

ETSI TS 125 141 V3.3.0 (2000-10)

Technical Specification

**Universal Mobile Telecommunications System (UMTS);
Base station conformance testing (FDD)
(3GPP TS 25.141 version 3.3.0 Release 1999)**



Reference

RTS/TSGR-0425141UR3

Keywords

UMTS

ETSI

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Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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1 Scope

The present document specifies the Radio Frequency (RF) test methods and conformance requirements for UTRA Base Stations (BS) operating in the FDD mode. These have been derived from, and are consistent with the UTRA Base Station (BS) specifications defined in [1].

The present document establishes the minimum RF characteristics of the FDD mode of UTRA for the Base Station (BS).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] 3GPP TS 25.104: "UTRA(BS) FDD; Radio transmission and Reception".
- [2] 3GPP TS 25.942: "RF system scenarios".
- [3] 3GPP TS 25.113: "Base station EMC".
- [4] ITU-R recommendation SM.329-7: "Spurious emissions".
- [5] ITU-T recommendation O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".
- [6] IEC 60721-3-3 (1994): "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): "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): "Environmental testing - Part 2: Tests. Tests A: Cold".
- [9] IEC 60068-2-2 (1974): "Environmental testing - Part 2: Tests. Tests B: Dry heat".
- [10] IEC 60068-2-6 (1995): "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Output power: The mean power of one carrier of the base station, delivered to a load with resistance equal to the nominal load impedance of the transmitter.

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.

Maximum output power: The mean power level per carrier of the base station measured at the antenna connector in a specified reference condition.

Power control dynamic range: The difference between the maximum and the minimum transmit output power of a code channel for a specified reference condition.

Total power dynamic range: The difference between the maximum and the minimum total transmit output power for a specified reference condition.

3.2 Void

3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
BER	Bit Error Ratio
BLER	Block Error Ratio
BS	Base Station
CW	Continuous Wave (unmodulated signal)
DCH	Dedicated Channel, which is mapped into Dedicated Physical Channel. DCH contains the data
DL	Down Link (forward link)
DPCH	Dedicated Physical Channel
E_b	Average energy per information bit for the PCCPCH, SCCPCH and DPCH, at the antenna connector
E_c	Average energy per PN chip
EVM	Error Vector Magnitude
FDD	Frequency Division Duplexing
F_{uw}	Frequency of unwanted signal
MS	Mobile Station
PCCPCH	Primary Common Control Physical Channel
PCDE	Peak Code Domain Error
PCH	Paging Channel
PPM	Parts Per Million
SCCPCH	Secondary Common Control Physical Channel
TDD	Time Division Duplexing
TPC	Transmit Power Control
UE	User Equipment
UL	Up Link (reverse link)
UTRA	UMTS Terrestrial Radio Access

3.4 Radio Frequency bands

3.4.1 Frequency bands

UTRA/FDD is designed to operate in either of the following paired bands:

- (a): 1 920 MHz to 1 980 MHz: up-link (Mobile transmit, base receive);
2 110 MHz to 2 170 MHz: down-link (Base transmit, mobile receive);
- (b)*: 1 850 MHz to 1 910 MHz: up-link (Mobile transmit, base receive);
1 930 MHz to 1 990 MHz: down-link (Base transmit, mobile receive).

NOTE: *: Used in Region 2.

Additional allocations in ITU region 2 are FFS.

Deployment in other frequency bands is not precluded.

3.4.2 TX–RX frequency separation

- (a) The minimum transmit to receive frequency separation is 134,8 MHz and the maximum value is 245,2 MHz and all UE(s) shall support a TX –RX frequency separation of 190 MHz when operating in the paired band defined in subclause 3.4.1(a).
- (b) UTRA/FDD can support both fixed and variable transmit to receive frequency separation.
- (c) When operating in the paired band defined in subclause 3.4.1(b), all UE(s) shall support a TX – RX frequency separation of 80 MHz.
- (d) The use of other transmit to receive frequency separations in existing or other frequency bands shall not be precluded.

3.5 Channel arrangement

3.5.1 Channel spacing

The nominal channel spacing is 5 MHz, but this can be adjusted to optimize performance in a particular deployment scenario.

3.5.2 Channel raster

The channel raster is 200 kHz, which means that the center frequency must be an integer multiple of 200 kHz.

3.5.3 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN). The value of the UARFCN in the IMT2000 band is defined as follows.

Table 3.1: UTRA Absolute Radio Frequency Channel Number

Uplink	$N_u = 5 * (F_{\text{uplink}} \text{ MHz})$	$0.0 \text{ MHz} \leq F_{\text{uplink}} \leq 3276.6 \text{ MHz}$ where F_{uplink} is the uplink frequency in MHz
Downlink	$N_d = 5 * (F_{\text{downlink}} \text{ MHz})$	$0.0 \text{ MHz} \leq F_{\text{downlink}} \leq 3276.6 \text{ MHz}$ where F_{downlink} is the downlink frequency in MHz

4 General test conditions and declarations

The requirements of this clause apply to all tests in the present document, when applicable.

Many of the tests in the present document measure a parameter relative to a value which is not fully specified in the UTRA specifications. For these tests, the conformance requirement is determined relative to a nominal value specified by the manufacturer.

Certain functions of a BS are optional in the UTRA specifications. Some requirements for the BS may be regional as listed in subclause 4.7.

When specified in a test, the manufacturer shall declare the nominal value of a parameter, or whether an option is supported.

4.1 Acceptable uncertainty of measurement equipment

The maximum acceptable uncertainty of measurement equipment is specified separately for each test, where appropriate. The measurement equipment shall enable the stimulus signals in the test case to be adjusted to within the specified tolerance, and the conformance requirement 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.

It should be noted that the stated uncertainties in subclause 4.1 apply to the test equipment only and do not include system effects due to mismatch between the DUT and the test equipment.

4.1.1 Measurement of test environments

The measurement accuracy of the BS test environments defined in Subclause 4.4, Test environments shall be.

- Pressure ± 5 kPa.
- Temperature ± 2 degrees.
- Relative Humidity ± 5 %.
- DC Voltage $\pm 1,0$ %.
- AC Voltage $\pm 1,5$ %.
- 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.

4.1.2 Transmitter

Subclause 6.2, Base station output power:

- base station maximum output power $\pm[0,5]$ dB.

Subclause 6.3, Frequency stability:

- carrier frequency $\pm[10]$ Hz.

Subclause 6.4.1, Inner loop power control in the downlink:

- transmitter power control step (relative 1 dB step) $\pm[0,3]$ dB;
- transmitter average power control step (relative 10×1 dB steps) $\pm[0,5]$ dB.

NOTE 1: Code domain power.

Subclause 6.4.3, Power control dynamic range:

- maximum and minimum power $\pm[0,8]$ dB;
- power control dynamic range (at 25 dB relative power) $\pm[0,5]$ dB.

NOTE 2: Code domain power.

Subclause 6.4.4, Total power dynamic range:

- total power $\pm[0,5]$ dB;

- total power dynamic range (at 18 dB relative power) $\pm[0,3]$ dB.

Subclause 6.2.2, CPICH power accuracy:

- CPICH power $\pm[0,8]$ dB.

NOTE 3: Code domain power.

Subclause 6.5.1, Occupied bandwidth:

- occupied channel bandwidth $\pm[]$ kHz.

Subclause 6.5.2.1, Spectrum emission mask:

- emission power:

Table 4.1: Uncertainty for Spectrum emission mask measurement

Frequency offset Δf	Uncertainty
$2,5 \leq \Delta f < 2,7$ MHz	$\pm[1,5]$ dB
$2,7 \leq \Delta f < 3,5$ MHz	$\pm[1,5]$ dB
$3,5 \leq \Delta f < 7,5$ MHz	$\pm[1,5]$ dB
$7,5 \leq \Delta f \leq \Delta f_{\max}$ MHz	$\pm[1,5]$ dB

Subclause 6.5.2.2, Adjacent Channel Leakage power Ratio (ACLR):

- ACLR ± 5 MHz (Relative carrier power) $\pm[0,8]$ dB;
- ACLR ± 10 MHz (Relative carrier power) $\pm[0,8]$ dB.

Subclause 6.5.3.7, Protection of the BS receiver:

- emission power $\pm[1,5]$ dB.

Subclause 6.5.3, Spurious emissions:

- conformance requirement in BS and coexistence receive bands:
 - emission power $\pm[2,0]$ dB.
- conformance requirements outside BS and coexistence receive bands:
 - emission power:
 - $f \leq 2.2$ GHz $\pm 1,5$ dB;
 - 2.2 GHz $< f \leq 4$ GHz $\pm 2,0$ dB;
 - $f > 4$ GHz $\pm 4,0$ dB.

Subclause 6.6, Transmit intermodulation:

- interference signal power relative the carrier power $\pm[1,0]$ dB;
- intermodulation power $\pm[1,5]$ dB.

Subclause 6.7.1, Modulation Accuracy:

- modulation accuracy (EVM) $\pm[2,5]$ % RMS.

Subclause 6.7.2, Peak code Domain error:

- peak code domain error $\pm[]$ dB.

4.1.3 Receiver

Subclause 7.2, Reference sensitivity level:

- test signal power $\pm[0,8]$ dB.

Subclause 7.3, Dynamic range:

- test signal power $\pm[0,8]$ dB;
- AWGN signal power $\pm[1,0]$ dB.

Subclause 7.4, Adjacent Channel Selectivity (ACS):

- test signal power $\pm[0,8]$ dB;
- interfering signal power (Relative to the test signal) $\pm[0,8]$ dB.

Subclause 7.5, Blocking characteristics:

- test signal power $\pm[0,8]$ dB:
- interfering signal power:
 - $f \leq 2,2$ GHz $\pm 0,7$ dB;
 - $2,2$ GHz $< f \leq 4$ GHz $\pm 1,5$ dB;
 - $f > 4$ GHz $\pm 3,0$ dB.

Subclause 7.6, Intermodulation characteristics:

- test signal power $\pm[0,8]$ dB;
- interfering signals power $\pm[0,7]$ dB.

Subclause 7.7, Spurious emissions:

- emission power:
 - $f \leq 2,2$ GHz $\pm 1,5$ dB;
 - $2,2$ GHz $< f \leq 4$ GHz $\pm 2,0$ dB;
 - $f > 4$ GHz $\pm 4,0$ dB.

4.1.4 Performance requirement

Subclause 8.2, Demodulation in static propagation condition:

- test signal power $\pm[]$ dB;
- E_b/I_0 (relative) $\pm[]$ dB.

Subclause 8.3, Demodulation of DCH in multipath fading conditions:

- test signal power $\pm[]$ dB;
- E_b/I_0 (relative) $\pm[]$ dB.

4.2 Test tolerances

The following values may be increased only on a test by test basis. The test tolerances should not be increased to take account of commonly known test system errors (such as mismatch, cable loss, etc.)

4.2.1 Transmitter

Subclause 6.2, Base station output power:

- base station maximum output power $\pm[0,5]$ dB.

Subclause 6.3, Frequency stability:

- carrier frequency $\pm[10]$ Hz.

Subclause 6.4.1, Inner loop power control in the downlink:

- transmitter power control step (relative 1 dB step) $\pm[0,3]$ dB;
- transmitter average power control step (relative 10×1 dB steps) $\pm[0,5]$ dB.

NOTE 1: Code domain power.

Subclause 6.4.3, Power control dynamic range:

- maximum and minimum power $\pm[0,8]$ dB;
- power control dynamic range (at 25 dB relative power) $\pm[0,5]$ dB.

NOTE 2: Code domain power.

Subclause 6.4.4, Total power dynamic range:

- total power $\pm[0,5]$ dB;
- total power dynamic range (at 18 dB relative power) $\pm[0,3]$ dB.

Subclause 6.2.2, CPICH power accuracy:

- CPICH power $\pm[0,8]$ dB.

NOTE 3: Code domain power.

Subclause 6.5.1, Occupied bandwidth:

- occupied channel bandwidth $\pm[]$ kHz.

Subclause 6.5.2.1, Spectrum emission mask:

- emission power:

Table 4.1: Uncertainty for Spectrum emission mask measurement

Frequency offset Δf		Uncertainty
$2,5 \leq \Delta f < 2,7$ MHz		$\pm[1,5]$ dB
$2,7 \leq \Delta f < 3,5$ MHz		$\pm[1,5]$ dB
$3,5 \leq \Delta f < 7,5$ MHz		$\pm[1,5]$ dB
$7,5 \leq \Delta f \leq \Delta f_{\max}$ MHz		$\pm[1,5]$ dB

Subclause 6.5.2.2, Adjacent Channel Leakage power Ratio (ACLR):

- ACLR ± 5 MHz (Relative carrier power) $\pm[0,8]$ dB;
- ACLR ± 10 MHz (Relative carrier power) $\pm[0,8]$ dB.

Subclause 6.5.3.7, Protection of the BS receiver:

- emission power $\pm[1,5]$ dB.

Subclause 6.5.3, Spurious emissions:

- conformance requirement in BS and coexistence receive bands:
 - emission power $\pm[0]$ dB.
- conformance requirements outside BS and coexistence receive bands:
 - emission power:
 - $f \leq 2.2$ GHz $\pm[0]$ dB;
 - 2.2 GHz $< f \leq 4$ GHz $\pm[0]$ dB;
 - $f > 4$ GHz $\pm[0]$ dB.

Subclause 6.6, Transmit intermodulation:

- interference signal power relative the carrier power $\pm[1,0]$ dB;
- intermodulation power $\pm[1,5]$ dB.

Subclause 6.7.1, Modulation Accuracy:

- modulation accuracy (EVM) $\pm[2,5]$ % RMS.

Subclause 6.7.2, Peak code Domain error:

- peak code domain error $\pm[]$ dB.

4.2.2 Receiver

Subclause 7.2, Reference sensitivity level:

- test signal power $\pm[0,8]$ dB.

Subclause 7.3, Dynamic range:

- test signal power $\pm[0,8]$ dB;
- AWGN signal power $\pm[1,0]$ dB.

Subclause 7.4, Adjacent Channel Selectivity (ACS):

- test signal power $\pm[0,8]$ dB;
- interfering signal power (Relative to the test signal) $\pm[0,8]$ dB.

Subclause 7.5, Blocking characteristics:

- test signal power $\pm[0,8]$ dB:
- interfering signal power:
 - $f \leq 2,2$ GHz $\pm 0,7$ dB;
 - $2,2$ GHz $< f \leq 4$ GHz $\pm 1,5$ dB;
 - $f > 4$ GHz $\pm 3,0$ dB.

Subclause 7.6, Intermodulation characteristics:

- test signal power $\pm[0,8]$ dB;
- interfering signals power $\pm[0,7]$ dB.

Subclause 7.7, Spurious emissions:

- emission power:

$f \leq 2,2$ GHz	$\pm[1,5]$ dB;
$2,2$ GHz $< f \leq 4$ GHz	$\pm[2,0]$ dB;
$f > 4$ GHz	$\pm[4,0]$ dB.

4.2.3 Performance requirement

Subclause 8.2, Demodulation in static propagation condition:

- test signal power $\pm[]$ dB;
- Eb/I0 (relative) $\pm[]$ dB.

Subclause 8.3, Demodulation of DCH in multipath fading conditions:

- test signal power $\pm[]$ dB;
- Eb/I0 (relative) $\pm[]$ dB.

4.2.4 RRM measurements

The following tolerances refer to the requirements of 25.133.

tbd

4.3 Interpretation of measurement results

Compliance with the requirement is determined by comparing the measured value (or derived value from the measured one) with the test limit. The test limit shall be calculated by adding the specified limit in the core requirement using the test tolerance as specified in subclause 4.2. The actual measurement uncertainty of the test equipment for the measurement of each parameter shall be included in the test report.

The recorded value for the test equipment uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in subclause 4.1 of the present document.

If the test equipment for a test is known to have a measurement uncertainty greater than that specified in subclause 4.1, it is still permitted to use this apparatus provided that an adjustment is made to the measured value as follows.

The initial test limit is derived as above. Any additional uncertainty in the test equipment over and above that specified in subclause 4.1 shall be used to tighten the test limit. This procedure will ensure that test equipment not compliant with subclause 4.1 does not increase the chance of passing a device under test where that device would otherwise have failed the test if test equipment compliant with subclause 4.1 had been used.

4.3 Output power and determination of power class

The requirements in the present document apply to base station intended for general-purpose applications.

In the future further classes of base stations may be defined; the requirements for these may be different than for general-purpose applications.

4.4 Test environments

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

4.4.1 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 4.2.

Table 4.2: 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.

NOTE: This may, for instance, be the case for measurements of radiated emissions performed on an open field test site.

4.4.2 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 [6];
- 2) the equipment class for the equipment under test, as defined in the IEC 60 721-3-4 [7];
- 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 outside of the standard operational conditions are not tested in the present document. These may be stated and tested separately.

4.4.2.1 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 [8].

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 [9].

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

4.4.3 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 inducing the required environmental phenomena into the equipment, conforming to the test procedure of IEC 60 068-2-6 [10]. Other environmental conditions shall be within the ranges specified in subclause 4.4.1.

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

4.4.4 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 [8] Test Ab/Ad and IEC 60 068-2-2 [9] 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 [8] Test Ab/Ad and IEC 60 068-2-2 [9] Test Bb/Bd: Dry Heat.

4.5 Selection of configurations for testing

Most tests in the present document are only performed for a subset of the possible combinations of test conditions. For instance:

- not all transceivers in the configuration may be specified to be tested;
- only one RF channel may be specified to be tested;
- only one timeslot may be specified to be tested.

When a test is performed by a test laboratory, the choice of which combinations are to be tested 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 choice of which combinations are to be tested may be specified by an operator.

4.6 BS Configurations

4.6.1 Receiver diversity

For the tests in clause 7 of the present document, 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 .

4.6.2 Duplexers

The requirements of the present document 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 present document in both cases.

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

- 1) subclause 6.2.1, base station maximum output power, for the highest static power step only, if this is measured at the antenna connector;
- 2) subclause 6.5, output RF spectrum emissions; outside the BS transmit band;
- 3) subclause 6.5.3.7, protection of the BS receiver;
- 4) subclause 6.6, 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 3GPP 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 ARFCNs to minimize intermodulation products falling on receive channels. For testing of complete conformance, an operator may specify the ARFCNs to be used.

4.6.3 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.

4.6.4 Ancillary RF amplifiers

<Table from GSM11.21 will be here. Note on passive elements should be here.>

Ancillary RF amplifier: a piece of equipment, which when connected by RF coaxial cables to the BS, has the primary function to provide amplification between the transmit and/or receive antenna connector of a BS and an antenna without requiring any control signal to fulfil its amplifying function.

The requirements of the present document shall be met with the ancillary RF amplifier fitted. At tests according to clauses 6 and 7 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 present document in both cases.

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

Table 4.3

	Subclause	TX amplifier only	RX amplifier only	TX/RX amplifiers combined (Note)
Receiver Tests	7.2		X	X
	7.5		X	X
	7.6		x	X
	7.7		x	
Transmitter Tests	6.2	x		X
	6.5.1	X		X
	6.5.2.2	X		x
	6.5.3	x		X
	6.6	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 subclauses 6.2 and 7.2 highest applicable attenuation value is applied.

4.6.5 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 subclause 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 (NOTE: diversity reception does not meet this requirement) thus the outputs from the transmitters as well as the inputs to the receivers are directly connected to several antennas (known as „aircombining"); or
- 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.

4.6.5.1 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 4.1.

