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Technical Specification

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Requirements for Support of Radio Resource Management (FDD)

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Contents

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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:

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where:

x the first digit:

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1 Scope

This Technical Specification specifies requirements for support of Radio Resource Management for FDD. These requirements include requirements on measurements in UTRAN and the UE as well as requirements on node dynamical behaviour and interaction, in terms of delay and response characteristics.

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.

- A non-specific reference to an TS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3GPP Homepage: www.3GPP.org

[2] 25.150 Introduction

[3] 25.101 MS Radio transmission and reception (FDD)

[4] 25.104 BTS Radio transmission and reception (FDD)

[5] 25.102 MS Radio transmission and reception (TDD)

[6] 25.105 BTS Radio transmission and reception (TDD)

[7] 25.103 RF parameters in support of RRM

[8] 25.141 Basestation conformance testing (FDD)

[9] 25.142 Basestation conformance testing (TDD)

[10] 25.113 Basestation EMC

[11] 25.942 RF System scenarios

[12] 25.922 RRM Strategies

[13] 25.215 Physical Layer Measurements (FDD)

[14] 25.225 Physical Layer Measurements (TDD)

[15] 25.302 Services provided by Physical Layer

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purpose of the present document the following definitions apply.

The main general definitions strictly related to the Transmission and Reception characteristics but important also for this specification can be found in [3] for UE FDD, in [4] for BS FDD, in [5] for UE TDD, in [6] for BS TDD.

3.2 Symbols

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

<symbol> <Explanation>

Symbol	Explanation
[…]	Values included in square bracket must be considered for further studies, because it means that a decision about that value was not taken;
$\hat{I}_{or}$	"RXLEV", see 25.101 or 25.102 section 3.3 and Annex C.

3.3 Abbreviations

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

RRM	Radio Resource Management
ACPR	Adjacent Channel Power Ratio
BS	Base Station
CW	Continuous wave (unmodulated signal)
DL	Down link (forward link)
EIRP	Equivalent Isotropic Radiated Power
FDD	Frequency Division Duplexing
FER	Frame Error Rate
PPM	Parts Per Million
RSSI	Received Signal Strength Indicator
SIR	Signal to Interference ratio
TDD	Time Division Duplexing
TPC	Transmit Power Control
UE	User Equipment
UL	Up link (reverse link)
UTRA	UMTS Terrestrial Radio Access

4 Idle Mode Tasks

4.1 Introduction

Note: The paging period and the repetition rate of relevant system information blocks needs to be defined.

4.2 RF Cell Selection Scenario

[Note: Some performance requirements in agreed scenarios are added into this section. More scenarios will be added later]

4.2.1 Requirements for Cell Selection Single carrier Single cell case

4.2.1.1 Cell Selection delay

The UE shall be capable of selecting a suitable cell within [5] seconds from switch on in the test case defined in following section in Table 4-1. The cell selection delay is defined as a time the UE needs for sending RRC Connection Request for Location Registration to UTRAN after the power has been switched on with a valid USIM and PIN is disabled.

4.2.1.2 Test Parameters

The stored information of the last registered PLMN is utilized in this test. The stored information includes UTRA RF CHANNEL NUMBER. The active cell in the test does not contain any neighbour cells in its measurement control information.

Table 4-1:

Parameter	**Unit**	**Cell 1**
UTRA RF Channel Number		Channel 1
CPICH_Ec/Ior	dB	-10
PCCPCH_Ec/Ior	dB	-12
SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
OCNS	dB	To Be Calculated
$\hat{I}_{or}/I_{oc}$	dB	0
I_{oc}	dBm/3.84 MHz	-60
CPICH_Ec/Io	dB	-13
Propagation Condition		AWGN
Qmin	dB	[ ]
UE_TXPWR_MAX_RACH	dBm	[ ]

4.2.1.3 Performance Requirements

Correct cell selection shall be greater than [X%] with [Y%] confidence. Cell selection is correct if within [5] seconds the UE camps on the cell,.

4.2.2 Requirements for Cell Selection multi carrier multi cell case

4.2.2.1 Cell selection delay

The UE shall be capable of selecting a suitable cell within [5+x] seconds from switch on in the test case defined in following section in

Table 4-2. The cell selection delay is defined as a time the UE needs for sending RRC Connection Request for Location Registration message to UTRAN after the power has been switched on with a valid USIM and PIN is disabled.

4.2.2.2 Test Parameters

The stored information of the last registered PLMN is utilized in this test. The stored information includes one of the UTRA RF CHANNEL NUMBERs used in the test. All the cells in the test are given in the measurement control information of each cell, which are on the RF carrier stored to the UE.

[Note: Here pilot pollution case with different power levels for cells could be included]

Table 4-2:

Parameter	Unit	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
UTRA RF Channel Number		Channel 1	Channel 1	Channel 1	Channel 2	Channel 2	Channel 2
CPICH_Ec/Ior	dB	-10	-10	-10	-10	-10	-10
PCCPCH_Ec/Ior	dB	-12	-12	-12	-12	-12	-12
SCH_Ec/Ior	dB	-12	-12	-12	--12	-12	-12
PICH_Ec/Ior	dB	-15	-15	-15	-15	-15	-15
OCNS	dB	To Be Calculated	To Be Calculated	To Be Calculated	To Be Calculated	To Be Calculated	To Be Calculated
$\hat{I}_{or}/I_{oc}$	dB	0	-4.8	-9.5	-4.8	5.9	-9.5
I_{oc}	dBm/3.84 MHz	-60			-60		
CPICH_Ec/Io	dB	-13	-16	-20	-16	-11	-20
Propagation Condition		AWGN			AWGN		
Qmin	dB	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
UE_TXPWR_MAX_RACH	dBm	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

4.2.2.3 Performance Requirements

Correct cell selection shall be greater than [X%] with [Y%] confidence. Cell selection is correct if within [5+x] seconds the UE camps on the cell, which fulfils the cell selection criteria.

4.3 RF Cell Re-Selection Scenario

[Note: One performance requirement in agreed scenario is added into this section. More scenarios will be added later]

4.3.1 Requirements for Cell Re-Selection single carrier multi cell case

4.3.1.1 Cell re-selection delay

When the UE is camped on one of the cells, the UE shall be capable of re-selecting a new cell in the test case defined in the following section in within [5] seconds from it becoming a cell to be re-selected according the cell re-selection criteria. The cells, which are possible to be re-reselected during the test are belonging to different location areas. The cell re-selection delay is then defined as a time the UE needs for sending RRC Connection Request for Location Update message to UTRAN.

