | MHz |

*Table 16a: Adjacent channel selectivity for Medium Range BS*

| Parameter | Level | Unit |
|---|---|---|
| Reference measurement channel data rate | 12.2 | kbit/s |
| Wanted signal mean power | -105 | dBm |
| Interfering signal mean power | -42 | dBm |
| $F_{uw}$ offset (modulated) | ±5 | MHz |

*Table 16b: Adjacent channel selectivity for Local Area BS*

| Parameter | Level | Unit |
|---|---|---|
| Reference measurement channel data rate | 12.2 | kbit/s |

| | | |
|---|---|---|
| Wanted signal mean power | -101 | dBm |
| Interfering signal mean power | -38 | dBm |
| $F_{uw}$ offset (modulated) | ±5 | MHz |

2.2.10.3 Conformance

Conformance tests described in clause 3.3.9 shall be carried out.

### *2.2.11 Radiated emissions*

2.2.11.1 Definition

This test assesses the ability of BS and repeater to limit unwanted emission from the enclosure port.

This test is applicable to base stations and also applicable to repeaters. This test shall be performed on a representative configuration of the equipment under test.

2.2.11.2 Limits

The frequency boundary and reference bandwidths for the detailed transitions of the limits between the requirements for out-of-band emissions and spurious emissions are based on ITU-R Recommendations SM.329-10 and SM.1539-1.

The requirements, shown in table 17, are applicable for frequencies in the spurious domain.

The BS and repeater shall meet the limits given in table 17.

*Table 17: Radiated spurious emissions requirements*

| **Frequency** | **Minimum requirement (E.R.P)/ reference bandwidth** | **Applicability** |
|---|---|---|
| 30 MHz ≤ f < 1 000 MHz | -36 dBm/100 kHz | All |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm/1 MHz | All |
| Fc1 - 12.5 MHz < f < Fc2 + 12.5 MHz | Not defined | UTRA FDD<br>UTRA TDD, 3.84 Mcps option<br>cdma2000, spreading rate 3 |
| Fc1 - 4 MHz < f < Fc2 + 4 MHz | Not defined | UTRA TDD, 1.28 Mcps option<br>cdma2000, spreading rate 1 |
| Fc1 - 500 kHz < f < Fc2 + 500 kHz | Not defined | UWC 136, 200 kHz option |
| Fc1 - 250 kHz < f < Fc2 + 250 kHz | Not defined | UWC 136, 30 kHz option |
| *Note 1: Centre frequency of first carrier frequency used by the BS and repeater.*<br>*Note 2: Centre frequency of last carrier frequency used by the BS and repeater.* | | |

2.2.11.3 Conformance

Conformance tests described in clause 3.3.10 shall be carried out.

# 3. MEASUREMENT

## 3.1. Conditions for testing

Tests defined in the technical standard shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

Normally it should be sufficient for all tests to be conducted using normal test conditions except where otherwise stated. For guidance on the use of other test conditions to be used in order to show compliance reference can be made to annex B.

Many tests in the technical standard are performed with appropriate frequencies in the bottom, middle and top of the operating frequency band of the BS. These are denoted as RF channels B (bottom), M (middle) and T (top) are defined in annex B, clause B.7.

The measurement system required for each test is described in annex D.

## 3.2. Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the technical standard shall be as follows:

- The measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the technical standard;
- The value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- The recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 18 and table 18a.

For the test methods, according to the technical standard, the measurement uncertainty figures shall be calculated in accordance with TR 100 028 [4] and shall correspond to an expansion factor (coverage factor) k = 1.96 (which provides a confidence level of 95% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 18 and table 18a are based on this expansion factor.

In all the relevant clauses in this clause all Bit Error Ratio (BER) measurements shall be carried out according to the general rules for statistical testing defined in ITU-T recommendation O.153 and TS 125 141, annex C.

*Table 18: Maximum uncertainty of the test system*

| Parameter | Conditions | Uncertainty |
|---|---|---|
| Spectrum emissions mask | | ±1.5 dB |
| Adjacent channel leakage power ratio (ACLR) | | ±0.8 dB |
| Transmitter spurious emissions | For "Spurious emissions":<br>f ≤ 2.2 GHz<br>2.2 GHz < f ≤ 4 GHz<br>f > 4 GHz<br><br>For the co-existence requirements:<br>For protection of the BS receiver: | <br>±1.5 dB<br>±2.0 dB<br>±4.0 dB<br><br>±2.0 dB<br>±3.0 dB |
| Base station maximum output power | | ±0.7 dB |
| Transmit intermodulation | For spectrum emissions mask:<br>For ACLR:<br>For "Spurious emissions":<br>f ≤ 2.2 GHz<br>2.2 GHz < f ≤ 4 GHz<br>f > 4 GHz<br>For co-existence requirements:<br>Interference signal: | ±2.5 dB<br>±2.2 dB<br><br>±2.5 dB<br>±2.8 dB<br>±4.5 dB<br>±2.8 dB<br>±1.0 dB |
| Receiver spurious emissions | For BS receive bands (-78 dBm):<br>Outside the BS receive bands:<br>f ≤ 2.2 GHz<br>2.2 GHz < f ≤ 4 GHz<br>f > 4 GHz | ±3.0 dB<br><br>±2.0 dB<br>±2.0 dB<br>±4.0 dB |
| Blocking characteristics | For offset < 15 MHz:<br>For offset ≥ 15 MHz and<br>f ≤ 2.2 GHz<br>2.2 GHz < f ≤ 4 GHz<br>f > 4 GHz | ±1.4 dB<br><br>±1.1 dB<br>±1.8 dB<br>±3.2 dB |
| Receiver intermodulation characteristics | | ±1.3 dB |
| Receiver adjacent channel selectivity (ACS) | | ±1.1 dB |

*Table 18a: Radiated emissions maximum measurement uncertainty*

| Parameter | Uncertainty for EUT dimension ≤ 1 m | Uncertainty for EUT dimension > 1 m |
|---|---|---|
| Effective radiated RF power between 30 MHz to 180 MHz | ±6 dB | ±6 dB |
| Effective radiated RF power between 180 MHz to 4 GHz | ±4 dB | ±6 dB |
| Effective radiated RF power between 4 GHz to 12.75 GHz | ±6 dB | ±9 dB (see note) |
| Conducted RF power | ±1 dB | ±1 dB |
| *Note: This value may be reduced to ± 6 dB when further information on the potential radiation characteristic of the EUT is available.* | | |

*Note 1:* For RF tests it should be noted that the uncertainties in table 18 apply to the Test System operating into a nominal 50 Ω load and do not include system effects due to mismatch between the EUT and the Test System.

