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Abstract of document:

Terminal Conformance Specifications; Radio transmission and reception (TDD)

Containing test specifications about:

- Transmitter Characteristics
- Receiver Characteristics
- Performance Requirements

Core specification for this document are:

- TS25.102 (UTRA (UE) Radio Transmission and Reception)
- TS 25.123 (Requirements for Support of Radio Resource Management (TDD))

Serving specifications for this document are:

- TS34.109 (Terminal logical test interface (FDD/TDD))
- TS 34.108 (Common Test Environment)

Peer specifications with respect to this document are:

- TS 34.121 (Terminal Conformance Specifications; Radio Transmission and Reception (FDD)
- TS 25.142 (Base Station Conformance Testing (TDD))
- TS 25.141 (Base Station Conformance Testing (FDD))

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Contents

Foreword

This Technical Specification has been produced by the 3GPP.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

Introduction

1. Scope

This present document specifies the measurement procedure for the conformance test of the mobile station that contain transmitting characteristics, receiving characteristics and performance requirements in TDD mode.

The Scope shall not contain requirements.

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, subsequent revisions do apply.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3GPP TS 25.102: "UE Radio transmission and reception (TDD)"

[2] 3GPP TS 25.123: "Requirements for Support of Radio Resource Management (TDD)"

[3] 3GPP TS 34.109 :"Logical Test Interface Special conformance testing functions"

[4] 3GPP TR 21.905 "Vocabulary for 3GPP Specifications"

[5] 3GPP TR 25.990 "Vocabulary for UTRAN"

3 Frequency bands and channel arrangement

3.1 General

The information presented in this section is based on a chip rate of 3.84 Mcps.

Note

1. Other chip rates may be considered in future releases.

3.2 Frequency bands

UTRA/TDD is designed to operate in the following bands;

a) 1900 – 1920 MHz: Uplink and downlink transmission
2010 – 2025 MHz Uplink and downlink transmission

b)* 1850 – 1910 MHz: Uplink and downlink transmission
1930 – 1990 MHz: Uplink and downlink transmission

Note: Appropriate adjustment is required for the parameters in the specified band

c)* 1910 – 1930 MHz: Uplink and downlink transmission

Note: Appropriate adjustment is required for the parameters in the specified band

* Used in ITU Region 2

Additional allocations in ITU region 2 are FFS.

Deployment in other frequency bands is not precluded.

The co-existence of TDD and FDD in the same bands is still under study in WG4.

3.3 TX–RX frequency separation

No TX-RX frequency separation is required as Time Division Duplex (TDD) is employed. Each TDMA frame consists of 15 timeslots where each timeslot can be allocated to either transmit or receive.

3.4 Channel arrangement

3.4.1 Channel spacing

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

3.4.2 Channel raster

The channel raster is 200 kHz, which means that the carrier frequency must be a multiple of 200 kHz.

3.4.3 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:

Lower IMT 2000 band:

$N_t = 5 * (F – 1885.2)$ $1885.2 \leq F \leq 2024.8$ where F is the carrier frequency in MHz

3. Transmitter Characteristics

3.1. General

Transmitting performance test of the UE is implemented during communicating with the SS via air interface. The procedure is used normal call protocol until the UE is communicating on traffic channel basically. On the traffic channel, the UE provides special function for testing that is called Logical Test Interface and the UE is tested using this function. (Refer to TS 34.109 Logical Test Interface Special conformance testing functions)

Unless detailed the transmitter characteristic are specified at the antenna connector of the UE. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed. Transmitter characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of this specification. It is recognized that different requirements and test methods are likely to be required for the different types of UE.

3.2. Maximum Output Power

3.2.1. Definition and applicability

The maximum output power and its tolerance are defined according to the Power Class of the UE.

The **output power**, Pout, of the UE is the power when averaged (in the sense of thermal power) over the useful part of the TS at the maximum power control setting delivered in to a load with resistance equal to the nominal load impedance.

The requirements in this test apply to all UTRA – UE containing TDD mode.

Note copied from TS 25.102 clause 6.2.1 (4): For UE using directive antennas for transmission, a class dependent limit will be placed on the maximum EIRP (Equivalent Isotropic Radiated Power)..

3.2.2. Conformance requirements

The error of the UE maximum output power shall not exceed the tolerance shown in Table 4.2.1 for single and multi-code, for single and multi-slot transmission mode.

Table 4.2.1: Maximum Output Power

Power Class	Maximum output power	Tolerance
1	+30 dBm	+1dB /-3dB
2	+24 dBm	+1dB /-3dB
3	+21 dBm	+2dB /-2dB
4	+10 dBm	+4dB /-4dB

The reference for this requirement is 25.102 §6.2.

3.2.3. Test purpose

For the following reasons:

Limit interference

Verify that the maximum output power is achievable

it is the purpose of the test to verify that the UE's maximum output power is within its tolerance limits under all environmental conditions.

3.2.4. Method of test

3.2.4.1. Initial conditions

Connect the SS to the UE antenna connector as shown in Figure A.1.

A call is set up according to the Generic call setup procedure using parameters as specified in Table 4.2.2.

Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.2.2: Test parameters for Maximum Output Power

Parameter	Value/description
Channel configuration	TBD
Number of DPCH in each active TS	TBD
Duty cycle	TBD
Closed Loop Power Control	Enabled

3.2.4.2. Procedure

(1) Set and send continuously up commands to the UE

(2) Measure thermal power over the useful part of the burst.

with the useful part starting TBD chips after the data symbols start and ending TBD chips before the guard period starts, and with a measurement bandwidth of at least 5 MHz.

(3) Average over TBD time slots.

(4) Run step (2) and (3) for RF channels Low / Mid / High

3.2.5. Test Requirements

The error of measured output power, derived in step (3) of subclause 4.2.4.2, shall not exceed the prescribed tolerance in Table 4.2.1.

3.3. Frequency Stability

3.3.1. Definition and applicability

The frequency stability is the difference of the modulated carrier frequency with AFC ON between the RF transmission from the UE and the RF transmission from the BS

The requirements of this test apply to all types of UTRA- UE.

3.3.2. Conformance requirements

The UE frequency stability shall be within ±0,1 ppm compared to signals received from the BS.

The reference for this requirement is 25.102 §6.3.

3.3.3. Test purpose

Reliable frequency stability of the UE's transmitter in certain tolerance limits is prerequisite for connectivity.

This test stresses the ability of the UE's receiver to derive correct frequency information from the received signal for the transmitter.

3.3.4. Method of test

3.3.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2). A call is set up according to the Generic call setup procedure using parameters as specified in Table 4.3.

(3) Enter the UE into loopback test mode and start the loopback test.
See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

<Editor's Note: The generic call setup procedure is currently specified in Annex A of TS 34.109.>

Table 4.3 Test parameters for Frequency Stability

Parameter	Value/description
SS power and quality	TBD
Duty Cycle	TBD
AFC	on
Closed Loop Power control	on
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.3.4.2. Procedure

(1) Measure the frequency error delta f across the TS according to Annex B

(2) Repeat step (1) for 200 bursts (time slots)

(3) Run Step (1) and (2) for RF channels Low /Mid/ High

3.3.5. Test Requirements

For all measured bursts (time slots) , the frequency error, derived in subclause 4.3.4.2, shall not exceed 10E-7.

3.4. Output Power Dynamics

Power control is used to limit the interference level.

4.4.1. Uplink power control

4.4.1.1. Definition and applicability

Uplink power control is the ability of the UE transmitter to adjust its output power in accordance with measured downlink path loss, values determined by higher layer signaling and parameter α as defined in TS 25.224. For the TDD mode the reciprocity of the channel allows accurate estimation of the required transmit power.

4.4.1.2 Conformance Requirements

4.4.1.2.1 Initial Accuracy

The UE power control initial accuracy error shall be less than +/-9dB under normal conditions and +/- 12dB under extreme conditions. 6.4.1.2 Differential accuracy, controlled input

4.4.1.2.2 Differential accuracy, controlled input

The power control differential accuracy, controlled input, is defined as the error in UE transmitter power change as a result of a change in SIR_{TARGET} according to table x.1 when the parameter α=0. The error shall not exceed the values in Table x.1

ΔSIR_{TARGET} dB	Power Error, dB
1	+/- 0.5
2	+/- 1
3	+/- 1.5
10	+/- 2
20	+/- 4

4.4.1.2.3 Differential accuracy, measured input

The power control differential accuracy, measured input, is defined as the error in UE transmitter power change as a result of a change in path loss L_{PCCPCH} according to table x.2. The conditions for the test are as in table x.3. The error shall not exceed the values in table x.2. in more than 95% of tests.

Table x.2

ΔL_{PCCPCH} dB	Power Error, dB
3	+/-
10	+/-

Table x.3

Condition	Value
$\frac{PCCPCH\_E_c}{I_o}$ in the lower power of the two states	3dB
Parameter α	1

4.4.1.3. Test Purpose

TBD

4.4.1.4 Method of test

4.4.1.4.1. Initial conditions

TBD

4.4.1.4.2. Procedure

TBD

4.4.1.5. Test requirements

TBD

3.4.1. Minimum transmit power

3.4.1.1. Definition and applicability

The minimum controlled output power of the UE is when the power control setting is set to a minimum value. This is when the uplink power control indicates a minimum transmit output power is required.

The requirements of this test apply to all types of UTRA- UE.

3.4.1.2.. Conformance requirements

The minimum transmit power shall be lower than or equal to –44 dBm

The reference for this requirement is TS 25.102 subclause 6.4.5.1.

3.4.1.3. Test purpose

The test purpose is to verify the ability of the UE to reduce its output power to a specified value.

3.4.1.4. Method of test

3.4.1.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the Generic call setup procedure using parameters as specified in Table 4.3.

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

<Editor's Note: The generic call setup procedure is currently specified in Annex A of TS 34.109.>

Table 4.4.3.4.1. Parameters of the UE transmitted signal for minimum transmit power test

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits min power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.4.1.4.2. Procedure

(1) Configure the UE transmitter to enable power control steps of size 1 dB.

(2) Measure power of the UE output signal over the useful part of the active time slot according to annex B

Note: Annex B returns the power in the decision points (displayed as reference power and power offset)

This is equivalent to thermal power at the air-interface. Insofar 4.4.3. minimum output power is consistent with 4.2 maximum output power.

(3) Average over TBD time slots.

(4) Configure the UE transmitter to enable power control steps of 2 dB and of 3 dB, respectively, and repeat steps (2) to (3).

(5) Run step (1) to (3) for RF channels Low Mid and High

3.4.1.5. Test requirements

For all measurements, the minimum transmit power derived in step (3) , (4) and (5) of .4.4.3.4.2 shall be below the predescribed value in clause 4.4.3.2.

3.5.

Empty, deleted in 25.102

3.5.1. Transmit OFF power

3.5.1.1. Definition and applicability

The transmit OFF power state is when the UE does not transmit. This parameter is defined as the maximum output transmit power within the channel bandwidth when the transmitter is OFF.

The requirements of this test apply to all types of UTRA-UE

3.5.1.2. Conformance requirements

The transmit OFF power shall be below −65 dBm measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α=0.22 and a bandwidth equal to the chip rate.

The reference for this requirement is TS 25.102 subclause 6.5..

3.5.1.3. Test purpose

This test verifies the ability of the UE to reduce its transmit OFF power to a value below the specified limit. This ability is needed to minimize the interference for other users receiving on the same frequency.

3.5.1.4. Method of test

3.5.1.4.1.Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.5.1.4.1

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.5.1.4.1 Parameters of the transmitted signal for transmit OFF power test

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.5.1.4.2. Procedure

(1) Measure thermal power over the useful part of the non active TS (adjacent to the active one),

with the useful part starting TBD chips after the guard period of the preceding time slot ends and

ending TBD chips before the first data symbol of the following time slot starts, and

with a measurement filter that has a RRC filter response with a roll off α = 0,22 and

a bandwidth equal to the chip rate, and

is centred in the channel bandwidth.