4.3.1.2 Test Parameters

One of the 6 cells in Table 4-3 is serving cell and all others are given in the measurement control information of the serving cell. 2 of the cells are possible for cell re-selection and 4 of the cells are steady interfering cells.

Table 4-3:

Parameter	Unit	Cell 1		Cell 2		Cell 3		Cell 4		Cell 5		Cell 6	
		T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
UTRA RF Channel Number		Channel 1		Channel 1		Channel 1		Channel 1		Channel 1		Channel 1	
CPICH_Ec/Ior	dB	-10		-10		-10		-10		-10		-10	
PCCPCH_Ec/Ior	dB	-12		-12		-12		-12		-12		-12	
SCH_Ec/Ior	dB	-12		-12		-12		-12		-12		-12	
PICH_Ec/Ior	dB	-15		-15		-15		-15		-15		-15	
$\hat{I}_{or}/I_{oc}$	dB	-4.8	0	0	-4.8	-9.5		-9.5		-9.5		-9.5	
I_{oc}	dBm/3.84 MHz	-60											
CPICH_Ec/Io	dB	-16	-13	-13	-16	-20		-20		-20		-20	
Propagation Condition		AWGN											
Qoffset		[ ]		[ ]		[ ]		[ ]		[ ]		[ ]	
Qhyst	dBm	[ ]		[ ]		[ ]		[ ]		[ ]		[ ]	
Treselection		[ ]		[ ]		[ ]		[ ]		[ ]		[ ]	
Qintrasearch	dB	[ ]		[ ]		[ ]		[ ]		[ ]		[ ]	

Time T1 is X seconds and T2 is Y seconds.

Note: T1 and T2 need to be defined so that cell re-selection reaction time is taken into account.

4.3.1.3 Performance Requirements

Correct cell re-selection shall be greater than [X%] with [Y%] confidence. Cell re-selection is correct if within [5] seconds the UE re-reselects a new cell, which fulfills the cell re-selection criteria.

4.3.1.4 Cell List Size

[The UE shall be capable of recording at least [6] of the strongest cells according to the cell re-selection criteria. The number of the strongest cells recorded inside the UE shall be at least [6].]

4.3.1.5 Maximum number of cells to be monitored

For re-selection purposes, the UE shall be capable of monitoring at least up to 32 neighbouring cells given in the measurement control information. The exact number of cells to be monitored will be determined by the measurement control information broadcast in the serving cell.

4.4 PLMN Selection and Re-Selection Scenario

4.5 Location Registration Scenario

5 RRC Connection mobility

5.1 Handover

5.1.1 Introduction

The handover process should be implemented in both the UE and UTRAN. The UE measurements and which radio links the UE shall use is controlled by UTRAN with RRC signalling.

Measurements are specified in TS25.215 and UE behaviour in response to UTRAN RRC messages is described in TS25.331.

5.1.2 Handover 3G to 3G

5.1.2.1 FDD Soft/Softer Handover

The soft handover procedure is initiated from UTRAN with an active set update message.

5.1.2.1.1 Maximum number of cells to be reported

The UE shall be capable of reporting the CPICH of at least [6] cells given in a measurement control message(s).

5.1.2.1.2 Measurement reporting delay

The measurement reporting delay is defined as the time from when a report is triggered at the physical layer according to the event or periodic mechanism set to trigger the measurement report, until the UE starts to transmit the measurement report over the Uu interface.

5.1.2.1.3 Test parameters

For section *5.1.2.1.3.1, 5.1.2.1.3.2* and *5.1.2.1.3.3* DL reference measurement channel 12.2 kbps shall be used but with power control turned on [see 25.101].

5.1.2.1.3.1 Correct reporting of neighbours and timing measurement accuracy in AWGN propagation condition

This test will derive that the terminal makes correct reporting of an event and that the measurement accuracy of the CFN-SFN observed timed difference between Cell 1 and Cell 2 is within defined limits. Cell 1 is current active cell, as illustrated in Figure 5-1. The power level of Cell 1 is kept constant and the power level of Cell 2 is changed using ($\hat{I}_{or}/I_{oc}$). Hysteresis, Threshold and Time to Trigger values are given in the table below and they are signalled from test device. In the measurement control information it is indicated to the UE that event-triggered reporting with Event 1A and 1B shall be used, SFN has to be decoded for neighbour cells. CPICH Ec/I0 and the CFN-SFN observed timed difference has to reported together with Event 1A reporting. CPICH Ec/I0 shall be reported for Event 1B reporting. New measurement control information, which defines neighbour cells etc., is always sent during time period Time 1. The number of neighbour cells in the measurement control information is 24.

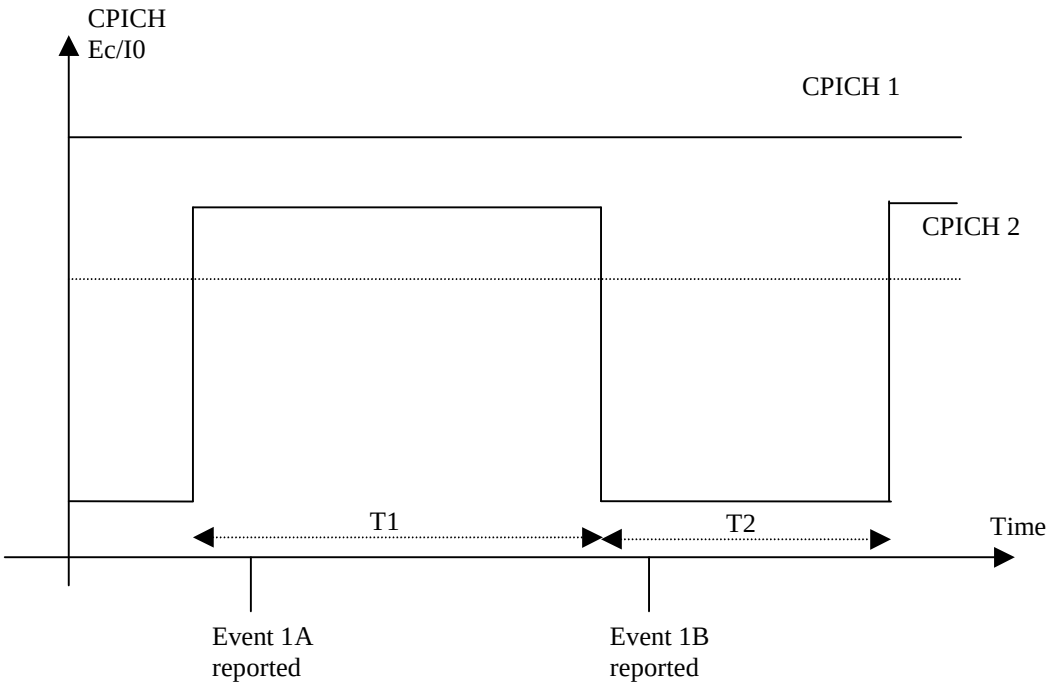

Figure 5-1: Illustration of parameters for soft handover measurement reporting test case