*Note 2:* Annex G of TR 100 028-2 provides guidance for the calculation of the uncertainty components relating to mismatch.

*Note 3:* If the Test System for a test is known to have a measurement uncertainty greater than that specified in table 18 and 18a, this equipment can still be used, provided that an adjustment is made follows:

- Any additional uncertainty in the Test System over and above that specified in table 18 and 18a is used to tighten the Test Requirements - making the test harder to pass (for some tests, e. g. receiver tests, this may require modification of stimulus signals).

**3.3. Essential radio test suites**

***3.3.1 Spectrum emission mask***

3.3.1.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: B, M and T; see clause 3.1.

1) Set-up the equipment as shown in annex D.

As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity, efficiency and avoiding e.g. carrier leakage, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

2) Measurements with an offset from the carrier centre frequency between 2.515 MHz and 4.0 MHz shall use a 30 kHz measurement bandwidth.

3) Measurements with an offset from the carrier centre frequency between 4.0 MHz and (f_offsetmax - 500 kHz) shall use a 1 MHz measurement bandwidth.

4) Detection mode: true RMS voltage or true average power.

3.3.1.2 Procedures

1) Set the BS to transmit a signal in accordance to test model 1 in annex C at the manufacturer's specified maximum output power.

2) Step the centre frequency of the measurement filter in contiguous steps and measure the emission within the specified frequencies ranges with specified measurement bandwidth and note that the measured value does not exceed the specified value.

The results obtained shall be compared to the limits in clause 2.2.2.2 in order to prove compliance.

### *3.3.2 Adjacent Channel Leakage power Ratio (ACLR)*

3.3.2.1 Initial conditions

Test environment: Normal; see annex B, clause B.1. RF channels to be tested: B, M and T with multiple carriers if supported; see clause 3.1.

1) Connect measurement device to the base station RF output port as shown in annex D.

2) The measurement device characteristics shall be:

- Measurement filter bandwidth: defined in clause 2.2.3.1;

- Detection mode: true RMS voltage or true average power.

3) Set the base station to transmit a signal modulated in accordance with annex C, Test model 1. The mean power at the RF output port shall be the maximum output power as specified by the manufacturer.

4) Set carrier frequency within the frequency band supported by BS. Minimum carrier spacing shall be 5 MHz and maximum carrier spacing shall be specified by manufacturer.

3.3.2.2 Procedure

Measure Adjacent channel leakage power ratio for 5 MHz and 10 MHz offsets both side of channel frequency. In multiple carrier case only offset frequencies below the lowest and above the highest carrier frequency used shall be measured.

The results obtained shall be compared to the limits in clause 2.2.3.2 in order to prove compliance.

### *3.3.3 Transmitter spurious emissions*

3.3.3.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: B, M and T with multiple carriers if supported; see clause 5.1.

1) Connect the BS antenna connector to a measurement receiver using an attenuator or a directional coupler if necessary.

2) Measurements shall use a measurement bandwidth in accordance to the tables in clause 2.2.4.2.

3) Detection mode: true RMS voltage or true average power.

4) Configure the BS with transmitters active at their maximum output power.

3.3.3.2 Procedure

1) Set the BS to transmit a signal in accordance with annex C, Test model 1 and at the manufacturer's specified maximum output power.

2) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

The results obtained shall be compared to the limits in clause 2.2.4.2 in order to prove compliance.

### *3.3.4 Base station maximum output power*

3.3.4.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: B, M and T; see clause 3.1.

In addition, on one UARFCN only, the test shall be performed under extreme power supply as defined in annex B, clause B.4.

*Note:* Tests under extreme power supply also test extreme temperature.

1) Connect the power measuring equipment to the base station RF output port.

3.3.4.2 Procedure

1) Set the base station to transmit a signal modulated with a combination of PCCPCH, SCCPCH and Dedicated Physical Channels specified as test model 1 in annex C.

2) Measure the mean power at the RF output port.

The results obtained shall be compared to the limits in clause 2.2.5.2 in order to prove compliance.

### *3.3.5 Transmit intermodulation*

3.3.5.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: B, M and T; see clause 3.1.

1) Test set-up in accordance to annex D.

3.3.5.2 Procedures

1) Generate the wanted signal in accordance to test model 1 in annex C at specified maximum BS output power.

2) Generate the interference signal in accordance to test model 1 in annex C with frequency offset of 5 MHz relative to the wanted signal, but excluding interference frequencies that are outside of the allocated frequency band for UTRA-FDD downlink specified in the scope of the technical standard.

3) Adjust ATT1 so the level of the WCDMA-modulated interference signal at BS is 30 dB below the wanted signal.

4) Perform the out-of-band emission tests as specified in clauses 3.3.1 and 3.3.2 for all third and fifth order intermodulation products which appear in the frequency ranges defined in clause 3.3.1 and 3.3.2. The width of the intermodulation products shall be taken into account.

5) Perform the spurious emission test as specified in clause 3.3.3 for all third and fifth order intermodulation products which appear in the frequency ranges defined in clause 3.3.3. The width of the intermodulation products shall be taken into account.

6) Verify that the emission level does not exceed the required level with the exception of interference signal frequencies.

7) Repeat the test for interference frequency offset of -5 MHz, but excluding interference frequencies that are outside of the allocated frequency band for UTRA-FDD downlink specified in clause 1.1.

