

# ETSI TS 102 658 V2.5.1 (2015-07)



## Digital Private Mobile Radio (dPMR) using FDMA with a channel spacing of 6,25 kHz

**PREVIEW**  
iTech STANDARDS  
(standards.it-eui.com)  
Full standard: <https://standards.it-eui.com/standards/etsi/543ede56-ed7a-4252-92e5-2a7f3423259/etsi-ts-102-658-v2.5.1-2015-07>

---

**Reference**RTS/ERM-TGDMR-325

---

**Keywords**

air interface, digital, FDMA, PMR, protocol, radio

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

---

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

---

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2015.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**GSM®** and the GSM logo are Trade Marks registered and owned by the GSM Association.

# Contents

Intellectual Property Rights .....	14
Foreword.....	14
Modal verbs terminology.....	14
1 Scope .....	15
2 References .....	15
2.1 Normative references .....	15
2.2 Informative references.....	15
3 Definitions, symbols and abbreviations .....	16
3.1 Definitions.....	16
3.2 Symbols.....	18
3.3 Abbreviations .....	18
4 Overview .....	20
4.0 General .....	20
4.1 Protocol architecture.....	20
4.1.0 General.....	20
4.1.1 Air Interface Physical Layer (layer 1).....	21
4.1.2 Air Interface Data Link Layer (layer 2) .....	21
4.1.3 Air Interface Call Control Layer (layer 3) .....	22
4.1.4 Architectural Configurations .....	22
4.1.4.0 General .....	22
4.1.4.1 Peer-to-Peer Direct Network (Mode 1).....	22
4.1.4.2 Centralized Repeater Network (Mode 2) .....	23
4.1.4.3 Managed Centralized Repeater Network (Mode 3).....	23
4.1.4.3.0 General .....	23
4.1.4.3.1 Beacon Channel.....	23
4.1.4.3.2 Traffic Channel.....	24
4.1.4.4 Services available.....	24
4.1.5 Channel Access Mechanisms.....	25
4.1.5.0 General .....	25
4.1.5.1 User Services.....	25
4.1.5.1.0 General .....	25
4.1.5.1.1 Voice calls .....	25
4.1.5.1.2 Status delivery .....	25
4.1.5.1.3 Status Polling Request.....	25
4.1.5.1.4 Short Data Delivery .....	26
4.1.5.1.5 Short Data Polling .....	26
4.1.5.1.6 Type 1 data .....	26
4.1.5.1.7 Type 2 data .....	26
4.1.5.1.8 Type 3 (packet) data .....	26
4.1.5.2 Random Access (Mode 1, Mode 2).....	26
4.1.5.3 Regulated Random Access (Mode 3).....	26
4.1.5.4 Polling.....	26
4.1.5.5 Beacon Signal .....	26
4.2 FDMA Structure.....	27
4.2.1 Overview of the transmission structure .....	27
4.2.2 Transmission format .....	27
4.2.2.0 General .....	27
4.2.2.1 Traffic Channel Message Frame .....	27
4.2.2.2 Traffic Channel Payload Frame .....	28
4.2.2.2.0 General .....	28
4.2.2.2.1 Traffic Channel Superframe .....	28
4.2.2.3 Traffic Channel Packet Data Header Frame.....	28
4.2.2.4 Traffic Channel End Frame.....	29
4.2.2.5 Beacon SYScast Frame .....	29
4.2.2.6 Appended Data Frame.....	29