Note: Annex B is not usable for this type of power measurement

(2) Average over TBD time slots.

(3) Run steps (1) and (2) for RF channels Low / Mid / High.

3.5.1.5. Test requirements

The value of the transmit OFF power derived according to subclause 4.5.1.4.2., shall be below the limit defined in subclause 4.5.1.2..

3.5.2. Transmit ON/OFF Time mask

3.6. Output RF spectrum emissions

3.6.1. Occupied bandwidth

3.6.1.1. Definition and applicability

Occupied bandwidth is a measure of the bandwidth containing 99% of the total integrated power for transmitted spectrum and is centred on the assigned channel frequency.

The requirements in this subclause shall apply to all types of UTRA - UE.

3.6.1.2. 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 25.102 subclause 6.6.1.

3.6.1.3. 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 SM.328-9 [7]. The test purpose is to verify that the emission of the UE 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.

3.6.1.4. Method of test

3.6.1.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.6.1.4.1.1.

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

<Editor's Note: The generic call setup procedure is currently specified in Annex A of TS 34.109.>

Table 4.6.1.4.1.1 Parameters of the UE transmitted signal for occupied bandwidth testing

Parameter	Value/description
TDD Duty Cycle	[1:14]
Number of DPCH in each active TS	[1]
Data content of DPCH	real life (sufficient irregular)
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power

3.6.1.4.2. Procedure

(1) Measure the power of the transmitted signal with a measurement filter of bandwidth [30 kHz]. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). The center frequency of the filter shall be stepped in contiguous 30 kHz steps from a minimum frequency, which shall be [7,5 – 0,015] MHz below the assigned channel frequency of the transmitted signal, up to a maximum frequency, which shall be [7,5 – 0,015] MHz above the assigned channel frequency of the transmitted signal. The step duration shall be sufficient slow to capture the active TS. The measured power shall be recorded for each step.

(2) Determine the total transmitted power by accumulating the recorded power measurements results of all steps.

(3) Determine the transmitted power within the assigned channel bandwidth by accumulating the recorded power measurements results of all steps with center frequencies from (2,5 – 0,015) MHz below the assigned channel frequency up to (2,5 – 0,015) MHz above the assigned channel frequency.

(4) Calculate the ratio

total transmitted power acc. to (2) / transmitted power within the assigned channel bandwidth acc. to (3).

3.6.1.5. Test requirements

The ratio calculated in step (4) of subclause 6.6.1.4.2 shall be 0,99 or greater.

3.6.2. Out of band emission

Out of band emissions are unwanted emissions immediately outside the nominal channel 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.

3.6.2.1. Spectrum emission mask

3.6.2.1.1. Definition and applicability

The spectrum emission mask of the UE is a requirement that applies to frequencies which are between 2.5 and 12.5MHz to both sides of the carrier frequency. The out of channel emission is specified relative to the UE output power in a 3.84 MHz bandwidth.

The requirements of this test apply to all types of UTRA-UE

3.6.2.1.2. Conformance requirements

The power of the 21dBm power class 3 UE emission shall not exceed the levels specified in table 4.6.2.1.2.

Table 4.6.2.1.2 : Spectrum Emission Mask Requirement

Frequency offset from carrier f	Minimum requirement	Measurement bandwidth
2.5 - 3.5 MHz	-35 -15*(Δf – 2.5) dBc	30 kHz
3.5 - 7.5 MHz	-35- 1*(Δf-3.5) dBc	1 MHz
7.5 - 8.5 MHz	-39 - 10*(Δf – 7.5) dBc	1 MHz
8.5 - 12.5 MHz	-49 dBc	1 MHz

Note

1. The first and last measurement position with a 30 kHz filter is 2.515 MHz and 3.485 MHz
2. The first and last measurement position with a 1 MHz filter is 4 MHz and 12 MHz
3. The lower limit shall be –50dBm/3.84 MHz or which ever is higher

3.6.2.1.3. Test purpose

It is the purpose of this test to limit interferences to other systems (wideband or narrowband)

3.6.2.1.4. Method of test

3.6.2.1.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.6.2.1.4.1

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.6.2.1.4.1 Test parameters for the UE spectrum emission mask test

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.6.2.1.4.1. Procedure

(1) Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 4.6.2.1.2.. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). The center frequency of the filter shall be stepped in contiguous steps according to table 4.6.2.1.2. The step duration shall be sufficient slow to capture the active TS. The measured power shall be recorded for each step.

(2) Measure the wanted output power according to annex B

(3) Display the results of (1) in dBc with respect to (2)

3.6.2.1.5. Test requirements

The result 4.6.2.1.4.2. step (3) shall fulfil the requirements of table 4.6.2.1.2.

3.6.2.2. Adjacent Channel Leakage power Ratio (ACLR)

3.6.2.2.1. Definition and applicability

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the transmitted power to the power measured after a receive filter in the adjacent channels(s). Both the transmitted power and the received power are measured with a filter response that has a Root-Raised Cosine (RRC) filter response with roll-off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The requirements in this subclause shall apply to all types of UTRA-UE.

3.6.2.2.2. Conformance requirements

The ACLR shall be better than the value specified in Table 4.6.2.2.2..

Table 4.6.2.2.2.: UE ACLR

Power Class	UE channel	ACLR limit
3	± 5 MHz	-33 dB or –50 dBm which ever is higher
3	± 10 MHz	-43 dB or –50 dBm which ever is higher

3.6.2.2.3. Test purpose

The test purpose is to verify the ability of the UE to limit the interference produced by the transmitted signal to other UTRA receivers operating at the first or second adjacent RF channel.

3.6.2.2.4. Method of test

3.6.2.2.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.6.2.2.4.1.

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.6.2.2.4.1. parameters of UE for ACLR test

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.6.2.2.4.1. Procedure

(1) Measure the wanted transmitted power of the active timeslot using the method in Annex B

(2) Average over TBD time slots.

(3) Measure interference power at the first lower adjacent RF channel (center frequency 5 MHz below the assigned channel frequency of the transmitted signal) over the useful part of the active TS i with the useful part starting TBD chips after the guard period of the preceding time slot ends and ending TBD chips before the first data symbol of the following time slot starts, and with a measurement filter that has a RRC filter response with a roll off α = 0,22 and a bandwidth equal to the chip rate.

(4) Average over TBD time slots.

(5) Calculate the ACLR by

Transmitted power acc. to (2) / interference power acc. to (4).

(6) Repeat steps (3), (4) and (5) for the second lower adjacent RF channel (center frequency 10 MHz below the assigned channel frequency of the transmitted signal) and also for the first and second upper adjacent RF channel (center frequency 5 MHz and 10 MHz, respectively).

3.6.2.2.5. Test requirements

The ACLR calculated in steps (5) and (6) of subclause 4.6.2.2.4.2 shall be equal or greater than the limits given in Table 4.6.2.2.2.

3.6.3. Spurious emissions

3.6.3.1. 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.

The frequency boundary and the detailed transitions of the limits between the requirement for out band emissions and spectrum emissions are based on ITU-R Recommendations SM.329.

3.6.3.2. Conformance requirements

These requirements are only applicable for frequencies which are greater than 12.5 MHz away from the UE center carrier frequency.

Table 4.6.3.2.a : General Spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
9 kHz ≤ f < 150 kHz	1 kHz	-36 dBm
150 kHz ≤ f < 30 MHz	10 kHz	-36 dBm
30 MHz ≤ f < 1000 MHz	100 kHz	-36 dBm
1 GHz ≤ f < 12.75 GHz	1 MHz	-30 dBm

Table 4.6.3.2.b : Additional Spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
925 MHz ≤ f ≤ 935 MHz	100 KHz	-67 dBm*
935 MHz < f ≤ 960 MHz	100 KHz	-79 dBm*
1805 MHz ≤ f ≤ 1880 MHz	100 KHz	-71 dBm*

Note: The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table ?? are permitted for each UARFCN used in the measurement.

3.6.3.3. Test purpose

The test purpose is to verify the ability of the UE to limit the interference caused by unwanted transmitter effects to other systems operating at frequencies which are more than 12,5 MHz away from of the UE's carrier frequency

3.6.3.4. Method of test

3.6.3.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.6.3.4.1.

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.6.3.4.1. parameters of the UE for spurious emissions test

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.6.3.4.2. Procedure

Measure the power of the spurious emissions applying measurement filters with bandwidths as specified in the relevant tables of 4.6.3.2. The characteristic of the filters shall be approximately Gaussian (typical spectrum analyzer filters). The center frequency of the filter shall be swept over the frequency bands as given in the tables. The sweep time shall be sufficiently low to capture the active time slots.

3.6.3.5. Test requirements

The spurious emissions measured according to subclause 4.6.3.4.2 shall not exceed the limits specified in the relevant tables of 4.6.3.2.

3.7. Transmit Intermodulation

3.7.1. 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 the presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

The UE intermodulation attenuation is defined by the ratio of the output power of the wanted signal to the output power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal. Both the wanted signal power and the intermodulation product power are measured with a filter response that is root-raised cosine (RRC) with roll-off α=0.22 and with a bandwidth equal to the chip rate.

The requirements of this test shall apply for all UTRA-UE

3.7.2. Conformance requirements

The requirement of transmitting intermodulation for carrier spacing 5 MHz is prescribed in the Table below.

Table 4.7.2 : Transmit Intermodulation

Interference Signal Frequency Offset	5MHz	10MHz
Interference Signal Level	-40 dBc	
Interferer Modulation	CW Note: BS Test uses a CDMA modulated signal	
Conformance Requirement	[-31dBc]	[-41]dBc

Note: This requirement is applicable to the 21 dBm power class 3 UE.

3.7.3. Test purpose

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into other UE, or BS receive band as an unwanted interfering signal

It is the purpose of this test to limit interferences to the own and other systems due to intermodulation products.

3.7.4. Method of test

3.7.4.1. Initial conditions

(1) Connect the SS and the interferer to the UE antenna connector as shown in Figure A.6.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.2.2.4.1

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.7.4.1. Parameters of the UE for transmit intermodulation test

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

Parameters of the interferer according to table 4.7.2.

3.7.4.2. Procedure

(1) Measure the unwanted emissions according to 4.7.1.

in a carrier offset spacing of 5 MHz and

in a frequency range [5 MHz to 12.75 GHz],

using an interferer +5MHz offset.

The frequency occupied by the interferer is excluded from the measurement.

(2) Repeat (1) with the other 3 interferer-configurations(-5Mz. +10 MHz, -10 MHz)

(3) Measure the wanted power according to annex B

(4) Display (1) and (2) in dBc with respect to (3)

3.7.5. Test requirements

The results in (4) from Clause 4.7.4.2. shall not exceed the prediscribed values in table 4.7.2.

3.8. Transmit Modulation

3.8.1. Modulation Accuracy

3.8.1.1. Definition and applicability

The modulation accuracy is a measure of the difference between the measured waveform and the theoretical modulated waveform (the error vector). It is the square root of the ratio of the mean error vector power to the mean reference signal power expressed as a %. The measurement interval is one timeslot.

The requirement of this subclause shall apply to all types of UTRA-UE

3.8.1.2. Conformance requirements

The modulation accuracy shall not exceed 17.5 %.

The reference for this requirement is TS 25.102 clause 6.8.2.

3.8.1.3. Test purpose

The transmitter shall generate a sufficient precise waveform, to enable the receiver to achieve the specified receiver performances

3.8.1.4. Method of test

3.8.1.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.8.1.4.1

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.8.1.4.1 Test parameters

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	[1]

3.8.1.4.2. Procedure

Measure EVM (Error Vector Magnitude) of the UE according to Annex B

3.8.1.4.3. Test requirements

The result shall nor exceed the predescribed tolerance in 4.8.1.2.

3.8.2. Peak code domain error

3.8.2.1. Definition and applicability

The code domain error is computed by projecting the error vector power onto the code domain at the maximum spreading factor. The error power for each code is defined as the ratio to the mean power of the reference waveform expressed in dB. And the Peak Code Domain Error is defined as the maximum value for Code Domain Error. The measurement interval is one timeslot.