8) Repeat the test for interference frequency offset of ±10 MHz and ±15 MHz, but excluding interference frequencies that are outside of the allocated frequency band for UTRA-FDD downlink specified in clause 1.1.

*Note:* The third order intermodulation products are (F1±2F2) and (2F1±F2), the fifth order intermodulation products are (2F1±3F2), (3F1±2F2), (4F1±F2), and (F1±4F2), where F1 represents the subject signal frequencies of 5 MHz channel and F2 represents the nterference signal frequencies of 5 MHz channel. The width of intermodulation products is 15 MHz for third order intermodulation products and 25 MHz for fifth order intermodulation products based on a bandwidth of 5 MHz for subject and interference signal.

The results obtained shall be compared to the limits in clause 2.2.6.2 in order to prove compliance.

### *3.3.6 Receiver spurious emissions*

3.3.6.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: M, with multi-carrier if supposed; see clause 3.1.

1) Connect a measurement receiver to the BS antenna connector as shown in annex D.

2) Enable the BS receiver.

3) Start BS transmission with channel configuration as specified in annex C, tables C.1 and C.2 at $P_{max}$.

3.3.6.2 Procedure

1) Terminate the BS TX antenna connector as shown in annex D.

2) Set measurement equipment parameters as specified in table 19.

3) Measure the spurious emissions over each frequency range described in clause 2.2.7.2.

4) Repeat the test using diversity antenna connector if available.

*Table 19: Measurement equipment parameters*

| **Measurement** | **as in table 13** |
|---|---|

| bandwidth | |
|---|---|
| Sweep frequency range | 30 MHz to 12.75 GHz |
| Detection | true RMS voltage or true average power |

The results obtained shall be compared to the limits in clause 2.2.7.2 in order to prove compliance.

### *3.3.7 Blocking characteristics*

3.3.7.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: M; see clause 3.1. The BS shall be configured to operate as close to the centre of the operating band as possible.

1) Connect WCDMA signal generator at the assigned channel frequency of the wanted signal and a signal generator to the antenna connector of one RX port.

2) Terminate any other RX port not under test.

3) Transmit a signal from the WCDMA signal generator to the BS. The characteristics of the signal shall be set according to the UL reference measurement channel (12.2 kbit/s) specified in TS 125 141 , annex A. The level of the WCDMA signal measured at the BS antenna connector shall be set to the level specified in clause 2.2.8.2.

3.3.7.2 Procedure

1) Set the signal generator to produce an interfering signal at a frequency offset $F_{uw}$ from the assigned channel frequency of the wanted signal which is given by:

$$F_{uw} = \pm (n \times 1 \text{ MHz}),$$

where n shall be increased in integer steps from n = 10 up to such a value that the centre frequency of the interfering signal covers the range from 1 MHz to 12.75 GHz. The interfering signal level measured at the antenna connector shall be set in dependency of its centre frequency, as specified in table 14. The type of the interfering signal is either equivalent to a continuous WCDMA signal with one code of chip frequency 3.84 Mchip/s, filtered by an RRC transmit pulse-shaping filter with roll-off $\alpha$ = 0.22, or a CW signal; see table 14.

2) Measure the BER of the wanted signal at the BS receiver.

3) Interchange the connections of the BS RX ports and repeat the measurements according to steps (1) to (2).

*Note:* TS 125 141, annex B describes the procedure for BER tests taking into account the statistical consequence of frequent repetition of BER measurements within the blocking test.

The results obtained shall be compared to the limits in clause 2.2.8.2 in order to prove compliance.

### *3.3.8 Receiver intermodulation characteristics*

3.3.8.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: B, M and T; see clause 3.1.

1) Set-up the equipment as shown in annex D.

3.3.8.2 Procedures

1) Generate the wanted signal (reference signal) and adjust ATT1 to set the signal level to the BS under test to the level specified in table 15.

2) Adjust the signal generators to the frequency offset of +10 MHz (CW tone) and +20 MHz (WCDMA modulated) from the frequency of the wanted signal.

3) Adjust the ATT2 and ATT3 to obtain the specified level of interference signal at the BS input.

4) Measure the BER.

5) Repeat the test for interference signal frequency offset of -10 MHz and -20 MHz for CW and WCDMA modulated respectively.

6) Repeat the whole test for the port which was terminated.

The results obtained shall be compared to the limits in clause 2.2.9.2 in order to prove compliance.

### *3.3.9 Adjacent Channel Selectivity (ACS)*

3.3.9.1 Initial conditions

Test environment: Normal; see annex B, clause B.1.

RF channels to be tested: B, M and T; see clause 3.1.

1) Set-up the equipment as shown in annex D.

3.3.9.2 Procedure

1) Generate the wanted signal and adjust the ATT1 to set the input level to the base station under test to the level specified in table 16.

2) Set-up the interference signal at the adjacent channel frequency and adjust the ATT2 to obtain the specified level of interference signal at the base station input defined in table 16. Note that the interference signal shall have an ACLR of at least 63 dB in order to eliminate the impact of interference signal adjacent channel leakage power on the ACS measurement.

3) Measure the BER.

4) Repeat the test for the port, which was terminated.

The results obtained shall be compared to the limits in clause 2.2.10.2 in order to prove compliance.

3.3.10 Radiated emissions

3.3.10.1 Test method

1) A test site fulfilling the requirements of ITU-R Recommendation SM.329-10 shall be used. The EUT shall be placed on a non-conducting support and shall be operated from a power source via a RF filter to avoid radiation from the power leads.

Average power of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser). At each frequency at which a component is detected, the EUT shall be rotated and the height of the test antenna adjusted to obtain maximum response, and the Effective Radiated Power (E.R.P) of that component determined by a substitution measurement. The measurement shall be repeated with the test antenna in the orthogonal polarization plane.

*Note:* Effective Radiated Power (E.R.P) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15 dB between e.i.r.p. and E.R.P.