Table 5-1

Parameter	**Unit**	**Cell 1**		**Cell 2**	
		Time 1	**Time 2**	**Time 1**	**Time 2**
CPICH_Ec/Ior	dB	-10		-10	
PCCPCH_Ec/Ior	dB	-12		-12	
SCH_Ec/Ior	dB	-12		-12	
DPCH_Ec/Ior	dB	TBD		TBD	
OCNS		[To Be Calculated]		[To Be Calculated]	
$\hat{I}_{or}/I_{oc}$	dB	0	0	-Infinity	-1.8
I_{oc}	dBm/3.84 MHz	-60			
CPICH_Ec/Io	dB	-13	-13	-Infinity	-14
Threshold	dB	3			
Hysteresis	dB	0			
Time to Trigger	msec	0			
Propagation Condition	AWGN				

Time period Time 1 is X seconds. Time period Time 2 is Y seconds.

The measurement reporting delay shall be less then 0.8 seconds in 90% of the cases with 95% confidence.

All the reported entities shall be within the requirements, as defined in section 10.

5.1.2.1.3.2 Correct reporting of neighbours in Fading propagation condition

This test will derive that the terminal makes correct reporting of an event. Cell 1 is current active cell. The power level of Cell 1 is kept constant and the power level of Cell 2 is changed using ($\hat{I}_{or}/I_{oc}$). Hysteresis, Threshold and Time to Trigger values are given in the table below and they are signaled from test device. In the measurement control information it is indicated to the UE that event-triggered reporting with Event 1A shall be used. Only the event number is reported in this case. New measurement control information, which defines neighbor cells etc., is sent always during time period Time 1. The number of neighbor cells in the measurement control information is 24.

Table 5-2

Parameter	Unit	Cell 1		Cell 2	
		Time 1	Time 2	Time 1	Time 2
CPICH_Ec/Ior	dB	-10		-10	
PCCPCH_Ec/Ior	dB	-12		-12	
SCH_Ec/Ior	dB	-12		-12	
DPCH_Ec/Ior	dB	TBD		TBD	
OCNS		[To Be Calculated]		[To Be Calculated]	
$\hat{I}_{or}/I_{oc}$	dB	0	0	-Infinity	-1.8
I_{oc}	dBm/3.84 MHz	-60			
CPICH_Ec/Io	dB	-13	-13	-Infinity	-14
Threshold	dB	3			
Hysteresis	dB	0			
Time to Trigger	msec	0			
Propagation Condition	2-tap Rayleigh fading, 0 dB, -10 dB, 50km/h, 100 km/h				

Time period Time 1 is X seconds. Time period Time 2 is Y seconds.

The measurement reporting delay shall be less then XX seconds in YY% with ZZ % confidence.

5.1.2.1.3.3 CPICH_Ec/Io measurement accuracy and incorrect reporting of neighbours in AWGN propagation condition

The test case will derive the terminal's measurement accuracy of CPICH_Ec/Io and false detection resistance. The terminal measurement accuracy of CPICH_Ec/Io is derived using the periodical reporting of active cell's measured CPICH_Ec/Io. The terminal's false detection resistance is derived by recording the amount of erroneous reports. Both Cell 1 and Cell 2 powers ($\hat{I}_{or}/I_{oc}$) are constant during the test case. Cell 2 is near to reporting range. Hysteresis, Threshold and Time to Trigger values are given in the table below and they are signaled from test device. In the measurement control information it is indicated to the UE that the CPICH_Ec/Io level of the active set cell has to reported periodically (and reporting period) and event-triggered reporting will also be used. The number of neighbor cells in the measurement control information is 24.

Table 5-3

Parameter	**Unit**	**Cell 1**	**Cell 2**
CPICH_Ec/Ior	dB	-10	-10
PCCPCH_Ec/Ior	dB	-12	-12
SCH_Ec/Ior	dB	-12	-12
DPCH_Ec/Ior	dB	TBD	TBD
OCNS		[To Be Calculated]	[To Be Calculated]
$\hat{I}_{or}/I_{oc}$	dB	0	-7.25
I_{oc}	dBm/3.84 MHz	-60	
CPICH_Ec/Io	dB	-13	-18
Threshold	dB	3	
Hysteresis	dB	0	
Time to Trigger	msec	0	
Propagation Condition	AWGN		

In the periodical reporting the accuracy of the reported CPICH_Ec/Io for cell 1 shall be within given accuracy limits in X% of the reports with Y% confidence.

Event triggered report rate shall not exceed X reports in Y seconds.

5.1.2.1.4 Active set dimension

The active set is defined as set of radio links simultaneously involved in a specific communication service between an User Equipment and a UTRAN access point. The UE shall be capable of supporting at least [6] radio links in the active set.

5.1.2.1.5 Active set update delay

The active set update delay start is defined as the time from when the UE receives the active set update message from UTRAN, or at the time stated through the activation time when to perform the active set update. The activation time stop is defined as the time when the UE successfully only uses the set of radio links stated in that message for power control. The active set update delay is defined as the time between the active set update start and the active set stop.

The active set update delay for different number of added cells is stated in the table below. There is different requirement on the active set update delay depending on if the cell has been within the monitored set of cells for the last [FFS] [s] or not.

[Editor's Note: the requirement of an active set update of at least [1] second after the reception of the UTRAN acknowledgement as proposed in R4-99712, shall be considered as a starting point for the setting of this requirement]

Table 5-4

Number of new cells present in the active set update message	Maximum active set update delay [ms]	
	Cells within monitored set	Cells outside monitored set
1		
2		
3		
4		
5		
6		

…		

If an active set update includes a combination of cells included and not included in the monitored set the maximum active set update delay is the sum of respective maximum delays.

5.1.2.1.6 BS Functionality in Site Selection Diversity Transmission (SSDT) Mode

Site Selection Diversity Transmission (SSDT) is an optional feature of BS. This requirement for SSDT mode ensures that BS correctly reacts to Layer 1 feedback signaling messages from UE.