4.2.3	Transmission sequences.....	29
4.2.3.1	Traffic Channel Voice or data payload item transmission .....	29
4.2.3.2	Traffic Channel Call set up, service request, etc .....	30
4.2.3.3	Traffic Channel Acknowledgement .....	30
4.2.3.4	Traffic Channel Status request acknowledgements:.....	30
4.2.3.5	Traffic Channel Disconnection: .....	30
4.2.3.6	Traffic Channel Preservation Message.....	31
4.2.3.7	Mode 3 Beacon Channel .....	31
4.2.3.8	Mode 1 Call Exchange .....	31
4.2.3.8.1	Mode 1 Voice Call.....	31
4.2.3.8.2	Mode 1 Data Call.....	33
4.2.3.9	Mode 2 Call Exchange .....	34
4.2.3.10	Co-channel BS networks .....	34
4.2.3.11	Mode 3 Operation .....	35
4.3	Addressing.....	37
4.4	Unified Data Transport Mechanism .....	37
4.5	Complementary Data.....	37
4.5.0	General.....	37
4.5.1	Support for Voice and Data call services.....	38
4.5.2	Transport of complementary data for MS control.....	38
5	Frame coding.....	38
5.0	General .....	38
5.1	Payload Frame [T].....	40
5.2	Message_Frame [BT].....	40
5.2.0	General.....	40
5.2.1	Communications_Start Header [T] .....	41
5.2.1.0	General .....	41
5.2.1.1	Concatenated Superframe to a Communications_Start Header[T] .....	42
5.2.2	Connection_Request Header [T].....	43
5.2.2.0	General .....	43
5.2.2.1	Called Party Check [T].....	43
5.2.2.2	Repeat Last Ack(RLA) [T] .....	44
5.2.2.3	Short Data Delivery Header message [T].....	44
5.2.2.4	Call Diversion [T] .....	45
5.2.3	Disconnect_Request Header [T].....	45
5.2.4	T_ACK B_ACK Message [T].....	45
5.2.4.0	General .....	45
5.2.4.1	Message Information for acknowledgements.....	46
5.2.5	Maintenance_Message [T].....	46
5.2.5.0	General .....	46
5.2.5.1	Idle Message [T] .....	47
5.2.5.2	Preservation message .....	47
5.2.5.3	Guard_Message [T].....	48
5.2.6	System_Request Header [T] .....	48
5.2.7	ACK header response to a System Request [T].....	49
5.2.8	System Delivery Header [T].....	49
5.2.9	Mode 1 and Mode 2 Status Messages [T].....	49
5.2.10	Status Polling Request Message [T] .....	50
5.2.11	BS_Command header(U) and response(D) [T].....	50
5.2.12	BS_Access header(U) and response(D) [T].....	51
5.2.13	Broadcast Messages [B] [T].....	51
5.2.13.0	General .....	51
5.2.13.1	Broadcast Aloha Message [B].....	52
5.2.13.2	Broadcast Announcements [B].....	52
5.2.13.2.0	General .....	52
5.2.13.2.1	Broadcast Announcement - Call Timers [B] .....	53
5.2.13.2.2	Broadcast Announcement - Vote Now [B].....	53
5.2.13.2.3	Broadcast Announcement - Mass Registration [B] .....	54
5.2.13.2.4	Broadcast Announcement - Real Time [B].....	54
5.2.13.3	Move Channel Broadcast [BT] .....	55
5.2.13.4	Goto Channel Broadcast [BT].....	55

5.2.13.5	Ambience Listening [T] .....	56
5.2.14	AHOY/Random Access Request Message [B] .....	57
5.2.14.0	General .....	57
5.2.14.1	B_AHOY Message Downlink [B] .....	57
5.2.14.2	Random Access Request Uplink [B] .....	59
5.2.15	UDT Header messages [B] .....	60
5.3	End_Frame .....	61
5.4	Packet Data Header [T] .....	62
5.5	Field Descriptions .....	62
5.5.0	General .....	62
5.5.1	Active ACTIVE [B] .....	63
5.5.2	Appended_Data [BT] .....	63
5.5.3	ARQ [T] .....	63
5.5.4	Backoff [B] .....	64
5.5.5	Call Timers [BT] .....	64
5.5.6	Communication format [BT] .....	65
5.5.7	Communication Mode [BT] .....	65
5.5.8	COMP [B] .....	66
5.5.9	Continuation_Flag [T] .....	66
5.5.10	Day of Week(DAYSOF_WEEK) [B] .....	66
5.5.11	Digits [BT] .....	67
5.5.12	Emergency Priority [BT] .....	67
5.5.13	End_Type [T] .....	67
5.5.14	Frame numbering [T] .....	68
5.5.15	Frequency Definitions FR, FT, SEP, BAND [BT] .....	68
5.5.16	Guard_Kind [T] .....	69
5.5.17	Long [B] .....	69
5.5.18	Mask [B] .....	69
5.5.19	Message Information [BT] .....	69
5.5.19.0	General .....	69
5.5.19.1	Message Information for Powersave [T] .....	70
5.5.19.2	Message Information for Types 1 and 2 data [T] .....	70
5.5.19.3	Message Information for Type 3 (packet) data [T] .....	71
5.5.19.4	Message Information for system transactions [T] .....	71
5.5.19.5	Message Information for B_ACK T_ACK acknowledgements [BT] .....	72
5.5.19.6	Message Information for Broadcast headers [BT] .....	72
5.5.19.7	Message Information for BS Command headers [T] .....	73
5.5.19.8	Message Information for additional services [B] .....	73
5.5.20	Message_Type [BT] .....	74
5.5.21	Month B_MONTH .....	74
5.5.22	N Rand_Wait [B] .....	74
5.5.23	Preservation_Message PM [T] .....	75
5.5.24	POL_FMT [B] .....	75
5.5.25	Reason [BT] .....	75
5.5.26	Reg [B] .....	78
5.5.27	Reserved [BT] .....	78
5.5.28	Service Function [B] .....	78
5.5.29	SLD format [T] .....	78
5.5.29.1	S Low Data in the voice superframe .....	78
5.5.29.2	S Low Data field use with Type 1 or 2 data .....	79
5.5.30	Status .....	79
5.5.30.1	Status for Mode 1 and Mode 2 systems [T] .....	79
5.5.30.2	Status for Mode 3 systems [B] .....	80
5.5.31	SYMB [BT] .....	80
5.5.32	SYSscat [B] .....	80
5.5.32.0	General .....	80
5.5.32.1	SYSscat1 [B] .....	80
5.5.32.2	SYSscat2 or SYSscat3 [B] .....	81
5.5.32.2.0	General .....	81
5.5.32.2.1	SYSscat2 or SYSscat3 Call Timer MS to MS [B] .....	81
5.5.32.2.2	Call Timer for line connected calls and packet data [B] .....	81
5.5.32.2.3	SYSscat2 or SYSscat3 Real Time [B] .....	81