E.R.P (dBm) = e.i.r.p. (dBm) - 2.15

(ITU-R Recommendation SM.329-10, annex 1).

2) The BS shall transmit with maximum power declared by the manufacturer with all transmitters active. Set the base station to transmit a signal as defined in the applicable part for measurement of spurious emissions.

In case of a repeater the gain and the output power shall be adjusted to the maximum value as declared by the manufacturer. Use an input signal as defined in the applicable part for the measurement of spurious emissions.

3) The video bandwidth shall be approximately three times the resolution bandwidth. If this video bandwidth is not available on the measuring receiver, it shall be the maximum available and at least 1 MHz.

3.3.10.2 Test configurations

This clause defines the configurations for emission tests as follows:

- The equipment shall be tested under normal test conditions as specified in the functional standards;

- The test configuration shall be as close to normal intended use as possible;

- If the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum configuration of ancillary equipment necessary to exercise the ports;

- If the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operation conditions and to ensure that all the different types of termination are tested;

- The test conditions, test configuration and mode of operation shall be recorded in the test report;

- Ports which in normal operation are connected shall be connected to an ancillary equipment or to a representative piece of cable correctly terminated to simulate the input/output characteristics of the ancillary equipment, Radio Frequency (RF) input/output ports shall be correctly terminated;

- Ports which are not connected to cables during normal operation, e.g. service connectors, programming connectors, temporary connectors etc. shall not be connected to any cables for the purpose of this test. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the EUT, precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables.

For an EUT which contains more than one BS, it is sufficient to perform tests relating to connectors of each representative type of the BS forming part of the EUT.

At the manufacturer's discretion the test may be performed on the ancillary equipment separately or a representative configuration of the combination of radio and ancillary equipment. In each case the EUT is tested against all applicable emission clauses of the technical standard and in each case, compliance enables the ancillary equipment to be used with different radio equipment.

The results obtained shall be compared to the limits in clause 2.2.11.2 in order to prove compliance.

## 4. REGULATION ON MANAGEMENT

Base Stations for IMT-2000 CDMA Direct Spread (UTRA FDD) must comply with requirements in this technical regulation.

## 5. RESPONSIBILITY OF ORGANISATIONS/INDIVIDUALS

Organizations/individuals in Vietnam are responsible to comply with this technical regulation and to accept supervision of regulatory authority as existing regulations.

## 6. IMPLEMENTATION

**6.1.** Vietnanm Telecommunication Authority and local departments of Information and Communication are responsible to instruct and implement this technical regulation.

**6.2.** This technical regulation superseded TCN 68-220:2004.

**6.3.** In cases of referencing regulations changed, modified or superseded, new versions is applied.

**ANNEX A**
**(Normative)**
**BASE STATION CONFIGURATIONS**

## A.1 Receiver diversity

For the tests in clause 3 of the technical standard, the specified test signals shall be applied to one receiver antenna connector, with the remaining receivers are disabled or their antenna connectors being terminated with 50 Ω.

### A.2 Duplexers

The requirements of the technical standard shall be met with a duplexer fitted, if a duplexer is supplied as part of the BS. If the duplexer is supplied as an option by the manufacturer, sufficient tests should be repeated with and without the duplexer fitted to verify that the BS meets the requirements of the technical standard in both cases.

The following tests should be performed with the duplexer fitted, and without it fitted if this is an option:

1) clause 3.3.4, base station maximum output power, for the highest static power step only, if this is measured at the antenna connector;

2) clause 3.3.3, output RF spectrum emissions; outside the BS transmit band;

3) clause 3.3.5, transmit intermodulation; for the testing of conformance, the carrier frequencies should be selected to minimize intermodulation products from the transmitters falling in receive channels. The remaining tests may be performed with or without the duplexer fitted.

*Note 1:* When performing receiver tests with a duplexer fitted, it is important to ensure that the output from the transmitters does not affect the test apparatus. This can be achieved using a combination of attenuators, isolators and filters.

*Note 2:* When duplexers are used, intermodulation products will be generated, not only in the duplexer but also in the antenna system. The intermodulation products generated in the antenna system are not controlled by the specifications, and may degrade during operation (e.g. due to moisture ingress). Therefore, to ensure continued satisfactory operation of a BS, an operator will normally select UARFCNs to minimize intermodulation products falling on receive channels. For testing of complete conformance, an operator may specify the UARFCNs to be used.

## A.3 Power supply options

If the BS is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

This applies particularly if a BS contains a DC rail which can be supplied either externally or from an internal mains power supply. In this case, the conditions of extreme power supply for the mains power supply options can be tested by testing only the external DC supply option. The range of DC input voltages for the test should be sufficient to verify the performance with any of the power supplies, over its range of operating conditions within the BS, including variation of mains input voltage, temperature and output current.

## A.4 Ancillary RF amplifiers

The requirements of the technical standard shall be met with the ancillary RF amplifier fitted. At tests according to clause 3 for TX and RX respectively, the ancillary amplifier is connected to the BS by a connecting network (including any cable(s), attenuator(s), etc.) with applicable loss to make sure the appropriate operating conditions of the ancillary amplifier and the BS. The applicable connecting network loss range is declared by the manufacturer. Other characteristics and the temperature dependence of the attenuation of the connecting network are neglected. The actual attenuation value of the connecting network is chosen for each test as one of the applicable extreme values. The lowest value is used unless otherwise stated.

Sufficient tests should be repeated with the ancillary amplifier fitted and, if it is optional, without the ancillary RF amplifier to verify that the BS meets the requirements of the technical standard in both cases.

