TSG-RAN Working Group 4 (Radio) meeting #6
Queensferry 26 - 29 July 1999

TSGR4#6(99)365

Agenda Item: **8.6**

Source: **S25.103 Editor**

Title: **S25.103 v1.0.0 “RF Parameters in Support of RRM”**

Document for: **Approval**

TS 25.103 V1.0.0 (1999-06)

Technical Specification

3rd Generation Partnership Project (3GPP); Technical Specification Group (TSG) RAN; Working Group 4 (WG4);

RF Parameters in Support of Radio Resource Management

Reference
<Workitem> (<Shortfilename>.PDF)

Keywords
<keyword[, keyword]>

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Contents

1. Intellectual Property Rights

IPRs essential or potentially essential to the present deliverable may have been declared to 3GPP and/or its organizational partners. The information pertaining to these essential IPRs, if any, is publicly available for 3GPP **members and non-members, free of charge**. This can be found in the latest version of the 3GPP Technical Report: [tbd.].
Pursuant to the 3GPP Interim IPR Policy, no investigation, including IPR searches, has been carried out by 3GPP . No guarantee can be given as to the existence of other IPRs not referenced in the [tbd.] , which are, or may be, or may become, essential to the present document.

[Editor's note: This section needs to be reviewed. It is assumed here than a 3GPP IPR report will be available in the near future.]

2. Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project, Technical Specification Group RAN, working group 4.
The contents of this TS may be subject to continuing work within the 3GPP and may change following TSG RAN WG4 approval. Should the TSG RAN WG4 modify the contents of this TS, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version m.t.e
where:

- m indicates [major version number]
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated into the specification.

3. Scope

This Technical Specification shall describe RF parameters and Requirements for the Radio Resource Management.

4. 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

5. Definitions, symbols and abbreviations

5.1 Definitions

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

Power Setting	The value of the control signal, which determines the desired transmitter, output Power. Typically, the power setting would be altered in response to power control commands
Maximum Power Setting	The highest value of the Power control setting which can be used.
Maximum output Power	This refers to the measure of power when averaged over the transmit timeslot at the maximum power setting.
Peak Power	The instantaneous power of the RF envelope which is not expected to be exceeded for [99.9%] of the time
Maximum peak power	The peak power observed when operating at a given maximum output power.
Average transmit power	The average transmitter output power obtained over any specified time interval, including periods with no transmission. <Editor: This definition would be relevant when considering realistic deployment scenarios where the power control setting may vary. >
Maximum average power	The average transmitter output power obtained over any specified time interval, including periods with no transmission, when the transmit time slots are at the maximum power setting. <Editor: The average power at the maximum power setting would also be consistent with defining a long term average power>

5.2 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;

5.3 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

6. General Description of Radio Resource Management

7. Idle Mode Tasks (FDD)

7.1 Introduction

[The requirements presented in these sections will be reviewed depending on the further progress in TSG RAN WG1 and TSG RAN WG2]

7.2 RF Cell Selection Scenario

Cell selection delay

The UE shall be capable of detecting, decoding, and camping on a suitable cell within [FFS] seconds from switch on with prior knowledge of cells. *[The exact definition of "prior knowledge of cells"will be further defined in details also in dependency with the work in progress in other TSG RAN WGs]*

7.2.1 Requirements for Cell Selection

7.2.1.1 Cell Selection Monitoring Requirements

7.2.1.2 Measurement Requirements

7.2.2 RF Parameters used for Cell Selection Criteria

7.3 RF Cell Re-Selection Scenario

Cell re-selection delay

The UE shall be capable of re-selecting and camping on a new cell (within the same location area) within [FFS] seconds from it becoming the candidate cell for cell re-selection.

7.3.1 Requirements for Cell Re-Selection

7.3.1.1 Cell Re-Selection Monitoring Requirements

7.3.1.1.1 Cell List Size

The number of the strongest cells recorded inside the UE shall be at least [FFS].

7.3.1.1.2 Maximum number of cells to be monitored

For re-selection purposes, the UE shall be capable of monitoring at least [FFS] neighboring cells given in the neighbor cell list. The exact number of cells to be monitored will be determined by the used cell re-selection strategy/algorithm.