5.5.32.2.4	SYScast2 or SYScast3 Common Frame Counter [B].....	82
5.5.32.2.5	SYScast2, SYScast3 Calling Party Address [B].....	82
5.5.33	System Identity Code [B] .....	83
5.5.34	Tx_Wait [T] .....	83
5.5.35	UAD [BT].....	83
5.5.36	UDT_Format [BT].....	84
5.5.37	Version [BT].....	84
5.5.38	Vote Now Advice Parameters [B] .....	84
5.5.39	Withdrawn W [B] .....	84
5.6	Appended_Data Messages [BT].....	85
5.6.0	General.....	85
5.6.1	Appended_Data MS ID Format .....	85
5.6.2	Appended_Data Binary Format .....	85
5.6.3	Appended_Data BCD Format .....	86
5.6.4	Appended_Data (ISO 7 bit character set Format).....	86
5.6.5	Appended_Data (ISO 8 bit character set format).....	86
5.6.6	Appended_Data NMEA (EN 61162-1) format .....	87
5.6.7	Appended_Data IPV4 format .....	88
5.6.8	Appended_Data IPV6 format .....	88
5.6.9	Appended_Data Filler.....	88
6	Synchronization.....	89
6.1	Frame synchronization .....	89
6.1.1	FS1 .....	89
6.1.2	FS2 .....	89
6.1.3	FS3.....	89
6.1.4	FS4.....	89
6.1.5	Channel Code.....	89
6.1.5.0	General.....	89
6.1.5.1	Channel Code for Mode 1 and Mode 2 Systems.....	91
6.1.5.2	Channel Code for Mode 3 Systems.....	91
6.1.5.2.0	General .....	91
6.1.5.2.1	Channel Code Determined by Frequency.....	91
6.1.5.2.2	Channel Code Determined by Frequency and System Identity Code.....	91
6.1.6	Preamble .....	93
7	Interleaving and FEC coding.....	93
7.1	CRC addition.....	93
7.2	Hamming code .....	93
7.3	Scrambling .....	94
7.4	Interleaving.....	94
7.5	FEC coding of CCH (superframe).....	95
7.6	FEC coding of MI (message info') and HI (header info') .....	95
7.7	FEC coding of END information .....	96
7.8	FEC coding of Appended Data.....	96
8	Bearer Services, tele-services and supplementary services.....	96
8.0	General .....	96
8.1	Call types.....	97
8.1.1	Individual call .....	97
8.1.2	Group call .....	98
8.2	Addressing.....	98
8.3	Channel Codes.....	98
8.4	Messages .....	98
8.4.1	Downlink Traffic Channel messages .....	98
8.4.2	Uplink Traffic Channel messages.....	99
8.4.3	Downlink Beacon messages .....	99
8.4.4	Uplink Beacon messages .....	100
9	Packet data.....	100
9.1	Format .....	100
9.2	Receiving party .....	101
9.3	Packet frame coding .....	102

