

ETSI EN 302 307-2 V1.4.1 (2024-08)



**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)**

ETSI EN 302 307-2 V1.4.1 (2024-08)

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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 Digital Video Broadcasting Project (DVB) is an industry-led consortium of broadcasters, manufacturers, network operators, software developers, regulatory bodies, content owners and others committed to designing global standards for the delivery of digital television and data services. DVB fosters market driven solutions that meet the needs and economic circumstances of broadcast industry stakeholders and consumers. DVB standards 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 to provide global standardisation, interoperability and future proof specifications.

The present document is part 2 of a multi-part deliverable covering the optional extensions of the DVB-S2 system, denoted "DVB-S2X", as identified below:

Part 1: "DVB-S2";

Part 2: "DVB-S2 Extensions (DVB-S2X)".

National transposition dates	
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 2025
Date of withdrawal of any conflicting National Standard (dow):	31 May 2025

Modal verbs terminology

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Introduction

The optional extensions of the S2 system have been approved in 2014 and are identified by the S2X denomination. Such extensions are non-backwards-compatible with ETSI EN 302 307 [4], are optional for the implementation of new receivers under ETSI EN 302 307-1 [3], but are normative for the implementation of receivers under the present document: mapping of specific S2X building blocks to application areas is specified in Table 1. For every S2X application area, as defined in Table 1, the configurations for the corresponding S2 application area, as defined in ETSI EN 302 307-1 [3], Table 1, will be implemented. In case of conflicts the definition of the S2X application area applies.

The present document targets the core application areas of S2 (Digital Video Broadcasting, forward link for interactive services using ACM, Digital Satellite News Gathering and professional digital links such as video point-to-point or Internet trunking links), and new application areas requiring very-low carrier-to-noise and carrier-to-interference operation (VL-SNR).

In particular for DTH, a possible use case is the launch of UHDTV-1 (e.g. 4k) television services in Ku-/Ka-band that will adopt HEVC encoding. In this context it may be desirable to eventually use fragments of smaller blocks of capacity on two or three DTH transponders and bond them into one logical stream. This permits to maximize capacity exploitation by avoiding the presence of spare capacity in individual transponders and/or to take maximum advantage of statistical multiplexing.

The S2X system offers the ability to operate with very-low carrier-to-noise and carrier-to-interference ratios (SNR down to -10 dB), to serve markets such as airborne (business jets), maritime, civil aviation internet access, VSAT terminals at higher frequency ranges or in tropical zones, small portable terminals for journalists and other professionals. Furthermore, the S2X system provides transmission modes offering significantly higher capacity and efficiency to serve professional links characterized by very-high carrier-to-noise and carrier-to-interference ratios conditions.

The present document reuses the S2 system architecture, while adding finer MODCOD steps, sharper roll-off filtering, technical means for bonding of multiple transponders and additional signalling capacity by means of an optional periodic super-frame structure, extended PLHEADER signalling schemes and the support of GSE-Lite signals.

The present document maintains the same clause numbering as ETSI EN 302 307-1 [3], in order to facilitate cross-reference.

1 Scope

The present document specifies the optional extensions of the S2 system, identified by the S2X denomination. The present document also includes amendments to the standard to enable beam hopping operation.

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.

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

- [1] [ETSI TS 101 545-1 \(V1.1.1\)](#): "Digital Video Broadcasting (DVB); Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 1: Overview and System Level specification".
- [2] [ETSI TS 102 606-1 \(V1.2.1\)](#): "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 1: Protocol".
- [3] [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".
- [4] [ETSI EN 302 307 \(V1.1.1\)](#): "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications".
- [5] [ETSI EN 300 468](#): "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".
- [6] [ETSI TS 102 606-2](#): "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 2: Logical Link Control (LLC)".
- [7] [ETSI ETS 300 801](#): "Digital Video Broadcasting (DVB); Interaction channel through Public Switched Telecommunications Network (PSTN)/Integrated Services Digital Networks (ISDN)".
- [8] [ETSI EN 301 195](#): "Digital Video Broadcasting (DVB); Interaction channel through the Global System for Mobile communications (GSM)".
- [9] [ETSI ES 200 800](#): "Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution systems (CATV)".
- [10] [ETSI ETS 300 802](#): "Digital Video Broadcasting (DVB); Network-independent protocols for DVB interactive services".
- [11] [ETSI EN 301 790](#): "Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems".