5.1.2.1.6.1.1 Minimum Requirements

For the conditions specified in Table 5-5, the BS shall transmit or not transmit the downlink DPDCH channel.

Table 5-5: 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 above test should be for repeated for each of the three code sets “long”, “medium” and “short” Cell ID code sets. The UE emulator can check the power ratio of downlink DPDCH/DPCCH in order to confirm whether BS transmitted the DPDCH.

5.1.2.2 FDD Hard Handover

The hard handover procedure is initiated from UTRAN with an handover command message. The hard handover procedure may cause the UE to change its frequency.

5.1.2.2.1 Requirements

5.1.2.2.1.1 Maximum number of cells/frequencies to be monitored on other frequencies

The UE shall be capable of measuring the CPICH of at least [FFS] cells on a maximum of [FFS] frequencies, different from the frequency currently used by the UE.

The cells and frequencies are given to the UE in a measurement control message(s), and the measurement slots available with compressed mode is given through physical channel reconfiguration parameters.

5.1.2.2.1.2 Measurement reporting delay

The measurement reporting delay start is defined as the time from when a report is triggered at the physical layer, and in the end of an available [FFS] ms measurement slot, according to the event or periodic mechanism set to trigger the measurement report. The measurement reporting delay end is defined as the time when the UE tries to transmit the measurement report over the Uu interface.

The measurement reporting delay is defined as the time between the measurement reporting delay start and the measurement reporting delay stop.

[Editors Note: The details for this requirement and the relation to compressed mode are FFS.]

For all possible events defined in the measurement control messages as inter-frequency measurement reporting criteria, the measurement reporting delay shall not exceed the time stated in the table below.

Table 5-6

TTI for DCCH carrying measurement report [ms]	Maximum measurement reporting delay [ms]
10	
20	
40	
80	

5.1.2.2.1.2.1 System Level Requirement on Measurement Reporting Delay

[This Section specifies a system level requirement on measurement reporting delay for the network scenario described; when the values in Table 5-6 in Section 5.1.2.2.1.2 will be specified, also the requirement described in this section will be taken into account; in this way a merge between the two sections will be possible]

For hard handover purposes, the measurement reporting delay shall not exceed [5] seconds under the following network conditions: Initial serving cell at $\hat{I}_{or}$ = -70 dBm/3.84MHz, with 6 neighbours at $\hat{I}_{or}$ = -75 dBm/3.84MHz. Then the new cell is switched on at $\hat{I}_{or}$ = -60 dBm/3.84MHz, all steady signals.

5.1.2.2.1.3 Hard Handover Delay

The hard handover delay is defined as the time from when the UE receives the handover command message from UTRAN, until the UE successfully uses the entire set of radio links stated in that message for power control.

The hard handover delay is stated in the table below. There is different requirement on the hard handover delay depending on if the cell has been within the monitored set of cells for the last [FFS] [s] or not.

Table 5-7

Number of new cells present in the handover command message	Maximum active set update delay [ms]	
	Cells within monitored set	Cells outside monitored set
1-6…		

5.1.3.3 FDD/TDD Handover

5.1.3.3.1 Requirements

5.1.3.3.2 RF Parameters

5.1.4 Handover 3G to 2G

In the early days of UMTS deployment it can be anticipated that the service area will not be as contiguous and extensive as existing second generation systems. It is also anticipated that UMTS network will be an overlay on the 2nd generation network and utilise the latter, in the minimum case, as a fall back to ensure continuity of service and maintain a good QoS as perceived by the user.

5.1.4.1 Handover to GSM

This section presents some of the important aspects of GSM handover required to be performed by the UE. For the full specifications reference should be made the GSM recommendations.

The underlying requirement is to ensure continuity of service to the UMTS user. The handover requirements for 3G to GSM should be comparable to GSM to GSM handover requirements.

The MS (GSM terminology) shall be able to monitor up to [32] carriers.

The MS shall be able synchronize to [6] carriers

The MS shall be able to report back to the network on the [6] strongest cells with correctly identified BSIC.

The MS shall be able to perform this task at levels down to the reference sensitivity level or reference interference levels as specified in GSM 05.05.

The MS shall demodulate the SCH on the BCCH carrier of each surrounding cell and decode the BSIC as often as possible, and as a minimum at least once every [10 seconds].

5.1.4.1.1 Requirements

5.1.4.1.2. RF Parameters

5.2 Radio Link Management

5.2.1 Link adaptation

5.2.1.1 Definition of the function

Radio link adaptation is the ability of the UE to select the suitable transport format combination from the assigned transport format combination set, in order to maintain inner loop power control, in the case of reaching its maximum transmit power. This is necessary for supporting the highest bit-rate as possible when enough transmit power is not available.

5.2.1.2 Link adaptation delay minimum requirement

In this section, the UE maximum transmit power is defined as the UE maximum output power, which is defined by the UE power class.

When the UE output power is approaching the UE maximum transmit power and the inner loop power control can no longer be maintained for coverage reasons, the UE shall adapt to the transport format combination corresponding to the next lower bit-rate. Before doing that, the UE output power measured over at least [t1] ms shall be [margin1] dB within the maximum (margin1 is FFS).

As soon as the UE output power is [margin1] dB below the UE maximum transmit power and the UE has enough data to send, it shall continuously estimate whether the output power needed for a switch to the transport format combination corresponding to the next higher bit-rate does not exceed [margin1] dB below the maximum. Before the UE switches to the next higher rate transport format it shall have enough power to support that up-switch for at least [t2] ms.

The minimum delay requirements t1 and t2 shall be zero or a multiple of 10 ms. (Whether t1, t2 and margin1 should be configurable is FFS).

5.2.1.3 Link adaptation maximum delay requirement

As soon as the UE has detected the switching feasibility, it shall start to use the transport format combination corresponding to the new bit-rate selected within 10 ms.

5.3 Cell Update

5.4 URA Update

6 RRC Connection Control

6.1 Requirements for RRC Re-establishment

6.6.1 RRC Re-establishment delay

When the UE is in Cell_DCH state, the UE shall be capable of sending a RRC CONNECTION RE-ESTABLISHMENT CONNECT message, in the test case defined in the following section, within $T_{RLFAIL}+T_{RESELECT}$ seconds from when the radio connection was lost. The RRC Re-establishment delay is defined as the time between the radio connection is lost to when the UE starts to send preambles on the PRACH. This is exemplified in Figure 6-1, where the RRC Re-establishment delay is the time between T_{start} and T_{stop}.