9.4	Data frame size .....	102
9.5	Valid data length .....	103
9.6	Data checksum .....	103
9.7	Standard Packet Exchange Format .....	103
10	Call procedures.....	105
10.0	General .....	105
10.1	Call procedures for Mode 1 .....	106
10.1.0	General.....	106
10.1.1	Common procedures for Mode 1 Voice and Data calls .....	107
10.1.1.1	Mode 1 Call set up. ....	107
10.1.2	Mode 1 Voice calls .....	108
10.1.2.1	Mode 1 Voice Call in progress.....	108
10.1.2.2	Mode 1 Voice Call with Slow Data .....	109
10.1.2.3	Mode 1 Voice Call with Attached Data .....	109
10.1.2.4	Mode 1 Voice Call Termination.....	109
10.1.3	Mode 1 Data Calls .....	110
10.1.3.0	General .....	110
10.1.3.1	Mode 1 T1 and T2 Data calls .....	110
10.1.3.2	Mode 1 T3 (Packet) Data Calls .....	111
10.1.3.3	Mode 1 Individual Status Code polling.....	114
10.1.3.4	Mode 1 Short Data Delivery .....	115
10.1.4	Mode 1 Traffic Channel Powersave .....	117
10.1.4.0	General .....	117
10.1.4.1	Transmitted format.....	117
10.1.4.2	Receive format .....	118
10.2	Call procedures for Mode 2.....	118
10.2.0	General.....	118
10.2.1	Mode 2 MS to MS Call set up .....	119
10.2.2	Mode 2 MS to MS Voice Calls.....	120
10.2.3	Mode 2 Data Calls .....	121
10.2.3.1	Mode 2 T1 and T2 Data Calls.....	121
10.2.3.2	Mode 2 T3 (Packet) Data Calls.....	122
10.2.3.3	MS to MS Status request and responses.....	122
10.2.3.4	MS to MS Short Data.....	123
10.2.4	Mode 2 MS Mode 2 Call Diversion.....	125
10.2.4.0	General .....	125
10.2.4.1	Setting the diversion.....	126
10.2.4.2	Cancelling the diversion.....	126
10.2.5	Mode 2 Connection to line connected destinations.....	126
10.2.5.0	General .....	126
10.2.5.1	Voice Call Connection_Request message .....	129
10.2.5.2	Call Matrix for calls to line connected destinations .....	129
10.2.6	Mode 2 calls from line connected sources .....	129
10.2.6.0	General .....	129
10.2.6.1	Call Matrix for calls from line connected destinations .....	130
10.2.7	Mode 2 Co-channel repeater networks .....	130
10.2.7.0	General .....	130
10.2.7.1	MS originated repeater polling.....	130
10.2.7.1.0	General .....	130
10.2.7.1.1	Description of the messages .....	132
10.2.7.2	BS originated repeater polling.....	132
10.2.7.2.0	General .....	132
10.2.7.2.1	Description of the messages .....	133
10.2.7.3	Access and Response timing .....	134
10.3	Call Procedures for Mode 3.....	134
10.3.0	General.....	134
10.3.1	Mode 3 UDT Mechanism .....	135
10.3.1.0	General .....	135
10.3.1.1	Format of the Appended_Data.....	137
10.3.1.2	UDT Structure.....	138
10.3.1.2.1	UDT Content for Services Carried on the Downlink channel .....	138



