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Digital Video Broadcasting (DVB);
Second Generation DVB
Interactive Satellite System (DVB-RCS2);
Part 2: Lower Layers for Satellite standard

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Contents

Intellectual Property Rights 11
Foreword 11
Modal verbs terminology 12
Introduction 12
1 Scope 14
2 References 14
2.1 Normative references 14
2.2 Informative references 15
3 Definition of terms, symbols and abbreviations 16
3.1 Terms 16
3.2 Symbols 19
3.3 Abbreviations 20
4 Two-way Satellite Interactive Satellite System models 23
4.0 Introduction 23
4.1 Interactive Satellite System Reference Models 23
4.2 System Model 23
4.3 Dynamic Connectivity 24
4.4 Reference Architectures 24
4.5 Protocol Stack Model 24
4.6 The Lower Layers 24
4.6.0 Introduction 24
4.6.1 Lower Layer Services 25
4.6.2 Lower Layer Interfaces 27
5 Forward Link and Regenerative Mesh Downlink 29
5.0 Introduction 29
5.1 SDU Transport in the Forward Link 29
5.1.0 Introduction 29
5.1.1 SDU Transport in GSE PDUs 30
5.1.1.0 Introduction 30
5.1.1.1 Implicit Integrity Protection of SDU (optional) 30
5.1.1.2 Explicit Integrity Protection of SDU 30
5.1.1.3 Maximum Transfer Unit for an SDU in the Forward Link 30
5.1.2 SDU Transport in TS Packets (optional) 30
5.2 Addressing in the forward link 31
5.2.0 Introduction 31
5.2.1 Addressing of L2S 31
5.2.2 Addressing the Unicast Higher Layer Traffic 31
5.2.2.0 Introduction 31
5.2.2.1 Addressing Unicast Sent with GSE 31
5.2.2.2 Addressing Unicast Sent over a TS Packet stream (optional) 31
5.2.3 Addressing the Multicast Higher Layer Traffic 32
5.2.3.0 Introduction 32
5.2.3.1 Addressing Multicast over GSE 32
5.2.3.2 Addressing Multicast over TS Packet stream 32
5.3 Layer 2 FEC (optional) 32
5.3.0 Introduction 32
5.3.1 LL-FEC Frame 33
5.3.1.0 Introduction 33
5.3.1.1 Filling of Application Data Table 33
5.3.1.2 Generation of the FEC Data Table 34
5.3.1.2.0 Introduction 34
5.3.1.2.1 Reed-Solomon Code 34
5.3.1.2.2 Raptor Code 35

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ETSI EN 301 545-2 V1.4.0 (2023-10)
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5.3.2 Carriage of LL-FEC Frames 35
5.3.2.0 Introduction 35
5.3.2.1 Carriage of Application Data 36
5.3.2.1.0 Introduction 36
5.3.2.1.1 GSE-FEC application data optional header extension 36
5.3.2.1.2 NLOS Adaptation optional header extension 37
5.3.2.2 Carriage of Parity Data 38
5.3.2.3 Real-Time Parameters 40
5.4 DVB-S2(X) Physical Layer 40
5.4.0 Introduction 40
5.4.1 DVB-S2 CCM operation 41
5.4.2 DVB-S2 and DVB-S2X ACM operation 41
5.4.2.1 ACM TDM carrying TS packets (optional) 41
5.4.2.2 Single stream ACM TDM carrying GSE PDU 41
5.4.2.3 Multi-stream ACM TDM carrying GSE PDU (optional) 41
5.4.2.4 Transmission mode usage 41
5.4.2.5 PL frame usage 42
5.4.2.6 SYNC Byte Usage 42
5.4.3 FL Modulation and Coding 42
5.4.4 Symbol Scrambling 42
5.4.4.0 Introduction 42
5.4.4.1 Broadcast Type Symbol Scrambling 42
5.4.4.2 Custom Type Symbol Scrambling (optional) 42
5.4.4.3 Two-way Symbol Scrambling 43
5.4.5 Direct Sequence Spread Spectrum (optional) 43