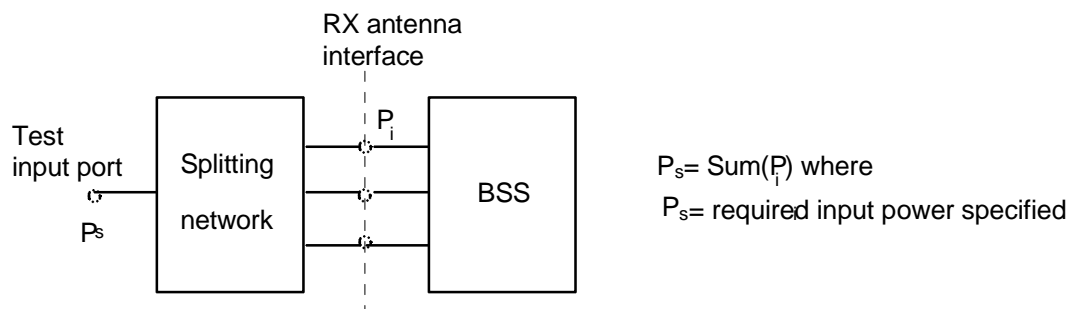


Figure 4.1: Receiver test set-up

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

4.6.5.2 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 maximised.

An example of a suitable test configuration is shown in figure 4.2.

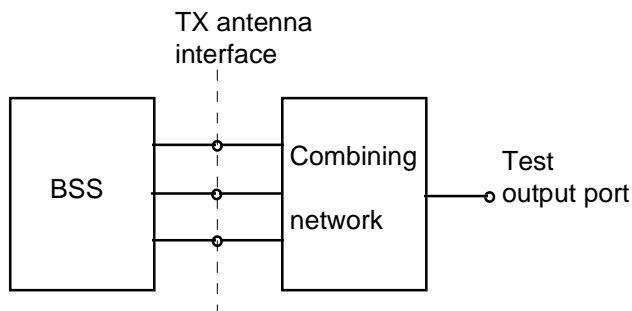


Figure 4.2: Transmitter test set-up

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

4.7 Regional requirements

Some requirements in TS 25.141 may only apply in certain regions. Table 4.4 lists all requirements that may be applied differently in different regions.

Table 4.4: List of regional requirements

Subclause number	Requirement	Comments
3.4.1	Frequency bands	Some bands may be applied regionally.
3.4.2	Tx-Rx Frequency Separation	The requirement is applied according to what frequency bands in subclause 5.2 that are supported by the BS.
6.2.1.2	Base station output power	In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges defined for the Normal test environment in subclause 4.4.1.
6.5.2.1	Spectrum emission mask	The mask specified may be mandatory in certain regions. In other regions this mask may not be applied.
6.5.3.5	Spurious emissions (Category A)	These requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329-7 [1], are applied.
6.5.3.6	Spurious emissions (Category B)	These requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329-7 [1], are applied.
6.5.3.8.1	Co-existence with GSM900 – Operation in the same geographic area	This requirement may be applied for the protection of GSM 900 MS in geographic areas in which both GSM 900 and UTRA are deployed.
6.5.3.8.2	Co-existence with GSM900 – Co-located base stations	This requirement may be applied for the protection of GSM 900 BTS receivers when GSM 900 BTS and UTRA BS are co-located.
6.5.3.9.1	Co-existence with DCS1800 – Operation in the same geographic area	This requirement may be applied for the protection of DCS 1800 MS in geographic areas in which both DCS 1800 and UTRA are deployed.
6.5.3.9.2	Co-existence with DCS1800 – Co-located base stations	This requirement may be applied for the protection of DCS 1800 BTS receivers when DCS 1800 BTS and UTRA BS are co-located.
6.5.3.10	Co-existence with PHS	This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA are deployed.
6.5.3.11	Co-existence with services in adjacent frequency bands	This requirement may be applied for the protection in bands adjacent to 2110-2170 MHz, as defined in subclause 5.2(a) and 1930-1990 MHz, as defined in subclause 5.2(b) in geographic areas in which both an adjacent band service and UTRA are deployed.
6.5.3.12.1	Co-existence with UTRA TDD – Operation in the same geographic area	This requirement may be applied to geographic areas in which both UTRA-TDD and UTRA-FDD are deployed.
6.5.3.12.2	Co-existence with UTRA TDD – Co-located base stations	This requirement may be applied for the protection of UTRA-TDD BS receivers when UTRA-TDD BS and UTRA FDD BS are co-located.
7.5	Blocking characteristic	The requirement is applied according to what frequency bands in subclause 5.2 that are supported by the BS.

5 Format and interpretation of tests

Each test in the following clauses has a standard format:

X Title

All tests are applicable to all equipment within the scope of the present document, unless otherwise stated.

X.1 Definition and applicability

This subclause gives the general definition of the parameter under consideration and specifies whether the test is applicable to all equipment or only to a certain subset.

X.2 Conformance requirements

This subclause describes the requirement under test has to fulfil to ensure compliance with the relevant specification.

In addition, this subclause contains the reference to the subclause to the 3GPP reference (or core) specification from which the conformance requirements are derived.

X.3 Test purpose

This subclause defines the purpose of the test.

X.4 Method of test

X.4.1 Initial conditions

This subclause defines the initial conditions for each test, including the basic measurement set-up.

X.4.2 Procedure

This subclause describes the steps necessary to perform the test and provides further details of the test definition like point of access (e.g. antenna port), domain (e.g. frequency-span), range, weighting (e.g. bandwidth), and algorithms (e.g. averaging).

X.5 Test requirements

This subclause defines the pass/fail criteria for the equipment under test.

6 Transmitter

6.1 General

Unless otherwise stated, all tests in this clause shall be performed at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a TX amplifier, a diplexer, a filter or the combination of such devices is used, the tests according to subclauses 4.6.2 and/or 4.6.4, depending on the device added, shall be performed to ensure that the requirements are met at test port B.

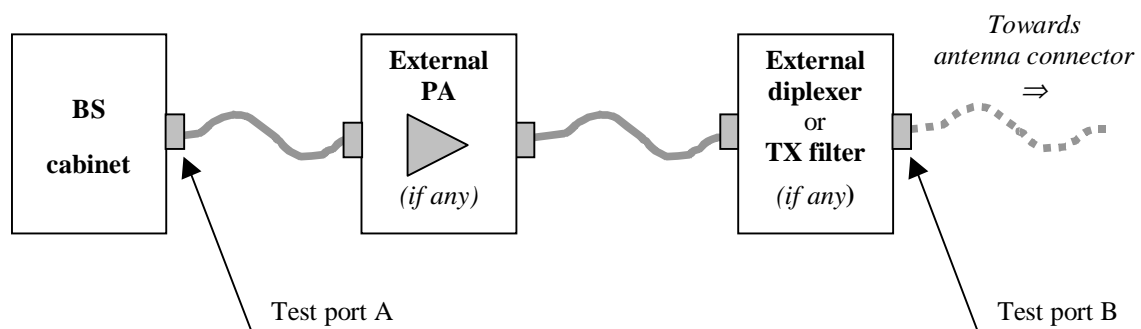


Figure 6.1: Transmitter test ports

Power levels are expressed in dBm.

6.1.1 Test Models

The set-up of physical channels for transmitter tests shall be according to one of the test models below. A reference to the applicable table is made with each test.

A code "level setting" of -X dB is the setting that according to the base station manufacturer will result in a code power of nominally X dB below the maximum output power. The relative accuracy of the level settings shall conform to subclause 6.4.2.

6.1.1.1 Test Model 1

This model shall be used for tests on:

- spectrum emission mask;
- ACLR;
- spurious emissions;
- transmit intermodulation;
- base station maximum output power.

64 DPCHs at 30 kbps (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 6.1: Test Model 1 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset (x256T _{chip})
PCCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	3.2	-15	16	120
DPCH (SF=128)	16/32/64	76.8 in total	see table 6.2	see table 6.2	see table 6.2

Table 6.2: DPCH Spreading Code, Timing offsets and level settings for Test Model 1

Code	Timing offset ($\times 256T_{\text{chip}}$)	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
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
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

Code	Timing offset (x256T _{chip})	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)	Level settings (dB) (64 codes)
118	149			-22
122	85			-20
126	69			-15

NOTE: The figures for code power are nominal and have tolerance of ± 1 dB.

6.1.1.2 Test Model 2

This model shall be used for tests on:

- output power dynamics.

Table 6.3: Test Model 2 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset (x256T _{chip})
PCCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	10	-10	16	120
DPCH (SF=128)	3	2 x 10, 1 x 50	2 x -10, 1 x -3	24, 72, 120	1, 7, 2

6.1.1.3 Test Model 3

This model shall be used for tests on:

- peak code domain error.

Table 6.4: Test Model 3 Active Channels

Type	Number of Channels	Fraction of Power (%) 16/32	Level settings (dB) 16/32	Channelization Code	Timing offset (x256T _{chip})
PCCPCH+SCH	1	12,6/7,9	-9 / -11	1	0
Primary CPICH	1	12,6/7,9	-9 / -11	0	0
PICH	1	10/3,2	-10 / -15	16	120
DPCH (SF=256)	16/32	63,7/80,4 in total	see table 6.5	see table 6.5	see table 6.5

As with Test Model 1, not every base station implementation will support 32 DPCH, a variant of this test model containing 16 DPCH are also specified. The conformance test shall be performed using the larger of these two options that can be supported by the equipment under test.

Table 6.5: DPCH Spreading Code, Toffset and Power for Test Model 3

Code	Toffset	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)
64	86	-14	-16
69	134	-14	-16
74	52	-14	-16
78	45	-14	-16
83	143	-14	-16
89	112	-14	-16
93	59	-14	-16
96	23	-14	-16
100	1	-14	-16
105	88	-14	-16
109	30	-14	-16
111	18	-14	-16
115	30	-14	-16
118	61	-14	-16
122	128	-14	-16
125	143	-14	-16
67	83		-16
71	25		-16
76	103		-16
81	97		-16
86	56		-16
90	104		-16
95	51		-16
98	26		-16
103	137		-16
108	65		-16
110	37		-16
112	125		-16
117	149		-16
119	123		-16
123	83		-16
126	5		-16

NOTE: The figures for code power are nominal and have tolerance of ± 1 dB.

6.2.1.3.1 Test Model 4

This model shall be used for tests on:

- EVM measurement.

Table 6.6: Test Model 4 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset
PCCPCH+SCH	1	50 to 1.6	-3 to -18	1	

6.1.1.4 DPCH Structure of the Downlink Test Models

For the above test models the following structure is adopted for the DPCH. The DPDCH and DPCCH have the same power level. The timeslot structure should be as described by TS 25.211-slot format 10 and 6 that are reproduced in table 6.7.

Table 6.7: DPCH structure of the downlink test models

Slot Format #1	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/Frame			Bits/Slot	DPDCH Bits/Slot		DPCCH Bits/Slot		
				DPDCH	DPCCH	TOT		NData1	Ndata2	NTFCI	NTPC	Npilot
10	60	30	128	450	150	600	40	6	24	0	2	8
6	30	15	256	150	150	300	20	2	8	0	2	8

The test DPCH has frame structure so that the pilot bits are defined over 15 timeslots according to the relevant columns of TS 25.211, which are reproduced in table 6.8.

Table 6.8: Frame structure of DPCH

Symbol #	Npilot = 8			
	0	1	2	3
Slot #0	11	11	11	10
1	11	00	11	10
2	11	01	11	01
3	11	00	11	00
4	11	10	11	01
5	11	11	11	10
6	11	11	11	00
7	11	10	11	00
8	11	01	11	10
9	11	11	11	11
10	11	01	11	01
11	11	10	11	11
12	11	10	11	00
13	11	00	11	11
14	11	00	11	11

The TPC bits alternate 00 / 11 starting with 00 in timeslot 0.

The aggregate 15 x 30 = 450 DPDCH bits per frame are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. To ensure non-correlation of the PN9 sequences, each DPDCH shall use its channelization code as the seed for the PN sequence at the start of each frame, according to its timing offset.

The sequence shall be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The generator shall be seeded so that the sequence begins with the channelization code starting from the LSB, and followed by 2 consecutive ONES for SF=128 and 1 consecutive ONE for SF=256.

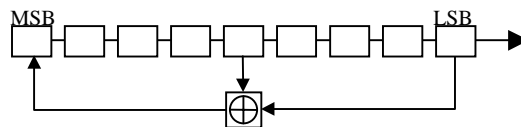


Figure 6.2

6.1.1.5 Common channel Structure of the Downlink Test Models

6.1.1.5.1 P-CCPCH

The aggregate 15 x 18 = 270 P-CCPCH bits per frame are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. Channelization code of the P-CCPCH is used as the seed for the PN sequence at the start of each frame.

The generator shall be seeded so that the sequence begins with the 8 bit channelization code starting from the LSB, and followed by a ONE.

6.1.1.5.2 PICH

PICH carries 18 Paging Indicators (PI) sent in the following sequence from left to right [1 0 1 1 0 0 0 1 0 1 1 0 0 0 1 0 1 0]. This defines the 288 first symbols ($= \pm 1 \pm j$) of the PICH. No power is transmitted for the 12 remaining unused symbols ($=0$).

6.1.1.5.3 Primary scrambling code and SCH

The scrambling code should be 0.

Where multiple repetitions of the Test Model signals are being used to simulate a multi-carrier signal the scrambling code for the lower frequency is 0. Carriers added at successively higher frequencies use codes 1, 2,... and their frame structures are time offset by 1/5, 2/5... of a time slot duration.

The scrambling code defines the SSC sequence of the secondary SCH. In their active part, primary and secondary SCH share equally the power level defined for "PCCPCH+SCH".

6.2 Base station output power

Output power, P_{out} , of the base station is the mean power of one carrier delivered to a load with resistance equal to the nominal load impedance of the transmitter.

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

6.2.1 Base station maximum output power

6.2.1.1 Definition and applicability

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.

6.2.1.2 Conformance requirement

In normal conditions, the Base station maximum output power shall remain within +2 dB and -2 dB of the manufacturer's rated output power.

In extreme conditions, the Base station maximum output power shall remain within +2.5 dB and -2.5 dB of the manufacturer's rated output power.

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges defined for the Normal test environment in subclause 4.4.1.

6.2.1.3 Method of test

6.2.1.3.1 Initial conditions

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

6.2.1.3.2 Procedure

1. Set the base station to transmit a signal modulated with a combination of PCCPCH, SCCPCH and Dedicated Physical Channels specified as test model1 in subclause 6.1.1.1.
2. Measure the mean power at the RF output port over a certain slots.

6.2.1.4 Test requirements

Maximum output power requirement shall be met as specified in subclause 6.2.1.2.

6.2.2 CPICH power accuracy

6.2.2.1 Definition and applicability

CPICH power accuracy is defined as the maximum deviation between the ordered channel power and the power in that channel measured at the TX antenna interface. The requirement is applicable for all BS types.

6.2.2.2 Conformance Requirement

See subclause 6.2.2.5.

6.2.2.3 Test purpose

The purpose of the test is to verify, that the BS under test delivers CPICH power within margins, thereby allowing reliable cell planning and operation.

6.2.2.4 Method of test

6.2.2.4.1 Initial conditions

Establish applicable temperature and supply voltage, as specified in subclause 4.4.

Connect BS to code domain analyser as shown in annex B.

Disable inner loop power control.

Set-up BS transmission at maximum total power as specified by the supplier. Channel set-up shall be according to subclause 6.1.1.2.

6.2.2.4.2 Procedure

Measure the power in the PCCPCH and PCPICH according to annex E.

Repeat the measurement for all other applicable temperatures and supply voltages.

6.2.2.5 Test requirement

The measured CPICH power shall be within ± 2.1 dB of the ordered absolute value.

6.3 Frequency error

6.3.1 Definition and applicability

Frequency error is the measure of the difference between the actual BTS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

It is not possible to verify by testing that the data clock is derived from the same frequency source as used for RF generation. This may be confirmed by a manufacturers declaration

6.3.2 Conformance requirement

The Frequency Error shall be within ± 0.05 PPM.

6.3.3 Test purpose

To verify that the Frequency Error is within the limit specified in 6.3.2

6.3.4 Method of test

6.3.4.1. Initial Conditions

- 1) Connect the base station RF output port to the test equipment. Refer to annex B.1.2 for a functional block diagram of the test set-up.
- 2) Set the base station to transmit a signal modulated with PCCPCH. Total power at the RF output port shall be $P_{max-3dB}$ and $P_{max-18dB}$.

6.3.4.2. Procedure

Measure the Frequency Error according to annex E.

6.3.5 Test requirement

The Frequency Error shall meet the limit specified in 6.3.2

6.4 Output power dynamics

Power control is used to limit the interference level. The BS transmitter uses a quality-based power control on the downlink. The physical channels for the following test(s) shall be set-up according to subclause 6.1.1.2.

6.4.1 Inner loop power control

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

6.4.2 Power control steps

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.1 Definition and applicability

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.2 Conformance requirement

The BS transmitter shall have the capability of setting the inner loop output power with a step sizes of 1 dB mandatory and 0,5 dB optional.

- (a) The tolerance of the power control step due to inner loop power control shall be within the range shown in table 6.9.
- (b) The tolerance of the combined output power change due to inner loop power control shall be within the range shown in table 6.10a.

Table 6.9: Transmitter power control step tolerance

Power control commands in the down link	Transmitter power control step tolerance			
	1 dB step size		0,5 dB step size	
	Lower	Upper	Lower	Upper
Up(TPC command "1")	+0,5 dB	+1,5 dB	+0,25 dB	+0,75 dB
Down(TPC command "0")	-0,5 dB	-1,5 dB	-0,25 dB	-0,75 dB

Table 6.10a: Transmitter combined output power tolerance

Power control commands in the down link	Transmitter combined output power change tolerance after 10 consecutive equal commands (up or down)			
	1 dB step size		0.5dB step size	
	Lower	Upper	Lower	Upper
Up(TPC command "1")	+8 dB	+12 dB	+4 dB	+6 dB
Down(TPC command "0")	-8 dB	-12 dB	-4 dB	-6 dB

The reference for this requirement is TS 25.104 [1] subclause 6.4.1.1.1

6.4.2.3 Test purpose

To verify those requirements for the power control step size and response are met as specified in subclause 6.4.2.2.

6.4.2.4 Method of test

6.4.2.4.1 Initial conditions

- (1) Connect the suitable measurement equipment to the BS antenna connector as shown in annex B.
- (2) Start BS transmission with channel configuration as specified in table 6.3 Test model 2.
- (3) Establish downlink power control with parameters as specified in table 6.10b.

Table 6.10b

Parameter	Level/status	Unit
UL signal level	Ref.sens + 10 dB	DBm/3,84 MHz
Data sequence	PN9	

6.4.2.4.2 Procedure

- 1) Set and send alternating TPC bits from the UE simulator or UL signal generator.
- 2) Measure mean power level of the code under the test each time TPC command is transmitted. All steps within power control dynamic range declared by manufacturer shall be measured. Use the code power measurement method defined in annex E.
- 3) Measure the 10 highest and the 10 lowest power step levels within the power control dynamic range declared by manufacturer by sending 10 consecutive equal commands as described table 6.10a.
- 4) Check that average step size tolerance requirement shall be met.

6.4.2.5 Test requirement

- (a) BS shall fulfil step size requirement for all power control steps declared by manufacture as specified in subclause 6.4.2.2.

- (b) For all measured Up/Down cycles, the difference of transmission power between before and after 10 equal commands (Up and Down), derived in step (3), shall not exceed the prescribed range in subclause 6.4.2.2.

6.4.3 Power control dynamic range

6.4.3.1 Definition and applicability

The power control dynamic range is difference between the maximum and the minimum transmit output power of a code channel for a specified reference condition. Transmit modulation shall be maintained within whole dynamic range as specified in TS 25.104 subclause 6.8.

6.4.3.2 Conformance requirement

Down link (DL) power control dynamic range:

- maximum power: BS maximum output power -3 dB or greater;
- minimum power: BS maximum output power -28 dB or less.

The reference for this requirement is TS 25.104 [1] subclause 6.4.2.1.