10.3.1.2.2	UDT Mechanism for the Uplink channel .....	139
10.3.1.3	Single Part and Multi-part call set-up .....	139
10.3.1.4	MS behaviour to B_AHOY messages.....	139
10.3.2	Mode 3 call examples .....	140
10.3.2.1	An individual voice call example.....	140
10.3.2.2	A Mode 3 talkgroup call example .....	141
10.3.2.3	Mode 3 Short Data call example .....	142
10.3.2.4	Mode 3 Call to PABX/PSTN example.....	142
10.3.2.5	Mode 3 Call from the PABX/PSTN example .....	143
10.3.2.6	Mode 3 transport of complementary data example .....	144
10.3.2.7	Mode 3 transport of complementary data and an extended address example. ....	144
10.3.2.8	Mode 3 Refusal of Service.....	145
10.3.3	Mode 3 Detailed Call procedures .....	146
10.3.3.0	General .....	146
10.3.3.1	Mode 3 Procedures common to Voice calls and Data Calls.....	146
10.3.3.1.1	Availability of requesting MS .....	146
10.3.3.1.2	Call Cancellation .....	146
10.3.3.1.3	Acknowledgements sent to calling MS .....	146
10.3.3.1.4	Maintenance of call progress waiting timers .....	147
10.3.3.1.5	Traffic Channel Assignment.....	147
10.3.4	Mode 3 Voice Call Procedures .....	148
10.3.4.0	General .....	148
10.3.4.1	Voice Call Procedures for the BS .....	148
10.3.4.1.0	General .....	148
10.3.4.1.1	BS Response to single-part voice call set-up.....	149
10.3.4.1.2	BS Response to multi-part voice call set-up.....	149
10.3.4.1.3	Acknowledgements sent by the BS to the calling MS (voice).....	149
10.3.4.1.4	Voice Radio Check.....	150
10.3.4.1.5	Availability Check for Voice Calls connected through Gateways .....	150
10.3.4.2	Voice Call Procedures for MS .....	150
10.3.4.2.0	General .....	150
10.3.4.2.1	Initiating a single-part voice call service .....	151
10.3.4.2.2	Response to the single-part individual voice service request .....	151
10.3.4.2.3	Initiating a multi-part voice call service .....	151
10.3.4.2.4	Response to the multi-part voice service request.....	152
10.3.4.2.5	Acknowledgements received by the calling MS (voice) .....	152
10.3.4.2.6	Availability Check to the called MS (voice) .....	153
10.3.4.2.7	Traffic Channel Allocation.....	153
10.3.4.3	Procedures for the Voice Traffic Channel.....	153
10.3.4.3.0	General .....	153
10.3.4.3.1	BS Procedures for the Voice Traffic Channel .....	153
10.3.4.3.2	MS Procedures for the Voice Traffic Channel .....	155
10.3.5	Mode 3 Data Call Procedures .....	156
10.3.5.0	General .....	156
10.3.5.1	Data Call Procedures for the BS .....	156
10.3.5.1.0	General .....	156
10.3.5.1.1	BS Response to single-part data call set-up.....	157
10.3.5.1.2	BS Response to multi-part data call set-up.....	157
10.3.5.1.3	Acknowledgements sent by the BS to the calling MS (data).....	157
10.3.5.1.4	Radio Check for Data .....	158
10.3.5.1.5	Availability Check for Data Calls connected through Gateways .....	158
10.3.5.2	Data Call Procedures for MS .....	158
10.3.5.2.0	General .....	158
10.3.5.2.1	Initiating a single-part data call service .....	159
10.3.5.2.2	Response to the single-part data call service request.....	159
10.3.5.2.3	Initiating a multi-part data call service .....	160
10.3.5.2.4	Response to the multi-part data service request.....	160
10.3.5.2.5	Acknowledgements received by the calling MS (data) .....	160
10.3.5.2.6	Availability Check to the called MS (data) .....	160
10.3.5.2.7	Traffic Channel Allocation.....	161
10.3.5.3	Procedures for the Data Traffic Channel.....	161
10.3.5.3.0	General .....	161



10.3.5.3.1	BS Procedures for the Data Traffic Channel .....	161
10.3.5.3.2	MS Procedures for the Data Traffic Channel .....	162
10.3.5.4	Mode 3 Short Data Message Procedure .....	163
10.3.5.4.0	General .....	163
10.3.5.4.1	Short Data Procedures for the BS .....	165
10.3.5.4.2	Short Data Message procedures for MS .....	166
10.3.5.4.3	Initiating a Short Data Message service .....	167
10.3.5.4.4	Response to a random access short data message .....	167
10.3.5.4.5	Acknowledgements received by the calling MS .....	168
10.3.5.4.6	Timeout waiting for further signalling .....	168
10.3.5.4.7	MS receiving a short data message .....	168
10.3.5.5	Mode 3 Short Data Polling Service .....	168
10.3.5.5.0	General .....	168
10.3.5.5.1	Short Data Polling Procedures for the BS .....	170
10.3.5.5.2	Short Data Polling Message procedures for MS .....	171
10.3.5.5.3	Initiating a Short Data Polling service .....	172
10.3.5.5.4	Response to a random access short data polling message .....	172
10.3.5.5.5	Final Acknowledgement transmitted by the calling MS .....	172
10.3.5.5.6	Timeout waiting for further signalling .....	173
10.3.5.5.7	MS receiving a B_AHOY poll for a short polling message .....	173
10.3.5.6	Mode 3 Status Call Service .....	173
10.3.5.6.0	General .....	173
10.3.5.6.1	Status Service Delivery Procedure .....	173
10.3.5.7	Mode 3 Call Diversion .....	176
10.3.5.7.1	Call Diversion Service .....	176
10.3.5.7.2	Call set-up to an MS that has a Diverted address .....	179
10.3.5.8	Mode 3 MS Stun/Revive Procedures .....	179
10.3.5.8.0	General .....	179
10.3.5.8.1	MS Stun/Revive without authentication .....	180
10.3.5.9	Mode 3 MS Kill .....	181
10.3.5.9.0	General .....	181
10.3.5.9.1	Kill procedures for the BS .....	181
10.3.5.9.2	Kill procedure with ESN check for the MS .....	182
10.3.5.10	Mode 3 Dynamic Regroup Service .....	183
10.3.5.10.1	Dynamic Regroup Service .....	183
10.3.5.10.2	Dynamic Regroup Procedures for the BS .....	185
10.3.5.10.3	Dynamic Regroup procedures for MS .....	186
10.3.6	Message Address Matrix for Mode 3 Call services .....	187
10.3.6.0	General .....	187
10.3.6.1	Call Services that require the allocation of a Traffic Channel .....	187
10.3.6.1.1	MS to MS or talkgroup Voice, T1, T2, T3 data call .....	187
10.3.6.1.2	MS call to PSTN, PABXI and other extended addresses .....	188
10.3.6.1.3	Call from PSTN, PABX, or other line connected address to MS or talkgroup .....	189
10.3.6.2	Call Services that only require the Beacon Channel .....	190
10.3.6.2.1	MS Short Data Call to MS or talkgroup .....	190
10.3.6.2.2	Short Data Call from PSTN, PABX, LINEI, DISPATI to MS or talkgroup .....	191
10.3.6.2.3	Short Data Call from MS to PSTN, PABX, LINEI, DISPATI .....	191
10.3.6.2.4	Short Data Polling from MS to MS .....	191
10.3.6.2.5	Short Data MS Polling from a gateway .....	192
10.3.6.2.6	Status Transport from MS to MS or talkgroup .....	192
10.3.6.3	Complementary data .....	192
10.3.6.4	Other Mode 3 Services .....	193
10.3.6.4.1	Call Diversion Service .....	193
10.3.6.4.2	Registration .....	194
10.3.6.4.3	Serial Number Check .....	194
10.3.6.4.4	MS Stun/Revive .....	194
10.3.6.4.5	MS Kill .....	194
11	Channel coding process .....	195
11.1	Voice superframe .....	195
11.1.0	General .....	195
11.1.1	Voice + Attached data call .....	196