6 Forward Link L2S 43
6.0 Introduction 43
6.1 Protocol Stack 43
6.2 Forward Link L2S Components 44
6.2.0 Introduction 44
6.2.1 Network Clock Reference Indication 44
6.2.1.0 Introduction 44
6.2.1.1 NCR in Continuous GS 44
6.2.1.2 NCR in TS Packet Stream (optional) 45
6.2.2 Broadcast Tables 46
6.2.2.0 Introduction 46
6.2.2.1 Network Information Table (NIT) 46
6.2.2.2 RCS Map Table (RMT) 46
6.2.2.3 Superframe Composition Table (SCT) 46
6.2.2.4 Frame Composition Table version 2 (FCT2) 46
6.2.2.5 Broadcast Configuration Table (BCT) 47
6.2.2.6 Satellite Position Table (SPT) and Satellite Access Tables (SAT) 47
6.2.2.7 Correction Message Table (CMT) 47
6.2.2.8 Terminal Burst Time Plan Table version 2 (TBTP2) 47
6.2.2.9 Multicast Mapping Table version 2 (MMT2) 47
6.2.2.10 Transmission Mode Support Table version 2 (TMST2) 47
6.2.2.11 Fast Access Table (FAT) 47
6.2.2.12 Supplementary Tables (optional) 48
6.2.3 Terminal Information Message (TIM) 48
6.3 Refresh and Update Intervals 48
6.4 Syntax and Coding of FL Signals for L2S 48
6.4.0 Introduction 48
6.4.1 Table and Message Identification and Placement 48
6.4.2 The NCR Packet 51
6.4.3 Transport of Configuration Tables and Messages 51
6.4.3.1 Transport in Continuous Generic Stream 51
6.4.3.1.0 Introduction 51
6.4.3.1.1 Un-addressed Lower Layer Signalling Transport in GSE Packets 51
6.4.3.1.2 Addressed Lower Layer Signalling Transport in GSE Packets 52
6.4.3.2 Transport in TS Packets (optional) 52
6.4.3.2.0 Introduction 52

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Document Preview
ETSI EN 301 545-2 V1.4.0 (2023-10)
https://standards.iteh.ai/catalog/standards/sist/b4df30d5-3856-407a-b4b6-c4fee85f869a/etsi-en-301-545-2-v1.4.0-2023-10