When testing, the following tests should be repeated with the optional ancillary amplifier fitted according to table A.1, where x denotes that the test is applicable

*Table A.1: Table of tests applicable to Ancillary RF Amplifiers*

| | Clause | TX amplifier only | RX amplifier only | TX/RX amplifiers combined (see note) |
|---|---|---|---|---|
| Receiver Tests | 3.3.7 | | x | x |
| | 3.3.8 | | x | x |
| | 3.3.6 | | x | |
| Transmitter Tests | 3.3.4 | x | | x |
| | 3.3.2 | x | | x |
| | 3.3.3 | x | | x |
| | 3.3.5 | x | | x |
| *Note: Combining can be by duplex filters or any other network. The amplifiers can either be in RX or TX branch or in both. Either one of these amplifiers could be a passive network.* | | | | |

In test according to clause 3.3.4, the highest applicable attenuation value is applied.

## A.5 BS using antenna arrays

A BS may be configured with a multiple antenna port connection for some or all of its transceivers or with an antenna array related to one cell (not one array per transceiver). This clause applies to a BS which meets at least one of the following conditions:

- The transmitter output signals from one or more transceiver appear at more than one antenna port; or

- There is more than one receiver antenna port for a transceiver or per cell and an input signal is required at more than one port for the correct operation of the receiver thus the outputs from the transmitters as well as the inputs to the receivers are directly connected to several antennas (known as "aircombining"); or

*Note:* Diversity reception does not meet this requirement

- Transmitters and receivers are connected via duplexers to more than one antenna.

- If a BS is used, in normal operation, in conjunction with an antenna system which contains filters or active elements which are necessary to meet the UTRA requirements, the conformance tests may be performed on a system comprising the BS together with these elements, supplied separately for the purposes of testing. In this case, it must be demonstrated that the performance of the configuration under test is representative of the system in normal operation, and the conformance assessment is only applicable when the BS is used with the antenna system.

For conformance testing of such a BS, the following procedure may be used.

### A.5.1 Receiver tests

For each test, the test signals applied to the receiver antenna connectors shall be such that the sum of the powers of the signals applied equals the power of the test signal(s) specified in the test.

An example of a suitable test configuration is shown in figure A.1.

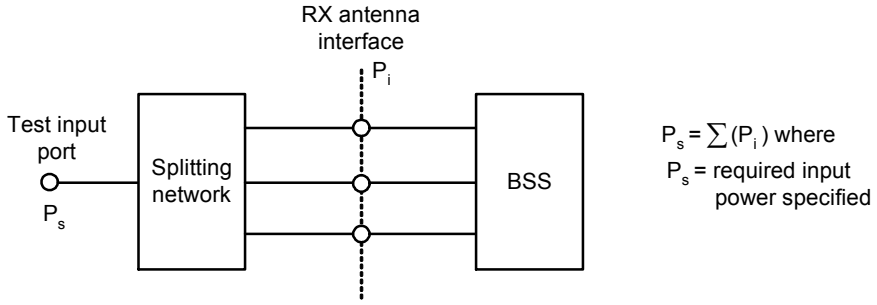


*Figure A.1: Receiver test set-up*

For spurious emissions from the receiver antenna connector, the test may be performed separately for each receiver antenna connector.

### A.5.2 Transmitter tests

For each test, the test signals applied to the transmitter antenna connectors ($P_i$) shall be such that the sum of the powers of the signals applied equals the power of the test signal(s) ($P_s$) specified in the test. This may be assessed by separately measuring the signals emitted by each antenna connector and summing the results, or by combining the signals and performing a single measurement. The characteristics (e.g. amplitude and phase) of the combining network should be such that the power of the combined signal is maximized.

An example of a suitable test configuration is shown in figure A.2.

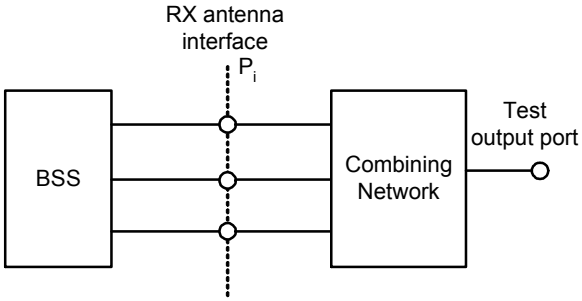


*Figure A.2: Transmitter test set-up*

For intermodulation attenuation, the test may be performed separately for each transmitter antenna connector.

## ANNEX B
## (Informative)
## ENVIRONMENTAL PROFILE SPECIFICATION

For each test in the present document, the environmental conditions under which the BS is to be tested are defined.

The following environmental conditions may be declared by the supplier:

- Barometric pressure: minimum and maximum;

- Temperature: minimum and maximum;

- Relative humidity: minimum and maximum;

- Power supply: lower and upper voltage limit.

When operating outside the boundary limits of the declared operational environmental profile the equipment should not make ineffective use of the radio frequency spectrum so as to cause harmful interference.

## B.1. Normal test environment

When a normal test environment is specified for a test, the test should be performed within the minimum and maximum limits of the conditions stated in table B.1.

*Table B.1: Limits of conditions for Normal Test Environment*

| Condition | Minimum | Maximum |
|---|---|---|
| Barometric pressure | 86 kPa | 106 kPa |
| Temperature | 15°C | 30°C |
| Relative Humidity | 20% | 85% |
| Power supply | Nominal, as declared by the manufacturer | |
| Vibration | Negligible | |

The ranges of barometric pressure, temperature and humidity represent the maximum variation expected in the uncontrolled environment of a test laboratory. If it is not possible to maintain these parameters within the specified limits, the actual values shall be recorded in the test report.

## B.2. Extreme test environment

The manufacturer shall declare one of the following:

1) The equipment class for the equipment under test, as defined in the IEC 60 721-3-3;

2) The equipment class for the equipment under test, as defined in the IEC 60 721-3-4;

3) The equipment that does not comply to the mentioned classes, the relevant classes from IEC 60 721 documentation for Temperature, Humidity and Vibration shall be declared.

*Note:* Reduced functionality for conditions that fall out side of the standard operational conditions are not tested in the present document. These may be stated and tested separately.

### *B.2.1. Extreme temperature*

When an extreme temperature test environment is specified for a test, the test shall be performed at the standard minimum and maximum operating temperatures defined by the manufacturer's declaration for the equipment under test.