11.2	Type 1 data superframe .....	198
11.3	Type 2 Data superframe .....	199
11.4	Type 3 (Packet) Data frame.....	201
11.5	Messages .....	203
11.6	End frames.....	204
11.7	SYScast Frames.....	205
11.8	Appended Data Frames .....	206
12	Channel access .....	207
12.0	General .....	207
12.1	Channel access for Mode 1 [M1] .....	209
12.1.0	General.....	209
12.1.1	Listen Before Transmit (LBT) [M1].....	209
12.1.2	Hang time messages and timers [M1].....	210
12.1.2.1	Definition [M1] .....	210
12.1.2.2	Action by receiving stations [M1].....	210
12.1.2.3	Call duration timers [M1].....	210
12.1.2.3.1	Item Duration Timer for Voice Calls [M1] .....	210
12.1.2.3.2	Item Duration Timer for Data Calls [M1] .....	210
12.1.3	Transmit admit criteria [M1] .....	210
12.1.3.1	Channel "Politeness" [M1].....	210
12.1.3.2	General Timing [M1] .....	211
12.1.3.3	Transmission re-tries [M1].....	211
12.1.3.4	Emergency channel access procedures [M1].....	211
12.1.3.4.0	General .....	211
12.1.3.4.1	Emergency Break-in requests [M1].....	211
12.2	Channel access for Mode 2 [M2] .....	212
12.2.0	General.....	212
12.2.1	Listen Before Transmit (LBT) [M2].....	213
12.2.2	Hang time messages and timers [M2].....	213
12.2.2.1	Definition [M2] .....	213
12.2.2.2	Action by receiving stations [M2].....	214
12.2.2.3	Call duration timers [M2].....	214
12.2.2.3.1	Item Duration Timer for Voice Calls [M2] .....	214
12.2.2.3.2	Item Duration Timer for Data Calls [M2] .....	214
12.2.2.3.3	Maximum call duration timer for Mode 2 calls .....	214
12.2.3	Transmit admit criteria [M2] .....	215
12.2.3.1	Channel "Politeness" [M2].....	215
12.2.3.1.1	MS .....	215
12.2.3.1.2	BS .....	215
12.2.3.2	General Timing [M2] .....	215
12.2.3.3	Transmission re-tries [M2].....	216
12.2.3.4	Emergency channel access procedures [M2] .....	216
12.2.3.4.0	General .....	216
12.2.3.4.1	Emergency Break-in requests [M2].....	217
12.3	Channel access for Mode 3 [M3] .....	217
12.3.0	General.....	217
12.3.1	Mode 3 Channel Structure .....	217
12.3.2	Introduction to the Beacon Structure [M3] .....	218
12.3.2.0	General .....	218
12.3.2.1	Beacon Timing [M3].....	218
12.3.3	Network architecture [M3] .....	219
12.3.3.1	Network functions.....	219
12.3.3.1.0	General .....	219
12.3.3.1.1	Establishing service .....	219
12.3.3.1.2	Network Identifier .....	219
12.3.3.2	MS Location by Registration .....	219
12.3.4	Trunking methods [M3].....	220
12.3.5	Beacon Channel Formats [M3].....	220
12.3.5.0	General .....	220
12.3.5.1	Use of the SYScast Frames .....	221
12.3.5.1.0	General .....	221