6.4.3.2.1 Un-addressed Transport in TS Packets (optional) 52
6.4.3.2.2 Addressed Lower Layer Signal Transport in TS Packet Stream (optional) 53
6.4.4 The SCT Content 56
6.4.5 The FCT2 Content 57
6.4.6 The BCT Content 59
6.4.6.0 Introduction 59
6.4.6.1 Format Data Block for LM Burst 60
6.4.6.2 Format Data Block for CPM Burst 62
6.4.6.3 Format Data Block for Continuous Transmission 64
6.4.6.4 Format Data Block for Spread-Spectrum LM Burst 66
6.4.7 The SPT and SAT Content 69
6.4.7.0 Introduction 69
6.4.7.1 The SPT Content 69
6.4.7.2 The SAT Content 70
6.4.8 The CMT Content 70
6.4.9 The TBTP2 Content 71
6.4.10 The NIT Content 73
6.4.11 The RMT Content 74
6.4.12 The MMT2 Content 75
6.4.13 The TMST2 Content 76
6.4.14 The TIM Content 78
6.4.15 The Fast Access Table Content (optional) 79
6.4.16 Supplementary SI Tables Content (optional) 80
6.4.17 The Descriptors 80
6.4.17.0 Introduction 80
6.4.17.1 Correction Message Descriptor 80
6.4.17.2 Control Assign Descriptor 81
6.4.17.3 Echo Value Descriptor 82
6.4.17.4 Linkage Descriptor 82
6.4.17.5 Satellite Return Link Descriptors 84
6.4.17.5.0 Introduction 84
6.4.17.5.1 Satellite Return Link Descriptor 84
6.4.17.5.2 Satellite Return Link v2_Descriptor 85
6.4.17.6 Satellite Forward Link Descriptors 86
6.4.17.6.0 Introduction 86
6.4.17.6.1 Satellite Forward Link Descriptor 87
6.4.17.6.2 Satellite Forward Link_v2 Descriptor 90
6.4.17.7 Logon Contention Descriptor 90
6.4.17.8 Correction Control Descriptor 91
6.4.17.9 Mobility Control Descriptor 92
6.4.17.10 Correction Message Extension Descriptor 92
6.4.17.11 Void 93
6.4.17.12 Implementation Type Descriptor (optional) 93
6.4.17.13 LL FEC Identifier Descriptor (optional) 95
6.4.17.14 Frame Payload Format Descriptor 97
6.4.17.15 Pointing Alignment Support Descriptor 98
6.4.17.16 Forward Link Streams Descriptor (optional) 101
6.4.17.17 Lower Layer Service Descriptor 101
6.4.17.18 Logon Response Descriptor 104
6.4.17.19 DHCP Option Descriptor 105
6.4.17.20 TRANSEC Message Descriptor 106
6.4.17.21 Transmission Offset Descriptors 107
6.4.17.21.0 Introduction 107
6.4.17.21.1 Transmission Offset Descriptor 107
6.4.17.21.2 Transmission Offset V2 Descriptor 108
6.4.17.22 RCS Content Descriptor (optional) 109
6.4.17.23 Logon Security Descriptor (optional) 109
6.4.17.24 Random Access Load Control Descriptor 110
6.4.17.25 CLI Instruction Descriptor (optional) 111
6.4.17.26 Random Access Traffic Method Descriptor (optional) 112
6.4.17.27 Network Layer Info descriptor 113
6.4.17.28 Higher Layers Initialization descriptor 113

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ETSI EN 301 545-2 V1.4.0 (2023-10)
https://standards.iteh.ai/catalog/standards/sist/b4bb-c4fee85f869a/etsi-en-301-545-2-v1.4.0-2023-10

6.4.17.29 Lowest Software Version descriptor 114
6.4.17.30 Mesh System descriptor (optional) 115
6.4.17.31 Extension Protocol descriptor (optional) 115
6.4.17.32 Continuous Carrier Control Descriptor (optional) 116
6.5 Transmission of Forward Link L2S Data Structures 118