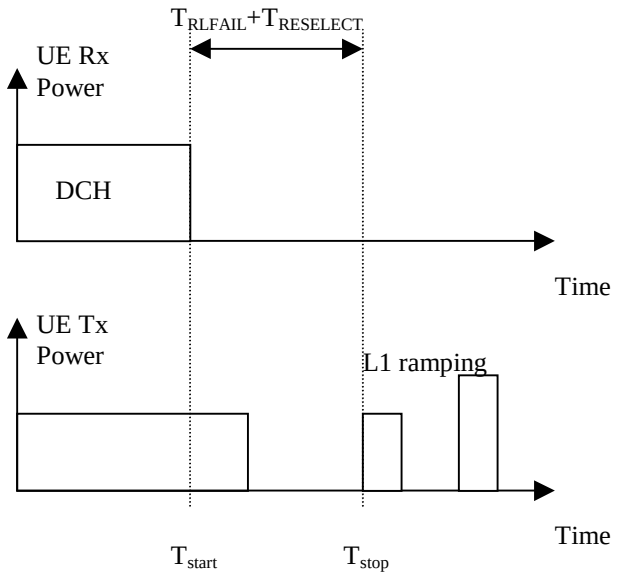

Figure 6-1: RRC Connection Re-establishment Requirement

6.6.2 Test Parameters

This test shall include 6 cells, one serving, one target and four steady interferes. The UE shall be in connected mode with a DL reference measurement channel 12.2 kbps dedicated traffic channel ongoing to one cell (serving cell). Measurement control information shall be signalled from the test device at least 5 seconds before T_{start}. At T_{start} the traffic channel is switched off. T_{stop} is defined as the time when the UE starts to send preambles on PRACH to the target cell.

Unless explicitly stated the test parameters should be similar to the test parameters for Cell Reselection, time T1, section 4.3.1.2. System information shall be provided in the same manner as for the test for cell re-selection, section 4.3.1.2.

The following additional parameters are needed:

Table 6-1

Parameter	**Unit**	**Value**
DPCH_Ec/Ior	dB	TBD
N313	Frames	TBD
T313	msec	0

6.6.2.1 Test 1 – Target Cell known by UE

All six cells in the test shall be given in the measurement control information to the UE before the test is started.

6.6.2.2 Test 2 – Target cell not known by UE

All cells except the target cell shall be in the measurement control information to the UE before the test is started.

6.6.2.3 Performance Requirements

For both test 1 and test 2, correct RRC Re-establishment shall be greater than 90% with 95% confidence. RRC Re-establishment is correct if within T seconds the UE tries to re-establish the RRC connection with the target cell. T is defined in Table 6-2.

Editors note: T_{RLFAIL} is depending on the value set for N313. Once decided, this shall be counted for here.

Table 6-2: Requirements for RRC Re-establishment

	Cell known by UE	**Cell not known by UE**
Intra Frequency	$T=T_{RLFAIL}$+800 ms	$T=T_{RLFAIL}$+3000 ms

6.2 Radio Access Bearer Control

[Editor's Note: Radio Access Bearer Control Procedures are a series of mechanisms used to control the UE and system resources. Some of these procedures cause Physical Channel Reconfiguration and Transport Channel Reconfiguration. This section specifies time delay requirements on Physical Channel Reconfiguration and Transport Channel configuration in different reconfiguration cases.]

7 Power Management

7.1 UE Output power dynamics

Power control is used to limit the interference level. The details on the Output Power Dynamics are specified in S25.71, "UTRA (UE) FDD; Radio Transmission and Reception".

7.1.1 Open Loop Power Control

Open loop power control is the ability of the UE transmitter to set its output power to a specific value.

The UE open loop power control tolerance is specified in S25.71 "UTRA (UE) FDD; Radio Transmission and Reception".

7.1.2 UE Inner Loop Power Control

7.1.2.1. Inner loop power control in Uplink

Inner loop power control in the Uplink is the ability of the UE transmitter to adjust its output power in accordance with the TPC symbols received in the downlink..

7.1.2.1.1 Power control steps

The power control step is the minimum step change in the UL- transmitter output power in response to a power control command.

7.1.2.1.1.1 Minimum requirement

The UE transmitter shall have the capability of setting the inner loop output power with a step sizes of 1, 2 and 3 dB

(a) The tolerance of the transmitter output power step due to inner loop power control shall be within the range shown in S25.101 "UTRA (UE) FDD; Radio Transmission and Reception".

(b) The tolerance of the transmitter average output power step due to inner loop power control shall be within the range shown in S25.101 "UTRA (UE) FDD; Radio Transmission and Reception".

7.1.2.2 Inner Loop Power Control in Downlink

Inner loop power control in the downlink is the ability of the UE receiver to estimate the received SIR, compare it with the SIR target and transmit the TPC symbols in accordance to the results of this comparison. The details on the UE implementation requirements are specified in S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

7.1.2.2.1 Minimum requirement

(c) The downlink tolerance of the SIR measurements shall be within the range shown in S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".
(d) The dynamic range of the SIR measurement of the received signal in the downlink shall be better than shown in S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

(c) The transmitted TPC symbols must respond to a change in the received SIR within the time period specified in S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

7.2 BS Output Power Dynamics

Power control is used to limit the interference level. The transmitter uses a quality-based power control on both the uplink and downlink; The details on the Output Power Dynamics are specified in S25.104, "UTRA (BS) FDD; Radio Transmission and Reception".

7.2.1 BS Inner Loop Power Control

Inner Loop power control is the ability of the BS transmitter to adjust its output power in response to the UL/DL received signal.

For Inner Loop correction on the Downlink Traffic Channel (with respect to the open loop estimate), the base station adjust its mean output power level in response to each valid power control bit received from MS on the Uplink Traffic Channel. The details on the BS Closed Loop Power Control are specified in S25.104, "UTRA (BS) FDD; Radio Transmission and Reception".

7.2.1.1 Power Control Steps

The power control step is the minimum step change in the power of one of the physical channels transmitted by the DL transmitter. The requirements on the Power Control Step are specified in S25.104, "UTRA (BS) FDD; Radio Transmission and Reception".

7.2.1.2 Power Control Dynamic Range

The power control dynamic range is difference between the maximum and the minimum transmit output power of a traffic channel for a specified reference condition. The requirements on the Power Control Dynamic Range are specified in S25.104, "UTRA (BS) FDD; Radio Transmission and Reception".