This specification is applicable for multi-code transmission only.

The requirement of this test applies to all UTRA-UE, applicable for multi-code transmission.

3.8.2.2. Conformance Requirement

The peak code domain error shall not exceed [ ] dB.

The reference for this requirement is TS 25.102 Clause 6.8.3.1

3.8.2.3. Test purpose

It is the purpose of this test to limit crosstalk among codes

3.8.2.4. Method of test

3.8.2.4.1. Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.1.

(2) A call is set up according to the generic call setup procedure using parameters as specified in Table 4.2.2.4.1

(3) Enter the UE into loopback test mode and start the loopback test.

See TS34.109 Terminal Logical Test Interface (FDD/TDD) for details regarding generic call setup procedure and loopback test.

Table 4.2.2.4.1 Test parameters

Parameter	Value/description
Duty Cycle	[1:14]
AFC	on
Open Loop Power control	On: SS transmit level such that UE transmits max power
Data content	real life (sufficient irregular)
Number of DPCH in each active TS	2
Spreading factor	16

3.8.2.4.2. Procedure

Measure peak code domain error of the UE according to Annex B

3.2.2.5. Test requirements

The result shall nor exceed the predescribed tolerance in 4.2.2.2

4. Receiver Characteristics

4.1. General

Receiving performance test of the UE is implemented during communicating with the SS via air interface. The procedure uses normal call protocol until the UE is communicating on traffic channel basically. On the traffic channel, the UE provides special function for testing that is described in Logical Test Interface and the UE is tested using this function. (Refer to TS 34.109 Logical Test Interface (FDD/TDD) Special conformance testing functions)

Unless otherwise stated the receiver characteristics are specified at the antenna connector of the UE. For UE(s) with an integral antenna only, a reference antenna with a gain of 0 dBi is assumed. UE with an integral antenna may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. Receiver characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of this specification. It is recognized that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in Section 5 are defined using the DL reference measurement channel (12.2 kbps) specified in Annex C.2.2

4.2 Reference sensitivity level

4.2.1 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.

The requirements in this sub-clause shall apply to all types of UTRA UE

4.2.2 Conformance requirements

For the DL reference measurement channel specified in annex C, the reference sensitivity level and performance of the UE shall be as specified in table 5.2.2.1 below.

Table 5.2.2.1: UE reference sensitivity levels

Data rate	UE reference sensitivity level (dBm)	BER
12,2 kbps	-105 dBm	BER shall not exceed 0,001

The reference for this requirement is TS 25.102 subclause 7.3.

4.2.3 Test purpose

The test purpose is to verify the ability of the UE to receive a prescribed test signal at the lower end of the dynamic range under defined conditions (no interference, no multipath propagation) with a BER not exceeding a specified level. This test is also used as a reference case for other tests to allow the assessment of degradations due to various sources of interference.

4.2.4 Method of test

4.2.4.1 Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.3.

(2) A call is set up according to the Generic call setup procedure. The characteristic of the call shall be according to the DL reference measurement channel (12.2 kbit/s) specified in annex C.

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

(4) The level of SS output signal measured at the UE antenna connector shall be –105 dBm.

4.2.4.2 Procedure

Measure the BER of DCH received from the UE at the SS.

4.2.4.3 Test requirements

The measured BER, derived in step (1), shall not exceed 0,001.

4.3 Maximum Input Level

4.3.1 Definition and applicability

This is defined as the maximum receiver input power, measured at the antenna connector, which does not degrade the specified BER performance.

The requirements in this sub-clause shall apply to all types of UTRA UE

4.3.2 Conformance requirements

The BER shall not exceed 0,001 for the parameters specified in Table 5.3.2

Table 5.3.2. : Maximum input level

Parameter	Level	Unit
$\frac{\Sigma \text{DPCH\_Ec}}{I_{or}}$	-7	dB
$\hat{I}_{or}$	-25	dBm/3.84 MHz

Editor‘s Note: The composition of this multiple signal is to be clarified.

The reference for this requirement is TS 25.102 sub-clause 7.4.

4.3.3 Test purpose

The test purpose is to verify the ability of the UE to receive a prescribed test signal at the upper end of the dynamic range under defined conditions (no interference, no multipath propagation) with BER not exceeding a specified value..

4.3.4 Method of test

4.3.4.1 Initial conditions

(1) Connect the SS to the UE antenna connector as shown in Figure A.3.

(2) A call is set up according to the Generic call setup procedure. The characteristic of the call shall be according to the DL reference measurement channel (12.2 kbit/s) specified in annex C.

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

(4) The level of SS output signal measured at the UE antenna connector shall be according to table 5.3.2.

4.3.4.2 Procedure

Measure the BER of DCH received from the UE at the SS.

4.3.5 Test requirements

The measured BER, derived in step (1), shall not exceed 0,001.

TBD

4.4. Adjacent Channel Selectivity (ACS)

4.4.1. Definition and applicability

Adjacent Channel Selectivity is a measure of a receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an adjacent channel signal.

The requirements of this test apply to all UTRA UE

4.4.2. Conformance requirements

The BER, measured on the wanted signal, in the presence of an interference signal, shall not exceed 0,001 for the parameters specified in Table 11.

Table 11: Adjacent Channel Selectivity

Power Class		Units
3	[33]	dBm

Parameter	Value	Unit
Data rate	12.2	kbps
Wanted signal	[ ]	dBm
Interfering signal	[ ]	dBm
Offset of Fuw (Modulated) with respect to the wanted signal	5	MHz

Editor's note: It is noted that R4-99212(Definition of Adjacent Channel Selectivity (ACS)) can be applied to TDD as well as FDD. It is needed to check if this concept can be applied in TDD or not.

The reference of this requirement is TS 25.102. Clause 7.5

4.4.3. Test purpose

The test purpose is to verify the ability of the UE-receiver to sufficiently suppress the interfering signal in the channel adjacent to the wanted channel.

4.4.4. Method of test

4.4.4.1 Initial conditions

(1) Connect the SS and the interferer to the UE antenna connector as shown in Figure A.4.

(2) A call is set up according to the Generic call setup procedure . The characteristic of the call shall be according to the DL reference measurement channel (12.2 kbit/s) specified in annex C

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

(4) Set the signal generator to produce an interference signal. The interference signal shall be equivalent to a continuously running wideband CDMA signal with one code and chip frequency 3.84 Mchip/s and rolloff 0.22.

4.4.4.2 Procedure

(1) Set the interference signal 5 MHz above the assigned channel frequency of the wanted signal

(2) Measure the BER of the wanted signal received from the UE at the SS.

(3) Set the interference signal 5 MHz below the assigned channel frequency of the wanted signal and repeat (2)

4.4.5 Test requirements

The measured BER, derived in step (2) , shall not exceed 0,001.

4.5. Blocking Characteristics

4.5.1. Definition and applicability

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at is assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

The requirements of this test apply to all UTRA UE

4.5.2. Conformance requirements

The BER shall not exceed 0,001 for the parameters specified in table 12 and table 13. For table 13 up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size for the interference signal.

Table 12: In-band blocking

Parameter	Band 1	Band 2	Unit
Wanted Signal Level	<REFSENS> + 3 dB	<REFSENS> + 3 dB	dBm/3.84 MHz
Unwanted Signal Level (modulated)	-56	-44	dBm/3.84 MHz
Blocking offset	10<=|f-fo|<15	|f-fo|≥15	MHz

Table 13: Out of band blocking

Parameter	Band 1	Band 2	Band 3	Unit
Wanted Signal Level	<REFSENS> + 3 dB	<REFSENS> + 3 dB	<REFSENS> + 3 dB	dBm/3.84 MHz
Unwanted Signal Level (CW)	-44	-30	-15	dBm
Blocking signal frequency regions	1840 <f <1885 1935 <f <1995 2040 <f <2095	1815 <f <1840 2095 <f <2120	1< f <1815 2120< f <12750	MHz

Note: On frequency regions 1885 <f< 1900 MHz, 1920 <f< 1935 MHz, 1995 <f< 2010 MHz and 2025<f< 2040 MHz, the appropriate in-band blocking or adjacent channel selectivity in section 7.5.1 shall be applied.

4.5.3. Test purpose

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

4.5.3 Method of test

4.5.4.1 Initial conditions

(1) Connect the SS and the interfering Signal generator to the antenna connector as shown in Figure A.5.

(2) A call is set up according to the Generic call setup procedure. . The characteristic of the call shall be according to the DL reference measurement channel (12.2 kbit/s) specified in annex C

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

4.5.4.2 Procedure

(1) The wanted signal frequency channel is set into the middle of the band.

(2) The interfering Signal Generator is stepped through the frequency range indicated in Table 12 with a step size of 1MHz

(3) The interference signal shall be equivalent to a continuously running wideband CDMA signal with one code and chip frequency 3.84 Mchip/s and rolloff 0.22.

(4) Measure the BER of the wanted signal received from the UE at the SS for each step of the interferer

(5) Repeat the inband blocking for wanted frequency channels low–band and high-band

(6) The wanted signal frequency channel is set into the middle of the band.

(7) The interfering Signal Generator is stepped through the frequency range indicated in Table 13 with a step size of 1MHz

(8) The interference signal is a CW signal

(9) Measure the BER of the wanted signal received from the UE at the SS for each step of the interferer

Note: Due to the large amount of time-consuming BER tests it is recommended to speed up a single BER test by reducing the 0.001-BER confidence level [10 000 bits under test or 10 errors] for screening the critical frequencies. Critical frequencies must be identified using standard BER confidence level. [30 000 bits or 30 errors]

4.5.4 Test requirements

The measured BER, derived in step (4) and (5), shall not exceed 0,001 (without exception)

The measured BER, derived in step (9), shall not exceed 0,001 except for up to 24 different frequencies of the interfering signal. These frequencies are further processed in clause 5.6 Spurious response.

4.6 Spurious Response

4.6.1 Definition and applicability

Spurious response is a measure of the receiver’s ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the blocking limit is not met.

The requirements of this test apply to all types of UTRA for the UE.

4.6.2. Conformance requirements

The BER shall not exceed 0,001 for the parameters specified in Table 14.

Table 14: Spurious Response

Parameter	Value	Unit
Wanted Signal Level	<REFSENS> + 3 dB	dBm/3.84 MHz
Unwanted Signal Level (CW)	-44	dBm
Fcw	Spurious response frequencies	MHz

4.6.3. Test purpose

Spurious response frequencies, identified in the blocking test, are measured against a less stringent test requirement. The test stresses the ability of the receiver to withstand high level interference signals without undue degradation of its sensitivity due to the receiver's frequency conversion concept.

4.6.4 Method of test

4.6.4.1 Initial conditions

(1) Connect the SS and the unwanted signal to the UE antenna connector as shown in Figure A.6.

(2) A call is set up according to the Generic call setup procedure. . The characteristic of the call shall be according to the DL reference measurement channel (12.2 kbit/s) specified in annex C.

(3) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

4.6.4.2 Procedure

(1) Repeat the wanted signal frequency setting from the blocking test. Set the level according to table 14.

(2) Repeat the frequency settings of the interferer signal, at which the blocking test failed. Set the level according to table 14

(3) Measure the BER of DCH received from the UE at the SS for each of the settings (1) and (2).

4.6.5 Test requirements

The measured BER, derived in step (3), shall not exceed 0,001.

4.7. Intermodulation Characteristics

4.7.1. 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 receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

The requirements of this test shall apply to all UTRA UE

4.7.2. Conformance requirements

The BER shall not exceed 0,001 for the parameters specified in table 15.

Table 15: Receive intermodulation characteristics

Parameter	Value	Unit
Wanted Signal Level	<REFSENS> + 3 dB	dBm/3.84 MHz
I_{ouw1}	-46	dBm
I_{ouw2}	-46	dBm/3.84 MHz
Offset Fuw1 (CW)	|10|	MHz
Offset Fuw2 (Modulated)	|20|	MHz

4.7.3. Test purpose

The test stresses the ability of the receiver to withstand two or more high level interference signals without undue degradation of its sensitivity due to the receiver's non-linear elements.