7 Return Link and Mesh Uplink 118
7.0 Introduction 118
7.1 Return Link Logical Link Control 120
7.1.0 Introduction 120
7.1.1 SDU Transport in the Return Link 120
7.1.2 Maximum Transfer Unit for an SDU in the Return Link 120
7.2 Return Link Medium Access Control 120
7.2.0 Introduction 120
7.2.1 The Addressed Link PDU (ALPDU) 121
7.2.1.0 Introduction 121
7.2.1.1 Addressed Link PDU Format and Syntax 121
7.2.1.1.0 Introduction 121
7.2.1.1.1 compressed_protocol_type Field 122
7.2.1.1.2 `protocol_type` Field 123
7.2.1.1.3 `alpdu_label_byte` Field (optional) 123
7.2.1.1.4 `sdu_byte` Field 123
7.2.1.1.5 `fragmenting_aldpdu` 124
7.2.1.1.6 `sequence_number` Field 124
7.2.1.1.7 `alpdu_crc` Field (optional) 124
7.2.1.2 The ALPDU Label 124
7.2.1.3 Identifying the Transmission Resources for the ALPDU 124
7.2.1.4 Mapping the ALPDU to Available Payload 125
7.2.1.4.0 Introduction 125
7.2.1.4.1 Forwarding the ALPDU in One Payload-adapted PDU 125
7.2.1.4.2 Forwarding the ALPDU Using Several Payload-adapted PDUs 125
7.2.1.4.3 Integrity Protection of a Fragmented ALPDU 125
7.2.1.4.4 Multiplexing Payload-adapted PDUs used for Different ALPDUs 125
7.2.2 The Payload-adapted PDU (PPDU) 125
7.2.2.0 Introduction 125
7.2.2.1 start_indicator and end_indicator Fields 127
7.2.2.2 `ppdu_length` Field 127
7.2.2.3 `fragment_id` Field 128
7.2.2.4 alpdu_label_type Field 128
7.2.2.5 protocol_type_suppressed Field 128
7.2.2.6 `ppdu_label_byte` Field (optional) 128
7.2.2.7 `use_alpdu_crc` Field 128
7.2.2.8 `total_length` Field 129
7.2.2.9 `alpdu_byte` Field 129
7.2.2.10 The PPDU Label (optional) 129
7.2.3 The Frame PDU 129
7.2.3.1 Context Differentiation of the Frame PDU 129
7.2.3.2 The Frame PDU Format and Syntax 130
7.2.3.3 The Payload Label 131
7.2.4 Lower Layer Addressing by the RCST 132
7.2.4.0 Introduction 132
7.2.4.1 Addresses used for Lower Layer Signalling towards NCC 132
7.2.4.2 Lower Layer Addressing of SDUs 132
7.2.4.2.0 Introduction 132
7.2.4.2.1 Transparent Star 132
7.2.4.2.2 Transparent Mesh 133
7.2.4.2.3 Regenerative Mesh 134
7.2.4.3 Virtual Network Addressing 134
7.2.5 Random Access 134
7.2.5.0 Introduction 134
7.2.5.1 Channels for Random Access 134

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ETSI EN 301 545-2 V1.4.0 (2023-10)
https://standards.iteh.ai/catalog/standards/sist/...-en-301-545-2-v1.4.0-2023-10

7.2.5.1.1 Timeslots for Random Access Logon 134
7.2.5.1.2 Timeslots for Random Access Control (optional) 134
7.2.5.1.3 Timeslots for Random Access User Traffic (optional) 134
7.2.5.2 Random Access Methods 135
7.2.5.2.0 Introduction 135
7.2.5.2.1 Slotted Aloha 135
7.2.5.2.2 CRDSA (optional) 135
7.2.5.3 Resources for contention 139
7.2.6 Dedicated access 139
7.2.6.0 Introduction 139
7.2.6.1 Channels for Dedicated access 139
7.2.6.1.1 Timeslots Dedicated to an RCST and for Logon Burst 139
7.2.6.1.2 Timeslots Dedicated to an RCST and for Control Burst 139
7.2.6.1.3 Timeslots Dedicated to an RCST and for Traffic/Control Content 139
7.2.6.1.4 Timeslots Dedicated to an RCST and for Traffic Content 140
7.2.6.1.5 Carrier Dedicated to an RCST and for Traffic/Control Content 140
7.2.6.2 Unsolicited Resources for Dedicated access 140
7.2.6.3 Solicitation for Resources for Dedicated access 140
7.2.6.3.0 Introduction 140
7.2.6.3.1 Volume Based Dynamic Capacity 141
7.2.6.3.2 Rate Based Dynamic Capacity (RBDC) 141
7.2.6.3.3 Requests per request class 142
7.2.6.3.4 Limitation of the Requested Level of Resources 142
7.2.6.3.5 Carrier for Continuous Transmission (Option) 142
7.2.7 Burst Time Plan Distribution 142
7.2.8 Assignment of a Carrier for Continuous Transmission (Option) 143
7.3 Transmission Bursts 143
7.3.1 Transmission Burst Content Type 143
7.3.2 Burst Waveform 143
7.3.3 Energy Dispersal 144
7.3.4 Payload CRC 144
7.3.5 Coding and Interleaving 145
7.3.5.0 Introduction 145
7.3.5.1 The Turbo FEC Encoder for Linear Modulation 145
7.3.5.1.0 Introduction 145
7.3.5.1.1 Turbo Code Permutation 146
7.3.5.1.2 Circulation of Initial State 147
7.3.5.1.3 Rates and Puncturing Map 147
7.3.5.2 Convolutional Encoder for CPM 148
7.3.5.2.0 Introduction 148
7.3.5.2.1 The FEC Encoder for CPM 149
7.3.5.2.2 Trellis Termination 150
7.3.5.2.3 The Bit-interleaver for CPM 150
7.3.6 Inclusion of Known Symbols 152
7.3.6.0 Introduction 152
7.3.6.1 Burst Construction for TC-LM and SS-TC-LM 152
7.3.6.2 Burst Construction for CC-CPM 153
7.3.7 Modulation 153
7.3.7.0 Introduction 153
7.3.7.1 Linear Modulation of Burst 153
7.3.7.1.0 Introduction 153
7.3.7.1.1 Baseband Shape and Group Delay 153
7.3.7.1.2 Preamble and Post-amble Symbols 154
7.3.7.1.3 Pilot Block Symbols 154
7.3.7.1.4 Payload Symbols 154
7.3.7.1.5 Direct-Sequence Spreading 158
7.3.7.2 Continuous Phase Modulation of Burst 158
7.3.7.2.0 Introduction 158
7.3.7.2.1 Continuous Phase Modulation Signal and Pulse Shaping 158
7.3.7.2.2 Continuous Phase Modulation Bit to Symbol Mapping 159
7.3.7.2.3 Phase Trellis Termination 160
7.3.8 Burst Transmission Power Envelope 161