2.2 Informative references

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3 Definition of terms, symbols and abbreviations

3.1 Terms

Void.

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 302 307-1 [3] and the following apply:

d_{SF}	SF-pilot distances
P_{SF}	SF-pilot field length
H_{ST}	SFH-Trailer (ST) Matrix
H_{SOSF}	Start Of SuperFrame Matrix
R_S	Symbol rate corresponding to the bilateral Nyquist bandwidth of the modulated signal

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 302 307-1 [3] and the following apply:

128APSK	128-ary Amplitude and Phase Shift Keying
256APSK	256-ary Amplitude and Phase Shift Keying
64APSK	64-ary Amplitude and Phase Shift Keying
BBF	Base Band Frame
BH	Beam Hopping
BHTC	Beam Hopping Transmission Channel
BHTP	Beam Hopping Time Plan
BPSK	Binary Phase Shift Keying
CNTR	Counter
CU	Capacity Unit
DT	Dwell Time
EHF	Extended Header Field
EXOR	Exclusive-OR (logical operator/function)
FER	Frame Error Rate
GSE	Generic Stream Encapsulation
GSE-HEM	Generic Stream Encapsulation - High Efficiency Mode
GSE-LLC	Generic Stream Encapsulation - Logical Link Control
HEVC	High Efficiency Video Coding
PLH	Physical Layer Header
PLI	Protection Level Indication
RFU	Reserved for Future Use
SF	Super-Frame

SFFI	Super-Frame Format Indicator
SFH	Super-Frame Header
SFL	Super Frame Length
SOSF	Start Of Super-Frame
ST	Super-Frame Header Trailer
UHDTV	Ultra High Definition TeleVision
VL-SNR	Very Low - Signal to Noise Ratio
VSAT	Very Small Aperture Terminal
WH	Walsh-Hadamard

4 Transmission system description

4.0 General aspects

See ETSI EN 302 307-1 [3], clause 4.

4.1 System definition

See ETSI EN 302 307-1 [3], clause 4.1.

4.2 System architecture

See ETSI EN 302 307-1 [3], clause 4.2.

The present document reuses the S2 system architecture as described in ETSI EN 302 307-1 [3], Figure 1, while adding finer MODCOD steps, sharper roll-off filtering, technical means allowing time-slicing of wide-band signals (for a reduced processing speed in the receiver), technical means for bonding of multiple transponders, among other technologies.

Additional signalling capacity is provided:

- an optional periodic super-frame structure with signalling of the format of the super-frame content and further benefits like simplifying synch recovery at VL-SNR and allowing periodic pilot structures and PL-Scramblers;
- an extended PLHEADER signalling scheme to support the additional MODCODs;
- an extended PLHEADER signalling scheme to support Mobile Frames (VL-SNR);
- a high-efficiency BBFRAME mode (GSE-HEM), similar to the T2 and C2 systems, to transport GSE/GSE-Lite packets;
- signalling of streams which are GSE-Lite compliant.

Annex E includes optional additional formats to enable operation of beam -hopping. The specified waveforms provide additional signalling and framing options that support both periodic, pre-scheduled beam hopping operation, as well as random, traffic driven illumination policy, at signal to noise ratios ranging from -10 dB and above.

4.3 System configurations

See ETSI EN 302 307-1 [3], clause 4.3.

Table 1 associates the S2X system elements to the applications areas. All elements in Table 1 are optional in transmitting and receiving equipment complying with the S2 specification. At least "Normative" subsystems and functionalities shall be implemented in the transmitting and receiving equipment to comply with the present document for a specific application area.