8 Radio Link Surveillance

9 Timing characterisitics

9.1 Synchronisation Performance

9.1.1 Search of other Cells

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

9.1.1.1 Minimum requirement

TBD

Table 9-1: Test Parameters for the Search of other Cells

Parameter	Unit	Channel 1		Channel 2	
		Time 1	Time 2	Time 1	Time 2
$PCCPCH\ \frac{E_c}{I_{or}}$	dB				
$\hat{I}_{or}/I_{oc}$	dB				
I_{oc}	dBm/3.84 MHz	-60			
$PCCPCH\ \frac{E_c}{I_o}$	dB				

9.2. UE Transmit Timing

9.2.1 Initial transmission timing, Maximum timing adjustment size and Maximum timing adjustment rate

The UE shall have capability to follow the frame timing change of the connected Node B. UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, and maximum adjustment rate are defined in the following requirements.

9.2.1.1 Minimum requirement

For parameters specified in Table 9-2, UE initial transmission timing error shall be less than or equal to ±1.5 Chip. The reference point for the UE initial transmit timing control requirement shall be the first significant path of the corresponding downlink DPCCH/DPDCH frame.

The UE shall be capable of changing the transmission timing according the received downlink DPCCH/DPDCH frame. The maximum amount of the timing change in one adjustment shall be 1/4 Chip.

The maximum adjustment rate shall be 1/4 chip per 280ms. In particular, within any given 280 ms period, the UE transmit timing shall not change in excess of +-1/4 chip from the timing at the beginning of this 280ms period.

Table 9-2: Test parameters for Transmission timing requirement.

Parameter	Unit	Cell 1 and 2 level
DPCH_Ec/ Ior	dB	-17

$\hat{I}_{or,}$ Cell 1	dBm/3.84 MHz	-96
$\hat{I}_{or,}$ Cell 2	dBm/3.84 MHz	-97
Information data rate	Kbps	12.2
TFCI	-	On
Propagation condition	AWGN	

a) Cell 2 starts transmission 5 seconds after call has been initiated. UE shall maintain it's original timing properties.

b) Cell 1 stop transmission 5 seconds after cell 2 has started transmission. UE shall adjust transmission timing with a maximum change of 1/4 chip per adjustment, and maximum timing adjustment rate of 1/4 chip per 280ms.

9.3 Reception Timing

The reception timing of the MS is determined during the specified operation.

9.3.1 Minimum requirement

TBD

9.4 Signalling requirements

9.4.1 Signalling response delay

For all messages requiring a RRC response to be sent to UTRAN, the UE shall send that response with a maximum signalling response delay specified in this section. This delay consists of several delay parts. The first part is a general processing delay in order to create the response. The second part is dependent on some specific actions the UE shall perform according to that particular message.

The signalling response delay is defined as the time from when the UE receives the RRC message from UTRAN, until the UE successfully has performed actions according to the RRC message and the UE tries to transmit the RRC response message over the Uu interface.

9.4.2 Test Parameters

For all the tests the TTI for the DCCH shall be set to 80 ms.

[Note: There should be one test of reconfiguring TFS and TFCS without changing the physical layer

A similar test could then also be made where a new dedicated physical channel activation is included]

9.4.3 Performance requirements

This signalling response delay shall not exceed the sum of general processing delay and all action delays related to the specific RRC message.

General processing delay shall not exceed 100 ms in 90% of the cases with 95% confidence.

Delay parts related to actions are listed in the table below.

Delay part caused by a specific action	Maximum delay for this action [ms]
Establishment of new dedicated channel	140
Establishment of all radio bearer(s) in one RRC message	50
Re-configuration of all radio bearer(s) in one RRC message	50
Release of all radio bearer(s) in one RRC message	10
…	

For all actions not listed the requirement on delay is zero.

9.4.4 Signalling processing

If several consecutive RRC messages are sent to the UE, the UE shall be able to process the messages in parallel with the receiving of the next messages. The UE shall also perform actions according to the RRC messages and if applicable send answers to the messages in parallel (for those messages where procedure interaction is allowed according to TS 25.331) with receiving new messages.

9.4.5 Test parameters

For all the tests the TTI for the transport channel carrying DCCH shall be 80 ms.

Messages shall be sent to the UE at a rate of 10 messages per second.

The rest of the parameters are TBD.

9.4.6 Performance requirements

The UE shall be able to respond according to the test in 9.4.1 in 90% of the cases with 95% confidence.

10 Measurements Performance Requirements

One of the key services provided by the physical layer is the measurement of various quantities which are used to trigger or perform a multitude of functions. Both the UE and the UTRAN are required to perform a variety of measurements. The complete list of measurements is specified in TSG RAN WG2 S25.302 "Services Provided by Physical Layer". The physical layer measurements for FDD are described and defined in TSG RAN WG1 TS25.215 “Physical layer – Measurements (FDD)”. In this section for FDD, per each measurement the relevant requirements on performance in terms of accuracy are reported.

Unless explicitly stated,

- all measurements shall be reported within the defined requirements in 90% of the cases with 95% confidence, on the confidence level applying for all measurements.
- Measurement periods FFS
- Measurement channel 12.2 kbps as per TS25.101
- Single event reporting

10.1 Measurements Performance for UE

10.1.1 CPICH RSCP

Requirement	**Absolute accuracy:** **Normal Conditions** +/-6dB for levels below –70dBm; +/-8dB over the full range Valid for UTRA carrier RSSI >= -94dBm. **Extreme Conditions** +/-9dB for levels below –70dBm; +/-11dB over the full range Valid for UTRA carrier RSSI >= -94dBm. **Relative accuracy:** +-3 dB for intra-frequency +-6 dB for inter-frequency Valid when the minimum level > -114 dBm, the difference in signal level < 20 dB and UTRA carrier RSSI>=-94dBm.

10.1.2 RSCP

[Note: there is general assumption that the Pilot Bit Number of DCCH should be equal to 8]

Requirement	**Absolute accuracy:** **Normal Conditions** [ ]dB for levels below –70dBm; [ ]dB over the full range Valid for UTRA carrier RSSI >= -94dBm. **Extreme Conditions** +/-[]dB for levels below –70dBm; +/- []dB over the full range Valid for UTRA carrier RSSI >= -94dBm. **Relative accuracy:** [ ] dB for intra-frequency Valid when the minimum level > -91-10log10(SF) dBm, the difference in signal level < 20 dB and UTRA carrier RSSI>=-94dBm

10.1.3 SIR

Requirement	**Absolute accuracy**: for []<SIR<[] dB when UTRA carrier RSSI>=-94dBm.