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Document Preview
ETSI EN 301 545-2 V1.4.0 (2023-10)
https://standards.iteh.ai/catalog/standards/sist/4df50d5-3856-40/a-b4b6-c4fee851869a/etsi-en-301-545-2-v1.4.0-2023-10

7.3.9 Transmission Burst Timing 162
7.3.9.0 Introduction 162
7.3.9.1 Burst Transmission Start Accuracy 163
7.3.9.2 Symbol Clock Accuracy 163
7.3.9.3 Carrier Frequency Accuracy 163
7.4 Void 163
7.5 The Return Link Structure (MF-TDMA) 164
7.5.0 Introduction 164
7.5.1 Segmentation of the Return Link Resources 164
7.5.1.0 Introduction 164
7.5.1.1 Superframe 164
7.5.1.2 Superframe Sequence 165
7.5.1.3 Frame 165
7.5.1.4 Timeslot 167
7.5.2 Guard time 167
7.5.3 The Dynamic MF-TDMA Transmission Channel 167
7.5.4 The Frequency Range of the Dynamic Transmission Channel 169
7.6 Return Link Continuous Carrier (Option) 169

8 Return Link L2S 171
8.0 Introduction 171
8.1 Transport of the Logon PDU 171
8.2 Transport of the Control PDU 172
8.2.1 Transport of Control PDU in Control Burst 172
8.2.2 Transport of Control PDU multiplexed with higher layer PDUs 172
8.3 Syntax and Coding of RL Signals for L2S 172
8.3.0 Introduction 172
8.3.1 Logon PDU content 172
8.3.2 Control PDU Content 176
8.3.3 CSC Burst Issued by RCST 186
8.3.4 Transmission of Return Link L2S Data Structures 187