12.3.5.1.1	SYC1 SYScast Frame.....	221
12.3.5.1.2	SYC2 or SYSC3 SYScast Frame .....	221
12.3.5.2	Beacon Frame Structure.....	221
12.3.5.2.1	Frames on the Beacon downlink channel .....	221
12.3.5.2.2	Frames on the Beacon uplink channel .....	222
12.3.6	Channel Access for a Beacon Channel .....	222
12.3.6.1	Basic Structure .....	222
12.3.6.1.1	Channel Structure .....	222
12.3.6.1.2	Physical Channel Addressing .....	223
12.3.6.1.3	Sub-Division of the MS population.....	223
12.3.7	Random Access Procedures.....	224
12.3.7.0	General.....	224
12.3.7.1	The Random Access Principle .....	224
12.3.7.1.0	General conventions .....	224
12.3.7.1.1	Random Access Control .....	225
12.3.7.1.2	Action after receiving an acknowledgement .....	233
12.3.7.1.3	MS Arriving on a Beacon Channel.....	233
12.3.8	Beacon Channel Acquisition and Retention .....	233
12.3.8.0	General.....	233
12.3.8.1	Vote Now .....	234
12.3.8.2	MS Parameter.....	235
12.3.8.3	Beacon Channel Acquisition Procedures .....	236
12.3.8.3.0	General .....	236
12.3.8.3.1	Entry into Beacon Acquisition Procedures.....	236
12.3.8.3.2	Identifying a Candidate Beacon Channel .....	237
12.3.8.3.3	Confirmation - Monitoring the BS downlink channel signal quality.....	240
12.3.8.3.4	MS Leaving a Beacon Channel .....	240
12.3.8.3.5	Leaving a Beacon Channel Whilst Waiting for Signalling.....	241
12.3.8.4	Registration, Power Save, and Authentication Procedures .....	241
12.3.8.4.1	General .....	241
12.3.8.4.2	Registration Procedures.....	243
12.3.9	Mass re-registration .....	246
12.3.9.0	General .....	246
12.3.9.1	Procedure for MS on receipt of Mass Re-registration Broadcast.....	246
12.3.9.2	De-registration .....	247
12.3.10	Beacon Power Save .....	247
12.3.10.1	Overview .....	247
12.3.10.2	Power Save Procedures .....	248
12.3.10.2.1	Basic Power Save Procedures.....	248
12.3.11	Electronic Serial Number Check Procedures.....	250
12.3.11.0	General.....	250
12.3.11.1	Format of the Electronic Serial Number (ESN) .....	250
12.3.11.2	ESN Procedures for the BS to authenticate an MS .....	250
12.3.11.3	ESN Procedures for the MS .....	251
12.4	Traffic Channel Access for Mode 3 .....	252
12.4.0	General.....	252
12.4.1	Preservation of the traffic channel [M3] .....	252
12.4.2	Reassignment of the traffic channel for an emergency call .....	252
13	Timers, constants levels and addresses .....	253
13.1	Timers .....	253
13.2	Constants .....	254
13.3	Levels .....	255
13.4	Gateways/Identifiers.....	255
13.5	Message Matrix's.....	256
14	Physical Layer .....	257
14.1	General parameters.....	257
14.1.0	General.....	257
14.1.1	Frequency range.....	257
14.1.2	RF carrier bandwidth .....	257
14.1.3	Transmit frequency error .....	257