10.1.4 UTRA carrier RSSI

Requirement	**Absolute accuracy:** **Normal Conditions** +/-4dB for levels below –70dBm Valid for levels >-94dBm. **Extreme Conditions** +/-7dB for levels below –70dBm Valid for levels >-94dBm. **Relative accuracy** (between measurements on two carriers): +-5 dB over the full range Valid when the minimum level > -94 dBm and the difference < 20 dB.

10.1.5 GSM carrier RSSI

Requirement	According to the requirements in GSM 05.08

10.1.6 CPICH Ec/No

Requirement	**Absolute accuracy** (measured on one code): +/-4dB over the full range when UTRA carrier RSSI>=-94dBm and CPICH RSCP >= -115dBm. **Relative accuracy** (between measurements on two codes): +-3 dB for intra-frequency +-6 dB for inter-frequency When UTRA carrier RSSI>=-94dBm and CPICH RSCP >= -114dBm.

10.1.7 Transport channel BLER

Requirement	The UE shall report the CRC results

10.1.8 Physical channel BER

Requirement	+/-10% of the absolute Physical channel BER value

10.1.9 UE transmitted power

Requirement	**Absolute accuracy:** **Normal Conditions** +-9dB for the upper 20dB of the range. **Extreme Conditions** +-12dB for the upper 20dB of the range.

10.1.10 CFN-SFN observed time difference

Requirement	+/-0.5 chips period

10.1.11 SFN-SFN observed time difference

Requirement	+/-0.5 chips period for both type 1 and type 2.

10.1.12 UE Rx-Tx time difference

Requirement	+/-1.5 chips period.

10.1.13 Observed time difference to GSM cell

Requirement	+- 20 chips.

10.2 Measurements Performance for UTRAN

10.2.1 RSSI

Requirement	**Relative accuracy:** .FFS

10.2.2 SIR

Requirement	**Absolute accuracy**: +/- 3dB for 0<SIR<10 dB when RSSI>=-105dBm.

10.2.3 Transmitted carrier power

Requirement	**Absolute accuracy:** +-3dB over the full range. **Relative accuracy** (relative to the maximum transmit power): +- []dB over the full range.

10.2.4 Transmitted code power

Requirement	**Absolute accuracy:** +-3dB over the full range. **Relative accuracy** (relative to the maximum transmit power): +- 2dB over the full range.

10.2.5 Transport channel BLER

Requirement	-

10.2.6 Physical channel BER

Requirement	+/-10% of the absolute BER value

10.2.7 Round trip time

Requirement	+/-0.5 chips period

11 Annex A Measurement Definition (Informative)

In this Annex the definitions of those Measurements, whose requirements are specified, in Section 10 of this specification are reported for information. The complete list of measurements is specified in TSG RAN WG2 TS25.302 "Services Provided by Physical Layer". ". The physical layer measurements for FDD are described and defined in TSG RAN WG1 TS25.215 “Physical layer – Measurements (FDD)”.

11.1 Measurements Performance for UE

11.1.1 CPICH RSCP

Definition	Received Signal Code Power, the received power on one code after de-spreading measured on the pilot bits of the CPICH. The reference point for the RSCP is the antenna connector at the UE.

11.1.2 RSCP

[Editor’s Note: in accordance to RP-99564, while this measurement is agreed in TS 25.215 is not considered yet in TS 25.302; this measurement is here reported for consistency with TDD mode since during WG4#8 it was decided to consider this measurement for TDD]

Definition	Received Signal Code Power, the received power on one code after de-spreading measured on the pilot bits of the DPCCH after RL combination. The reference point for the RSCP is the antenna connector at the UE.

11.1.3 ISCP

Note that it is not a requirement that the ISCP shall be possible to report to higher layers. The ISCP is defined in this section because it is included in the definition of SIR.

Definition	Interference Signal Code Power, the interference on the received signal after de-spreading. Only the non-orthogonal part of the interference is included in the measurement. The reference point for the ISCP is the antenna connector at the UE.

11.1.4 SIR

Definition	Signal to Interference Ratio, defined as the RSCP divided by ISCP. The SIR shall be measured on DPCCH after RL combination. The reference point for the SIR is the antenna connector of the UE.

11.1.5 UTRA carrier RSSI

Definition	Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth. Measurement shall be performed on a UTRAN downlink carrier. The reference point for the RSSI is the antenna connector at the UE.

11.1.6 GSM carrier RSSI

Definition	Received Signal Strength Indicator, the wide-band received power within the relevant channel bandwidth. Measurement shall be performed on a GSM BCCH carrier. The reference point for the RSSI is the antenna connector at the UE.

11.1.7 CPICH Ec/No

Definition	The received energy per chip divided by the power density in the band. The Ec/No is identical to RSCP/RSSI. Measurement shall be performed on the CPICH. The reference point for Ec/No is the antenna connector at the UE.

11.1.8 Transport channel BLER

Definition	Estimation of the transport channel block error rate (BLER). The BLER estimation shall be based on evaluating the CRC on each transport block after RL combination. BLER estimation is only required for transport channels containing CRC. In connected mode the BLER shall be possible to measure on any transport channel. If requested in idle mode it shall be possible to measure the BLER on transport channel PCH.

11.1.9 Physical channel BER

Definition	The physical channel BER is an estimation of the average bit error rate (BER) before channel decoding of the DPDCH data after RL combination. At most it shall be possible to report a physical channel BER estimate at the end of each TTI for the transferred TrCh's, e.g. for TrCh's with a TTI of x ms a x ms averaged physical channel BER shall be possible to report every x ms.

11.1.10 UE transmitted power

Definition	The total UE transmitted power on one carrier. The reference point for the UE transmitted power shall be the UE antenna connector.

11.1.11 CFN-SFN observed time difference

Definition	The CFN-SFN observed time difference to cell is defined as: OFF×38400+ T_m, where: T_m= T_{RxSFN} - (T_{UETx}-T_0), given in chip units with the range [0, 1, …, 38399] chips T_{UETx} is the time when the UE transmits an uplink DPCCH/DPDCH frame. T_0 is defined in TS 25.211 section 7.1.3. T_{RxSFN} is time at the beginning of the next received neighbouring P-CCPCH frame after the time instant T_{UETx}-T_0in the UE. If the next neighbouring P-CCPCH frame is received exactly at T_{UETx}-T_0 then T_{RxSFN}=T_{UETx}-T_0 (which leads to T_m=0). and OFF=(CFN_{Tx}-SFN) mod 256, given in number of frames with the range [0, 1, …, 255] frames CFN_{Tx} is the connection frame number for the UE transmission of an uplink DPCCH/DPDCH frame at the time T_{UETx}. SFN = the system frame number for the neighbouring P-CCPCH frame received in the UE at the time T_{RxSFN}.