9 M&C Functions Supported by L2S 187
9.0 Introduction 187
9.1 Connecting the Forward Link 188
9.1.0 Introduction 188
9.1.1 Acquisition of the Forward Link Signalling 188
9.1.2 Acquisition of Multiple Forward Link Streams (optional) 189
9.1.3 Acquisition of Multiple Forward Link TDMs (optional) 189
9.2 Connecting the Return Link 190
9.2.0 Introduction 190
9.2.1 Return Link States and State Transitions 190
9.2.2 Initialize for Logon Procedure 193
9.2.3 Lower Layer Logon Procedure 194
9.2.3.0 Introduction 194
9.2.3.1 Basic Logon Procedure 194
9.2.3.2 Logon via Dynamically Allocated Logon Timeslots 196
9.2.3.3 Logon with Support for Large Timing Uncertainty 196
9.2.4 Acquiring the Superframe Sequence for Operation 197
9.2.5 TDMA Synchronization Procedure 197
9.2.6 Synchronization Monitoring Process 198
9.2.7 Logoff Procedures 199
9.2.8 Control of Continuous Carrier Transmission 199
9.3 Protocol Type Support 201
9.4 Interactive Network Entry 201
9.4.0 Introduction 201
9.4.1 Entry Type Indication 202
9.4.2 Alignment Status 202
9.4.3 Subscription Status 202
9.4.4 Higher Layers Initialization Status 202
9.4.5 Commissioning Status 203
9.4.6 Lower Layer Capabilities 203

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(https://standards.iteh.ai)
Document Preview
ETSI EN 301 545-2 V1.4.0 (2023-10)
https://standards.iteh.ai/catalog/standards/sist/...-301-545-2-v1.4.0-2023-10

9.4.7 Higher Layer Capabilities 203
9.4.8 Providing the unicast MAC Addresses for the Higher Layers 203
9.4.9 Lower Layer Service Assignment 203
9.4.10 Initialization of the Higher Layers 204
9.4.11 Initialization for Mesh Communication 204
9.5 Return Link Timeslot Grid Control 205
9.6 Timeslot Access Method Control 205
9.7 Random Access Load Control 205
9.7.1 Contention Control for Logon Timeslots 205
9.7.1.1 Stationary RA Load Control for Logon 205
9.7.1.2 Dynamic RA Load Control for Logon 206
9.7.2 Contention Control for Control Timeslots (optional) 206
9.7.2.0 Introduction 206
9.7.2.1 Stationary RA Load Control for Control Signals 206
9.7.3 Contention Control for Traffic Timeslots 206
9.7.3.0 Introduction 206
9.7.3.1 Stationary RA Load Control for Traffic 206
9.7.3.2 Dynamic RA Load Control for Traffic 207
9.8 Forward Link Feeder MODCOD Control 208
9.9 Control of RCST Transmission Characteristics 208
9.9.1 EIRP Control 208
9.9.2 Transmission Duration Control 209
9.9.3 Symbol Rate Control 209
9.9.4 Return Link MODCOD Control 209
9.9.5 Waveform Configuration Control 210
9.9.5.0 Introduction 210
9.9.5.1 Configuring the Waveform for TC-LM 210
9.9.5.2 Configuring the Waveform for CC-CPM 211
9.9.5.3 Configuring the waveform for CRDSA TC-LM (optional) 211
9.9.5.4 Configuring the waveform for SS-TC-LM (optional) 211
9.9.5.5 Configuring the waveform for the Continuous Carrier (optional) 212
9.9.6 Contention Diversity Transmission Control (optional) 213
9.10 Frame Payload Format Control 213
9.10.0 Introduction 213
9.10.1 Payload Content Type Control 214
9.10.2 Frame Payload Format Differentiation 214
9.10.3 Frame Payload Format Control 215
9.10.4 ALPDU Label Format Control 215
9.10.5 SDU Protocol Type Field Control 215
9.10.6 Essential Traffic Payload Structures 215
9.10.6.0 Introduction 215
9.10.6.1 Transparent Star 216
9.10.6.2 Transparent Mesh 216
9.10.6.3 Regenerative Mesh 216
9.10.6.4 Transparent Star Continuous Transmission 216
9.11 Return Link Status Supervision 217
9.12 Remote Control of the RCST 217
9.12.0 Introduction 217
9.12.1 Log Off 217
9.12.2 Hold Transmission 217
9.12.3 Wakeup 217
9.12.4 Remote Echo 217
9.12.5 SNMP Set to Remote (optional) 217
9.12.6 CLI Instruction to Remote (optional) 218
9.12.7 Network Failure and Recovery 218
9.12.8 Rain Fade Indications 218
9.13 Control of the MTU 218
9.14 Pointing Alignment Support 218
9.15 M&C of the CC operation (Option) 219