4.7.4. Method of test

4.7.4.1 Initial conditions

(4) Connect the SS and the unwanted signals to the UE antenna connector as shown in Figure A.6.

(5) A call is set up according to the Generic call setup procedure. . The characteristic of the call shall be according to the DL reference measurement channel (12.2 kbit/s) specified in annex C.

(6) Enter the UE into loopback test mode and start the loopback test.

See [3] TS 34.109 Logical Test Interface for details regarding generic call setup procedure and loopback test.

4.7.4.2 Procedure

(4) Set the interfering signals as indicated in Table 15 with positive offset with respect to the wanted signal.

(5) Measure the BER of DCH received from the UE at the SS.

(6) Set the interfering signals as indicated in Table 15 with negative offset with respect to the wanted signal and repeat (2)

4.7.5 Test requirements

The measured BER, derived in step (2) and (3), shall not exceed 0,001.

4.8. Spurious Emissions

4.8.1. Definition and applicability

The Spurious Emissions Power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

The requirements of this test are applicable for all UTRA UE

4.8.2. Conformance requirements

The spurious emission shall be:

1. Less than -60dBm/ 3.84MHz at the mobile station antenna connector, for frequencies within the UTRA/TDD and UTRA/FDD UE receive band.
2. Less than -57dBm/100kHz at the mobile station antenna connector, for frequencies band from 9kHz to 1GHz.
3. Less than -47dBm/100kHz at the mobile station antenna connector, for frequencies band from 1GHz to 12.75GHz.

The reference for this requirement is TS 25.102 clause 7.9

4.8.3. Test purpose

The test purpose is to verify the UE's ability to limit interference caused by receiver spurious emissions to the own and the other systems. The test requirements are tighter than in 4.6.3 ((TX) Spurious Emissions) because the time of Receive–Only-Operation is generally much longer than RX-TX-Operation.

4.8.4. Method of test

4.8.4.1 Initial conditions

(1) Connect the measurement equipment to the UE antenna connector according to Fig A.8

The measurement equipment shall measure power through a 100 kHz filter with a approximately gaussian filter-characteristic (typical spectrum analyzer) or a matched filter with a bandwidth equal to the chip frequency 3.84 Mchip/s and rolloff 0.22.

(2) Enable the UE receiver and set Cell Search Mode on a PCCPCH. Since there is no down link signal, the UE should not pass the Cell Search mode.

<*Editor's Note: The method to set Cell Search Mode should be defined.*>

4.8.4.2 Procedure

(1) Measure the power of spurious emissions by covering the UTRA/TDD and UTRA/FDD UE receive band in contiguous steps of [200 kHz]. Apply the matched filter. The step duration shall be sufficient slow to capture intermittent spurious emissions.

(2) Measure the power of spurious emissions by covering the bands 100 kHz to 1GHz and 1GHz to 12.75 GHz (except UTRA/TDD and UTRA/FDD UE receive band) in contiguous steps of 100 kHz. Apply the 100 kHz filter. The step duration shall be sufficient slow to capture intermittent spurious emissions.

4.8.5 Test requirements

The all measured spurious emissions, derived in step (1) and (2), shall be:

(a) *Less than –60 dBm / 3.84 MHz at the UE antenna connector, for frequencies within the UE receive band.*
(b) Less than –57 dBm/100 kHz at the UE antenna connector, for frequencies band from 9 kHz to 1 GHz.

(c) Less than –47 dBm/100 kHz at the UE antenna connector, for frequencies band from 1 GHz to 12.75 GHz.

5. Performance Requirements

5.1. General

The performance requirements for the UE in this section is specified for the measurement channels specified in Annex C and the test environments specified in Annex D.

5.2. Dynamic reference sensitivity performance

The minimum required dynamic reference sensitivity performance is specified according to the traffic rate and the propagation conditions.

5.2.1. Demodulation in non fading Channel

5.2.1.1. Demodulation of Paging Channel

5.2.1.1.1. Definition and applicability

TBD

5.2.1.1.2. Conformance requirements

TBD

5.2.1.1.3. Test purpose

TBD

6.2.1.1.4 Method of test

5.2.1.1.3.1. Initial conditions

TBD

5.2.1.1.3.2. Procedure

TBD

5.2.1.1.4. Test requirements

TBD

5.2.1.2. Demodulation of Forward Access Channel

5.2.1.2.1. Definition and applicability

TBD

5.2.1.2.2. Conformance requirements

TBD

5.2.1.2.3. Test purpose

TBD

5.2.1.2.4. Method of test

5.2.1.2.4.1. Initial conditions

TBD

5.2.1.2.4.2. Procedure

TBD

5.2.1.2.5. Test requirements

TBD

5.2.1.3. Demodulation of Dedicated Traffic Channel

5.2.1.3.1. Definition and applicability

TBD

5.2.1.3.2. Conformance requirements

TBD

5.2.1.3.3. Test purpose

TBD

5.2.1.3.4. Method of test

5.2.1.3.4.1. Initial conditions

TBD

5.2.1.3.4.1. Procedure

TBD

5.2.1.3.5. Test requirements

TBD

5.2.2. Demodulation of DCH in Multi-path Fading Channel

5.2.2.1. Single Link Performance

5.2.2.1.1. Definition and applicability

The receive characteristic of the Dedicated Traffic Channel (DTCH) in the non-fading fading environments is determined by the average bit error rate (BER). BER is specified for the each individual data rate specified of the DTCH. DTCH is mapped into the Dedicated Physical Channel (DPCH).

5.2.2.1.2. Conformance requirements

TBD

5.2.2.1.3. Test purpose

TBD

5.2.2.1.4. Method of test

5.2.2.1.4.1. Initial conditions

TBD

5.2.2.1.4.2. Procedure

TBD

5.2.2.1.5. Test requirements

TBD

5.2.2.2. Multi Link Performance

5.2.2.2.1. Definition and applicability

TBD

5.2.2.2.2. Conformance requirements

TBD

5.2.2.2.3. Test purpose

TBD

5.2.2.2.4. Method of test

5.2.2.2.4.1. Initial conditions

TBD

5.2.2.2.4.1. Procedure

TBD

5.2.2.2.5. Test requirements

TBD

5.3. Rx synchronisation characterisitics

5.3.1. Synchronization Performance

5.3.1.1. Search of other Cells

5.3.1.1.1. Definition and applicability

Search of other cells test is used to check whether the UE correctly searches and measures other BS(s) during the specified operation.

5.3.1.1.2. Conformance requirements

TBD

5.3.1.1.3. Test purpose

TBD

5.3.1.1.4. Method of test

5.3.1.1.4.1. Initial conditions

TBD

5.3.1.1.4.2. Procedure

TBD

5.3.1.1.5. Test requirements

TBD

5.3.2. Inter-Frequency Handover.

5.3.2.1. Definition and applicability

The UE has to have the ability to make an Inter-frequency handover. This type of handover can happen within a BS or between two BS(s). Currently [ARIB Vol. 3] does not define requirements for Inter-frequency handover. <This item is ffs>

5.3.2.2. Conformance requirements

TBD

5.3.2.3. Test purpose

TBD

5.3.2.4. Method of test

5.3.2.4.1. Initial conditions

TBD

5.3.2.4.2. Procedure

TBD

5.3.2.5. Test requirements

TBD

5.4. Timing requirements

5.4.1. Synchronization

5.4.1.1. Definition and applicability

The timing of the UE is determined during specified operation.

