ETSI EN 301 545-2 V1.5.1 (2026-04)

EUROPEAN STANDARD

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

Reference
REN/JTC-DVB-417-2

Keywords
DVB, interaction, satellite

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 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Contents

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI IPR online database.

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

Foreword

This 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).

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.

European Broadcasting Union
CH-1218 GRAND SACONNEX (Geneva)
Switzerland
Tel: +41 22 717 21 11
Fax: +41 22 717 24 81

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 EN 301 545-2";

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

National transposition dates	
Date of adoption of this EN:	21 April 2026
Date of latest announcement of this EN (doa):	31 July 2026
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2027
Date of withdrawal of any conflicting National Standard (dow):	31 January 2027

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.

Introduction

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 Return Link Encapsulation (RLE).
- 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-geostationary orbit satellites (NGSO, also referred to as non-geosynchronous satellites) 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.

Version 1.5.1 of the present document adds support for NGSO constellations. The operational bandwidth of the return link was extended and lower roll-off waveforms were introduced. Major amendments included the addition of DVB-S2X waveforms on the return link, either within the TDMA grid or over a continuous carrier, replacing the former continuous carrier waveform, which was deprecated.

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.

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 in the ETSI docbox.

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

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: "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); Harmonised 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 Directive 2014/53/EU ".

[6] ISO/IEC 13818-1:2025 "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); Part 1: 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: "Internet Protocol".

[13] IETF RFC 2464: "Transmission of IPv6 Packets over Ethernet Networks".

[14] ANSI/IEEE 754™-2019: "IEEE Standard for Binary Floating-Point Arithmetic".

[15] ETSI TS 102 472: "Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Content Delivery Protocols".

[16] ETSI EN 302 307-2: "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 2: DVB-S2 Extensions (DVB-S2X)".

2.2 Informative 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.

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

The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

[i.1] ETSI TR 101 790 (V1.4.1): "Digital Video Broadcasting (DVB); Interaction channel for Satellite Distribution Systems; Guidelines for the use of EN 301 790".

[i.2] ETSI TR 101 202: "Digital Video Broadcasting (DVB); Implementation guidelines for Data Broadcasting".

[i.3] ETSI TS 102 602: "Satellite Earth Stations and Systems (SES); Broadband Satellite Multimedia; Connection Control Protocol (C2P) for DVB-RCS; Specifications".

[i.4] ETSI ETS 300 802: "Digital Video Broadcasting (DVB); Network-independent protocols for DVB interactive services".

[i.5] IETF RFC 5163 (2008): "Extension Formats for Unidirectional Lightweight Encapsulation (ULE) and the Generic Stream Encapsulation (GSE)".

[i.6] IEEE 802.1Q™ (2005): "IEEE Standard for Local and Metropolitan Area Networks - Virtual Bridged Local Area Networks Revision".

[i.7] IEEE 802.1X™ (2010): "IEEE Standard for Local and metropolitan area networks - Port-Based Network Access Control".

[i.8] IETF RFC 4326 (2005): "Unidirectional Lightweight Encapsulation (ULE) for Transmission of IP Datagrams over an MPEG-2 Transport Stream (TS)".

[i.9] IETF RFC 3095 (2005): "RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed".

[i.10] IETF RFC 826 (1982): "Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware".

[i.11] IETF RFC 3643 (2003): "Fibre Channel (FC) Frame Encapsulation".

[i.12] IETF RFC 2516 (1999): "A Method for Transmitting PPP Over Ethernet (PPPoE)".

[i.13] IETF RFC 3032 (2001): "MPLS Label Stack Encoding".

[i.14] IEEE 802.1ad™-2005: "IEEE Standard for Local and Metropolitan Area Networks - Virtual Bridged Local Area Networks - Revision - Amendment 4: Provider Bridges".

[i.15] ETSI TS 101 545-1: "Digital Video Broadcasting (DVB); Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 1: Overview and System Level specification".