6.4.3.3 Test purpose

To verify that the minimum power control dynamic range is met as specified in subclause 6.4.3.2.

6.4.3.4 Method of test

6.4.3.4.1 Initial conditions

- 1) Connect the measurement equipment to the BS antenna connector as shown in annex B.
- 2) Channel configuration defined in table 6.3 Test model 2 shall be used.
- 3) Set BS frequency.
- 4) Start BS transmission.

6.4.3.4.2 Procedure

P_{max} shall be defined as described in subclause 6.2.1 Base station maximum output power.

- 1) Set power of the DPCH under test to the P_{max}-3 dB level. Power levels for other code channels shall be adjusted as necessary.
- 2) Measure mean power level of the code channel under test. Use the code power measurement method defined in annex E.
- 3) Set power of the DPCH under test to the minimum value by means determined by the manufacturer. Power levels for other code channels shall remain unchanged.
- 4) Measure mean power level of the code channel under test.

6.4.3.5 Test requirement

Power control dynamic range requirement shall be met as specified in subclause 6.4.3.2.

6.4.4 Total power dynamic range

6.4.4.1 Definition and applicability

The total power dynamic range is difference between the maximum and the minimum transmit output power for a specified reference condition.

6.4.4.2 Conformance requirement

The down link (DL) total power dynamic range shall be 18 dB or greater. The reference for this requirement is TS 25.104 [1] subclause 6.4.3.1.

6.4.4.3 Test purpose

To verify that the total power dynamic range as specified in TS 25.104 subclause 6.4.3.1. The test is to ensure that the total output power can be reduced while still transmitting a single code. This is to ensure that the interference to neighbouring cells is reduced.

<Editor's note: The rationale of the requirement should be clarified.>

6.4.4.4 Method of test

6.4.4.4.1 Initial requirement

- 1) Connect the measurement equipment to the BS antenna connector as shown in annex B.
- 2) Channel configuration defined in table 6.3 Test model 2 [but without traffic channel] shall be used.

<Editor's note: The conditions should be clarified.>

- 3) Set BS frequency.
- 4) Start BS transmission.

6.4.4.4.2 Procedure

- 1) Pmax shall be defined as described in subclause 6.2.1 Base station maximum output power.
- 2) Set the power level of the code channels such that BS output power level is 18 dB lower than BS maximum output power. All code channels shall use same power level.
- 3) Measure the mean transmission power level

6.4.4.5 Test requirement

BS shall achieve total power dynamic range as specified in subclause 6.4.3.2.

6.5 Output RF spectrum emissions

The physical channels for the following test(s) shall be set-up according to subclause 6.1.1.1.

6.5.1 Occupied bandwidth

6.5.1.1 Definition and applicability

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage $\beta/2$ of the total mean transmitted power.

The value of $\beta/2$ should be taken as 0,5%.

6.5.1.2 Conformance requirements

The occupied bandwidth shall be less than 5 MHz based on a chip rate of 3,84 Mcps.

The reference for this requirement is TS 25.104 subclause 6.6.1.

6.5.1.3 Test purpose

The occupied bandwidth, defined in the Radio Regulations of the International Telecommunication Union ITU, is a useful concept for specifying the spectral properties of a given emission in the simplest possible manner; see also Recommendation ITU-R Recommendation SM.328-9 [7]. The test purpose is to verify that the emission of the BS does not occupy an excessive bandwidth for the service to be provided and is, therefore, not likely to create interference to other users of the spectrum beyond undue limits.

6.5.1.4 Method of test

6.5.1.4.1 Initial conditions

- 1) Connect the Measurement device to the BS antenna connector.
- 2) Start transmission on a single carrier according to test model defined in subclause 6.1.1.1.

6.5.1.4.2 Procedure

- 1) Measure the spectrum of the transmitted signal across a span of 10 MHz, based on an occupied bandwidth requirement of 5 MHz. The selected resolution bandwidth (RBW) filter of the analyzer shall be 30 kHz or less. The spectrum shall be measured at 400 or more points across the measurement span.

NOTE: The detection mode of the spectrum analyzer will not have any effect on the result if the statistical properties of the out-of-OBW power are the same as those of the inside-OBW power. Both are expected to have the Rayleigh distribution of the amplitude of Gaussian noise. In any case where the statistics are not the same, though, the detection mode must be power responding. There are at least two ways to be power responding. The spectrum analyzer can be set to "sample" detection, with its video bandwidth setting at least three times its RBW setting. Or the analyzer may be set to respond to the average of the power (root-mean-square of the voltage) across the measurement cell.

- 2) Compute the total of the power, P_0 , (in power units, not decibel units) of all the measurement cells in the measurement span. Compute P_1 , the power outside the occupied bandwidth on each side. P_1 is half of the total power outside the bandwidth. P_1 is half of $(100\% - (\text{occupied percentage}))$ of P_0 . For the occupied percentage of 99 %, P_1 is 0.005 times P_0 .
- 3) Determine the lowest frequency, f_1 , for which the sum of all power in the measurement cells from the beginning of the span to f_1 exceeds P_1 .
- 4) Determine the highest frequency, f_2 , for which the sum of all power in the measurement cells from the end of the span to f_2 exceeds P_1 .
- 5) Compute the occupied bandwidth as $f_2 - f_1$.

6.5.1.5 Test requirements

The bandwidth calculated in step (5) of subclause 6.5.1.4.2 shall be less than 5 MHz.

6.5.2 Out of band emission

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 power ratio for the transmitter.

6.5.2.1 Spectrum emission mask

NOTE: This subclause may be mandatory in certain regions. In other regions this mask may not be applied.

6.5.2.1.1 Definitions and applicability

The mask defined in Tables 6.3 to 6.6 below may be mandatory in certain regions. In other regions this mask may not be applied.

6.5.2.1.2 Conformance requirements

For regions where this clause applies, 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 6.11 to 6.14 for the appropriate BS maximum output power, in the frequency range from $\Delta f = 2.5$ MHz to $f_{\text{offset}_{\text{max}}}$ from the carrier frequency, where:

- Δf 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;
- $f_{\text{offset}_{\text{max}}}$ is either 12.5 MHz or the offset to the UMTS Tx band edge as defined in subclause 3.4.1, whichever is the greater.

f_{offset} is the separation between the carrier frequency and the centre of the measuring filter.

Table 6.11: Spectrum emission mask values, BS maximum output power $P \geq 43$ dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2.5 \leq \Delta f < 2.7$ MHz	$2.515\text{MHz} \leq f_{\text{offset}} < 2.715\text{MHz}$	-14 dBm	30 kHz
$2.7 \leq \Delta f < 3.5$ MHz	$2.715\text{MHz} \leq f_{\text{offset}} < 3.515\text{MHz}$	$-14 - 15 \cdot (f_{\text{offset}} - 2.715)$ dBm	30 kHz
	$3.515\text{MHz} \leq f_{\text{offset}} < 4.0\text{MHz}$	-26 dBm	30 kHz
$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0\text{MHz}$	-13 dBm	1 MHz
$7.5 \leq \Delta f$ MHz	$8.0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-13 dBm	1 MHz

Table 6.12: Spectrum emission mask values, BS maximum output power $39 \leq P < 43$ dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2.5 \leq \Delta f < 2.7$ MHz	$2.515\text{MHz} \leq f_{\text{offset}} < 2.715\text{MHz}$	-14 dBm	30 kHz
$2.7 \leq \Delta f < 3.5$ MHz	$2.715\text{MHz} \leq f_{\text{offset}} < 3.515\text{MHz}$	$-14 - 15 \cdot (f_{\text{offset}} - 2.715)$ dBm	30 kHz
	$3.515\text{MHz} \leq f_{\text{offset}} < 4.0\text{MHz}$	-26 dBm	30 kHz
$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0\text{MHz}$	-13 dBm	1 MHz
$7.5 \leq \Delta f$ MHz	$8.0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 56$ dBm	1 MHz

Table 6.13: Spectrum emission mask values, BS maximum output power $31 \leq P < 39$ dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2.5 \leq \Delta f < 2.7$ MHz	$2.515\text{MHz} \leq f_{\text{offset}} < 2.715\text{MHz}$	P - 53 dBm	30 kHz
$2.7 \leq \Delta f < 3.5$ MHz	$2.715\text{MHz} \leq f_{\text{offset}} < 3.515\text{MHz}$	$P - 53 - 15(f_{\text{offset}} - 2.715)$ dBm	30 kHz
	$3.515\text{MHz} \leq f_{\text{offset}} < 4.0\text{MHz}$	P - 65 dBm	30 kHz
$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0\text{MHz}$	P - 52 dBm	1 MHz
$7.5 \leq \Delta f$ MHz	$8.0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	P - 56 dBm	1 MHz

Table 6.14: 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
$2.5 \leq \Delta f < 2.7$ MHz	$2.515\text{MHz} \leq f_{\text{offset}} < 2.715\text{MHz}$	-22 dBm	30 kHz
$2.7 \leq \Delta f < 3.5$ MHz	$2.715\text{MHz} \leq f_{\text{offset}} < 3.515\text{MHz}$	$-22 - 15(f_{\text{offset}} - 2.715)$ dBm	30 kHz
	$3.515\text{MHz} \leq f_{\text{offset}} < 4.0\text{MHz}$	-34 dBm	30 kHz
$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0\text{MHz}$	-21 dBm	1 MHz
$7.5 \leq \Delta f$ MHz	$8.0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-25 dBm	1 MHz

6.5.2.1.3 Test purpose

The purpose of this test is to verify that the BS meet the spectrum emission requirements as specified in TS 25.104, subclause 6.6.2.1.

6.5.2.1.4 Method of test

6.5.2.1.4.1 Initial conditions

- 1) Set-up the equipment as shown in annex A.
- 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 $(\Delta f_{\text{max}} - 500 \text{ kHz})$. shall use a 1 MHz measurement bandwidth. The 1MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements
- 4) Detection mode: True RMS.

6.5.2.1.5 Procedures

- 1) Set the BS to transmit a signal in accordance to test model 1, subclause 6.2.1.1.1 at by the manufacturer 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.

6.5.2.1.6 Test requirements

In all measurements, the requirements according to subclause 6.5.2.1.2 shall be fulfilled.

6.5.2.2 Adjacent Channel Leakage power Ratio (ACLR)

6.5.2.2.1 Definition and applicability

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the transmitted power to the power measured after a receiver filter in the adjacent channel(s). Both the transmitted power and the received power are measured through a matched filter (Root Raised Cosine and roll-off 0.22) with a noise power bandwidth equal to the chip rate. The requirements 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.

6.5.2.2.2 Conformance requirement

Table 6.15: BS ACLR

BS channel offset below the first or above the last carrier frequency used	ACLR limit
5 MHz	45 dB
10 MHz	50 dB

6.5.2.2.3 Test purpose

To verify that the adjacent channel leakage power ratio requirement shall be met as specified in subclause 6.5.2.2.2.

6.5.2.2.4 Method of test

6.5.2.2.4.1 Initial conditions

- 1) Connect measurement device to the base station RF output port as shown in annex B.
- 2) The measurement device characteristics shall be:
 - measurement filter bandwidth: defined in subclause 6.5.2.2.1;
 - detection mode: true RMS voltage or true average power.
- 3) Set the base station to transmit a signal modulated in accordance with 6.1.1.1 Test model 1. Total 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.

6.5.2.2.4.2 Procedure

- 1) 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.
- 2) All RF channel configurations supported by BS shall be verified.

6.5.2.2.5 Test requirement

Adjacent channel leakage power ratio requirement shall be met as specified in subclause 6.5.2.2.2.

6.5.3 Spurious emissions

6.5.3.1 Definition and applicability

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 either subclause 6.5.3.4.1 or subclause 6.5.3.4.2 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 (RMS).

6.5.3.2 Test purpose

This test measures conducted spurious emission from the BS transmitter antenna connector, while the transmitter is in operation.

6.5.3.3 Test case

The BS shall be configured with transmitters active at their maximum output power for all transmission modes foreseen by the manufacturer's specification.

Set the base station to transmit a signal as stated in subclause 6.1.1.1. Total power at the RF Output port shall be the nominal power as specified by the manufacturer.

The transmitter antenna connector shall be connected to a measurement receiver with the same characteristic impedance, using an attenuator or directional coupler if necessary.

The detecting device shall be configured with a measurement bandwidth as stated in the tables.

6.5.3.4 Conformance Requirements

6.5.3.4.1 Spurious emissions (Category A)

The following requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation [4], are applied.

6.5.3.4.1.1 Minimum Requirement

The power of any spurious emission shall be attenuated by at least the minimum requirement.

Table 6.16: BS Mandatory spurious emissions limits, Category A

Band	Maximum level	Measurement Bandwidth	Note
9 kHz to 150 kHz	-13 dBm	1 kHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
150 kHz to 30 MHz		10 kHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
30 MHz to 1 GHz		100 kHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
1 GHz to 12,75 GHz		1 MHz	Upper frequency as in ITU-R SM.329-7, subclause 2.6

6.5.3.4.2 Spurious emissions (Category B)

The following requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation [4], are applied.

6.5.3.4.2.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.17: BS Mandatory spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9 kHz ↔ 150 kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
150 kHz ↔ 30 MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
30 MHz ↔ 1 GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
1 GHz ↔ Fc1 – 60 MHz or 2 100 MHz <i>Whichever is the higher</i>	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1
Fc1 – 60 MHz or 2 100 MHz whichever is the higher ↔ Fc1 – 50 MHz or 2 100 MHz whichever is the higher	-25 dBm	1 MHz	Specification more stringent than ITU-R SM.329-7, subclause 4.1
Fc1 – 50 MHz or 2100 MHz whichever is the higher ↔ Fc2 + 50 MHz or 2180 MHz whichever is the lower	-15 dBm	1 MHz	Specification more stringent than ITU-R SM.329-7, subclause 4.1
Fc2 + 50 MHz or 2180 MHz whichever is the lower ↔ Fc2 + 60 MHz or 2 180 MHz Whichever is the lower	-25 -13 dBm	1 MHz	Specification more stringent than ITU-R SM.329-7, subclause 4.1
Fc2 + 60 MHz or 2 180 MHz <i>Whichever is the lower</i> ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-7, subclause 4.1. Upper frequency as in ITU-R SM.329-7, subclause 2.6
Fc1: Center frequency of first carrier frequency used. Fc2: Center frequency of last carrier frequency used.			

6.5.3.4.3 Protection of the BS receiver

This requirement may be applied in order to prevent the receiver of the BS being desensitised by emissions from the BS transmitter which are coupled between the antennas of the BS.

This requirement assumes the scenario described in [2]. For different scenarios, the manufacturer may declare a different requirement.

This requirement is not applicable to antenna ports which are used for both transmission and reception (e.g. which have an internal duplexer).

NOTE: In this case, the measurement of Reference Sensitivity will directly show any desensitization of the receiver.

6.5.3.4.3.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.18: BS Spurious emissions limits for protection of the BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
1 920 MHz to 1 980 MHz For operation in Frequency Bands defined in subclause 3.4.1(a)	-96 dBm	100 kHz	
1 850 MHz to 1 910 MHz For operation in Frequency Bands defined in subclause 3.4.1(b)	-96 dBm	100kHz	

6.5.3.4.4 Co-existence with GSM 900

6.5.3.4.4.1 Operation in the same geographic area

This requirement may be applied for the protection of GSM 900 MS in geographic areas in which both GSM 900 and UTRA are deployed.

This requirement assumes the scenario described in [2]. For different scenarios, the manufacturer may declare a different requirement.

6.5.3.4.4.1.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.19: BS Spurious emissions limits for BS in geographic coverage area of GSM 900

Band	Maximum Level	Measurement Bandwidth	Note
921 MHz to 960 MHz	-47 dBm	100 kHz	

6.5.3.4.4.2 Co-located base stations

This requirement may be applied for the protection of GSM 900 BS receivers when GSM 900 BS and UTRA BS are co-located.

6.5.3.4.4.2.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.20: BS Spurious emissions limits for protection of the BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
876 MHz to 915 MHz	-98 dBm	100 kHz	

6.5.3.4.5 Co-existence with DCS 1800

6.5.3.4.5.1 Operation in the same geographic area

This requirement may be applied for the protection of DCS 1800 MS in geographic areas in which both DCS 1800 and UTRA are deployed.

This requirement assumes the scenario described in [2]. For different scenarios, the manufacturer may declare a different requirement.

6.5.3.4.5.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.21: BS Spurious emissions limits for BS in geographic coverage area of DCS 1800

Band	Maximum Level	Measurement Bandwidth	Note
1 805 MHz to 1 880 MHz	-57 dBm	100 kHz	

6.5.3.4.5.2 Co-located basestations

This requirement may be applied for the protection of DCS 1800 BS receivers when DCS 1800 BS and UTRA BS are co-located.

6.5.3.4.5.2.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.22: BS Spurious emissions limits for BS co-located with DCS 1800 BTS

Band	Maximum Level	Measurement Bandwidth	Note
1 710 MHz to 1 785 MHz	-98 dBm	100 kHz	

6.5.3.4.6 Co-existence with PHS

This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA are deployed.

6.5.3.4.6.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.23: BS Spurious emissions limits for BS in geographic coverage area of PHS

Band	Maximum Level	Measurement Bandwidth	Note
1 893,5 MHz to 1 919,60 MHz	-41 dBm	300 kHz	

6.5.3.4.7 Co-existence with services in adjacent frequency bands

This requirement may be applied for the protection in bands adjacent to 2 110 MHz to 2 170 MHz, as defined in subclause 3.4.1(a) and 1 930 MHz to 1 990 MHz, as defined in subclause 3.4.1(b) in geographic areas in which both an adjacent band service and UTRA are deployed.

6.5.3.4.7.1 Minimum requirement

The power of any spurious emission shall not exceed.

Table 6.24: BS spurious emissions limits for protection of adjacent band services

Band (f)	Maximum Level	Measurement Bandwidth	Note
2 100 MHz to 2 105 MHz For operation in frequency bands as defined in subclause 3.4.1(a)	$-30 + 3,4 (f - 2 100 \text{ MHz}) \text{ dBm}$	1 MHz	
2 175 MHz to 2 180 MHz For operation in frequency bands as defined in subclause 3.4.1(a)	$-30 + 3,4 (2 180 \text{ MHz} - f) \text{ dBm}$	1 MHz	
1 920 MHz to 1 925 MHz For operation in frequency bands as defined in subclause 3.4.1(b)	$-30 + 3,4 (f - 1 930 \text{ MHz}) \text{ dBm}$	1 MHz	
1 995 MHz to 2 000 MHz For operation in frequency bands as defined in subclause 3.4.1(b)	$-30 + 3,4 (2 000 \text{ MHz} - f) \text{ dBm}$	1 MHz	

6.5.3.4.8 Co-existence with UTRA-TDD

6.5.3.4.8.1 Operation in the same geographic area

This requirement may be applied to geographic areas in which both UTRA-TDD and UTRA-FDD are deployed.

6.5.3.4.8.1.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.25: BS Spurious emissions limits for BS in geographic coverage area of UTRA-TDD

Band	Maximum Level	Measurement Bandwidth	Note
1 900 MHz to 1 920 MHz	-52 dBm	1 MHz	
2 010 MHz to 2 025 MHz	-52 dBm	1 MHz	

6.5.3.4.8.2 Co-located base stations

This requirement may be applied for the protection of UTRA-TDD BS receivers when UTRA-TDD BS and UTRA FDD BS are co-located.

6.5.3.4.8.2.1 Minimum Requirement

The power of any spurious emission shall not exceed.