14.1.4	Time base clock drift error.....	257
14.2	Modulation .....	258
14.2.1	Symbols .....	258
14.2.2	4FSK generation .....	258
14.2.2.0	General .....	258
14.2.2.1	Deviation index .....	258
14.2.2.2	Square root raised cosine filter.....	259
14.2.2.3	4FSK Modulator .....	259
14.3	Transmit Power Ramping.....	260
<b>Annex A (normative): Standard User Interface.....</b>		<b>261</b>
A.0	General .....	261
A.1	Numbering and dialling plan.....	261
A.1.1	Introduction to the numbering and dialling plan .....	261
A.1.2	Subscriber mapping.....	262
A.1.2.1	User Interface - Air Interface.....	262
A.1.2.1.0	General .....	262
A.1.2.1.1	Mapping for MS address space .....	263
A.1.2.1.1.0	General .....	263
A.1.2.1.1.1	The concept of the wildcard character.....	263
A.1.2.1.1.2	The concept of stored parameters .....	263
A.1.2.1.1.3	The concept of ad-hoc arrangement .....	263
A.1.2.1.1.4	The rules for the sender .....	263
A.1.2.1.1.5	The rules for the recipient.....	263
A.1.2.1.1.6	Mapping of dialled strings to the AI address space .....	264
A.1.2.2	Addresses .....	265
A.1.2.3	Conversion rules .....	265
A.1.2.3.1	MS addresses.....	265
A.1.2.3.2	Limiting the length of the destination address .....	265
A.1.2.3.3	All talkgroup address.....	266
A.1.3	User dialling plan .....	266
A.1.3.1	User numbering .....	266
A.1.3.1.0	General .....	266
A.1.3.1.1	Dialling method.....	266
A.1.3.1.2	Call Type determination.....	266
A.1.3.1.3	Call modifier strings.....	266
A.1.3.2	Dialled digits to address mapping.....	267
A.1.3.3	Storage requirements .....	267
A.1.3.3.1	MS individual address.....	267
A.1.3.3.2	Dialled Talkgroups.....	267
A.1.3.3.3	All MSs .....	267
A.1.3.3.4	Non-dialable numbers .....	267
A.1.3.3.5	Talkgroup recognition.....	268
A.1.3.3.5.1	All numeric talkgroups .....	268
A.1.3.3.5.2	Talkgroups defined by wildcards.....	268
A.1.3.3.5.3	MS receives a talkgroup call .....	268
A.1.3.4	Dialling procedures.....	269
A.1.3.4.1	MS calls .....	269
A.1.3.4.1.1	Seven digit dialling.....	269
A.1.3.4.1.2	Abbreviated dialling .....	269
A.1.3.4.1.3	Masked dialling .....	269
A.1.3.4.1.4	Dialling with numbers and wildcards .....	270
A.1.3.4.2	Gateway Calls .....	270
A.1.3.4.2.0	General .....	270
A.1.3.4.2.1	Telephone call .....	270
A.1.3.4.2.2	PABX call.....	271
A.1.3.4.2.3	IP call.....	271
A.1.3.4.3	Call modifiers.....	272
A.1.3.4.3.0	General .....	272
A.1.3.4.3.1	Broadcast call .....	272
A.1.3.4.3.2	Priority call .....	272

A.1.3.4.3.3	Emergency Call .....	272
A.1.3.4.3.4	Status poll call .....	272
A.1.3.4.3.5	Status delivery call .....	272
A.1.3.4.3.6	Divert own call .....	273
A.1.3.4.3.7	Force talkgroup service .....	273
A.1.3.4.4	Call set-up abandon or call complete .....	273
A.1.3.4.4.0	General .....	273
A.1.3.4.4.1	Call set-up abandon or call complete - Mode 1 .....	273
A.1.3.4.4.2	Call set-up abandon or call complete - Mode 2 .....	273
A.1.3.4.4.3	Call set-up abandon or call complete - Mode 3 .....	273

## **Annex B (informative): Beacon Channel Hunting Procedures .....274**

B.1	Introduction .....	274
B.1.0	General .....	274
B.1.1	Resuming a Beacon hunt channel.....	276
B.1.2	Commanded Beacon hunt channel .....	276
B.1.2.1	Conditions to enter a Commanded Beacon hunt.....	276
B.1.2.2	Nominated Channel for the Single Channel Hunt.....	276
B.1.2.3	Short Hunt Sequence .....	277
B.1.2.3.0	General .....	277
B.1.2.3.1	Conditions to enter a Short Channel Hunt.....	277
B.1.2.4	Comprehensive Hunt Sequence .....	277
B.1.2.4.0	General .....	277
B.1.2.4.1	Conditions to enter a Comprehensive Channel Hunt .....	277
B.1.2.5	Receiver Sensitivity During Beacon Channel Acquisition .....	278
History	.....	279

iTech STANDARD PREVIEW  
 (standards.iteh.ai)  
 Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/543ede56-ed7a-4252-92e5-2a7f83423259/etsi-ts-102-658-v2.5.1-2015-07>