*Minimum temperature:*

The test shall be performed with the environment test equipment and methods including the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60 068-2-1.

*Maximum temperature:*

The test shall be performed with the environmental test equipment and methods including the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60 068-2-2.

*Note:* It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

## B.3. Vibration

When vibration conditions are specified for a test, the test shall be performed while the equipment is subjected to a vibration sequence as defined by the manufacturer’s declaration for the equipment under test. This shall use the environmental test equipment and methods of including the required environmental phenomena in to the equipment, conforming to the test procedure of IEC 60 068-2-6. Other environmental conditions shall be within the ranges specified in subclause B.1.

*Note:* The higher levels of vibration may induce undue physical stress in to equipment after a prolonged series of tests. The testing body should only vibrate the equipment during the RF measurement process.

## B.4. Power supply

When extreme power supply conditions are specified for a test, the test shall be performed at the standard upper and lower limits of operating voltage defined by manufacturer's declaration for the equipment under test.

*Upper voltage limit:*

The equipment shall be supplied with a voltage equal to the upper limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 Test Ab/Ad and IEC 60 068-2-2 Test Bb/Bd: Dry Heat.

*Lower voltage limit:*

The equipment shall be supplied with a voltage equal to the lower limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 Test Ab/Ad and IEC 60 068-2-2 Test Bb/Bd: Dry Heat.

## B.5. Definition of Additive White Gaussian Noise (AWGN) Interferer

The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.

## B.6. Acceptable uncertainty of Test System

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified tolerance and the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95%, unless otherwise stated.

A confidence level of 95% is the measurement uncertainty tolerance interval for a specific measurement that contains 95% of the performance of a population of test equipment.

For RF tests, it should be noted that the uncertainties in subclause B.6 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the EUT and the Test System.

The measurement accuracy of the BS test environments shall be.

| | |
|---|---|
| Pressure | : ±5 kPa |
| Temperature | : ±2 degrees |
| Relative Humidity | : ±5% |
| AC Voltage | : ±1.5% |
| Vibration | : ±10% |
| Vibration frequency | : 0.1 Hz |

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

## B.7. Specified frequency range

The manufacturer shall declare:

- Which of the frequency bands defined in sub-clause 3.4, TS 125 141 is supported by the BS.

- The frequency range within the above frequency band(s) supported by the BS.

Many tests in this TS are performed with appropriate frequencies in the bottom, middle and top of the operating frequency band of the BS. These are denoted as RF channels B (bottom), M (middle) and T (top).

Unless otherwise stated, the test shall be performed with a single carrier at each of the RF channels B, M and T.

When the requirements are specific to multiple carriers, and the BS is declared to support N>1 carriers, numbered from 1 to N, the interpretation of B, M and T for test purposes shall be as follows:

For testing at B,

- The carrier of lowest frequency shall be centred on B

For testing at M,

- If the number N of carriers supported is odd, the carrier (N+1)/2 shall be centred on M,

- If the number N of carriers supported is even, the carrier N/2 shall be centred on M.

For testing at T

- The carrier of highest frequency shall be centred on T.

When a test is performed by a test laboratory, the UARFCNs to be used for RF channels B, M and T shall be specified by the laboratory. The laboratory may consult with operators, the manufacturer or other bodies.

When a test is performed by a manufacturer, the UARFCNs to be used for RF channels B, M and T may be specified by an operator.

## ANNEX C
## (Nomartive)
## TEST MODEL 1

This model shall be used for tests on:

- Occupied bandwidth;
- Spectrum emission mask;
- ACLR;
- Spurious emissions;
- Transmit intermodulation;
- Base station maximum output power.
- Total power dynamic range (at Pmax)
- Frequency error (at Pmax)
- Error Vector Magnitude (at Pmax)
- IPDL time mask

64 DPCHs at 30 ksps (SF = 128) distributed randomly across the code space, at random power levels and random timing offsets are defined so as to simulate a realistic traffic scenario which may have high PAR (Peak to Average Ratio).

Considering that not every base station implementation will support 64 DPCH, variants of this test model containing 32 and 16 DPCH are also specified. The conformance test shall be performed using the largest of these three options that can be supported by the equipment under test.

"Fraction of power" is relative to the maximum output power on the TX antenna interface under test.

*Table C.1: Test Model 1 Active Channels*

| Type | Number of Channels | Fraction of Power (%) | Level setting (dB) | Channelization Code | Timing offset ($x256T_{chip}$) |
|---|---|---|---|---|---|
| P-CCPCH+SCH | 1 | 10 | -10 | 1 | 0 |
| Primary CPICH | 1 | 10 | -10 | 0 | 0 |
| PICH | 1 | 1.6 | -18 | 16 | 120 |
| S-CCPCH containing PCH (SF=256) | 1 | 1.6 | -18 | 3 | 0 |
| DPCH (SF=128) | 16/32/64 | 76.8 in total | see table C.2 | see table C.2 | see table C.2 |

*Table C.2: DPCH Spreading Code, Timing offsets and level settings for Test Model 1*

| Code | Timing offset ($x256T_{chip}$) | Level settings (dB) (16 codes) | Level settings (dB) (32 codes) | Level settings (dB) (64 codes) |
|---|---|---|---|---|
| 2 | 86 | -10 | -13 | -16 |
| 11 | 134 | -12 | -13 | -16 |
| 17 | 52 | -12 | -14 | -16 |