7.3.1.2 Measurement Requirements

7.3.1.2.1 Signal Strength Measurement Accuracy

For cell re-selection purposes, the UE shall measure the signal strength of PCCPCH of neighboring cells given in the neighbor cell list with an accuracy of +-[FFS] dB. *[The exact criteria for the measurement of the signal strength is FFS in dependency with the work in progress in other TSG RAN WGs]*

7.3.2 RF Parameters used for Cell Re-Selection Criteria

7.4 Radio Access Mode Selection and Re-Selection [F.F.S.]

7.5 PLMN Selection and Re-Selection Scenario

7.6 Location Registration Scenario

8. Idle Mode Tasks (TDD)

8.1 Introduction

[The requirements presented in these sections will be reviewed depending on the further progress in TSG RAN WG1 and TSG RAN WG2]

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8.3.1.2.1 Signal Strength Measurement Accuracy

For cell re-selection purposes, the UE shall measure the signal strength of neighboring cells given in the neighbor cell list with an accuracy of +-[FFS] dB. *[The exact criteria for the measurement of the signal strength is FFS in dependency with the work in progress in other TSG RAN WGs]*

8.3.2 RF Parameters used for Cell Re-Selection Criteria

8.4 Radio Access Mode Selection and Re-Selection [F.F.S.]

8.5 PLMN Selection and Re-Selection Scenario

8.6 Location Registration Scenario

9. RRC Connection mobility

9.1 Handover

9.1.1 Introduction

The overall handover process shall be implemented in the UE and RNS. Measurement of serving radio connection downlink performance and candidate cells received signal strengths and quality must be made in the UE. These measurements shall be signalled to the RNS for assessment. The RNS measures the uplink performance for the UE being served. The RNC uses measurements in conjunction with defined thresholds and handover strategy to make a handover decision.

9.1.2 Requirements

The reliability of handover in all its different forms is essential to the successful operation of a network. In performing handover preparation and execution the minimum requirements shall be:

- Quick detection of candidate cells
- Quick synchronisation to candidate cells
- Reporting of sufficient number of candidate cells
- Quick detection of degradation of link quality
- Reliable measurement procedures of serving and target cells
- Reliable and quick reporting mechanisms
- Reliable synchronisation mechanism
- Quick and safe release of resource
- Safe guards for failed handoffs
- Minimal disruption to service
- Minimal degradation to link quality
- Minimal degradation to other users
- Full Flexibility and efficiency to seamlessly handle the spectrum in a multi-operator scenario

9.1.3 Handover 3G to 3G

9.1.3.1 FDD Soft/Softer Handover

[The requirements presented in these sections will be reviewed depending on the further progress in TSG RAN WG1 and TSG RAN WG2]

9.1.3.1.1 Requirements

9.1.3.1.1.1 Handover Preparation Requirements

9.1.3.1.1.1.1 Maximum number of cells to be monitored

For soft handover purposes, the UE shall be capable of monitoring at least [FFS] neighboring cells given in the neighbor cell list. The exact number of cells to be monitored will be determined by the used soft handover strategy/algorithm.

9.1.3.1.1.1.2 Measurement reporting delay
The measurement delay is defined as the time it takes to report a measurement to the decision entity. For soft handover purposes, the measurement reporting delay shall not exceed [FFS] seconds.

9.1.3.1.1.1.3 Active set dimension
The active set is defined as the set of cells to which the UE is simultaneously connected. The system shall be capable of supporting a maximum number of [FFS] Cells in the active set.

9.1.3.1.1.1.4 Active set update time interval
An active set update of at least [FFS] seconds, after the reception of the UTRAN acknowledgement, shall be supported. The exact period will be determined by the used soft handover strategy/algorithm.

9.1.3.1.1.2 Measurement Requirements

9.1.3.1.1.2.1 Signal Strength Measurement Accuracy
For soft handover purposes, the UE shall measure the Ec/I0 of PCCPCH of neighboring cells given in the neighbor cell list with an accuracy of +-[FFS] dB.