11.1.12 SFN-SFN observed time difference

Definition	**Type 1:** The SFN-SFN observed time difference to cell is defined as: OFF×38400+ T_m, where: T_m= T_{RxSFNj} - T_{RxSFNi}, given in chip units with the range [0, 1, …, 38399] chips T_{RxSFNj} is the time at the beginning of a received neighbouring P-CCPCH frame from cell j. T_{RxSFNi} is time at the beginning of the next received neighbouring P-CCPCH frame from cell i after the time instant T_{RxSFNj} in the UE. If the next neighbouring P-CCPCH frame is received exactly at T_{RxSFNj} then T_{RxSFNj}= T_{RxSFNi} (which leads to T_m=0). And OFF=(SFN_j- SFN_i) mod 256, given in number of frames with the range [0, 1, …, 255] frames SFN_j = the system frame number for downlink P-CCPCH frame from cell j in the UE at the time T_{RxSFNj}. SFN_i = the system frame number for the P-CCPCH frame from cell i received in the UE at the time T_{RxSFNi}. **Type 2:** The relative timing difference between cell j and cell i, defined as $T_{CPICHRxj}$ - $T_{CPICHRxi}$, where: $T_{CPICHRxj}$ is the time when the UE receives one CPICH slot from cell j $T_{CPICHRxi}$ is the time when the UE receives the CPICH slot from cell i that is closest in time to the CPICH slot received from cell j
Applicable for	**Type 1:** Idle, Connected Intra **Type 2:** Idle, Connected Intra, Connected Inter

11.1.13 UE Rx-Tx time difference

Definition	The difference in time between the UE uplink DPCCH/DPDCH frame transmission and the first significant path, of the downlink DPCH frame from the measured radio link. Measurement shall be made for each cell included in the active set. Note: The definition of "first significant path" needs further elaboration.

11.1.14 Observed time difference to GSM cell

Definition	Time difference between the Primary CCPCH of the current cell and the timing of the GSM cell. The exact definition and further details on this parameter is contained in Chapter 9 of the TS25.302 "Services Provided by the Physical Layer".

11.2 Measurements Performance for UTRAN

11.2.1 RSSI

Definition	Received Signal Strength Indicator, the wide-band received power within the UTRAN uplink carrier channel bandwidth in an UTRAN access point. The reference point for the RSSI measurements shall be the antenna connector.

11.2.2 SIR

Definition	Signal to Interference Ratio, is defined as the RSCP divided by the ISCP. Measurement shall be performed on the DPCCH after RL combination in Node B. The reference point for the SIR measurements shall be the antenna connector.

11.2.3 Transmitted carrier power

Definition	Transmitted carrier power, is the total transmitted power on one carrier from one UTRAN access point. Measurement shall be possible on any carrier transmitted from the UTRAN access point. The reference point for the total transmitted power measurement shall be the antenna connector. In case of Tx diversity the total transmitted power for each branch shall be measured.

11.2.4 Transmitted code power

Definition	Transmitted code power, is the transmitted power on one carrier, one scrambling code and one channelisation code. Measurement shall be possible on any channelisation code transmitted from the UTRAN access point. The reference point for the transmitted code power measurement shall be the antenna connector. In case of Tx diversity the transmitted code power for each branch shall be measured.

11.2.5 Transport channel BLER

Definition	Estimation of the transport channel block error rate (BLER). The BLER estimation shall be based on evaluating the CRC on each transport block. Measurement shall be possible to perform on any transport channel after RL combination in Node B. BLER estimation is only required for transport channels containing CRC.

11.2.6 Physical channel BER

Definition	The physical channel BER is an estimation of the average bit error rate (BER) before channel decoding of the DPDCH data after RL combination in Node B. It shall be possible to report a physical channel BER estimate at the end of each TTI for the transferred TrCh's, e.g. for TrCh's with a TTI of x ms a x ms averaged physical channel BER shall be possible to report every x ms.

11.2.7 Round trip time

Note: The relation between this measurement and the TOA measurement defined by WG2 needs clarification.

Definition	Round trip time (RTT), is defined as RTT = T_{RX} – T_{TX}, where T_{TX} = The time of transmission of the beginning of a downlink DPCH frame to a UE. T_{RX} = The time of reception of the beginning (the first significant path) of the corresponding uplink DPCCH/DPDCH frame from the UE. Note: The definition of "first significant path" needs further elaboration. Measurement shall be possible on DPCH for each RL transmitted from an UTRAN access point and DPDCH/DPCCH for each RL received in the same UTRAN access point.

History

Document history		
TS 25.133 v2.3.0	12 1999	The content of document R4-99982 was included in Section 4. The content of document R4-99954 was included in Section 4.3.1.5. The content of R4-99952 was included in Section 5. The content of R4-99975 was included in Section 5.2. The content of document R4-99976 was included in Section 6.1. The content of document Tdoc R4-99917 was included in Section 5.1.3.1.1.5. The content of document of Tdoc R4-99962 was included. The content of document Tdoc R4-99803 was included. The content of document Tdoc R4-99953 was included in Section 10. The Open Item Section was deleted and it will be moved to the TR 30.504 “Workplan and Study Iems”.
TS 25,133 v2.2.1	11 1999	The Cell Reselection Reaction Time Requirement was deleted because that requirement will be covered in Section 4.3.1.2 in accordance with the decision taken during the RRM drafting session. Sections 4.2.2 “RF Parameters Used for Cell Selection” and 4.3.2 “RF Parameters Used For Cell Reselection” were deleted in accordance with the decision taken during the RRM drafting session. Moreover minor Editorial Changes were added.
TS 25.133 v2.2.0	11 1999	The changes agreed during the RRM drafting session held in Helsinki on the 18TH and 19TH of November (changes described also in the RRM drafting session report Tdoc R4-99785) were included.

TS 25.133 v2.1.0	11 1999	As agreed during WG4#8 the changes proposed by the following documents were included: Tdoc R4-99706, Modified scope and structure for 25.103;Tdoc R4-99707, Requirements for handover in 25.103;Tdoc R4-99712, Updating 25.103 v2.0.0 "RF Parameters in Support of RRM; Tdoc R4-99670, Test Requirements for Site Selection Diversity Transmission (SSDT); In accordance with Tdoc R4-99624 also the FDD part of measurements was updated taking into account RAN decision contained in Tdoc RP-99564.
S25.133 v2.0.0	11 1999	The specification was created during WG4#8. The specification includes the part for FDD before included in TS 25.103 v2.0.0.

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