Table 6.26: BS Spurious emissions limits for BS co-located with UTRA-TDD

Band	Maximum Level	Measurement Bandwidth	Note
1 900 MHz to 1 920 MHz	-86 dBm	1 MHz	
2 010 MHz to 2 025 MHz	-86 dBm	1 MHz	

6.6 Transmit intermodulation

6.6.1 Definition and applicability

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 level of 30 dB lower than that of the wanted signal. The frequency of the interference signal shall be 5 MHz, 10 MHz and 15 MHz offset below the first or above the last carrier frequency used.

The requirements are applicable for single carrier BS.

< Editor's note: Multi Carrier case to be specified. >

6.6.2 Conformance requirement

The transmit intermodulation level shall not exceed the out of band emission or the spurious emission requirements of subclauses 6.5.2 and 6.5.3.

6.6.3 Test purpose

The purpose of this test is to verify that the BS meet the transmit intermodulation requirements as specified in TS 25.104, subclause 6.7.

6.6.4 Method of test

6.6.4.1 Initial conditions

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

6.6.4.2 Procedures

- 1) Generate the wanted signal in accordance to test model 1, subclause 6.1.1.1 at specified maximum BS output power.
- 2) Generate the interference signal (WCDMA signal as specified in the table 6.1 and 6.2 (Test model 1)) with frequency offset of 5 MHz relative to the wanted signal in accordance to test model 2, subclause 6.1.1.2.
- 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 test as specified in subclause 6.5.2.
- 5) Perform the spurious emission test as specified in subclause 6.5.3.
- 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 off set of -5 MHz.
- 8) Repeat the test for interference frequency off set of ± 10 MHz and ± 15 MHz.

6.7 Transmit modulation

6.7.1 Error Vector Magnitude

6.7.1.1 Definition and applicability

The Error Vector Magnitude is a measure of the difference between the theoretical waveform and a modified version of the measured waveform. The modification is done according to annex E. This difference is called the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the modified mean reference signal power expressed as a %. The measurement interval is one power control group (timeslot).

6.7.1.2 Conformance Requirement

The Error Vector Magnitude shall be less than 17.5%

6.7.1.3 Test Purpose

To verify that the Error Vector Magnitude is within the limit specified in 6.7.1.2

6.7.1.4 Method of Test

Refer to annex B for a functional block diagram of the test set-up.

- 1) Connect the base station RF output port to the measurement equipment.
- 2) Set the base station to transmit a signal according to 6.2.1.3.1 (test model 4) on the main path only. Total power at the RF output port shall be $P_{max}-3dB$ and $P_{max}-18dB$.
- 3) Trigger the test equipment from the system time reference signal from the base station.
<Editor's note: Precise definition of "Triggering signal" shall be needed.>
4. Measure the Error Vector Magnitude as defined in annex E.

5. If the base station supports STTD or TxAA, repeat steps 1 through 4 with the diversity path (antenna connector 2) enabled instead of the main path

6.7.1.5 Test Requirement

The Error Vector Magnitude measured in 6.7.2.4 step 4 shall meet the limit specified in 6.7.2.2

6.7.2 Peak Code Domain Error

6.7.2.1 Definition and applicability

The Peak Code Domain Error is computed by projecting the error vector (as defined in 6.7.1) onto the code domain at a specific spreading factor. The Code Domain Error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. The measurement interval is one power control group (timeslot).

6.7.2.2 Conformance requirement

The peak code domain error shall not exceed -33 dB at spreading factor 256.

6.7.2.3 Test Purpose

It is the purpose of this test to discover and limit inter-code cross-talk.

6.7.2.4 Method of test

6.7.2.4.1 Initial conditions

- 1) Connect the measurement equipment to the BS antenna connector as shown in annex B. For non-transmit diversity modes, connect the antenna connector as shown in Figure B.2. If STTD or TxAA is supported by the BS, connect both antenna connectors as shown in Figure B.6.
- 2) Channel configuration defined in subclause 6.1.1.3 Test model 3 shall be used.
<Suggested Editor's Note: Changes to Test model 3 for TD tests are ffs>
- 3) Set BS frequency.
- 4) Start BS transmission

6.7.2.4.2 Procedure

- 1) Measure Peak code domain error according to annex E.

6.7.2.5 Test requirement

Peak code domain error shall meet the requirement as specified in subclause 6.7.2.2.

7 Receiver characteristics

7.1 General

Unless otherwise stated, all tests in this clause shall be performed at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a RX amplifier, a diplexer, a filter or the combination of such devices is used, the tests according to subclauses 4.6.2 and/or 4.6.4, depending on the device added, shall be performed to ensure that the requirements are met at test port B.

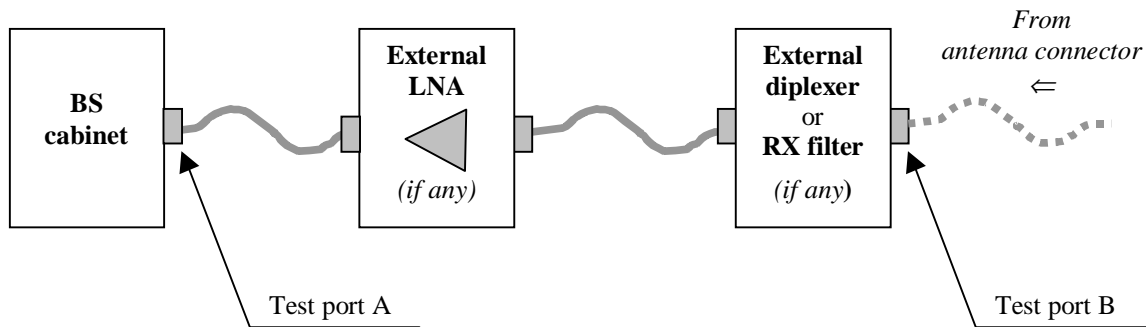


Figure 7.1: Receiver test ports

The tests in clause 7 assume that the receiver is not equipped with diversity. For receivers with diversity, unless otherwise stated, tests shall be performed by applying the specified signals to one of the receiver inputs, and terminating or disabling the other(s). The tests and requirements are otherwise unchanged.

In all the relevant subclauses in this clause all Bit Error Ratio (BER), Residual BER (RBER) and Block Error Ratio (BLER) measurements shall be carried out according to the general rules for statistical testing in annex A.

If external BER measurement is not used then the internal BER calculation shall be used instead. When internal BER calculation is used, the requirements of the verification test according to 7.8 shall be met in advance.

In tests performed with signal generators a synchronization signal may be provided, from the base station to the signal generator, to enable correct timing of the wanted signal.

7.2 Reference sensitivity level

7.2.1 Definition and applicability

The reference sensitivity is the minimum receiver input power measured at the antenna connector at which the BER does not exceed the specific value indicated in subclause 7.2.2. This test is performed without interfering signal with power applied to the BS antenna connector according to annex B. In the case duplex operation is supported, the measurement configuration principle is indicated for one duplex branch also in Annex B. In case of internal BER calculation is used example of test connection is as shown in figure B.7 The reference point for signal power is at the input of receiver (antenna connector).

7.2.2 Conformance requirement

The BER shall not exceed 0,001 for the parameters specified in table 7.1. The reference for this requirement is in TS 25.104 [1] subclause 7.3.1.

Table 7.1: BS reference sensitivity levels

Data rate	BS reference sensitivity level (dBm)	FER/BER
12,2 kbps	-121 dBm	BER shall not exceed 0,001
NOTE: Should only be specified for a measurement channel.		

7.2.3 Test purpose

To verify that the BS shall meet receiver sensitivity requirement as specified TS 25.104 [1] subclause 7.3.1.

7.2.4 Method of testing

7.2.4.1 Initial conditions

- 1) Connect BS to be tested to RF signal source.

- 2) Set frequency.
- 3) Start transmit 12,2kbps DPCH with reference measurement channel defined in annex A to the BS under test (PN-9 data sequence or longer).
- 4) Disable TPC function.

7.2.4.2 Procedure

- 1) Calculate BER from at least 30000 received data bits.
- 2) Set test signal power level transmitted for corresponding data rate as specified in table 7.1.
- 3) Measure BER.

7.2.5 Test requirement

Requirements for RX reference sensitivity specified in subclause 7.2.2 shall be fulfilled.

7.3 Dynamic range

7.3.1 Definition and applicability

Receiver dynamic range is the receiver ability to handle a rise of interference in the reception frequency channel. The receiver shall fulfil a specified BER requirement for a specified sensitivity degradation of the wanted signal in the presence of an interfering AWGN signal in the same reception frequency channel.

Minimum bandwidth of AWGN interferer shall be 1.5 times chip rate –5.76 MHz for a chip rate of 3.84 MHz.

7.3.2 Conformance requirement

The BER shall not exceed 0,001 for the parameters specified in table 7.2.

Table 7.2: Dynamic range

Parameter	Level	Unit
Data rate	12,2	kbps
Wanted signal	-91	dBm
Interfering AWGN signal	-73	dBm/3.84 MHz

7.3.3 Test purpose

The purpose of this test is to verify that the BS meet the dynamic range requirement as specified in TS 25.104, subclause 7.3.

7.3.4 Method of test

7.3.4.1 Initial conditions

- 1) Connect the test equipment as shown in annex B.

7.3.4.2 Procedure

- 1) Adjust the signal generator for the wanted signal to -91 dBm.
- 2) Adjust the AWGN generator level to -73 dBm/3.84 MHz and set the frequency to the same frequency as the tested channel.

- 3) Measure the BER for the tested service and verify that it is below the specified level.

Repeat the measurement for the other RX port.

7.3.5 Test requirements

Dynamic range requirement shall be met as specified in subclause 7.3.2

7.4 Adjacent Channel Selectivity (ACS)

7.4.1 Definition and applicability

Adjacent channel selectivity (ACS) is a measure of the receiver 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 center frequency of the assigned channel. ACS is the ratio of the receiver filter attenuation on the assigned channel frequency to the receiver filter attenuation on the adjacent channel(s).

The interference signal is detuned by F_{uw} MHz and modulated by a pseudo random binary sequence uncorrelated to the wanted signal.

7.4.2 Conformance requirement

The BER shall not exceed 0.001 for the parameters specified in the table

Table 7.3: Adjacent channel selectivity

Parameter	Level	Unit
Data rate	12.2	kbps
Wanted signal	-115	dBm
Interfering signal	-52	dBm
F_{uw} (Modulated)	± 5	MHz

7.4.3 Test purpose

The purpose of this test is to verify that the BS meets the dynamic range requirement as specified in TS 25.104, subclause 7.4.

7.4.4 Method of test

7.4.4.1 Initial conditions

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

7.4.4.2 Procedure

- 1) Generate the reference channel and adjust the ATT1 to set the input level to the base station under test to the specified -115 dBm.
- 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. 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. The interference signal shall be wide band CDMA signal of single code.
- 3) Measure the BER and control that the measured value does not exceed the specified value ($BER < 0,001$).
- 4) Repeat the test for the port, which was terminated.

7.4.5 Test requirements

Adjacent channel selectivity requirement shall be met as specified in subclause 7.4.2

7.5 Blocking characteristics

7.5.1 Definition and applicability

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 shall apply at all frequencies as specified in table 7.4.

The requirements in this subclause shall apply to base stations intended for general-purpose applications.

7.5.2 Conformance requirements

The BER shall not exceed 0.001 for the parameters specified in table 7.4.

Table 7.4(a): Blocking characteristics for operation in frequency bands in subclause 3.4.1(a)

Center Frequency of Interfering Signal	Interfering Signal Level	Wanted Signal Level	Minimum Offset of Interfering Signal	Type of Interfering Signal
1 920 MHz to 1 980 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1 900 MHz to 1 920 MHz 1 980 MHz to 2 000 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1 MHz to 1 900 MHz and 2 000 MHz to 12 750 MHz	-15 dBm	-115 dBm	-	CW carrier

Table 7.4(b): Blocking performance requirement for operation in frequency bands in subclause 3.4.1(b)

Center Frequency of Interfering Signal	Interfering Signal Level	Wanted Signal Level	Minimum Offset of Interfering Signal	Type of Interfering Signal
1 850 MHz to 1 910 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1 830 MHz to 1 850 MHz 1 910 MHz to 1 930 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1 MHz to 1 830 MHz 1 930 MHz to 12 750 MHz	-15 dBm	-115 dBm	-	CW carrier

7.5.3 Test purpose

The test stresses the ability of the BS receiver to withstand high-level interference from unwanted signals at frequency offsets of 10 MHz or more, without undue degradation of its sensitivity.

7.5.4 Method of test

7.5.4.1 Initial conditions

- 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 annex A subclause A.2.1. The level of the WCDMA signal measured at the BS antenna connector shall be set to the level specified in subclause 7.5.2.

7.5.4.2 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 center 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 center frequency, as specified in table 7.5.2.1. 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 7.5.2.1.

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

NOTE: The test procedure as defined in steps (1) and (2) requests to carry out more than 10 000 BER measurements. To reduce the time needed for these measurements, it may be appropriate to conduct the test in two phases: During phase 1, BER measurements are made on all center frequencies of the interfering signal as requested but with a reduced confidence level, with the aim to identify those frequencies which require more detailed investigation. In phase 2, detailed measurements are made only at those critical frequencies identified before, applying the required confidence level.

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

<Editor's note: The above NOTE is taken from proposal for TDD specification (R4-99789). Precise parameters for this 2-phase measurement shall be specified. >

7.5.5 Test requirements

In all measurements made according to subclause 7.5.4.2, the BER shall not exceed 0,001.

7.6 Intermodulation characteristics

7.6.1 Definition and applicability

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 receive 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.

7.6.2 Conformance requirement

The intermodulation performance should be met when the following signals are applied to the receiver.

Table 7.5: Interferer signals for intermodulation performance requirement

Type of Signal	Offset	Signal level
Wanted signal	-	-115 dBm
CW signal	10 MHz	-48 dBm
WCDMA signal with one code	20 MHz	-48 dBm

The BER for wanted signal shall not exceed 0,001 for the parameters specified in table 7.5.

7.6.3 Test purpose

The purpose of this test is to verify that the BS meet the intermodulation characteristics requirements as specified in TS 25.104, subclause 7.6.

7.6.4 Method of test

7.6.4.1 Initial conditions

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

7.6.4.2 Procedures

- 1) Generate the wanted signal (reference signal) and adjust ATT1 to set the signal level to the BS under test to the specified -115 dBm.
- 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 if possible.
- 3) Adjust the ATT2 and ATT3 to obtain the specified level of interference signal at the BS input.
- 4) Measure the BER and control that the measured value does not exceed the specified value.
- 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.

7.6.5 Test requirements

The BER for wanted signal shall not exceed 0,001.

7.7 Spurious Emissions

7.7.1 Definition and applicability

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 subclause 6.6.3 is valid.

7.7.2 Conformance requirements

The power of any spurious emission shall not exceed:

Table 7.7: Spurious emission minimum requirement

Band	Maximum level	Measurement Bandwidth	Note
1900 – 1980 MHz and 2010 – 2025 MHz	-78 dBm	3.84 MHz	
9 kHz – 1 GHz	-57 dBm	100 kHz	
1 GHz – 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.

7.7.3 Test purpose

To verify that the BS spurious emission meets the specifications described in subclause 7.7.2.

7.7.4 Method of test

7.7.4.1 Initial conditions

- 1) Connect a measurement receiver to the BS antenna connector as shown in annex B.
- 2) Enable the BS receiver.
- 3) Start BS transmission with channel configuration as specified in the table 6.1 and 6.2 (Test model 1).

7.7.4.2 Procedure

- 1) Set measurement equipment parameters as specified in table 7.6.
- 2) Measure the spurious emissions over each frequency range described in subclause 7.7.2.
- 3) Repeat test using diversity antenna connector if available.

Table 7.6

Measurement Band width	3.84 MHz (Root raised cosine,0.22) / 100 kHz (note)
Sweep frequency range	9 kHz to 12.75GHz
Detection	True RMS
NOTE: As defined in subclause 7.7.2.	

7.7.5 Test requirements

The all measured spurious emissions, derived in step (2), shall be within requirement limits as specified in subclause 7.7.2.

7.8 Verification of the internal BER calculation

7.8.1 Definition and applicability

Base Station System with internal BER calculation can synchronise it's receiver to known pseudo-random data sequence and calculates bit error ratio from the received data. This test is performed only if Base Station System has this kind of feature. All data rate's which are used in RX conformance testing shall be used in verification test. This test is performed by feeding measurement signal with known BER to the input of the receiver. Locations of the erroneous bits shall be randomly distributed within a frame. Erroneous bits shall be inserted to the data bit stream as shown in figure 7.1.

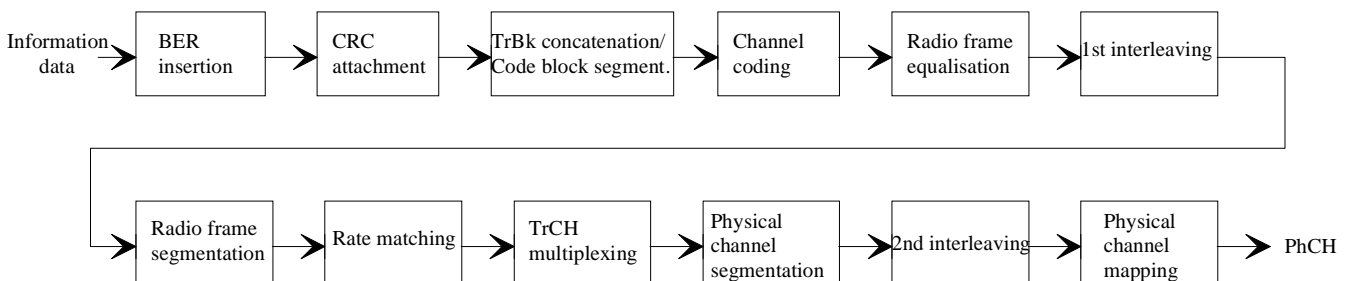


Figure 7.1: BER insertion into the information data

7.8.2 Conformance requirement

BER indicated by the Base Station System shall be within $\pm[10\%]$ of the BER generated by the RF signal source. Measurement shall be repeated for each measurement signal specified in table 7.7.

Table 7.7

Transport channel combination	Data rate	BER
DPCH	12,2 kbps	BER 0,01
TBD	TBD	TBD
...
NOTE: 10 times larger BER generator is used to get a good confidence.		

7.8.3 Test purpose

To verify that the internal BER calculation accuracy shall meet requirements for conformance testing.

7.8.4 Method of test

7.8.4.1 Initial conditions

- 1) Connect BS RX antenna connector to the RF signal source or UE simulator as shown in annex B.
- 2) Set correct signal source parameters as specified in table 7.8.

Table 7.8

Parameter	Level/status	Unit
UL signal level	Ref.sens +10 dB	dBm/3,84 MHz
Data sequence	PN9 or longer	

7.8.4.2 Procedure

- 1) Measure the BER of received signal from RF signal source or UE simulator to BS antenna connector.
- 2) BER calculation shall be done at least over 50 000 bits.
- 3) Repeat test for all required data rates.

7.8.5 Test requirement

BER indicated by the Base Station System shall be within requirement as specified in subclause 7.8.2.

8 Performance requirement

8.1 General

All Bit Error Ratio (BER) and Block Error ratio (BLER) measurements shall be carried out according to the general rules for statistical testing defined in ITU-T Recommendation O.153 [5].

If external BLER measurement is not used then the internal BLER calculation shall be used instead. When internal BLER calculation is used, the requirements of the verification test according to 8.6 shall be met in advance.

Performance requirements are specified for a number of test environments and multi-path channel classes.

The requirements only apply to those measurement channels that are supported by the base station.

The requirements only apply to a base station with dual receiver antenna diversity. The required E_b/N_0 shall be applied separately at each antenna port.

In tests performed with signal generators a synchronization signal may be provided, from the base station to the signal generator, to enable correct timing of the wanted signal.