5.4.1.2. Conformance requirements

TBD

5.4.1.3. Test purpose

TBD

5.4.1.4. Method of test

5.4.1.4.1. Initial conditions

TBD

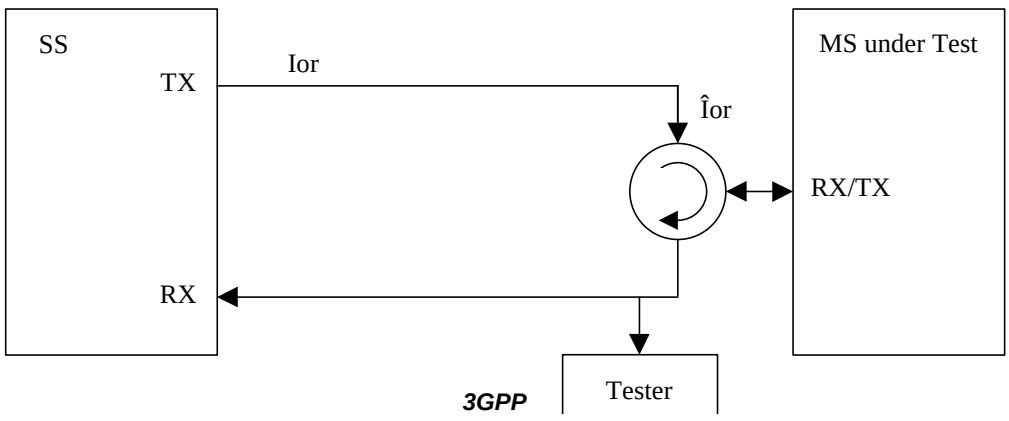
5.4.1.4.2. Procedure

TBD

5.4.1.5. Test requirements

TBD

Annex A: Connection Diagrams



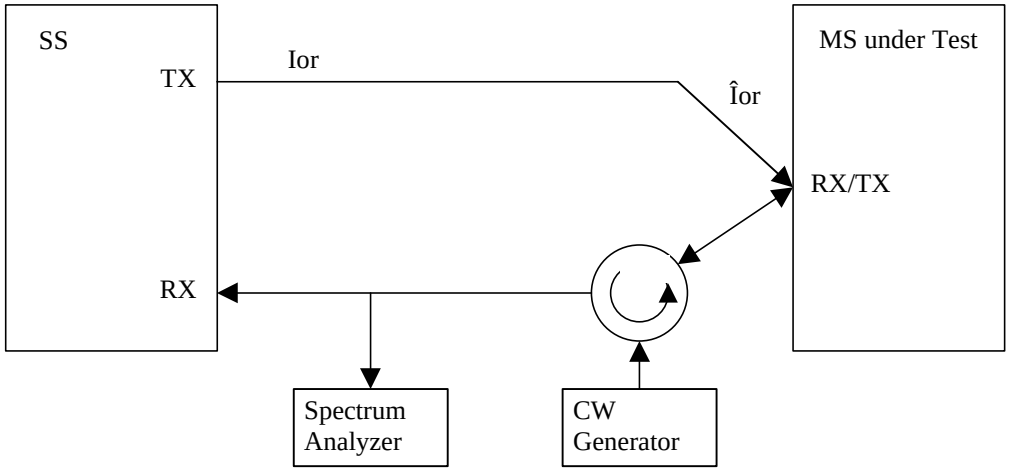


Figure A.2 Connection for TX Intermodulation Test

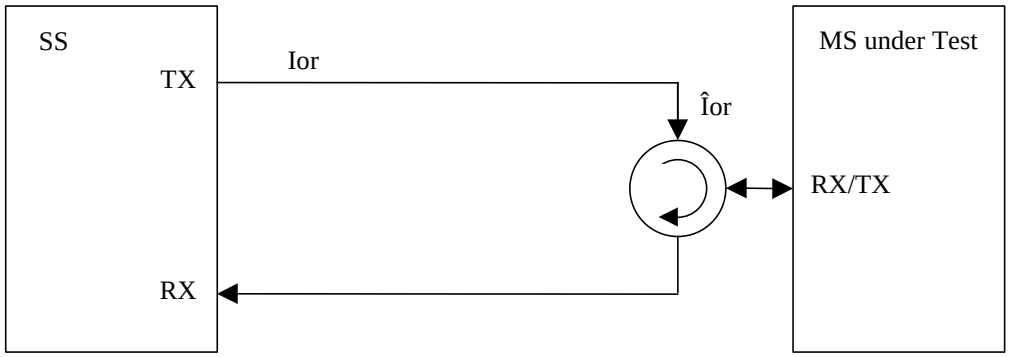


Figure A.3 Connection for Basic RX Test

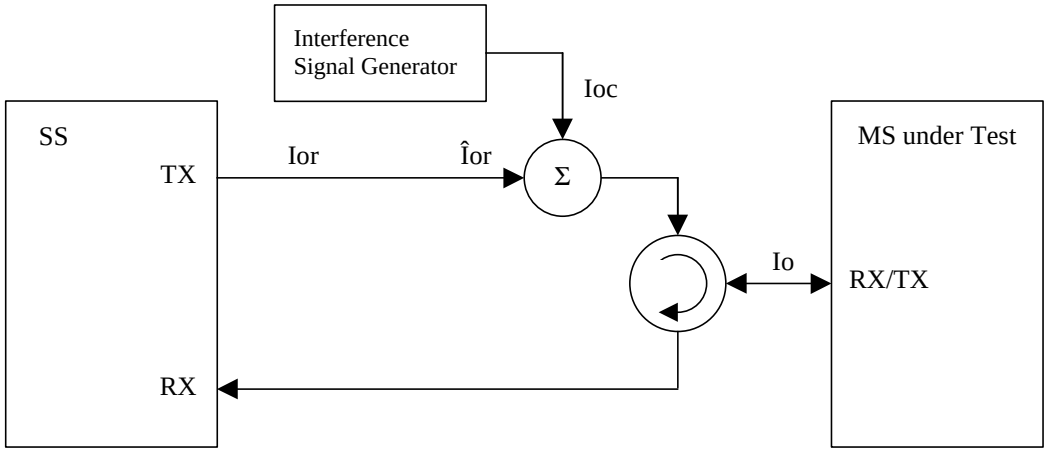


Figure A.4 Connection for RX Test with Interference

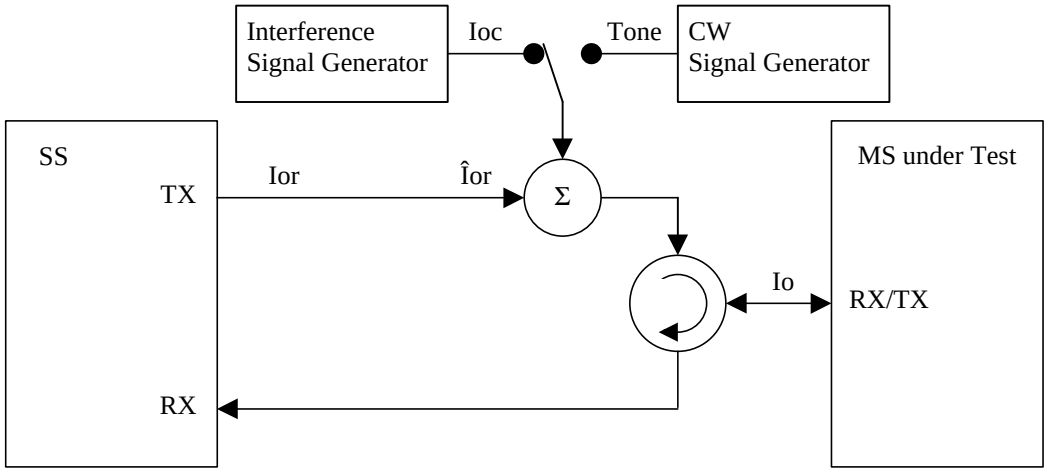


Figure A.5 Connection for RX Test with Interference or additional CW

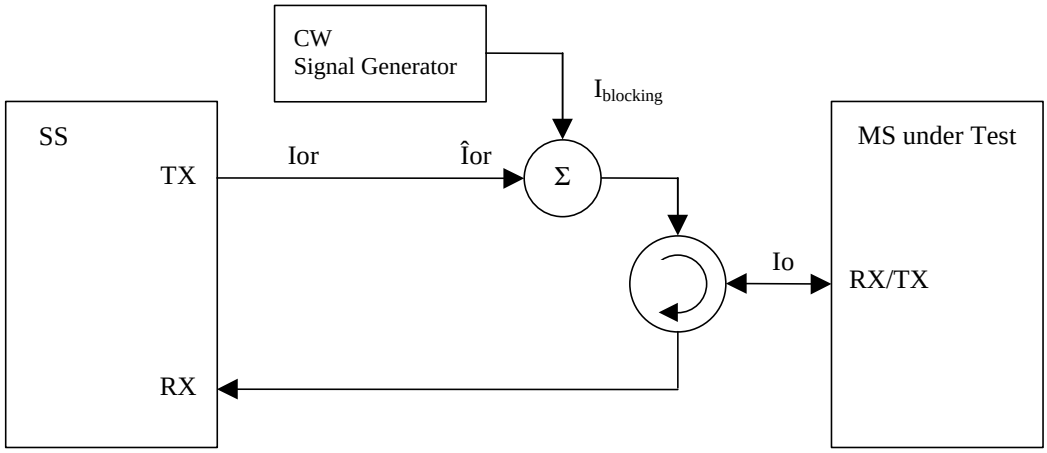


Figure A.6 Connection for RX Test with additional CW

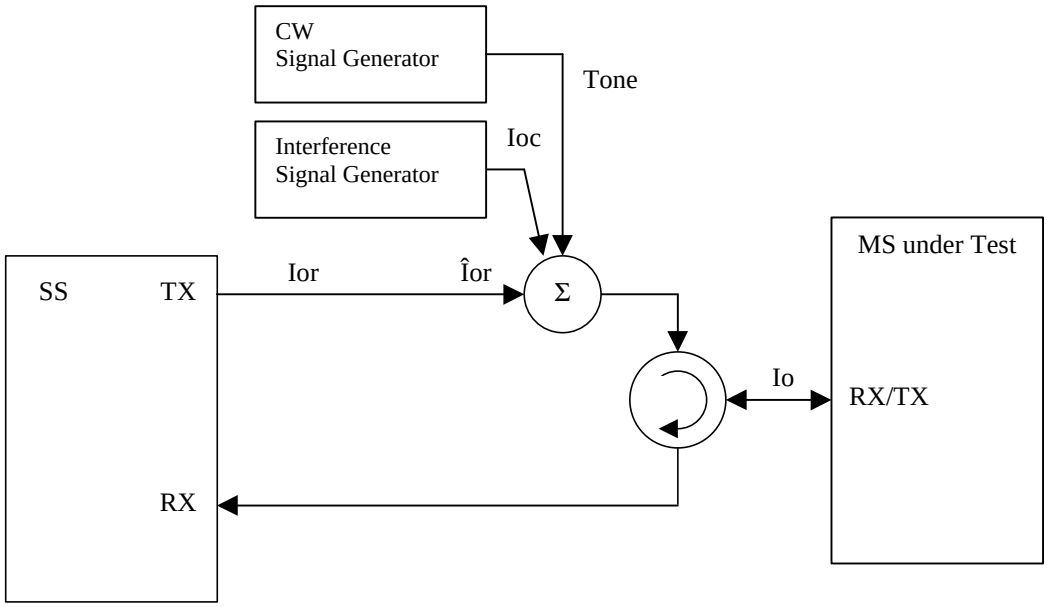


Figure A.7 Connection for RX Test with both Interference and additional CW

Figure A.8 Connection for Spurious Emission Test

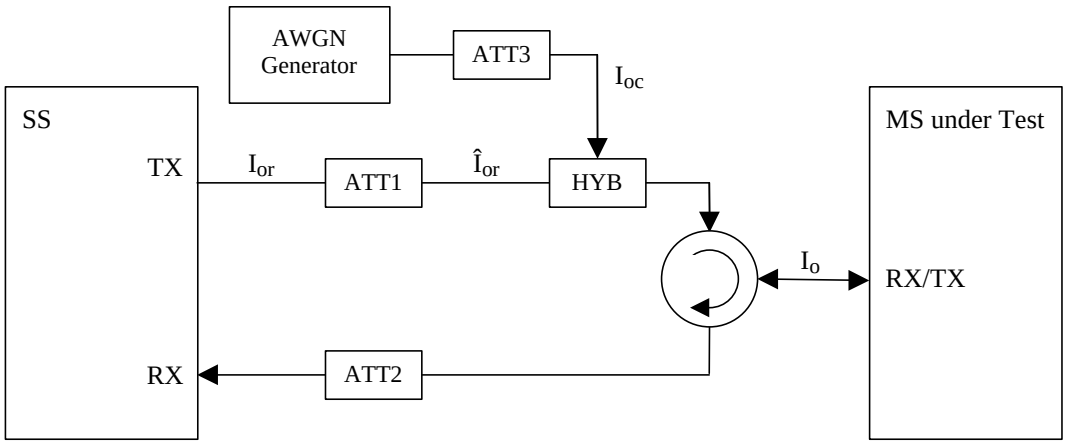


Figure A.9 Connection for Static Channel Test

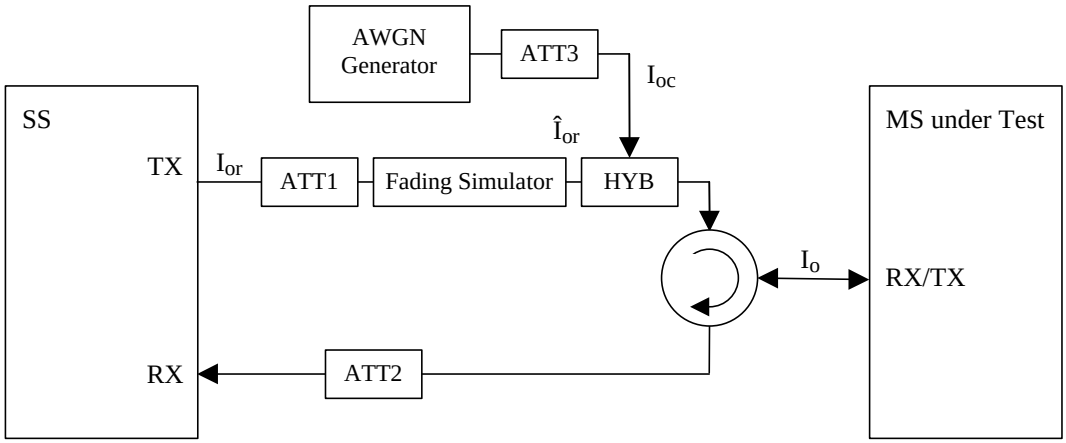


Figure A.10 Connection for Multiple Fading Channel Test

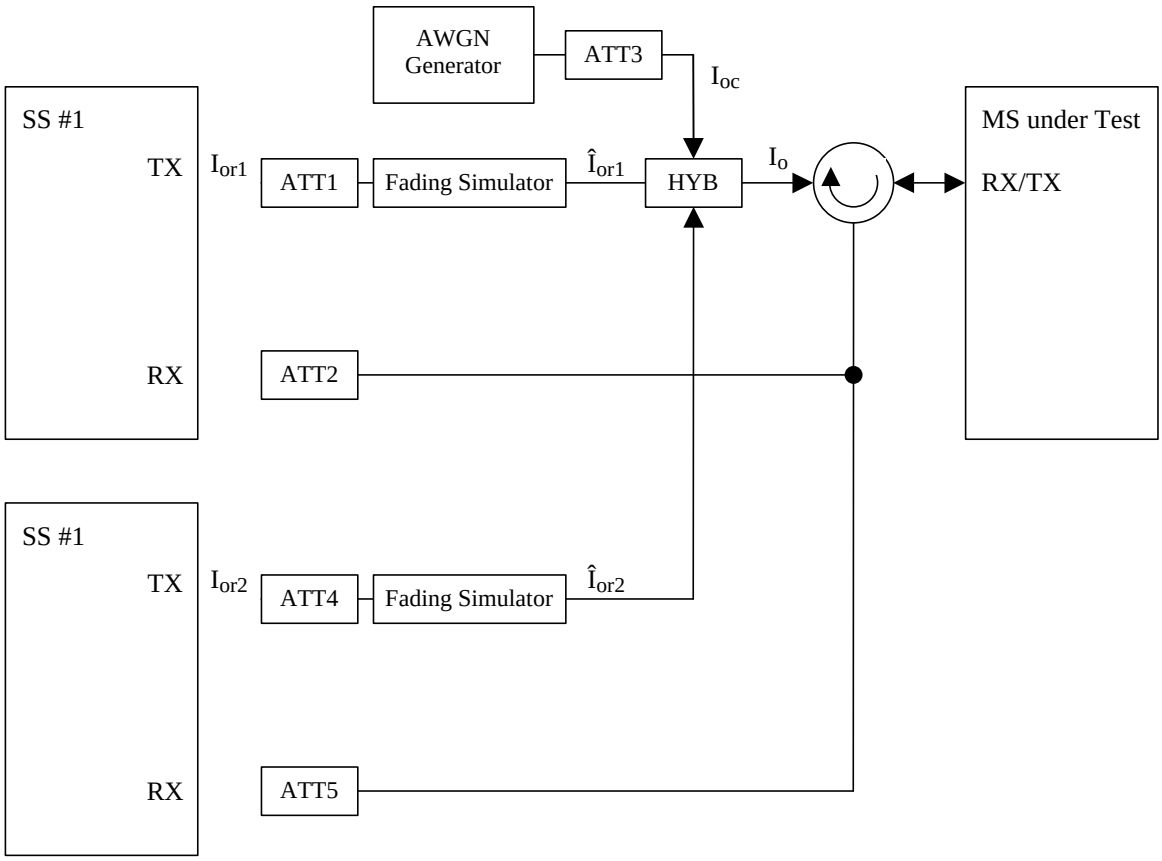


Figure A.11 Connection for Soft Handoff Test

Annex B: Global In-Channel TX-Test

B.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.

B.2 Definition of the process

B.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.

B.2.2 Output signal of the Tx under test

The output signal of the Tx under test is recorded through a matched filter (RRC 0.22, correct in shape and in position on the frequency axis) at one sample per chip.

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

Form1 (representing the physical signal in the entire measurement interval):

one vector **Z**, containing N = n x m complex samples;

with

n: number of symbols in the measurement interval;

m: number of chips per symbol.

Form 2 (derived from form 1 by descrambling and separating the samples into symbol intervals):

n time sequential vectors **z** with m complex samples, where each vector comprises a symbol interval.

B.2.3 Reference signal

The reference signal is constructed by the measuring equipment according to the relevant Tx specifications,

filtered by a matched filter and sampled at the Inter-Symbol-Interference-free instants.

Depending of the parameter to be evaluated, it is appropriate to represent the reference set of samples in one of the following three different forms:

Form1 (representing the physical signal in the entire measurement interval):

one vector **R**, containing N = n x m complex samples;

with

n: number of symbols in the measurement interval;

m: number of chips per symbol.

Form 2 (derived from form 1 before scrambling and by separating the samples into symbol intervals)

n time-sequential vectors **r** with m complex samples, where each vector comprises a symbol interval.

(Note: Clarification is needed in case of a multi-code with multi-rate signal)

Form 3 (derived from form 2 by separating the samples into code signals)

n sequential expressions $\sum_{i=1}^{k} \mathrm{rc}_i$,

with

k: number of codes;

a single summand $\mathbf{rc}_i$ representing the vector of one code i, containing m complex samples of the symbol interval

B.2.4 Provisions in case of multi code signals

In case of multi code signals, the code multiplex shall contain only orthogonal codes. (Otherwise non-orthogonal codes must be eliminated (e.g. by time-windowing the measurement interval or switch off).

B.2.5 Classification of measurement results

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

Results of type 1, where the error-free parameter has a non-zero magnitude. These parameters are:

RF Frequency

(Chip Frequency)

Power

Code Domain Power (in case of multi code)

Timing (only for UE)

Results of type 2, where the error-free parameter has value zero. These parameters are:

Error Vector Magnitude

Peak Code Domain Power Error

B.2.6 Process definition to achieve results of type 1