| Code | Timing offset ($x256T_{chip}$) | Level settings (dB) (16 codes) | Level settings (dB) (32 codes) | Level settings (dB) (64 codes) |
|---|---|---|---|---|
| 23 | 45 | -14 | -15 | -17 |
| 31 | 143 | -11 | -17 | -18 |
| 38 | 112 | -13 | -14 | -20 |
| 47 | 59 | -17 | -16 | -16 |
| 55 | 23 | -16 | -18 | -17 |
| 62 | 1 | -13 | -16 | -16 |
| 69 | 88 | -15 | -19 | -19 |
| 78 | 30 | -14 | -17 | -22 |
| 85 | 18 | -18 | -15 | -20 |
| 94 | 30 | -19 | -17 | -16 |
| 102 | 61 | -17 | -22 | -17 |
| 113 | 128 | -15 | -20 | -19 |
| 119 | 143 | -9 | -24 | -21 |
| 7 | 83 | | -20 | -19 |
| 13 | 25 | | -18 | -21 |
| 20 | 103 | | -14 | -18 |
| 27 | 97 | | -14 | -20 |
| 35 | 56 | | -16 | -24 |
| 41 | 104 | | -19 | -24 |
| 51 | 51 | | -18 | -22 |
| 58 | 26 | | -17 | -21 |
| 64 | 137 | | -22 | -18 |
| 74 | 65 | | -19 | -20 |
| 82 | 37 | | -19 | -17 |
| 88 | 125 | | -16 | -18 |
| 97 | 149 | | -18 | -19 |
| 108 | 123 | | -15 | -23 |
| 117 | 83 | | -17 | -22 |
| 125 | 5 | | -12 | -21 |
| 4 | 91 | | | -17 |
| 9 | 7 | | | -18 |
| 12 | 32 | | | -20 |
| 14 | 21 | | | -17 |
| 19 | 29 | | | -19 |
| 22 | 59 | | | -21 |
| 26 | 22 | | | -19 |
| 28 | 138 | | | -23 |
| 34 | 31 | | | -22 |
| 36 | 17 | | | -19 |
| 40 | 9 | | | -24 |

| Code | Timing offset ($x256T_{chip}$) | Level settings (dB) (16 codes) | Level settings (dB) (32 codes) | Level settings (dB) (64 codes) |
|---|---|---|---|---|
| 44 | 69 | | | -23 |
| 49 | 49 | | | -22 |
| 53 | 20 | | | -19 |
| 56 | 57 | | | -22 |
| 61 | 121 | | | -21 |
| 63 | 127 | | | -18 |
| 66 | 114 | | | -19 |
| 71 | 100 | | | -22 |
| 76 | 76 | | | -21 |
| 80 | 141 | | | -19 |
| 84 | 82 | | | -21 |
| 87 | 64 | | | -19 |
| 91 | 149 | | | -21 |
| 95 | 87 | | | -20 |
| 99 | 98 | | | -25 |
| 105 | 46 | | | -25 |
| 110 | 37 | | | -25 |
| 116 | 87 | | | -24 |
| 118 | 149 | | | -22 |
| 122 | 85 | | | -20 |
| 126 | 69 | | | -15 |

## ANNEX D
## (Informative)
## MEASUREMENT SYSTEM SET-UP

### D.1. Transmitter

#### *D.1.1 Out-of-band emission*

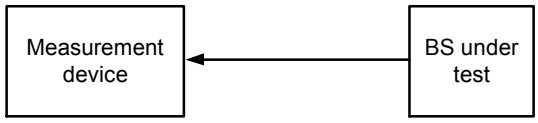


*Figure 1: Measuring system set-up for out-of-band emission*

#### *D.1.2 Frequency, Code Power and Transmit Modulation*

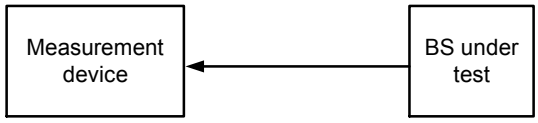


*Figure 2: Measuring system set-up for RF frequency, several code power tests and transmit modulation (EVM and PCDE)*

#### *D.1.3 Maximum output power*

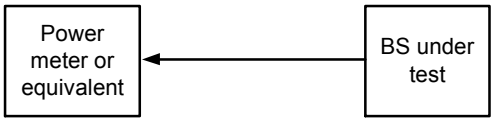


*Figure 3: Measuring system set-up for maximum output power*

#### *D.1.4 Transmit intermodulation*

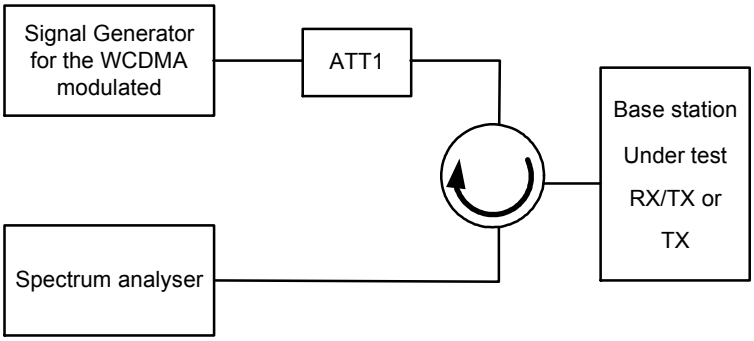


*Figure 4: Measuring system set-up for base station transmit intermodulation tests*