8.2 Demodulation in static propagation conditions

8.2.1 Demodulation of DCH

8.2.1.1 Definition and applicability

The performance requirement of DCH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

8.2.1.2 Conformance requirement

The BLER should not exceed the limit for the E_b/N_0 specified in table 8.1.

Table 8.1: Performance requirements in AWGN channel.

Measurement channel data rate (R_b)	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
12.2 kbps	n.a.	5.1 dB
64 kbps	1.5 dB	1.7 dB
144 kbps	0.8 dB	0.9 dB
384 kbps	0.9 dB	1.0 dB

The reference for this requirement is TS 25.104 subclause 8.2.1.1.

8.2.1.3 Test purpose

The test shall verify the receiver's ability to receive the test signal under static propagation conditions with a BLER not exceeding a specified limit.

8.2.1.4 Method of test

8.2.1.4.1 Initial conditions

- 1) Connect the BS tester generating the wanted signal and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

8.2.1.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) Adjust the equipment so that required E_b/N_0 specified in table 8.1 is achieved. To achieve the specified E_b/N_0 , the wanted signal level at the BS input should be adjusted to: $-84 + 10 \cdot \log_{10}(R_b / 3.84 \cdot 10^6) + E_b/N_0$ [dBm]. The wanted signal levels at the BS input for the specified E_b/N_0 levels in table 8.1 is found in table 8.2

Table 8.2: Wanted signal levels in AWGN channels.

Measurement channel data rate (R_b)	Wanted signal level for required BLER $< 10^{-1}$	Wanted signal level for required BLER $< 10^{-2}$
12.2 kbps	n.a.	-103.9 dBm
64 kbps	-100.3 dBm	-100.1 dBm
144 kbps	-97.5 dBm	-97.4 dBm
384 kbps	-93.1 dBm	-93 dBm

4) For each of the data rates in table 8.1 applicable for the base station, measure the BLER.

8.2.1.5 Test requirements

The BLER measured according to subclause 8.2.1.4.2 shall not exceed the limits specified in table 8.1.

8.3 Demodulation of DCH in multipath fading conditions

8.3.1 Multipath fading Case 1

8.3.1.1 Definition and applicability

The performance requirement of DCH in multipath fading Case 1 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

8.3.1.2 Conformance requirement

The BLER should not exceed the limit for the E_b/N_0 specified in table 8.3.

Table 8.3: Performance requirements in multipath Case 1 channel

Measurement channel data rate (R_b)	E_b/N_0 for required BLER $< 10^{-1}$	E_b/N_0 for required BLER $< 10^{-2}$
12.2 kbps	n.a.	11.9 dB
64 kbps	6.2 dB	9.2 dB
144 kbps	5.4 dB	8.4 dB
384 kbps	5.8 dB	8.8 dB

The reference for this requirement is TS 25.104 subclause 8.3.1.1

8.3.1.3 Test Purpose

The test shall verify the receiver's ability to receive the test signal under slow multipath fading propagation conditions with a BLER not exceeding a specified limit.

8.3.1.4 Method of test

8.3.1.4.1 Initial conditions

- 1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

8.3.1.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required E_b/N_0 specified in table 8.3 is achieved. To achieve the specified E_b/N_0 , the wanted signal level at the BS input should be adjusted to: $-84+10*\text{Log}_{10}(R_b/3.84*10^6)+E_b/N_0$ [dBm]. The wanted signal levels at the BS input for the specified E_b/N_0 levels in table 8.3 is found in table 8.4

Table 8.4: Wanted signal levels in multipath Case 1 channel

Measurement channel data rate (R_b)	Wanted signal level for required BLER < 10^{-1}	Wanted signal level for required BLER < 10^{-2}
12.2 kbps	n.a.	-97,1 dBm
64 kbps	-95.6 dBm	-92.6 dBm
144 kbps	-92.9 dBm	-89.9 dBm
384 kbps	-88.2 dBm	-85.2 dBm

- 5) For each of the data rates in table 8.3 applicable for the base station, measure the BLER.

8.3.1.5 Test requirements

The BLER measured according to subclause 8.3.1.4.2 shall not exceed the limits specified in table 8.2.

8.3.2 Multipath fading Case 2

8.3.2.1 Definition and applicability

The performance requirement of DCH in multipath fading Case 2 is determined by the maximum Block Error Rate (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The requirement in this subclause shall apply to base stations intended for general purpose applications.

8.3.2.2 Conformance requirement

The BLER should not exceed the limit for the E_b/N_0 specified in table 8.5.

Table 8.5: Performance requirements in multipath Case 2 channel

Measurement channel data rate (R_b)	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
12.2 kbps	n.a.	9.0 dB
64 kbps	4.3 dB	6.4 dB
144 kbps	3.7 dB	5.6 dB
384 kbps	4.1 dB	6.1 dB

The reference for this requirement is TS 25.104 subclause 8.3.2.1.

8.3.2.3 Test Purpose

The test shall verify the receiver's ability to receive the test signal that has a large time dispersion with a BLER not exceeding a specified limit.

8.2.2.4 Method of test

8.3.2.4.1 Initial conditions

- 1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

8.3.2.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required E_b/N_0 specified in table 8.5 is achieved. To achieve the specified E_b/N_0 , the wanted signal level at the BS input should be adjusted to: $-84 + 10 \cdot \log_{10}(R_b / 3.84 \cdot 10^6) + E_b/N_0$ [dBm]. The wanted signal levels at the BS input for the specified E_b/N_0 levels in table 8.5 is found in table 8.6.

Table 8.6: Wanted signal levels in multipath Case 2 channel

Measurement channel data rate (R_b)	Wanted signal level for required BLER < 10^{-1}	Wanted signal level for required BLER < 10^{-2}
12.2 kbps	n.a.	-100 dBm
64 kbps	-97.5 dBm	-95.4 dBm
144 kbps	-94.6 dBm	-92.7 dBm
384 kbps	-89.9 dBm	-87.9 dBm

- 5) For each of the data rates in table 8.5 applicable for the base station, measure the BLER.

8.3.2.5 Test requirements

The BLER measured according to subclause 8.3.1.4.2 shall not exceed the limits specified in table 8.5.

8.3.3 Multipath fading Case 3

8.3.3.1 Definition and applicability

The performance requirement of DCH in multipath fading Case 3 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The requirement in this subclause shall apply to base stations intended for general purpose applications.

8.3.3.2 Conformance requirement

The BLER should not exceed the limit for the E_b/N_0 specified in table 8.7.

Table 8.7: Performance requirements in multipath Case 3 channel

Measurement channel data rate (R_b)	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}	E_b/N_0 for required BLER < 10^{-3}
12.2 kbps	n.a.	6.7 dB	7.5 dB
64 kbps	2.7 dB	3.2 dB	3.4 dB
144 kbps	2.2 dB	2.5 dB	2.8 dB
384 kbps	2.6 dB	3.0 dB	3.5 dB

The reference for this requirement is TS 25.104 subclause 8.3.3.1.

8.3.3.3 Test purpose

The test shall verify the receivers ability to receive the test signal under fast fading propagation conditions with a BLER not exceeding a specified limit.

8.3.3.4 Method of test

8.3.3.4.1 Initial conditions

- 1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

8.3.3.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 4) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 5) Adjust the equipment so that required E_b/N_0 specified in table 8.4 is achieved. To achieve the specified E_b/N_0 , the wanted signal level at the BS input should be adjusted to: $-84 + 10 \cdot \log_{10}(R_b / 3.84 \cdot 10^6) + E_b/N_0$ [dBm]. The wanted signal levels at the BS input for the specified E_b/N_0 levels in table 8.7 is found in table 8.8.

Table 8.8: Performance requirements in multipath Case 3 channel

Measurement channel data rate (R_b)	Wanted signal level for required BLER $< 10^{-1}$	Wanted signal level for required BLER $< 10^{-2}$	Wanted signal level for required BLER $< 10^{-3}$
12.2 kbps	n.a	-102.3 dBm	-101.5 dBm
64 kbps	-99.1 dBm	-98.6 dBm	-98.4 dBm
144 kbps	-96.1 dBm	-95.8 dBm	-95.5 dBm
384 kbps	-91.4 dBm	-91.0 dBm	-90.5 dBm

- 6) For each of the data rates in table 8.7 applicable for the base station, measure the BLER

8.3.3.5 Test requirements

The BLER measured according to subclause 8.3.3.4.2 shall not exceed the limits specified in table 8.7.

8.4 Demodulation of DCH in moving propagation conditions

8.4.1 Definition and applicability

The performance requirement of DCH in moving propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

8.4.2 Conformance requirement

The BLER should not exceed the limit for the E_b/N_0 specified in table 8.9.

Table 8.9: Performance requirements in moving channel

Measurement channel data rate (R_b)	E_b/N_0 for required BLER $< 10^{-1}$	E_b/N_0 for required BLER $< 10^{-2}$
12.2 kbps	n.a.	
64 kbps		

The reference for this requirement is TS 25.104 subclause 8.4.1.

8.4.3 Test purpose

The test shall verify the receiver's ability to receive and track the test signal with a BLER not exceeding the specified limit.

8.4.3.1 Method of test

8.4.3.1.1 Initial conditions

- 1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex D.

8.4.3.1.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required E_b/N_0 specified in table 8.4 is achieved. To achieve the specified E_b/N_0 , the wanted signal level at the BS input should be adjusted to: $-84 + 10 \cdot \log_{10}(R_b / 3.84 \cdot 10^6) + E_b/N_0$ [dBm]. The wanted signal levels at the BS input for the specified E_b/N_0 levels in table 8.9 is found in table 8.10

Table 8.10: Wanted signal levels in moving channel

Measurement channel data rate (R_b)	Wanted signal level for required BLER $< 10^{-1}$	Wanted signal level for required BLER $< 10^{-2}$
12.2 kbps	n.a.	
64 kbps		

- 5) For each of the data rates in table 8.9 applicable for the base station, measure the BLER.

8.4.2.4 Test requirements

The BLER measured according to subclause 8.4.2.3.2 shall not exceed the limits specified in table 8.9.

8.5 Demodulation of DCH in birth/death propagation conditions

8.5.1 Definition and applicability

The performance requirement of DCH in birth/death propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The requirement in this subclause shall apply to base stations intended for general purpose applications.

8.5.2 Conformance requirement

The BLER should not exceed the limit for the E_b/N_0 specified in table 8.11.

Table 8.11: Performance requirements in birth/death channel

Measurement channel data rate (R_b)	E_b/N_0 for required BLER $< 10^{-1}$	E_b/N_0 for required BLER $< 10^{-2}$
12.2 kbps	n.a.	
64 kbps		

The reference for this requirement is TS 25.104 subclause 8.5.1.

8.5.2.1 Test purpose

The test shall verify the receiver's ability to receive the test signal to find new multi path components with a BLER not exceeding the specified limit.

8.5.2.2 Method of test

8.5.2.2.1 Initial conditions

- 1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

8.5.2.2.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required E_b/N_0 specified in table 8.4 is achieved. To achieve the specified E_b/N_0 , the wanted signal level at the BS input should be adjusted to: $-84 + 10 \cdot \log_{10}(R_b / 3.84 \cdot 10^6) + E_b/N_0$ [dBm]. The wanted signal levels at the BS input for the specified E_b/N_0 levels in table 8.11 is found in table 8.12

Table 8.12: Performance requirements in birth/death channel

Measurement channel data rate (R_b)	Wanted signal level for required BLER $< 10^{-1}$	Wanted signal level for required BLER $< 10^{-2}$
12.2 kbps	n.a.	
64 kbps		

- 5) For each of the data rates in table 8.11 applicable for the base station, measure the BLER.

8.5.2.3 Test requirements

The BLER measured according to subclause 8.5.2.2.2 shall not exceed the limits specified in table 8.11.

8.6 Verification of the internal BLER calculation

8.6.1 Definition and applicability

Base Station System with internal BLER calculates block error rate from the CRC blocks of the received. This test is performed only if Base Station System has this kind of feature. All data rates which are used in clause 8 Performance requirement testing shall be used in verification testing. This test is performed by feeding measurement signal with known BLER to the input of the receiver. Locations of the erroneous blocks shall be randomly distributed within a frame. Erroneous bits shall be inserted into the UL signal as shown in figure 8.1.

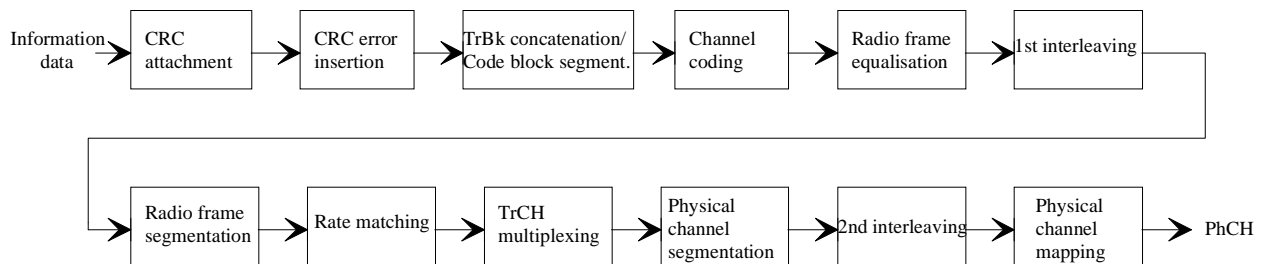


Figure 8.1: BLER insertion to the output data

8.6.2 Conformance requirement

BLER indicated by the Base Station System shall be within $\pm[10\%]$ of the BLER generated by the RF signal source. Measurement shall be repeated for each signal rate as specified in table 8.13.

Table 8.13

Transport channel combination	Data rate	BLER
DPCH	12,2 kbps	BLER 0.01
DPCH	64 kbps	BLER 0.01
DPCH	144 kbps	BLER 0.01
DPCH	384 kbps	BLER 0.01

NOTE: 10 times larger BLER generator is used to get a good confidence.

8.6.3 Test purpose

To verify that the internal BLER calculation accuracy shall met requirements for conformance testing.

8.6.4 Method of test

8.6.4.1 Initial conditions

1) Connect the BS tester generating the wanted signal to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

Table 8.14

Parameter	Level/status	Unit
UL signal level	Ref.sens +10 dB	dBm/3.84 MHz
Data sequence	PN9	

8.6.4.2 Procedure

1) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.

- 2) The BLER insertion to the wanted signal shall be configured according to the corresponding data rate in table 8.7.
- 3) Adjust the BS tester so that the required UL signal level specified in table 8.14 is achieved.

For each of the data rates in table 8.13 applicable for the base station, measure the BLER at least over 50 000 blocks.

8.6.5 Test requirement

BLER indicated by the Base Station System shall be within requirement as specified in subclause 8.6.2.

8.7 Site Selection Diversity Transmission (SSDT) Mode

8.7.1 Definition and applicability

Site Selection Diversity Transmission (SSDT) mode is an optional feature of BS and is a macro diversity method in soft handover mode. In SSDT mode, the UE selects one of the cells from its active set to be “primary”, all other active cells are classed as “non-primary”. The non-primary cells switch off the DCH transmission. The primary cell ID code is delivered to active cells using uplink FBI field of DPCCH.

The requirements and this test apply only to Base Station which has a function of SSDT mode.

8.7.1.1 Conformance requirements

According to the conditions specified in Table 8.15, the downlink DPDCH and DPCCH are properly transmitted or stopped.

Table 8.15: Parameters for SSDT mode test

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Cell ID of BS under test	-	A	A	A	A
SSDT Quality threshold, Q_{th} , set in BS	dB	-5			
Uplink: $\frac{DPCH - E_c}{I_o}$	dB	$Q_{th} + 10$	$Q_{th} + 10$	$Q_{th} - 3$	$Q_{th} - 3$
Cell ID transmitted by UE	-	A	B	A	B
Transmission Of downlink DPCCH	-	Yes	Yes	Yes	yes
Transmission Of downlink DPDCH	-	Yes	No	Yes	yes

The reference for this requirement is in TS 25.104 clause 8.6.

8.7.1.2 Test purpose

To verify that downlink transmission reaction of BS to Layer 1 feedback signalling messages from UE.

8.7.1.3 Method of test

8.7.1.3.1 Initial conditions

1. Connect a UE simulator and an AWGN noise source to the BS antenna connector as shown in Figure B.13.
2. Set up a call according to the Generic call setup procedure using parameters as specified in Table 8.6-1. SSDT Quality threshold Q_{th} should be set to the value specified by the manufacturer.
3. Activate SSDT function.

8.7.1.3.2 Procedure

1. Check downlink DCH, properly transmitted on or off, according to Table 8.6-1 under conditions of Test1 through Test4 with 3 types of Cell ID sets, "long", "medium" and "short", respectively.

8.7.1.3.3 Test Requirements

Downlink DCH of the BS under test shall be transmitted or stopped properly according to the conditions specified in Table 8.9

Annex A (normative): Measurement channels

A.1 Summary of UL reference measurement channels

The parameters for the UL reference measurement channels are specified in Table A.1 and the channel coding is detailed in figure A.1 through A.5 respectively.

NOTE: For all cases, one DPCCH shall be attached to DPDCH(s).

Table A.1: Reference measurement channels for UL DCH

Parameter		DCH for DTCH / DCH for DCCH					Unit
DPDCH	Information bit rate	12,2/2,4	64/2,4	144/2,4	384/2,4	2048/2,4	kbps
	Physical channel	60/15	240/15	480/15	960/15	960/15	kbps
	Spreading factor	64	16	8	4	4	
	Repetition rate	22/22	19/19	8/9	-18/-18	-1/-1	%
	Interleaving	20	40	40	40	80	ms
	Number of DPDCHs	1	1	1	1	6	
DPCCH	Dedicated pilot	6					bit/slot
	Power control	2					bit/slot
	TFCI	2					bit/slot
	Spreading factor	256					
Power ratio of DPCCH/DPDCH		-2,69	-5,46	-9,54	-9,54	-9,54	dB
Amplitude ratio of DPCCH/DPDCH		0,7333	0,5333	0,3333	0,3333	03333	

A.2 UL reference measurement channel for 12,2 kbps

The parameters for the UL reference measurement channel for 12,2 kbps are specified in table A.2 and the channel coding is detailed in figure A.2.