10 Mobile Terminal Operation (optional) 220
10.0 Introduction 220

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ETSI EN 301 545-2 V1.4.0 (2023-10)
https://standards.iteh.ai/catalog/standards/sist/b4df30d5-3856-407a-b4b6-c4fee851869a/etsi-en-301-545-2-v1-4-0-2023-10

10.1 Mobility Management 220
10.1.0 Introduction 220
10.1.1 Beam Handover 220
10.1.2 Satellite/Gateway Handover 222
10.2 Interference Avoidance 222
10.2.0 Introduction 222
10.2.1 Off-Axis EIRP Emission Density 223
10.2.2 Power Flux Density at the Surface of the Earth 223
10.2.3 Fault Conditions 223
11 Security 223
Annex A (normative): Reference waveforms 224
Annex B (normative): Interleaver Permutations for CC-CPM 233
Annex C (normative): CPM Phase response samples 253
Annex D (informative): Bibliography 255
History 256

iTeh Standards
(https://standards.iteh.ai)
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Foreword

This draft European Standard (EN) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

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NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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The DVB Project is an industry-led consortium of broadcasters, manufacturers, network operators, software developers, regulators and others from around the world committed to designing open, interoperable technical specifications for the global delivery of digital media and broadcast services. DVB specifications cover all aspects of digital television from transmission through interfacing, conditional access and interactivity for digital video, audio and data. The consortium came together in 1993.

The present document is part 2 of a multi-part deliverable covering the DVB Interactive Satellite System specification as identified below:

ETSI TS 101 545-1: "Overview and System Level specification";

ETSI EN 301 545-2: "Lower Layers for Satellite standard";

ETSI TS 101 545-3: "Higher Layers Satellite Specification";

ETSI TR 101 545-4: "Guidelines for Implementation and Use of ETSI EN 301 545-2";

ETSI TR 101 545-5: "Guidelines for the Implementation and Use of ETSI TS 101 545-3".

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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Introduction

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The present document is a specification of the lower layers and the lower layer embedded signalling for the management and control system, for two way interactive satellite networks specified by ETSI TS 101 545-3 [i.16]. It represents a new generation of ETSI EN 301 790 [1]. The following amendments have been made relative to ETSI EN 301 790 [1]:

- The modulation schemes are CPM, 8PSK and 16QAM, in addition to QPSK.
- The FEC for QPSK, 8PSK and 16QAM is a 16-state turbo code, commonly called Turbo-phi.
- The FEC for CPM is Convolutional Coding.
- The waveform characteristics are configurable to allow adaptation to different applications.
- A set of normative reference waveforms are specified, to support interoperability.
- The MF-TDMA burst constructions for the reference waveforms are differentiated with respect to the operating point, by balanced use of preamble, postamble and pilots so that the decoder synchronization sensitivity threshold corresponds with the payload decoding sensitivity threshold.
- The forward link packet encapsulation uses GSE as specified in ETSI TS 102 606 [8] with strengthened integrity control to comply with the recommendations for internet subnet-working as found in IETF RFC 3819 [9]. Alternative encapsulation over a TS Packet stream is supported for migration.

- The return link packet encapsulation is an adaptation of the generic stream encapsulation (ETSI TS 102 606 [8]), where the IP packets are fragmented just in time so that the fragments fit exactly into the remaining free space of varying size available in the transmission frame payloads of different size, without using an intermediate fixed frame size streaming layer like ATM and MPEG TS. This new encapsulation protocol for the return link was named RLE (Return Link Encapsulation).