The reference signal is varied with respect to the parameters mentioned in subclause B.2.5 under "results of type 1" in order to achieve best fit with the recorded signal under test (output signal of the Tx under test, filtered and sampled according to subclause B.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 in this best fit case will be called **R'.**

The varied parameters, leading to **R'** represent directly the wanted results of type 1. These measurement parameters are expressed as deviation from the reference value with dimensions same as the reference value.

In case of multi code, the type-1-parameters (frequency, (chip frequency) and timing) are varied commonly for all codes such that the process returns one frequency-error, (one chip-frequency error), one timing error.

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

Only the type-1-parameters (code powers) are varied individually such that the process returns k code powers (k: number of codes)

B.2.7 Process definition to achieve results of type 2

The difference between the signal under test (**Z**; see subclauseB.2.2) and the reference signal after the minimum process (**R'**; see subclauseB.2.6) is the error vector **E** versus time:

E = **Z** – **R'.**

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

<u>Form1</u> (representing the physical error signal in the entire measurement interval)

One vector **E**, containing N = n x m complex samples;

with

n: number of symbols in the measurement interval

m: number of chips per symbol

Form 2 (derived from form 1 by separating the samples into symbol intervals)

n time-sequential vectors **e** with m complex samples comprising one symbol interval

E gives results of type 2 applying the two algorithms defined in subclauses B 2.7.1 and B 2.7.2.

B.2.7.1 Error Vector Magnitude

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

(1) Take the error vector **E** defined in subclause B.2.7 (form 1) and calculate the RMS value of **E** chip-wise over the entire measurement interval; the result will be called RMS(**E**).

(2) Take the reference vector **R** defined in subclause B2.3 (form 1) and calculate the RMS value of **R** chip-wise over the entire measurement interval; the result will be called RMS(**R**)

(3) Calculate EVM according to

$$\mathrm{EVM} = \frac{\mathrm{RMS}(\mathbf{E})}{\mathrm{RMS}(\mathbf{R})} \mathrm{x}\, 100\%$$

(here, EVM is relative and expressed in %)

B.2.7.2 Peak Code Domain Power Error

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

(1) Take the error vectors **e** defined in subclause B.2.7 (form 2) and the reference vectors **rc** defined in Subclause B.2.3 (form 3) and calculate the inner product of **e** and **rc** chip-wise over the symbol duration for all symbols of the measurement interval and for all codes in the code space.
This gives a matrix of format k x n, each value representing an error voltage connected with a specific symbol and a specific code, which can be exploited in a large variety.

k: number of codes in the code space

n: number of symbols in the measurement interval

(2) Calculate k RMS values, each RMS value unifying n symbols within one code.
(This values can be called "absolute Code-EVMs" [Volt].)

(3) Find the peak value among the k "absolute Code-EVMs".
(This value can be called "absolute Peak-Code-EVM" [Volt].)

(4) Calculate the following term:

$$10\lg \frac{(\text{absolute Peak - Code} - \text{EVM})^2}{(\mathrm{RMS}(\mathbf{R}))^2}\ \mathrm{dB}.$$

This term is called Peak Code Domain Power Error (a relative value in dB).

(5) If the values RMS(**r**) are not constant during the measurement interval, Peak Code Domain Power Error should be expressed absolutely instead by the term:

$$\frac{(\text{absolute Peak} - \text{Code} - \text{EVM})^2}{50\,\text{Ohm}}$$

This term is called Absolute Peak Code Domain Power Error [Watt or dBm]

B.3 Applications

This process is applicable to the following paragraphs:

4.3 Frequency Stability

4.4 Output Power Dynamics

4.4.1 Open Loop Power Control

4.4.2 Closed Loop Power Control

4.4.3 Minimum Output Power

4.5 Transmit OFF Power

4.11 Transmit Modulation

4.11.1 Modulation Accuracy

4.11.2 Peak Code Domain Error

(Chip Frequency)

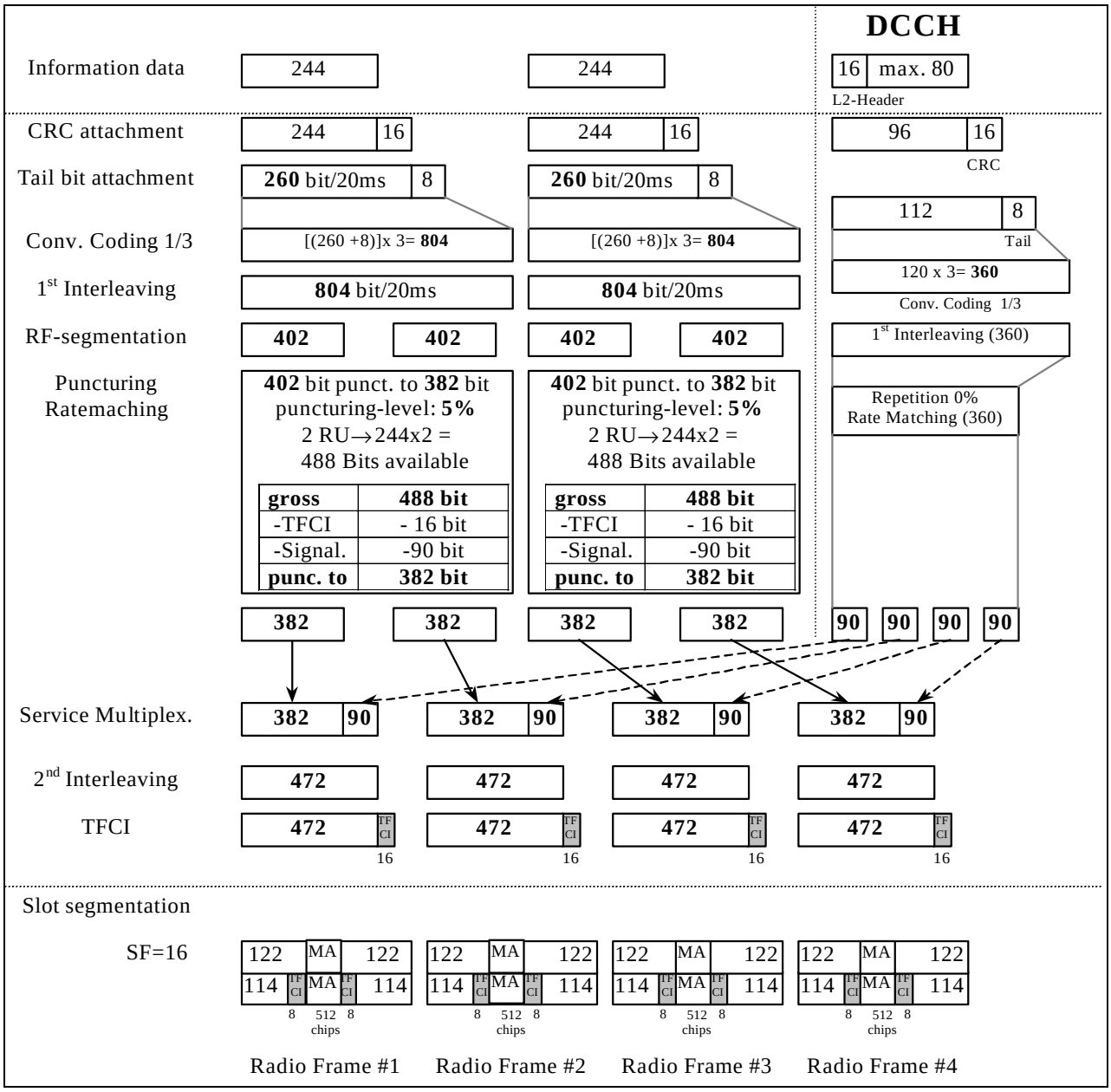
Annex C (normative): Measurement channels