9.1.3.1.1.2.2 Frame offset Measurement Accuracy
For soft handover purposes, the frame offset between the serving BS and the new one has to be measured by the UE. This has to be measured with an accuracy of +-[FFS] chips.

9.1.3.1.1.3 RF Scenario and RF Parameters Used

9.1.3.2 FDD Inter-Frequency Handover

There will be the need to perform inter-frequency hard handover between two carriers in FDD mode. This is in particularly for the case for networks that support Hierarchical Cell Structures (HCS), i.e., combinations of macro, micro, pico and other specific application cells.

It is known that the service provided by a specific layer will not be continuous. This means that there are trans-layer handovers where the UE will be handed over to a macro layer, before returning again to the micro layer.

This necessitates good performance and also introduces the fact that during soft handoff within one layer, the UE shall be able to monitor other FDD carriers for the purpose of inter-frequency handover.

From the system perspective, the inter-frequency hard handover must have comparable performance to that of soft handover.

9.1.3.2.1 Requirements
[The requirements presented in these sections will be reviewed depending on the further progress in TSG RAN WG1 and TSG RAN WG2]

9.1.3.2.1.1 Handover Preparation Requirements

9.1.3.2.1.1.1 Maximum number of cells/frequencies to be monitored
For hard handover purposes, the UE shall be capable of monitoring at least [FFS] frequencies. The exact number of frequencies to be monitored will be determined by the used hard handover strategy/algorithm.

9.1.3.2.1.1.2 Measurement reporting delay
For hard handover purposes, the measurement reporting delay shall not exceed [FFS] seconds.

9.1.3.2.1.2 Measurement Requirements

9.1.3.2.1.2.1 Signal Strength Measurement Accuracy
For hard handover purposes, the UE shall measure the signal strength of of neighboring cells given in the neighbor cell list with an accuracy of +-[FFS] dB. *[The exact criteria for the measurement of the signal strngth is FFS also in dependency wtith the work in progress in other TSG RAN WGs]*

9.1.3.2.1.2.2 Frame offset Measurement Accuracy
For hard handover purposes, the frame offset between the serving BS and the new one has to be measured by the UE. This has to be measured with an accuracy of +-[FFS] chips.

9.1.3.2.1.3 RF Scenario and RF Parameters Used

9.1.3.3 FDD/TDD Handover

9.1.3.3.1 Requirements

9.1.3.3.1.1 Handover Preparation Requirements

9.1.3.3.1.2 Measurement Requirements

9.1.3.3.1.3 RF Scenario and RF Parameters Used

9.1.3.4 TDD/TDD Handover

9.1.3.4.1 Requirements

9.1.3.4.1.1 Handover Preparation Requirements

9.1.3.4.1.2 Measurement Requirements

9.1.3.4.1.3 RF Scenario and RF Parameters Used

9.1.4 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.

9.1.4.1 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].

9.1.4.1.1 Requirements

9.1.4.1.1.1 Handover Preparation Requirements

9.1.4.1.1.2 Measurement Requirements

9.1.4.1.1.3 RF Scenario and RF Parameters Used

9.2 Radio Link Management

9.2.1 Link adaptation

9.3 Cell Update

9.4 URA Update

10. Admission control (FDD)

11. Admission control (TDD)

12. Radio access bearer control (FDD)

13. Radio access bearer control (TDD)

14. Dynamic Channel Allocation (FDD)

15. Dynamic Channel allocation (TDD)

16. Power Management (FDD)

16.1 Open Loop Power Control

16.1.1 Introduction

16.1.2 UE Implementation Requirements

16.1.2.1 Output power dynamics

Power control is used to limit the interference level. The details on the Output Power Dynamics are specified in Section 6.4 S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

16.1.3 UE Power Control Range Requirements

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 error is specified in S25.101 "UTRA (UE) FDD; Radio Transmission and Reception", Section 6.4.1, Table I

16.1.4 BS Implementation Requirements

16.1.4.1 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 Section 6.4 S25.104, "UTRA (BS) FDD; Radio Transmission and Reception".