- The link transport specification is generalized to suit a multitude of protocols, not only IP. This applies to the forward link as well as the return link and to the design of the RLE protocol. The support of transport of other protocols than IP is however considered implementation dependent.

- Support for random access user traffic is included.

- The framing structure of the return link is simplified.

- The payload size can be adapted by selecting a suitably sized burst. Bursts are a low number of multiples of a unit timeslot, and bursts of different size can be fitted to the unit grid by concatenating unit timeslots to larger timeslots that can hold larger bursts. This concatenation may be done just in time.

- The modulation and coding to be used in a timeslot can be selected independently, allowing per timeslot ACM for more granular and more flexible link adaptation. The adaptation for a timeslot may be done just in time.

- Power headroom reporting is included. The power control system supports an optional control mode aiming for constant power spectrum density over carriers of different BW as an alternative to control the EIRP.

Version 1.4.1 of the present document provides support for signalling about non-geosynchronous satellites (non-GSO) and about forward links using Annex E (superframes) of DVB-S2X ETSI EN 302 307-2 [16], used by multibeam satellites, for interference suppression, pre-coding and beam-hopping. Additional signalling relevant for beam-hopping systems has also been added.

The present document allows substantial configuration flexibility in that the burst constructions and FEC can be adapted to some extent to the operating environment of the RCST. In order to guide in implementation and interoperability a set of reference burst configurations are specified, and the essential configuration space for such configuration is also indicated.

Clause 2 provides the references. Clause 3 provides the definitions of terms, explains symbols and expands abbreviations. Clause 4 provides further guiding in the reading of the present document through the introduction of reference models. Clause 5 specifies the forward link. Clause 6 specifies the syntax and coding of the lower layer signalling system components used in the forward link. Clause 7 specifies the return link. Clause 8 specifies the syntax and coding of the lower layer signalling system components used in the return link. Clause 9 specifies the management and control functions supported via the network internal L2S system. Clause 10 is reserved for future specification of the operation of mobile terminals. Clause 11 addresses security. Annex A provides the normative reference burst constructions. Annex B provides the CC-CPM interleaver permutations in tabular form. Annex C provides the CPM pulse shape specification in tabular form. Annex D provides the bibliography list.

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1 Scope

The present document is a specification of the lower layers and the lower layer signalling system for the two-way satellite network variants defined by ETSI TS 101 545-3 [i.16]. The present document constitutes a complete specification of the lower layers for a transparent star satellite network, a transparent mesh overlay satellite network and a regenerative re-multiplexing satellite network. Also, components required for a satellite network with a TRANSEC system are included.

The present document is normative for the consumer terminal profile in a transparent star satellite network as defined by ETSI TS 101 545-3 [i.16], and does also include normative components specific to the other terminal profiles and satellite network variants defined by ETSI TS 101 545-3 [i.16].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI EN 301 790: "Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems".

[2] ETSI EN 302 307-1: "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 1: DVB-S2".

[3] ETSI EN 300 468 (V1.18.0): "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[4] ETSI EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".

[5] ETSI EN 301 459: "Satellite Earth Stations and Systems (SES); Harmonized EN for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit in the 29,5 to 30,0 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE Directive".

[6] ISO/IEC 13818-1:2022: "Information technology -- Generic coding of moving pictures and associated audio information -- Part 1: Systems".

[7] IEEE 802.3™: "IEEE Standard for Ethernet".

[8] ETSI TS 102 606: "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE) Protocol".

[9] IETF RFC 3819: "Advice for Internet Subnetwork Designers".

[10] ETSI TS 101 162: "Digital Video Broadcasting (DVB); Allocation of identifiers and codes for Digital Video Broadcasting (DVB) systems".

[11] IETF RFC 1112: "Host Extensions for IP Multicasting".

[12] IETF RFC 791 (1981): "Internet Protocol".

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