Table 1: S2X System configurations and application areas

System configurations		Broadcast services	Interactive services	DSNG	Professional services	VL-SNR
FECFRAME (normal) (see MODCODs below)	64 800 (bits)					
QPSK	1/4, 1/3, 2/5 (S2-MODCODs)	N	N	N	N	N
	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (S2-MODCODs)	N	N	N	N	N
	13/45	N	N	N	N	N
	9/20; 11/20	N	N	N	N	N
8PSK	3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (S2-MODCODs)	N	N	N	N	N
	23/36; 25/36; 13/18	N	N	N	N	N
8APSK-L (note 7)	5/9; 26/45	N	N	N	N	N
16APSK	2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (S2-MODCODs)	N	N	N	N	N
	26/45; 3/5; 28/45; 23/36; 25/36; 13/18; 7/9; 77/90	N	N	N	N	N
16APSK-L (note 7)	5/9; 8/15; 1/2; 3/5; 2/3	N	N	N	N	N
32APSK	3/4, 4/5, 5/6, 8/9, 9/10 (S2-MODCODs)	N	N	N	N	N
	32/45; 11/15; 7/9	N	N	N	N	N
32APSK-L (note 7)	2/3	N	N	N	N	N
64APSK	11/15; 7/9; 4/5; 5/6	O	N	N	N	O
64APSK-L (note 7)	32/45	O	N	N	N	O
128APSK	3/4; 7/9	NA	O	O	N	NA
256APSK	32/45; 3/4	NA	O	O	N	NA
256APSK-L (note 7)	29/45; 2/3; 31/45; 11/15	NA	O	O	N	NA
FECFRAME (short) (see MODCODs below)	16 200 (bits)					
QPSK	1/4, 1/3, 2/5 (S2-MODCODs)	NA	N	O	N	N
	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9 (S2-MODCODs)	NA	N	O	N	N
	11/45; 4/15; 14/45; 7/15 8/15; 32/45	NA	N	O	N	N
8PSK	3/5, 2/3, 3/4, 5/6, 8/9 (S2-MODCODs)	NA	N	O	N	N
	7/15; 8/15; 26/45; 32/45	NA	N	O	N	N
16APSK	2/3, 3/4, 4/5, 5/6, 8/9 (S2-MODCODs)	NA	N	O	N	N
	7/15; 8/15; 26/45; 3/5; 32/45	NA	N	O	N	N

System configurations		Broadcast services	Interactive services	DSNG	Professional services	VL-SNR
32APSK	3/4, 4/5, 5/6, 8/9 (S2-MODCODs)	NA	N	O	N	N
	2/3; 32/45	NA	N	O	N	N
VL-SNR Header (see MODCODs below) (note 1)		O	O	O	NA	N
QPSK	2/9 (normal)	NA	O	O	NA	N
BPSK	1/5; 4/15; 1/3 (short) 1/5; 11/45; 1/3 (medium)	NA	O	O	NA	N
BPSK-S Spreading Factor 2	1/5; 11/45 (short)	NA	O	O	NA	N
Fixed Size Super-frame (notes 8 and 11)		NA	O	O	O	O/NA (note 9)
Part 2 PLHEADER (note 5)	8-bits	N	N	N	N	N
Extended PLHEADER For Wide-band mode (note 5)	8+8 bits (time slicing)	O	O	NA	O	O
GSE-High Efficiency Mode	For GSE/GSE-Lite (note 6)	N	N	N	N	N
Roll-off 0,15; 0,10 and 0,05		N	N	N	N	N
Channel bonding (note 2)		N (note 3)	NA	NA	O	NA
VCM (note 4)		N	N	N	N	N
ACM		NA	N	O	O	N
Beam Hopping Periodic BH, VLSNR (note 8) (Superframe Format 5) (note 10)		O	O	O	O	O
Traffic driven BH VLSNR (note 8) (Superframe Format 6)		O	O	O	O	O