16.1.5 BS Power Control Range Requirements

16.2 Closed Loop Power Control

16.2.1 Introduction

16.2.2 UE Implementation Requirements

Closed loop power control is the ability of the UE transmitter to adjust its output power in accordance with the TPC symbols received in the down-link; The details on the UE implementation requirements are specified in Section 6.4.2 S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

16.2.2.1 Closed Loop Power Control in Downlink

Closed Loop Power Control in 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 result of this comparison.

(a) The tolerance of the SIR measurement for power control in downlink shall be within the range shown in Table I, Section 6.4.2.1.1 S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

(b) The minimum dynamic range of the SIR measurement of received signal in downlink shall be according the range shown in Table I, Section 6.4.2.1.1 S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

(c) The transmitted TPC symbols must react on a change of the received SIR within the Time given in Table I in Section 6.4.2.1.1 S25.101, "UTRA (UE) FDD; Radio Transmission and Reception".

16.2.3 UE Power Control Range Requirements

16.2.4 BS Implementation Requirements

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

For closed 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 Reverse Traffic Channel. The details on the UE implementation requirements are specified in Section 6.4.1 S25.104, "UTRA (BS) FDD; Radio Transmission and Reception".

16.2.5 BS Power Control Range Requirements

17. Power Management (TDD)

17.1 Open Loop Power Control

17.1.1 Introduction

17.1.2 UE Implementation Requirements

17.1.3 UE Power Control Range Requirements

17.1.4 BS Implementation Requirements

17.1.5 BS Power Control Range Requirements

18. Radio Link Surveillance (FDD)

18.1 Radio Link Measurement Requirements

18.1.1 Signal Strength

18.1.1.1 General

18.1.1.2 Physical Parameters

18.1.1.3 Statistical Parameters

18.1.1.4 Range of Parameters

18.1.2 Signal Quality

18.1.2.1 General

18.1.2.2 Physical Parameters

18.1.2.3 Statistical Parameters

18.1.2.4 Range of Parameters

18.1.3 Measurement Reporting

18.1.4 Absolute UE-BS Distance

18.2 Radio Link Failure Requirements

19. Radio Link Surveillance (TDD)

19.1 Radio Link Measurement Requirements

19.1.1 Signal Strength

19.1.1.1 General

19.1.1.2 Physical Parameters

19.1.1.3 Statistical Parameters

19.1.1.4 Range of Parameters

19.1.2 Signal Quality

19.1.2.1 General

19.1.2.2 Physical Parameters

19.1.2.3 Statistical Parameters

19.1.2.4 Range of Parameters

19.1.3 Measurement Reporting

19.1.4 Abosolute UE-BS Distance

19.2 Radio Link Failure Requirements

20. Annex A RF Power Management Scenario

21. Annex B RF Handover Scenario

22. Annex C (Informative) Open Items:

Section number	Section description	Status

23. History

Document history		
S25.103 v1.0.0	06-1999	The content of Tdoc R499-353 was included. Document Status was raised to version 1.0.0 and noted by TSG RAN as version 1.0.0.
S25.103 v0.1.0	05-1999	The document was submitted to the RAN and noted as version 0.1.0.
S25.103 v2.0.0	04-1999	In section 10.1.4.1 some values were put in square bracket in accordance with the comments received on the reflector; the new numbering S25.103 for the document was introduced. Moreover Section 4 about references was changed in accordance with the new numbering of WG4 documents. The document was approved by reflector and raised to v2.0.0.
S25.403 v1.0.0	04-1999	Document status raised to v1.0.0. The document numbering was changed to S25.403 in accordance to the 3GPP indication also if this numbering is still provisional. In Section 17 references to S4.01 were added.
S4.03 v0.0.4	03-1999	A new Table of Contents and structure based on Td R499-106 were included; moreover some parts from S4.01 were included for discussion.
S4.03 v0.03	03-1999	The Title and Scope of the Specification has been updated in accordance to the 3GPP TSG RAN decision.
S4.03 v0.02	02-1999	In Section 6.6 the last requirement was extended to a multioperator scenario.In Section 6.8.1 10 seconds was put in square bracket.
S4.03 v 0.01	02-1999	Output from WG4 drafting session on the S4.03 content. The structure of the document was proposed from document TSGW4#2(99)30. Some sections of the document TSGW4#2(99)68 were included in section 6 of this document.

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