### D.2 Receiver

#### *D.2.1 Receiver spurious emission*

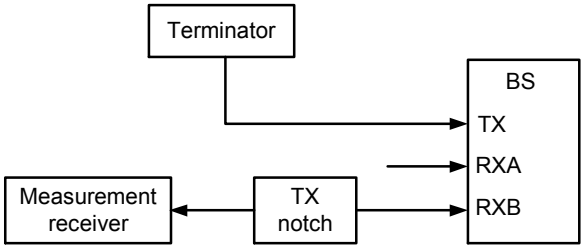


*Figure 5: Measuring system set-up for receiver spurious emission*

### *D.2.2 Blocking characteristics*

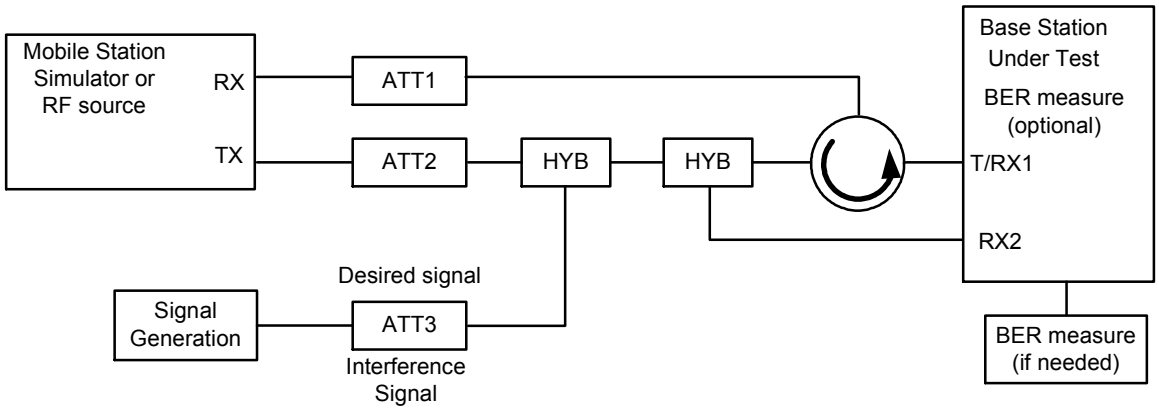


*Figure 6: Measuring system set-up for blocking characteristics*

### *D.2.3. Intermodulation characteristics*

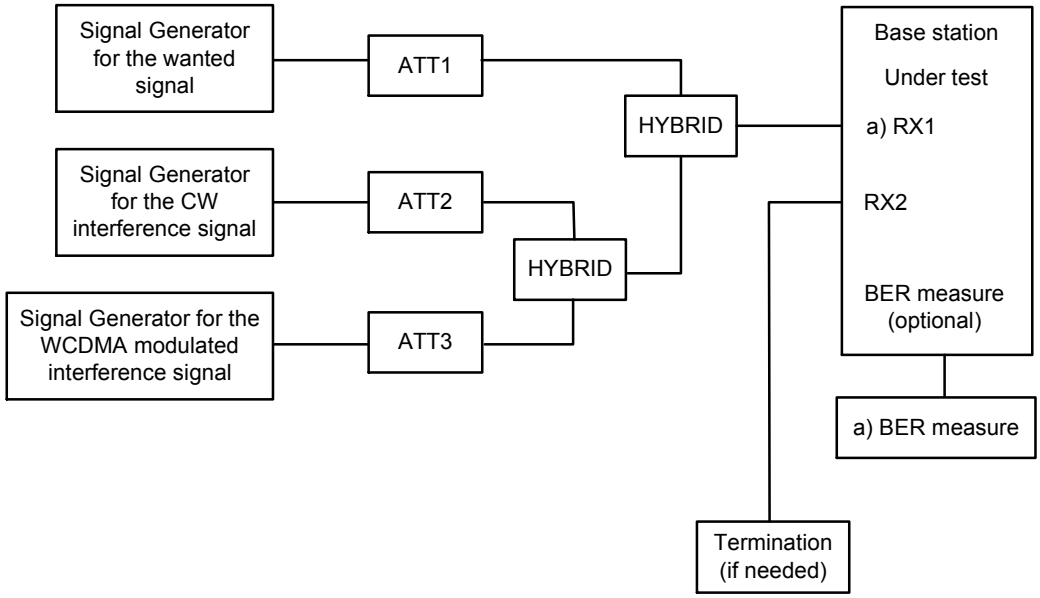


*Figure 7: Measuring system set-up for intermodulation characteristics*

### *D.2.4 Adjacent Channel Selectivity (ACS)*

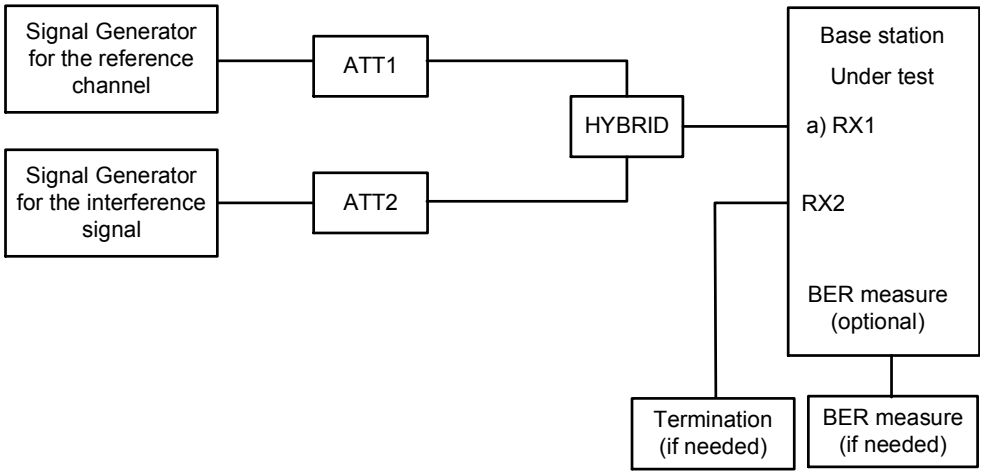


*Figure 8: Measuring system set-up for adjacent channel selectivity*

## ANNEX E
## (Normative)
## CHARACTERISTICS OF THE WCDMA INTERFERENCE SIGNAL

The WCDMA interference signal shall be a DPCH containing the DPCCH and one DPDCH. The data content for each channelization code shall be uncorrelated with each other and to the wanted signal and spread and modulated according to clause 4 of TS 25.213. Further characteristics of DPDCH and DPCCH are specified in table E.1.

*Table E.1: Characteristics of the WCDMA interference signal*

| Channel | Bit Rate | Spreading Factor | Channelization Code | Relative Power |
|---|---|---|---|---|
| DPDCH | 240 kbps | 16 | 4 | 0 dB |
| DPCCH | 15 kbps | 256 | 0 | -5.46 dB |

*Note:* The DPDCH and DPCCH settings are chosen to simulate a signal with realistic Peak to Average Ratio.