

3GPP TS 36.213 V8.8.0 (2009-09)

Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Physical layer procedures
(Release 8)**



The present document has been developed within the 3rd Generation Partnership Project (3GPPTM) and may be further elaborated for the purposes of 3GPP.

The present document has not been subject to any approval process by the 3GPP Organisational Partners and shall not be implemented. This Specification is provided for future development work within 3GPP only. The Organisational Partners accept no liability for any use of this Specification. Specifications and reports for implementation of the 3GPPTM system should be obtained via the 3GPP Organisational Partners' Publications Offices.

Keywords

UMTS, radio, layer 1

3GPP

Postal address

3GPP support office address

650 Route des Lucioles – Sophia Antipolis
Valbonne – France
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

<http://www.3gpp.org>

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© 2009, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TTA, TTC).
All rights reserved.

UMTS™ is a Trade Mark of ETSI registered for the benefit of its members
3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners
LTE™ is a Trade Mark of ETSI currently being registered for the benefit of its Members and of the 3GPP Organizational Partners
GSM® and the GSM logo are registered and owned by the GSM Association

Contents

Foreword	5
1 Scope	6
2 References	6
3 Definitions, symbols, and abbreviations	7
3.1 Symbols	7
3.2 Abbreviations	7
4 Synchronisation procedures	8
4.1 Cell search	8
4.2 Timing synchronisation	8
4.2.1 Radio link monitoring	8
4.2.2 Inter-cell synchronisation	8
4.2.3 Transmission timing adjustments	8
5 Power control	9
5.1 Uplink power control	9
5.1.1 Physical uplink shared channel	9
5.1.1.1 UE behaviour	9
5.1.1.2 Power headroom	12
5.1.2 Physical uplink control channel	12
5.1.2.1 UE behaviour	12
5.1.3 Sounding Reference Symbol	14
5.1.3.1 UE behaviour	14
5.2 Downlink power allocation	15
5.2.1 eNodeB Relative Narrowband TX Power restrictions	16
6 Random access procedure	16
6.1 Physical non-synchronized random access procedure	16
6.1.1 Timing	17
6.2 Random Access Response Grant	17
7 Physical downlink shared channel related procedures	18
7.1 UE procedure for receiving the physical downlink shared channel	19
7.1.1 Single-antenna port scheme	21
7.1.2 Transmit diversity scheme	21
7.1.3 Large delay CDD scheme	22
7.1.4 Closed-loop spatial multiplexing scheme	22
7.1.5 Multi-user MIMO scheme	22
7.1.6 Resource allocation	22
7.1.6.1 Resource allocation type 0	22
7.1.6.2 Resource allocation type 1	23
7.1.6.3 Resource allocation type 2	24
7.1.7 Modulation order and transport block size determination	25
7.1.7.1 Modulation order determination	25
7.1.7.2 Transport block size determination	26
7.1.7.2.1 Transport blocks not mapped to two-layer spatial multiplexing	27
7.1.7.2.2 Transport blocks mapped to two-layer spatial multiplexing	32
7.1.7.2.3 Transport blocks mapped for DCI Format 1C	33
7.1.7.3 Redundancy Version determination for Format 1C	33
7.2 UE procedure for reporting channel quality indication (CQI), precoding matrix indicator (PMI) and rank indication (RI)	33
7.2.1 Aperiodic CQI/PMI/RI Reporting using PUSCH	36
7.2.2 Periodic CQI/PMI/RI Reporting using PUCCH	40
7.2.3 Channel quality indicator (CQI) definition	47
7.2.4 Precoding Matrix Indicator (PMI) definition	48
7.3 UE procedure for reporting ACK/NACK	49

8	Physical uplink shared channel related procedures	52
8.1	Resource Allocation for PDCCH DCI Format 0	55
8.2	UE sounding procedure.....	55
8.3	UE ACK/NACK procedure	58
8.4	UE PUSCH Hopping procedure	58
8.4.1	Type 1 PUSCH Hopping.....	59
8.4.2	Type 2 PUSCH Hopping.....	60
8.5	UE Reference Symbol procedure	60
8.6	Modulation order, redundancy version and transport block size determination	60
8.6.1	Modulation order and redundancy version determination.....	60
8.6.2	Transport block size determination	62
8.6.3	Control information MCS offset determination.....	62
8.7	UE Transmit Antenna Selection	64
9	Physical downlink control channel procedures	64
9.1	UE procedure for determining physical downlink control channel assignment.....	64
9.1.1	PDCCH Assignment Procedure	64
9.1.2	PHICH Assignment Procedure	65
9.2	PDCCH validation for semi-persistent scheduling.....	66
10	Physical uplink control channel procedures	68
10.1	UE procedure for determining physical uplink control channel assignment.....	68
10.2	Uplink ACK/NACK timing	73
Annex A (informative):	Change history	74

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (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 present document, 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;
 - 3 or greater indicates TSG approved document under change control.
- 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 document.

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.