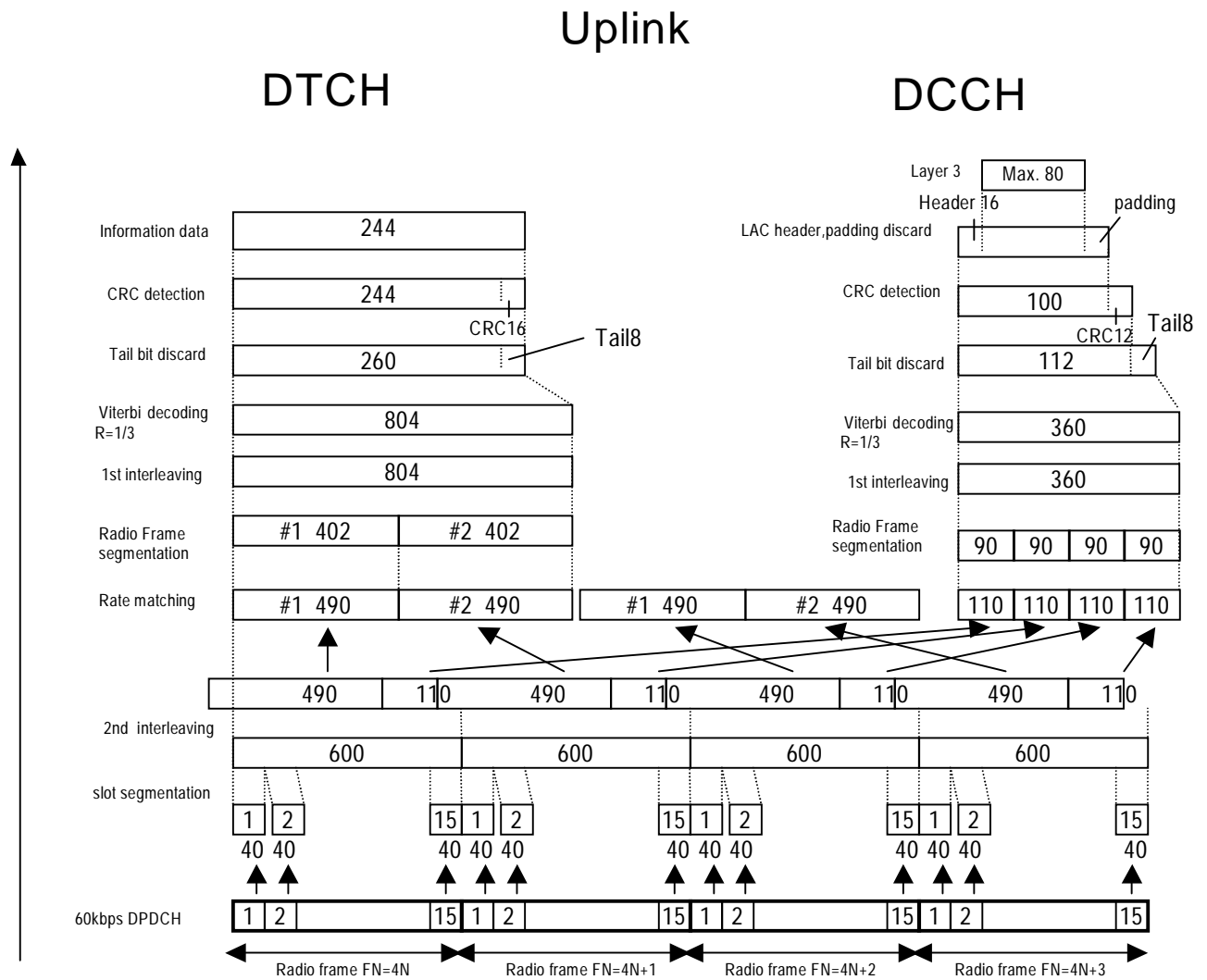


Figure A.2

Table A.2: UL reference measurement channel (12.2 kbps)

Parameter	Level	Unit
Information bit rate	12,2	kbps
DPCH	60	kbps
Power control	Off	
TFCI	On	
Repetition	22	%

A.3 UL reference measurement channel for 64 kbps

The parameters for the UL reference measurement channel for 64 kbps are specified in table A.3 and the channel coding is detailed in figure A.3.

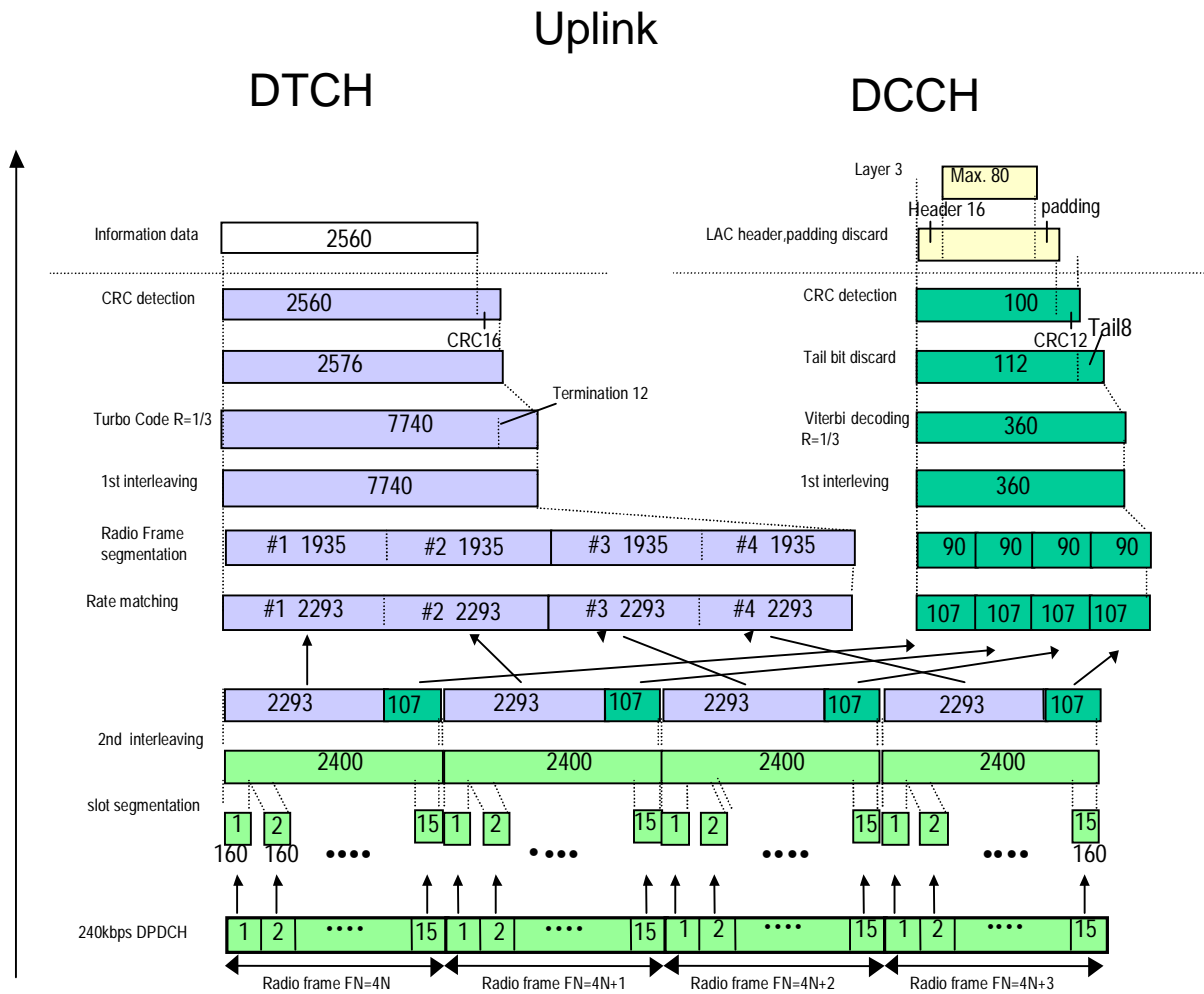


Figure A.3

Table A.3: UL reference measurement channel (64kbps)

Parameter	Level	Unit
Information bit rate	64	kbps
DPCH	240	kbps
Power control	Off	
TFCI	On	
Repetition	19	%

A.4 UL reference measurement channel for 144 kbps

The parameters for the UL reference measurement channel for 144 kbps are specified in table A.4 and the channel coding is detailed in figure A.4.

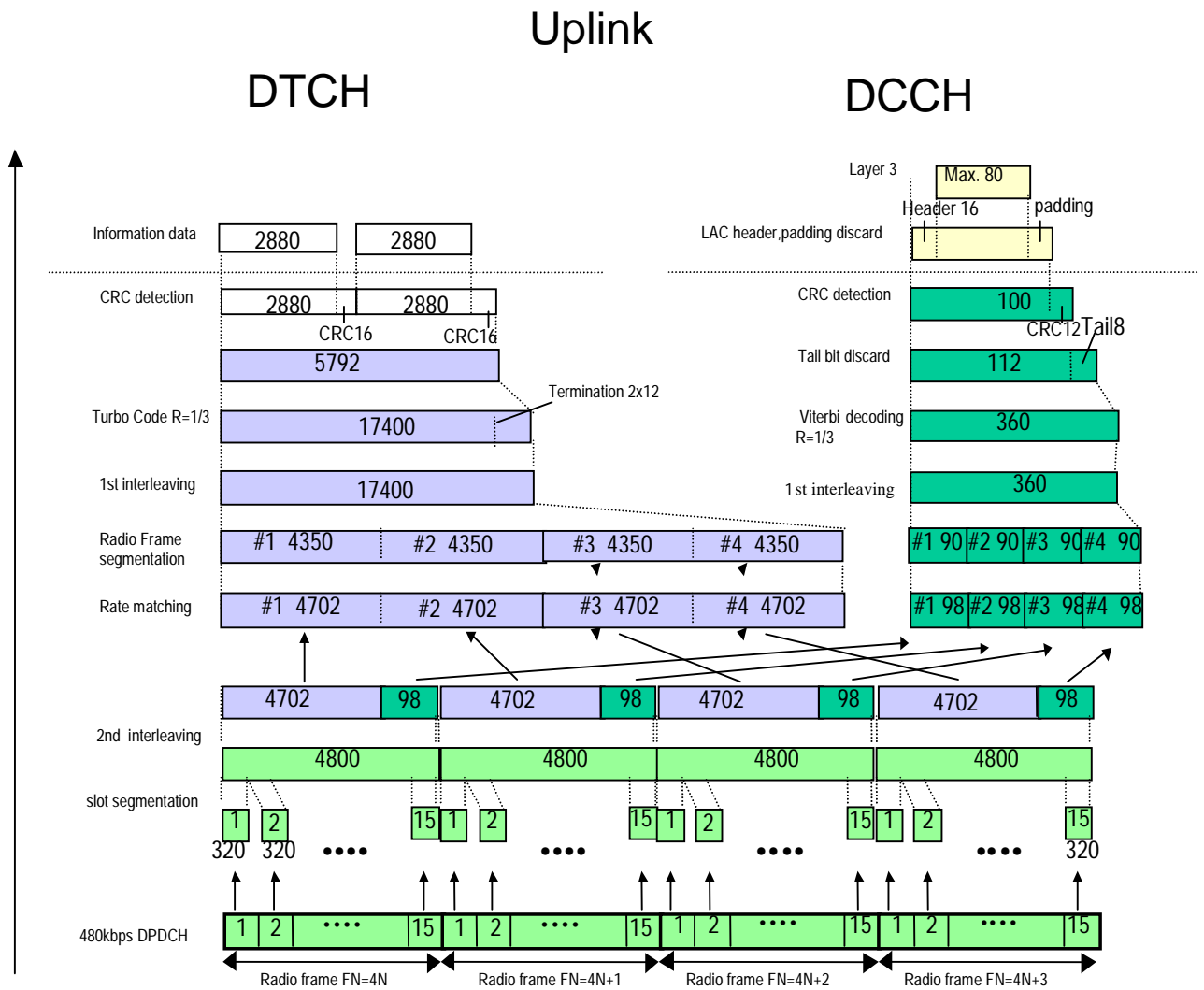


Figure A.4

Table A.4: UL reference measurement channel (144kbps)

Parameter	Level	Unit
Information bit rate	144	kbps
DPCH	480	kbps
Power control	Off	
TFCI	On	
Repetition	8	%

A.5 UL reference measurement channel for 384 kbps

The parameters for the UL reference measurement channel for 384 kbps are specified in table A.5 and the channel coding is detailed in figure A.5.

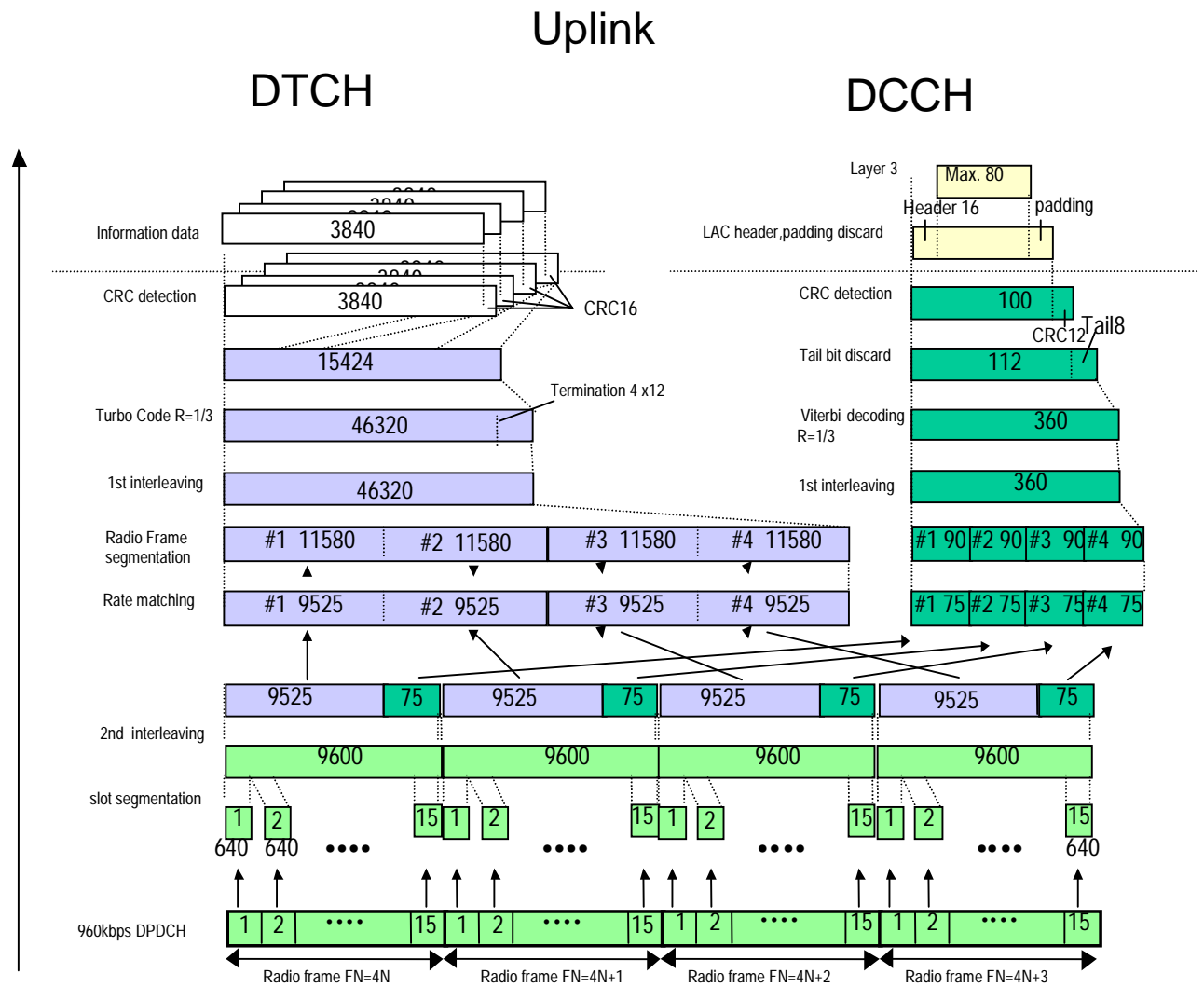


Figure A.5

Table A.5: UL reference measurement channel (384kbps)

Parameter	Level	Unit
Information bit rate	384	kbps
DPCH	960	kbps
Power control	Off	
TFCI	On	
Puncturing	18	%

A.6 UL reference measurement channel for 2048 kbps

The parameters for the UL reference measurement channel for 2048 kbps are specified in table A.6 and the channel coding is detailed in figure A.6.

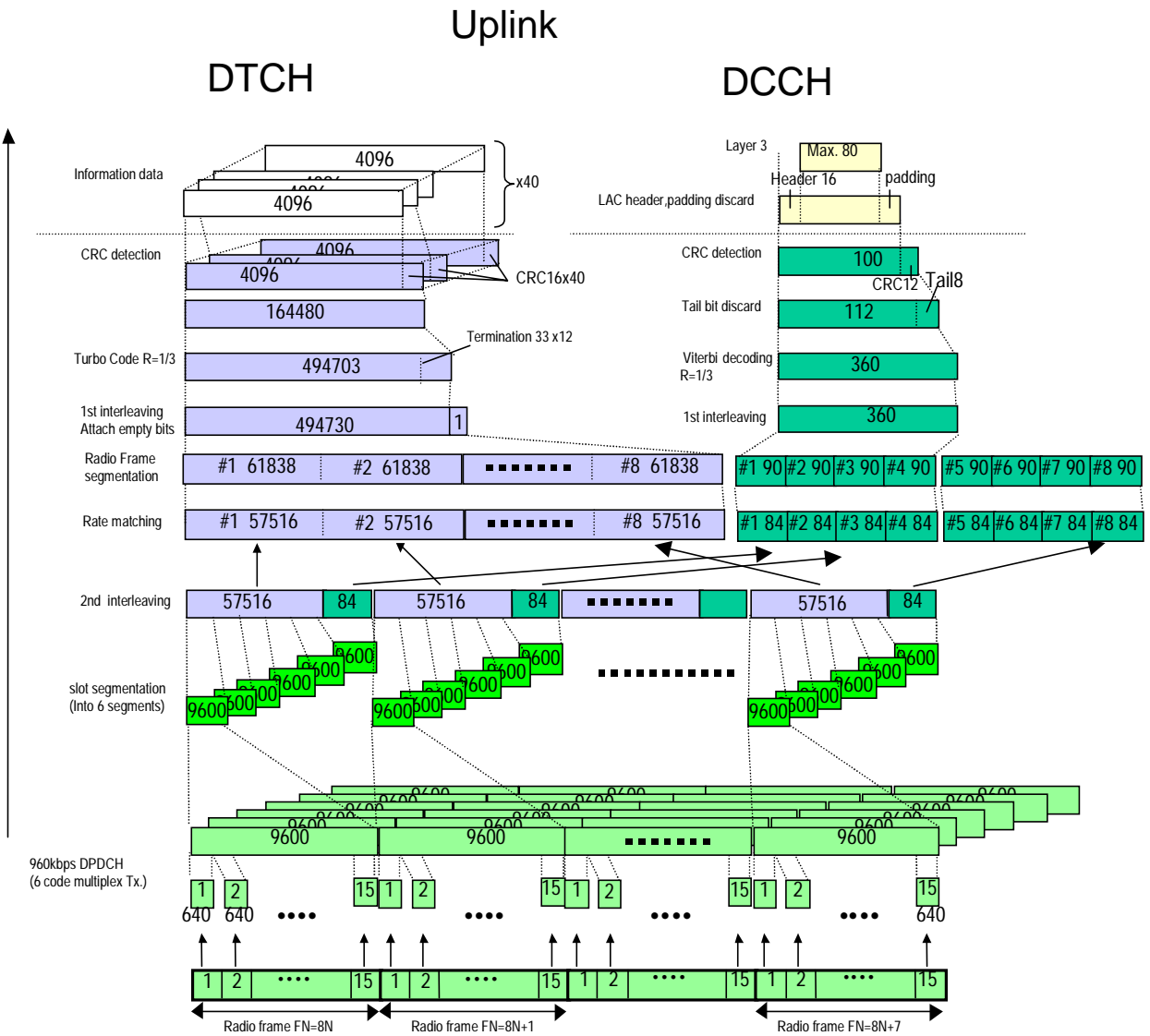


Figure A.6

Table A.6: UL reference measurement channel (2048kbps)

Parameter	Level	Unit
Information bit rate	2 048	kbps
DPCH	960	kbps
Power control	Off	
TCFI	On	
Puncturing	1	%

Annex B (informative): Measurement system set-up

Example of measurement system set-ups are attached below as an informative annex.