C.1 General

C.2 Reference measurement channel

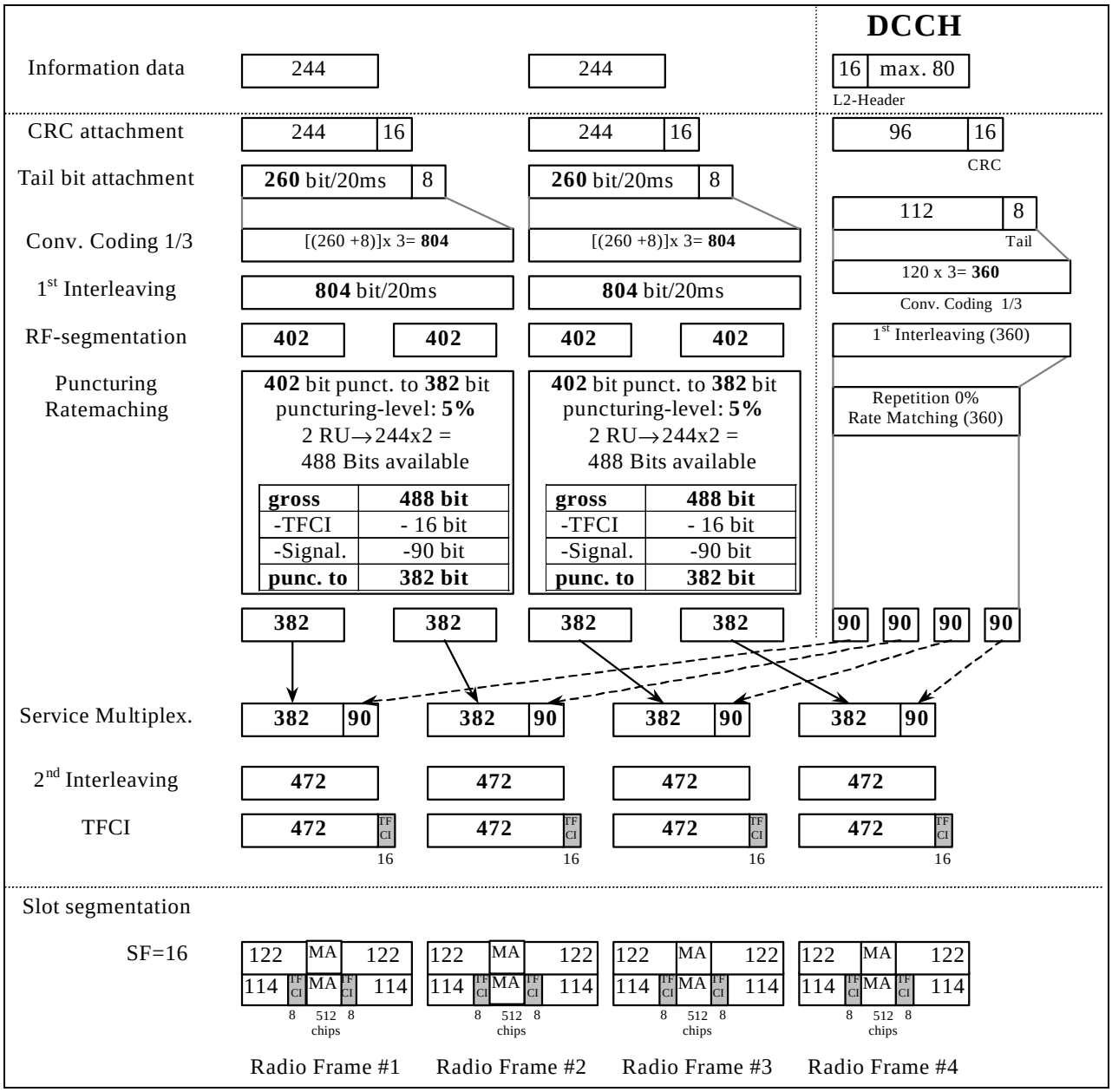
C.2.1 UL reference measurement channel (12.2 kbps)

Parameter	
Information data rate	12.2 kbps
RU´s allocated	2 RU
Midamble	512 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate 1/3 : DCH / DCCH	5% / 0 %



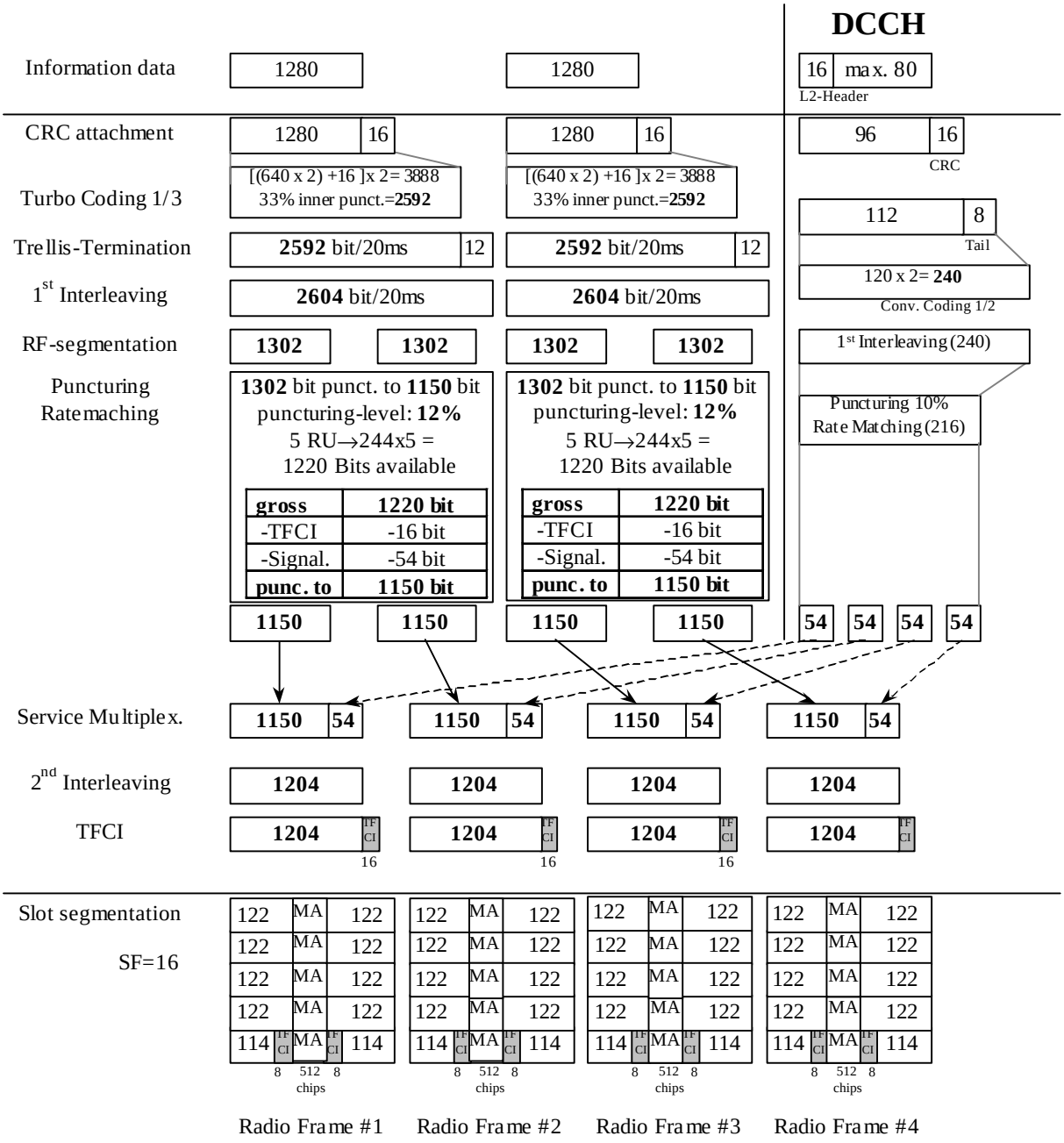
C.2.2 DL reference measurement channel (12.2 kbps)

Parameter	
Information data rate	12.2 kbps
RU´s allocated	2 RU
Midamble	512 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate 1/3 : DCH / DCCH	5% / 0 %



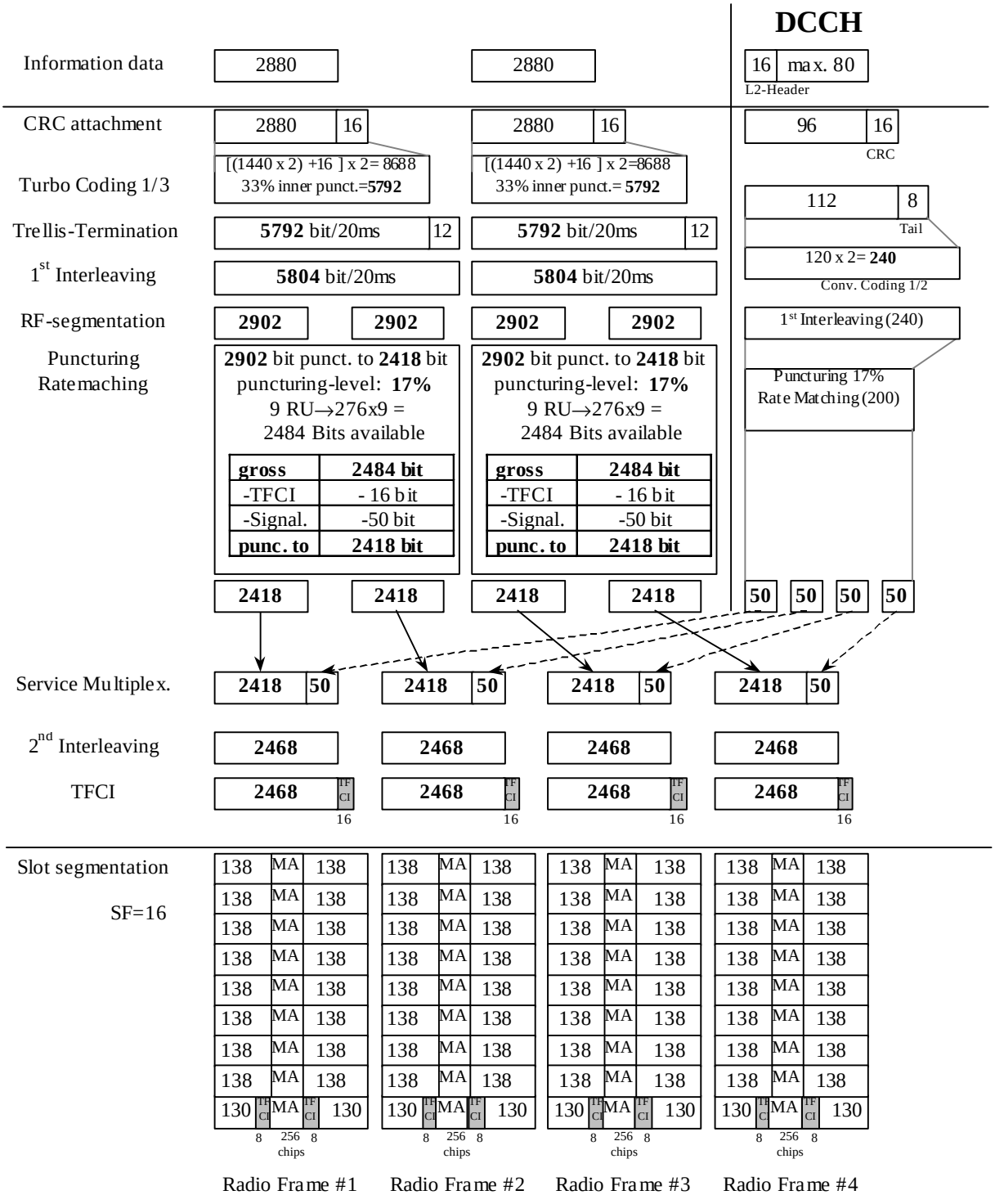
C.2.3 DL reference measurement channel (64 kbps)