B.1 Transmitter

B.1.1 Maximum output power, total power dynamic range

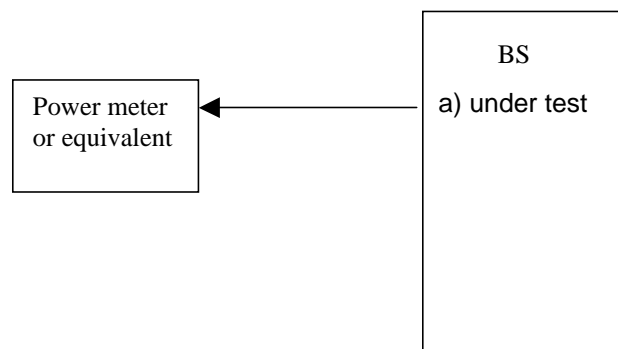


Figure B.1: Measuring system Set-up for maximum output power, total power dynamic range

B.1.2 Frequency, Code Power and Transmit Modulation

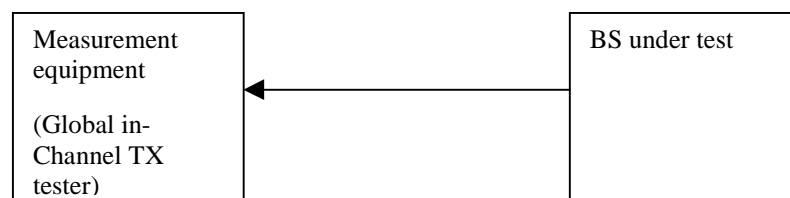


Figure B.2: Measurement system setup for RF frequency, several code power tests and transmit modulation (EVM and PCDE)

B.1.3 Power control steps and power control dynamic range

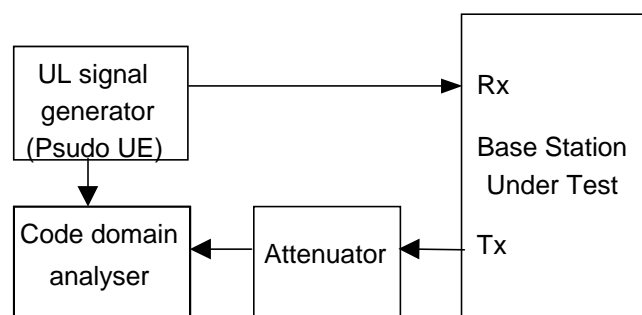


Figure B.3: Measuring system Set-up for power control steps and power control dynamic range measurements

B.1.4 Out of band emission

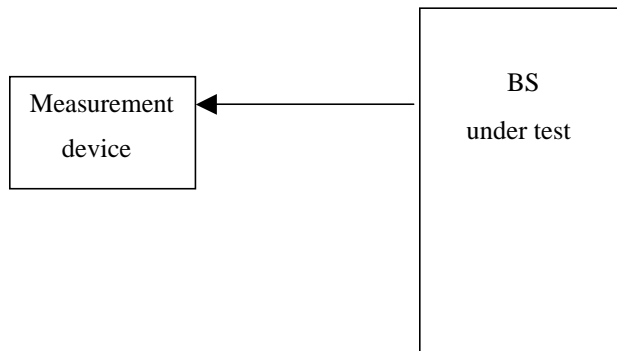


Figure B.4: Measuring system Set-up for Out of band emission measurements

B.1.5 Transmit intermodulation

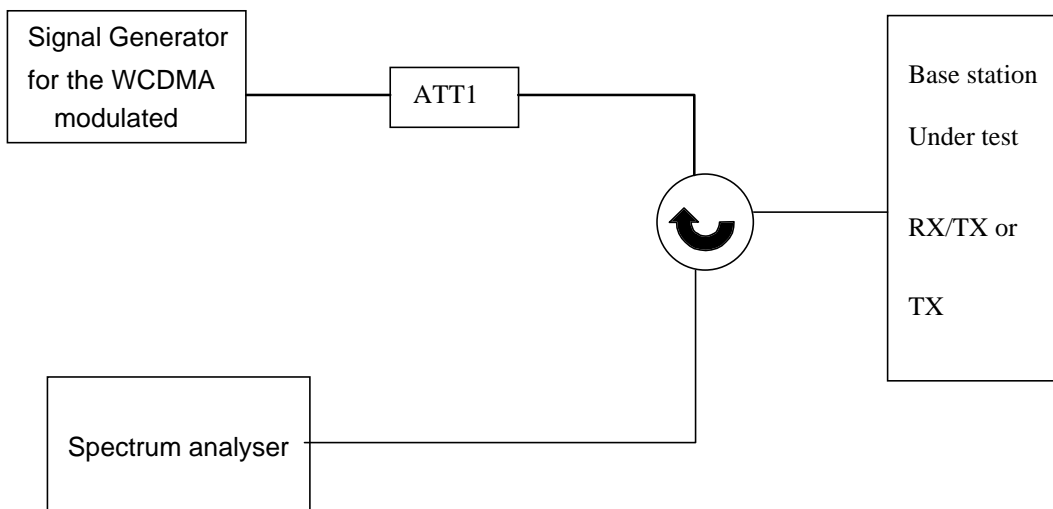


Figure B.5: Measuring system Set-up for Base Station Transmit Intermodulation Tests

B.1.6 Peak code domain error for the transmit diversity modes

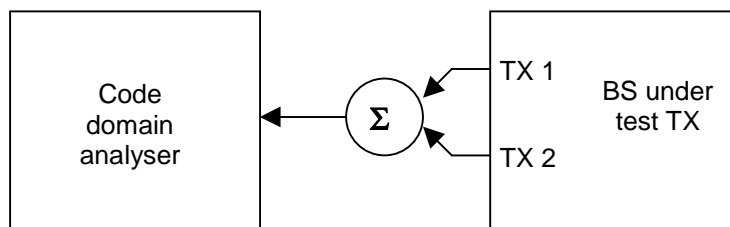


Figure B.6: Measuring system Set-up for peak code domain error measurements for transmit diversity modes

B.2 Receiver

B.2.1 Reference sensitivity level

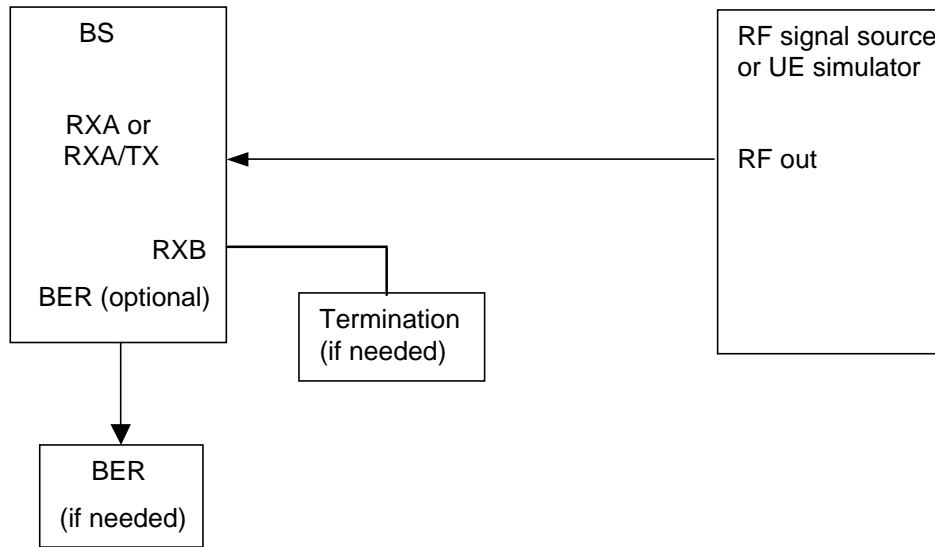


Figure B.7: Measuring system Set-up for Base Station Reference sensitivity level Testes

B.2.2 Dynamic range

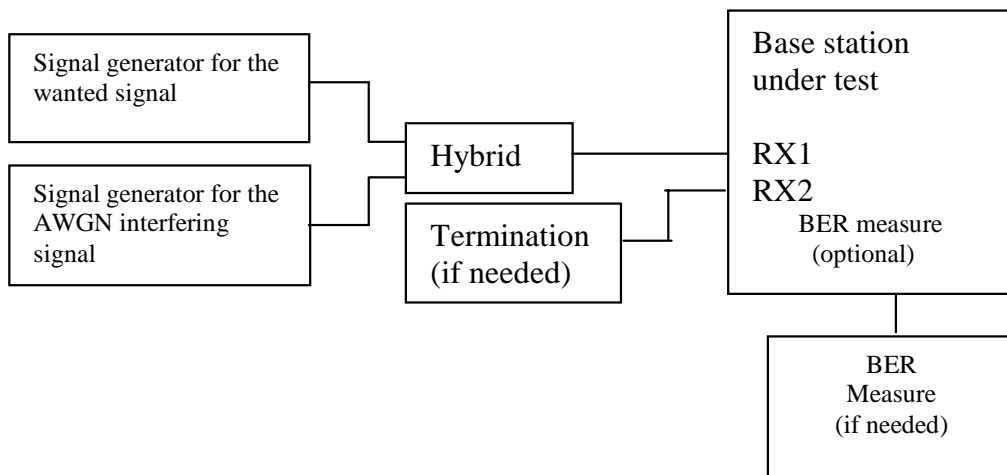


Figure B.8: Measuring system Set-up for Dynamic range

B.2.3 Adjacent Channel Selectivity (ACS)

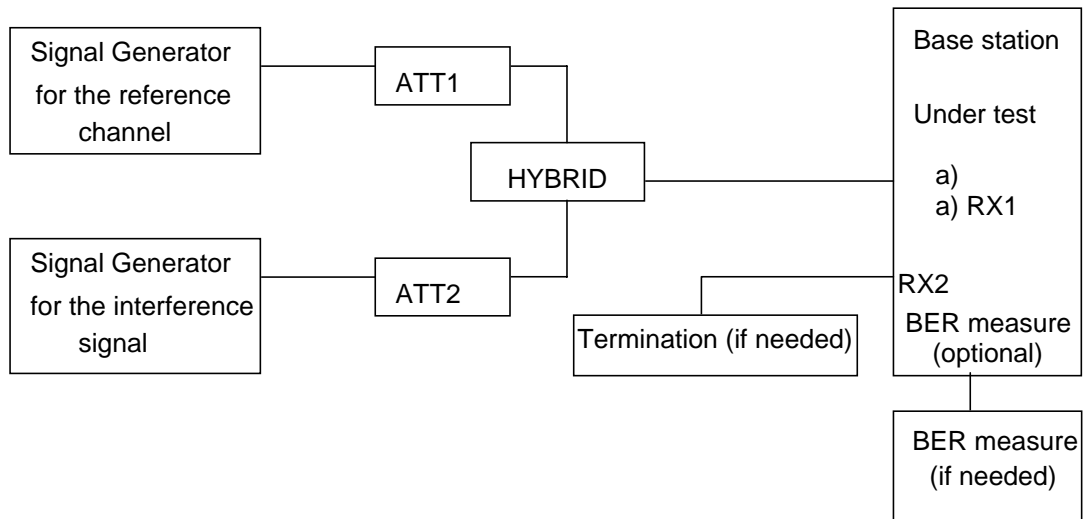


Figure B.9: Measuring system Set-up for Adjacent channel selectivity

B.2.4 Blocking characteristics

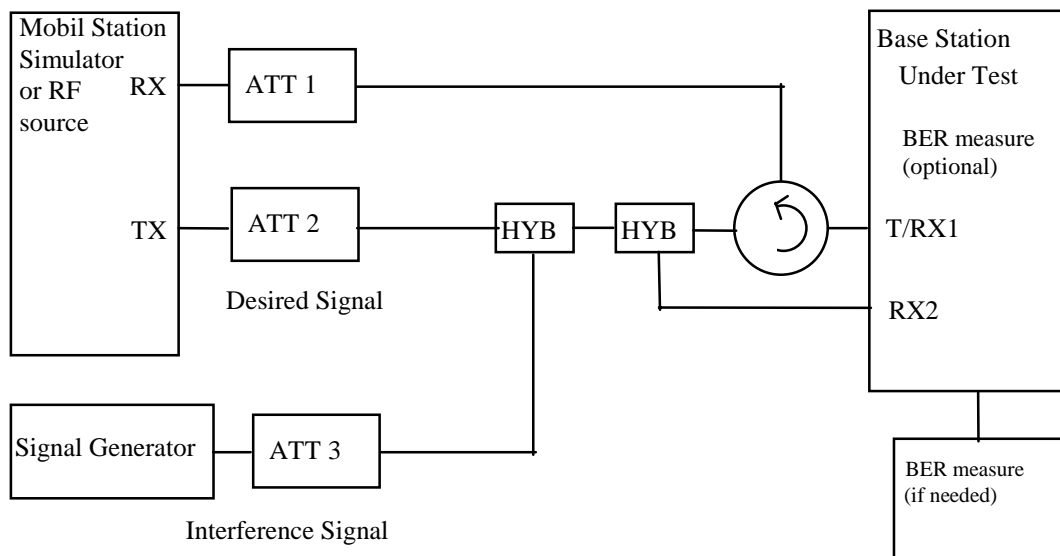


Figure B.10: Measuring system Set-up for Blocking characteristics

B.2.5 Intermodulation characteristics

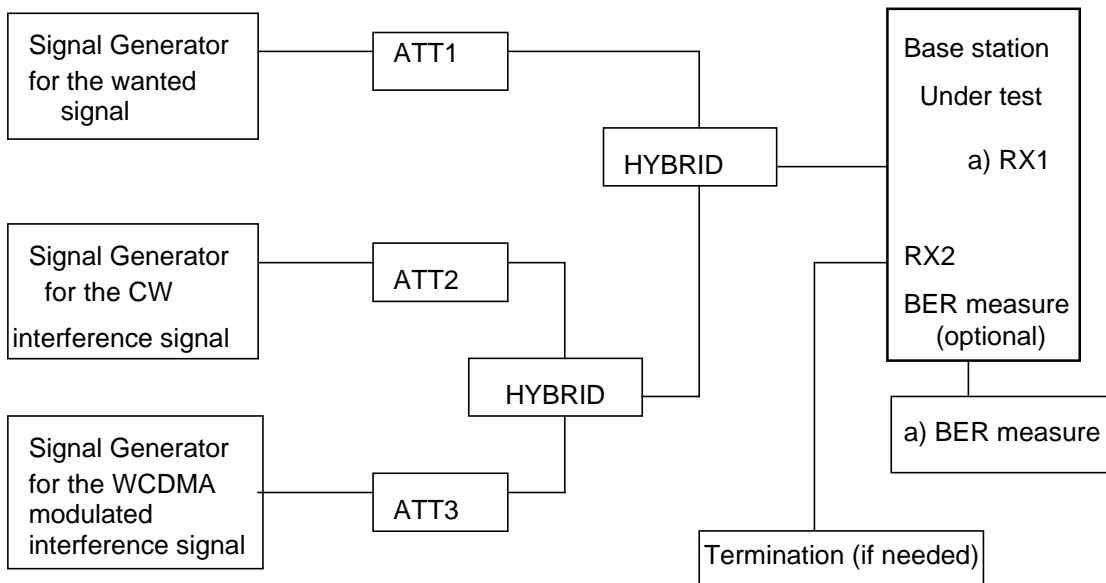


Figure B.11: Measuring system Set-up for intermodulation characteristics

B.2.6 Receiver spurious emission

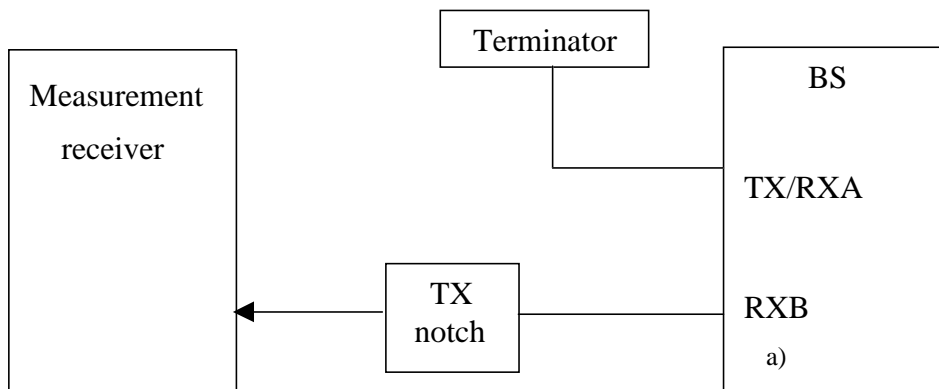


Figure B.12: Measuring system Set-up for Receiver spurious emission

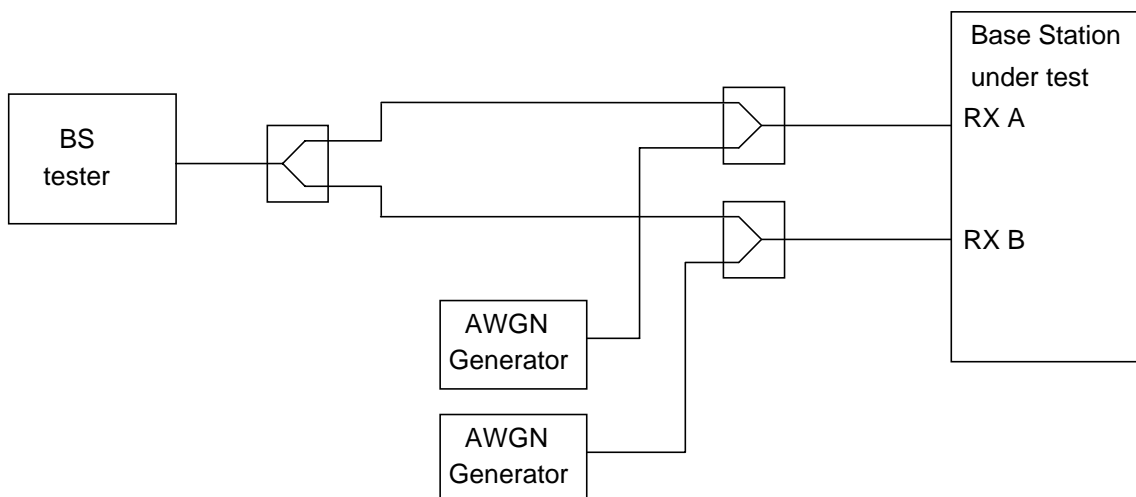


Figure B.13: Functional Set-up for Demodulation in static conditions

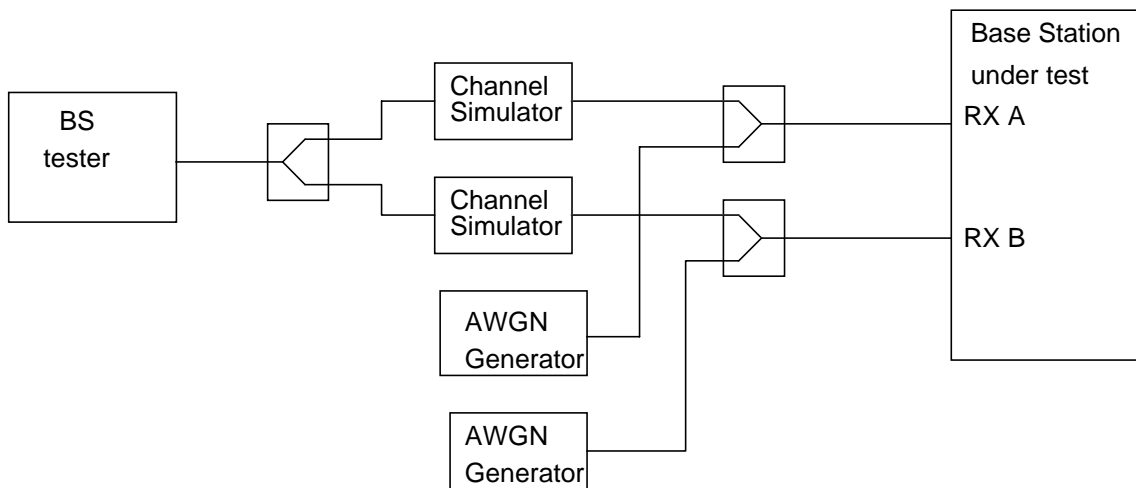


Figure B.14: Functional Set-up for Demodulation of DCH in multipath fading conditions

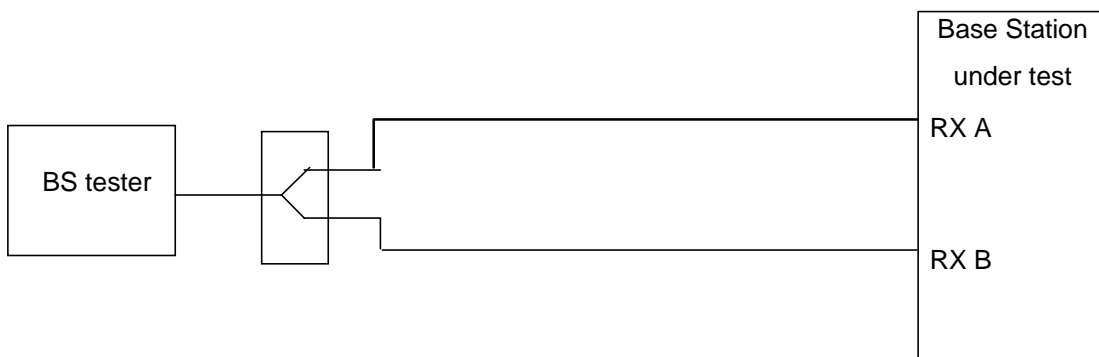


Figure B.15: Functional Set-up for Verification of the internal BLER calculation

Annex C (normative): Detailed definition of error events

1) Block Error Ratio (BLER):

- the block is defined as erased if the error detection functions using Cyclic Redundancy Check (CRC) in layer 1.

<Editor's note: Tentative definition of BLER is given. >

2) Bit Error Ratio (BER):

- the BER is the overall Bit Error Ratio (BER) independent of frame erasures or when erased frames are not defined.

Annex D (normative): Propagation conditions

D.1 Static propagation condition

The propagation for the static performance measurement is an Additive White Gaussian Noise (AWGN) environment. No fading or multi-paths exist for this propagation model.

D.2 Multi-path fading propagation conditions

Table D.1 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum.

Table D.1: Propagation Conditions for Multi path Fading Environments

Case 1, speed 3km/h		Case 2, speed 3 km/h		Case 3, 120 km/h	
Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]
0	0	0	0	0	0
976	-10	976	0	260	-3
		20000	0	521	-6
				781	-9

D.3 Moving propagation conditions

The dynamic propagation conditions for the test of the baseband performance are non fading channel models with two taps. The moving propagation condition has two tap, one static, Path0, and one moving, Path1. The time difference between the two paths is according Equation (D.1). The taps have equal strengths and equal phases.

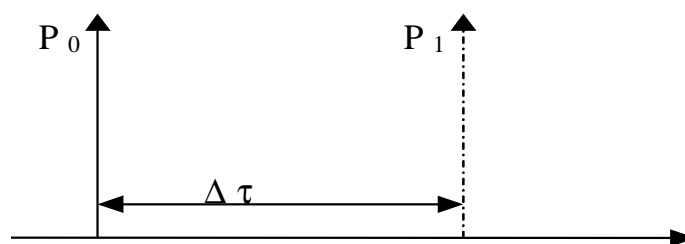


Figure D.1: The moving propagation conditions

$$\Delta\tau = B + \frac{A}{2}(1 + \sin(\Delta\omega \cdot t)) \quad \text{Equation d.1}$$

The parameters in the equation are shown in.

A	5 μ s
B	1 μ s
$\Delta\omega$	$40 \cdot 10^{-3} \text{ s}^{-1}$

D.4 Birth-Death propagation conditions

The dynamic propagation conditions for the test of the baseband performance is a non fading propagation channel with two taps. The moving propagation condition has two taps, Path1 and Path2 which alternate between 'birth' and 'death'. The positions the paths appear are randomly selected with an equal probability rate and is shown in figure D.2.

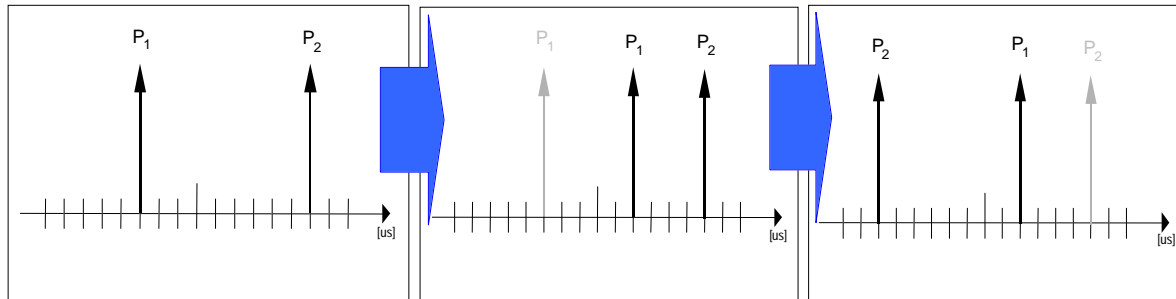


Figure D.2: Birth death propagation sequence

1. Two paths, Path1 and Path2 are randomly selected from the group $[-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5]$ μs . The paths have equal magnitudes and equal phases.
2. After 191 ms, Path1 vanishes and reappears immediately at a new location randomly selected from the group $[-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5]$ μs but excludes the point Path2. The magnitudes and the phases of the tap coefficients of Path 1 and Path 2 shall remain unaltered.
3. After an additional 191 ms, Path2 vanishes and reappears immediately at a new location randomly selected from the group $[-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5]$ μs but excludes the point Path1. The magnitudes and the phases of the tap coefficients of Path 1 and Path 2 shall remain unaltered.
4. The sequence in 2) and 3) is repeated.

Annex E (normative): Global In-Channel TX-Test

E.1 General

The global in-channel Tx test enables the measurement of all relevant parameters that describe the in-channel quality of the output signal of the Tx under test in a single measurement process. The parameters describing the in-channel quality of a transmitter, however, are not necessarily independent. The algorithm chosen for description inside this annex places particular emphasis on the exclusion of all interdependencies among the parameters. Any other algorithm (e.g. having better computational efficiency) may be applied, as long as the results are the same within the accuracy limits.

E.2 Definition of the process

E.2.1 Basic principle

The process is based on the comparison of the actual **output signal of the TX under test**, received by an ideal receiver, with a **reference signal**, that is generated by the measuring equipment and represents an ideal error free received signal. All signals are represented as equivalent (generally complex) baseband signals.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment, filtered by a matched filter (RRC 0.22, correct in shape and in position on the frequency axis) and stored at one sample per chip at the Inter-Symbol-Interference free instants.

The following form represents the physical signal in the entire measurement interval:

one vector **Z**, containing $N = ns \times sf + ma$ complex samples;

with

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (sf: spreading factor) (see Note: Symbol length)

ma: number of midamble chips (only in TDD)

E.2.3 Reference signal

The reference signal is constructed by the measuring equipment according to the relevant TX specifications.

It is filtered by the same matched filter, mentioned in E.2.2., and stored at the Inter-Symbol-Interference free instants. The following form represents the reference signal in the entire measurement interval:

one vector **R**, containing $N = ns \times sf + ma$ complex samples;

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (see Note: Symbol length)

ma: number of midamble chips (only in TDD)

E.2.4 Classification of measurement results

The measurement results achieved by the global in-channel TX test can be classified into two types:

- Results of type “deviation”, where the error-free parameter has a non-zero magnitude. (These are the parameters that quantify the integral physical characteristic of the signal). These parameters are:

RF Frequency

Power (in case of single code)

Code Domain Power (in case of multi code)

Timing (only for UE)

(Additional parameters: see Note: Deviation)

- Results of type “residual”, where the error-free parameter has value zero. (These are the parameters that quantify the error values of the measured signal, whose ideal magnitude is zero). These parameters are:

Error Vector Magnitude (EVM);

Peak Code Domain Error (PCDE).

(Additional parameters: see Note: residual)

E.2.5 Process definition to achieve results of type “deviation”

The reference signal (**R**; see subclause E.2.3) is varied with respect to the parameters mentioned in subclause E.2.4 under "results of type deviation" in order to achieve best fit with the recorded signal under test (**Z**; see subclause E.2.2). Best fit is achieved when the RMS difference value between the signal under test and the varied reference signal is an absolute minimum. The varied reference signal, after the best fit process, will be called **R'**.

The varying parameters, leading to **R'** represent directly the wanted results of type “deviation”. These measurement parameters are expressed as deviation from the reference value with units same as the reference value.

In case of multi code, the type-“deviation”-parameters (frequency, timing and (RF-phase)) are varied commonly for all codes such that the process returns one frequency-deviation, one timing deviation, (one RF-phase –deviation).

(These parameters are not varied on the individual codes signals such that the process returns k frequency errors... . (k: number of codes)).

The only type-“deviation”-parameters varied individually are code powers such that the process returns k code power deviations (k: number of codes). (see Note: Code Domain Power Meter)

E.2.6 Process definition to achieve results of type “residual”

The difference between the varied reference signal (**R'**; see subclause E.2.5.) and the TX signal under test (**Z**; see subclause E.2.2) is the error vector **E** versus time:

$$\mathbf{E} = \mathbf{Z} - \mathbf{R}'$$

Depending on the parameter to be evaluated, it is appropriate to represent **E** in one of the following two different forms:

Form EVM (representing the physical error signal in the entire measurement interval)

One vector **E**, containing $N = n_s \times s_f + m_a$ complex samples;

with

ns: number of symbols in the measurement interval

sf: number of chips per symbol (see Note: Symbol length)

ma: number of midamble chips (only in TDD)

Form PCDE (derived from Form EVM by separating the samples into symbol intervals)

ns time-sequential vectors \mathbf{e} with sf complex samples comprising one symbol interval.

\mathbf{E} and \mathbf{e} give results of type "residual" applying the two algorithms defined in subclauses N 2.6.1 and N 2.6.2.

E.2.6.1 Error Vector Magnitude (EVM)

The Error Vector Magnitude EVM is calculated according to the following steps:

- (1) Take the error vector \mathbf{E} defined in subclause E.2.6 (Form EVM) and calculate the RMS value of \mathbf{E} ; the result will be called RMS(\mathbf{E}).
- (2) Take the varied reference vector \mathbf{R}' defined in subclause E.2.5 and calculate the RMS value of \mathbf{R}' ; the result will be called RMS(\mathbf{R}').
- (3) Calculate EVM according to:

$$\text{EVM} = \frac{\text{RMS}(\mathbf{E})}{\text{RMS}(\mathbf{R}')} \times 100\% \quad \text{(here, EVM is relative and expressed in \%)}$$

(see note TDD)

E.2.6.2 Peak Code Domain Error (PCDE)

The Peak Code Domain Error is calculated according to the following steps:

- (1) Take the error vectors \mathbf{e} defined in subclause E.2.6 (Form PCDE)
- (2) To achieve meaningful results it is necessary to descramble \mathbf{e} , leading to \mathbf{e}' (see Note: Scrambling code)
- (3) Take the orthogonal vectors of the channelization code set \mathbf{C} (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1). (see Note: Symbol length)
- (4) Calculate the inner product of \mathbf{e}' with \mathbf{C} . Do this for all symbols of the measurement interval and for all codes in the code space.
This gives an array of format $k \times ns$, each value representing an error-vector representing a specific symbol and a specific code, which can be exploited in a variety of ways.

k: number of codes

ns: number of symbols in the measurement interval

- (5) Calculate k RMS values, each RMS value unifying ns symbols within one code.
(These values can be called "*Absolute CodeEVMs*" [Volt].)
- (6) Find the peak value among the k "*Absolute CodeEVMs*".
(This value can be called "*Absolute PeakCodeEVM*" [Volt].)
- (7) Calculate PCDE according to:

$$10 \cdot \lg \frac{(\text{“Absolute PeakCodeEVM”})^2}{(\text{RMS}(\mathbf{R}'))^2} \quad \text{dB} \quad (\text{a relative value in dB}).$$

(see Note: Denominator)

(see Note IQ)

(see Note TDD)

(see Note Synch channel)

E.3 Notes

Note: Symbol length) A general code multiplexed signal is multicode and multirate. In order to avoid unnecessary complexity, the measurement applications use a unique symbol-length, corresponding to a spreading factor, regardless of the really intended spreading factor. Nevertheless the complexity with a multicode / multirate signal can be mastered by introducing appropriate definitions.

Note: Deviation) It is conceivable to regard more parameters as type „deviation“ e.g. Chip frequency and RF-phase.

As chip-frequency and RF-frequency are linked together by a statement in the core specifications [1] it is sufficient to process RF frequency only.

A parameter RF-phase must be varied within the best fit process (N 2.5.). Although necessary, this parameter-variation doesn't describe any error, as the modulation schemes used in the system don't depend on an absolute RF-phase.

Note: residual) It is conceivable to regard more parameters as type „residual“ e.g. IQ origin offset. As it is not the intention of the test to separate for different error sources, but to quantify the quality of the signal, all such parameters are not extracted by the best fit process, instead remain part of EVM and PCDE.

Note: Denominator) If the denominator stems from mutual time shifted signals of different code powers, (e.g. BS, FDD) the measurement result PCDE should be expressed absolutely instead.

Note: Scrambling Code) In general a TX signal under test can use more than one scrambling code. Note that PCDE is primarily processed to investigate the unused channelization codes. In order to know which scrambling code shall be applied on unused channelization codes, it is necessary to restrict the test conditions: TX signal under test shall use exactly one scrambling code.

Note IQ) As in FDD/uplink each channelization code can be used twice, on the I and on the Q channel, the measurement result may indicate on which channel (I or Q) PCDE occurs.

Note TDD) EVM covers the midamble part as well as the data part; however PCDE disregards the midamble part.

Note: Synch Channel) A BS signal contains a physical synch channel, which is non orthogonal, related to the other channels. In this context note: The code channel bearing the result of PCDE is exactly one of the other physical channels (never the synch channel). The origin of PCDE (erroneous code power) can be any channel (including synch channel).

Note: Code Domain Power Meter) The minimum process described in E.2.5 returns k code-power-deviations each based on the relevant reference-code-power. (k = number of codes) In order to avoid unnecessary complexity it is necessary to select a measurement interval, where all reference-code-powers remain constant. In case code power steps are tested (e.g. subclause 6.4.2.4.2.), a suitable measurement interval shall be chosen by proper triggering or a search strategy inside a longer interval of the acquired data.

However the process is not dependent on this restriction. It stands non-constant power or code power as well.

Annex F (informative): Change Request history

CRs approved by TSG-RAN#7.

RAN doc	Spec	CR	R	Phas	Subject	Cat	Curren	New
RP-000022	25.141	001		R99	Clarification of Receiver Dynamic Range requirement	F	3.0.0	3.1.0
RP-000022	25.141	002		R99	Editorial changes	D	3.0.0	3.1.0
RP-000022	25.141	003		R99	Occupied bandwidth measurement	F	3.0.0	3.1.0
RP-000022	25.141	004		R99	Clarification of "random" in relation to injected bit errors	F	3.0.0	3.1.0
RP-000022	25.141	005		R99	Test Models for transmitter	B	3.0.0	3.1.0
RP-000022	25.141	006	1	R99	Regional requirements in TS 25.104	D	3.0.0	3.1.0
RP-000022	25.141	007		R99	Blocking test	F	3.0.0	3.1.0
RP-000022	25.141	008		R99	ACLR measurement	F	3.0.0	3.1.0
RP-000022	25.141	009		R99	Peak code domain error measurement	F	3.0.0	3.1.0
RP-000022	25.141	010		R99	Test point & set of specifications for use of external RF	F	3.0.0	3.1.0
RP-000022	25.141	011		R99	CR for Performance requirement in TS 25.141	F	3.0.0	3.1.0
RP-000022	25.141	012		R99	Spectrum emission mask	F	3.0.0	3.1.0
RP-000022	25.141	013		R99	BS configurations	B	3.0.0	3.1.0
RP-000022	25.141	014		R99	Test models	F	3.0.0	3.1.0
RP-000022	25.141	015		R99	Update to Downlink Test Models	F	3.0.0	3.1.0
RP-000022	25.141	016		R99	Remove revision marks in annex A	D	3.0.0	3.1.0
RP-000022	25.141	017		R99	Format and interpretation of tests	D	3.0.0	3.1.0
RP-000022	25.141	018		R99	Modifications for system set-up's TS25.141v3.0.0	F	3.0.0	3.1.0
RP-000022	25.141	019		R99	Intermodulation test	F	3.0.0	3.1.0
RP-000022	25.141	020		R99	Modifications for test models	C	3.0.0	3.1.0
RP-000022	25.141	021		R99	Receiver diversity	C	3.0.0	3.1.0
RP-000022	25.141	023		R99	Spectrum emission mask	F	3.0.0	3.1.0
RP-000022	25.141	024		R99	Rx spurious emissions measurement bandwidth	F	3.0.0	3.1.0
RP-000022	25.141	025		R99	Modification to the handling of measurement equipment	F	3.0.0	3.1.0
RP-000022	25.141	026		R99	Test models	F	3.0.0	3.1.0

CRs approved by TSG-RAN#8.

RAN Doc	Spec	CR	R	Phas	Subject	Cat	Curre	New
RP-000211	25.141	027		R99	Add test specification on SSdT to 8.6.	D	3.1.0	3.2.0
RP-000211	25.141	028		R99	Synchronization of signal generators	F	3.1.0	3.2.0
RP-000211	25.141	029		R99	Correction to Emission mask measurement	F	3.1.0	3.2.0
RP-000211	25.141	030		R99	Clarification of the specification on Peak Code Domain	F	3.1.0	3.2.0
RP-000211	25.141	031		R99	Performance requirements	F	3.1.0	3.2.0
RP-000211	25.141	032		R99	Frequency stability measurement using complex	F	3.1.0	3.2.0
RP-000211	25.141	033		R99	Editorial corrections on moving propagation conditions	F	3.1.0	3.2.0
RP-000211	25.141	034		R99	Editorial correction on Spurious emissions	D	3.1.0	3.2.0
RP-000211	25.141	035		R99	Corrections to the seed of P-CCPCH	F	3.1.0	3.2.0
RP-000211	25.141	036		R99	Data clock accuracy	F	3.1.0	3.2.0
RP-000211	25.141	037		R99	Corrections to several missing items and clarifications	F	3.1.0	3.2.0

CRs approved by TSG-RAN#9.

RAN Doc	Spec	CR	R	Phas	Subject	Cat	Curre	New
RP-000470	25.141	38		R99	Corrections to spectrum mask	F	3.2.0	3.3.0

RP-000470	25.141	39		R99	Editorial corrections for TS 25.141	F	3.2.0	3.3.0
RP-000470	25.141	40		R99	Global In-Channel TX-Test for use as annex in	F	3.2.0	3.3.0
RP-000470	25.141	41		R99	Reference measurement channels	F	3.2.0	3.3.0
RP-000470	25.141	42		R99	Handling of measurement uncertainties in Base station	F	3.2.0	3.3.0
RP-000470	25.141	43		R99	Clarifications of modulation accuracy and code domain	F	3.2.0	3.3.0
RP-000470	25.141	44		R99	Corrections to spectrum mask measurement method	F	3.2.0	3.3.0
RP-000470	25.141	45		R99	Test model clarifications	F	3.2.0	3.3.0
RP-000470	25.141	47		R99	Clarification of applicability of environmental range	F	3.2.0	3.3.0
RP-000470	25.141	48		R99	Clarification of "confidence level of 95%" in section 4.1	D	3.2.0	3.3.0
RP-000470	25.141	49		R99	Corrections to test models in TS 25.141	F	3.2.0	3.3.0
RP-000470	25.141	50		R99	Tap magnitudes and phases for Birth-Death	F	3.2.0	3.3.0

History

Document history		
V3.0.0	January 2000	Publication
V3.1.0	March 2000	Publication
V3.2.0	June 2000	Publication
V3.3.0	October 2000	Publication