Parameter	
Information data rate	64 kbps
RU´s allocated	5 codes SF16 = 5RU
Midamble	512 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / ½ DCCH	41.1% / 10%


DCCH
Information data
1280
1280
16
max. 80
L2-Header
CRC attachment
1280
16
1280
16
96
16
CRC
Turbo Coding 1/3
[(640 x 2) +16]x 2= 3888
33% inner punct.=2592
[(640 x 2) +16]x 2= 3888
33% inner punct.=2592
112
8
Tail
Trellis-Termination
2592 bit/20ms
12
2592 bit/20ms
12
120 x 2= 240
Conv. Coding 1/2
1st Interleaving
2604 bit/20ms
2604 bit/20ms
RF-segmentation
1302
1302
1302
1302
1st Interleaving (240)
Puncturing
Ratematching
1302 bit punct. to 1150 bit
puncturing-level: 12%
5 RU→244x5 =
1220 Bits available
1302 bit punct. to 1150 bit
puncturing-level: 12%
5 RU→244x5 =
1220 Bits available
Puncturing 10%
Rate Matching (216)
gross 1220 bit
-TFCI -16 bit
-Signal. -54 bit
punc. to 1150 bit
gross 1220 bit
-TFCI -16 bit
-Signal. -54 bit
punc. to 1150 bit
1150
1150
1150
1150
54
54
54
54
Service Multiplex.
1150
54
1150
54
1150
54
1150
54
2nd Interleaving
1204
1204
1204
1204
TFCI
1204
TFCI
16
1204
TFCI
16
1204
TFCI
16
1204
TFCI
Slot segmentation
SF=16
122
MA
122
114
TFCI
MA
TFCI
114
8
512 chips
8
Radio Frame #1
Radio Frame #2
Radio Frame #3
Radio Frame #4

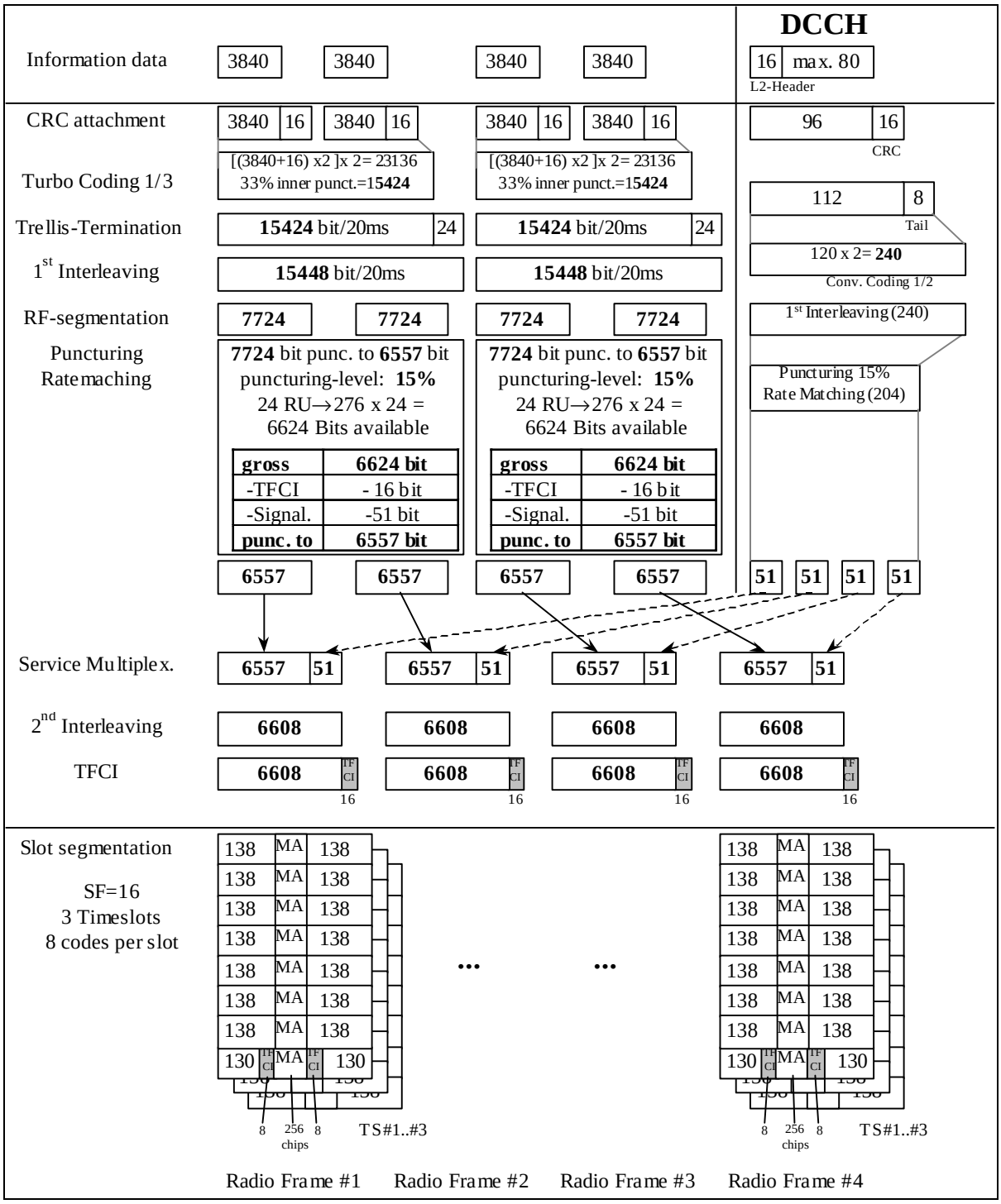
C.2.4 DL reference measurement channel (144 kbps)

Parameter	
Information data rate	144 kbps
RU´s allocated	9 codes SF16 = 9RU
Midamble	256 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate: 1/3 DCH / ½ DCCH	44.5% / 16.6%



C.2.5 DL reference measurement channel (384 kbps)

Parameter	
Information data rate	384 kbps
RU´s allocated	8*3TS = 24RU
Midamble	256 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / ½ DCCH	43.4% / 15.3%



Annex D (normative): Propagation conditions

D.1 Test Environments

Table D1 details the test services, the information data and the propagation conditions

Table D1: Test Environments for UE Performance Specifications

Test Services	Information Data Rate	Static	Multipath Case 1	Multipath Case 2	Multipath Case 3
		Performance metric			
Paging Message			-	-	-
FACH Message			-	-	-
Circuit Switched Services	12.2 kbps	BLER <	BLER <	BLER <	BLER <
	64 kbps	BLER <	BLER <	BLER <	BLER <
	144 kbps	BLER <	BLER <	BLER <	BLER <
	384 kbps	BLER <	BLER <	BLER <	BLER <
	2048 kbps	BLER <	-	-	-
Packet Switched Data	TBD	TBD	TBD	TBD	TBD

D.2 Propagation Conditions

D.2.1 Static propagation condition

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

D.2.2 Multi-path fading propagation conditions

Table D2 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum.

Table D2: 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

Annex E (normative): Environmental conditions

E.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of this specifications shall be fulfilled.

E.2 Environmental requirements

The requirements in this clause apply to all types of UE(s)

E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

+15°C to +35°C	for normal conditions (with relative humidity of 25 % to 75 %)
-10°C to +55°C	for extreme conditions (see IEC publications 68-2-1 and 68-2-2)

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in [1] TS 25.101 for extreme operation.

E.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 * nominal	1,1 * nominal	nominal
Regulated lead acid battery	0,9 * nominal	1,3 * nominal	1,1 * nominal
Non regulated batteries: Leclanché / lithium Mercury/nickel & cadmium	 0,85 * nominal 0,90 * nominal	 Nominal Nominal	 Nominal Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in [1] TS 25.101 for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

E.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes:

Frequency	ASD (Acceleration Spectral Density) random vibration
5 Hz to 20 Hz	0,96 m^2/s^3
20 Hz to 500 Hz	0,96 m^2/s^3 at 20 Hz, thereafter –3 dB/Octave

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in [1] TS 25.101 for extreme operation.

Annex F Requirements of Test Equipment

Annex G Open Issues (Informative)

1) The contents of Conformance requirements, Test purpose and Test requirements are almost same. Test requirements require the information that describes the requirements for Test method, System simulator, Test Environment and so on. Test purpose should describe what function or performance is tested.

2) Text for Test purpose schould be aligned between 34.121 and 34.122

3) Power vs Time mask (Trasmit ON/OFF, DTX) must require clear definitions of power measurement, measurement period, alignement of time domain (x-axis) position, and so on.

4) ACLR (Leakage due to Switching) should be clearly defined from testing viewpoint. Do we use peak hold technique to capture a transient phenomenon?

5) Cell selection & reselection testing, coverage of 25.103 core specifications

6) Test setup/initial conditions for TX tests. An Annex shall be created for reference. Only deviations from the annex shall be mentioned in the test itself.

7) Annex with Terminal Baseline and Service Implementation Capabilities to be inserted

~~8) Definfition of "Transmit Off Power" to be clarified between UE Test and BS Test~~. Closed

9) Does CWTS (The Chinese TDD) require our attention?

10) ~~Global in channels TX test is part of the test specifications UE FDD,UE TDD, BS TDD but not BS FDD. Shall we propose it to BS FDD?~~ Closed

11) Delete absolute peak code domain power error

12) Definition of Power still not agreed

13) Terms and abbreviations are a copy from 34.121 and not yet revised with respect to 34.122

14) Core Specifications 25.102 are currrently changed on Output power Dynamics. Here exisiting test specifications must be deleted and new ones mut be created.

Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- <Publication>: "<Title>".

History

Document history		
V0.0.0	1999-02-xx	Initial document. Except for the scope, all clauses are just blank.
V0.1.0	1999-04-13	Two reference documents are added. Other contents are not changed.
V0.0.2	1999-05-14	The document numbering was changed from TS XX.XX to iTS-T1.004. Other contents are not changed.
V0.0.3	1999-07-16	3GPP template and number
V0.0.4	1999-07-29	Version updated. Contents are not changed
V0.1.0	1999-09-09	Clause 4 filled with content according to TSG-T SWG RF #6 and with headers according to TS 25.102 V 1.3.0. Clause 5,6 and 7 filled with headers Annexes filled with headers or content
V0.2.0	1999-10-20	Clause 4.4 filled according to TSG-T-SWG RF#6 Clauses >4.4 to 6 filled with structure and partly with content derived from TS 25.102 V2.0.0 (1999-09) Annex D (propagation..) and annex C(measurement channels) copied from TS 25.102 V2.0.0 (1999-09)
V0.2.1	1999-11-25	Updating of the format
V0.3.0	199-12-01	Clause 4 updated according to T1RF SWG #8 Meeting Results of RAN4 Meeting #8 on 4.4.1. Uplink Power Control included
V 0.4.0.	1999-12-07	Results of T1RF SWG #9 Meeting (Dec 6 and 7 only) included
V1.0.0	1999-12-10	Approved as V1.0.0 at T1#5 to be presented at T#6 for information

Editor for:

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This document is written in Microsoft® Word 97.

This is the first report to TSG-T.

Current state:

Item	Estimated Level of Completeness	State of the core spec 25.102
4. Transmitter Characteristics	75%	90%
5. Receiver Characteristics	85%	90%
6. Performance Requirements	0%	0%
Annexes	50%	80%

Outstanding Issues:

1) Performance Requirements (excluding RRM issue) Date: March 2000

2) Performance Requirement (RRM issue) Date: June 2000 (uncertain)

Contentious Issues:

No serious contention issues are known.

The scope of the document, currently comprising

Transmitter Characteristics, Receiver Characteristics and Performance Requirements will be extended in future due to acceptance of TS 25.123 as a core specification.

Information for Release 99

Target for R99:

- Transmitter Characteristics
- Receiver Characteristics
- Performance Requirements

Reallocate to R00:

- Confidence level for statistical measurements
- Requirements for test equipment
- Complete range of test points and environmental conditions required for each test (Frequency range, voltage, etc.)