NETWORKTV

Satellite TV

DVB-S Reception

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Release 1.1

DVB-S Background

The Digital Video Broadcasting (DVB™) specifications cover digital media services delivered via cable, satellite and terrestrial transmitters, as well as by the internet and mobile communication systems. Related topics such as Ultra High Definition (UHD) TV and interactive television are also included. Services using DVB standards are available on every continent.

DVB-S was the first DVB standard for satellite, defining the framing structure, channel coding and modulation for 11/12 GHz satellite services in EN 300 421. The DVB-DSNG EN 301 210 standard specified, in addition to the DVB-S format, the new modulations for satellite news gathering and contribution services.

Digital satellite transmission technology has evolved considerably since the publication of the original DVB-S specification. DVB-S2 defines a "second generation" modulation and channel coding system for a very flexible standard, covering a variety of applications by satellite. New coding and modulation schemes as well as a new framing structure permit greater flexibility and more efficient use of capacity, and reasonable receiver complexity.

DVB-S2 is compatible with Moving Pictures Experts Group (MPEG-2 and MPEG-4) coded TV services, with a Transport Stream packet multiplex.

ETSI standards for DVB system specifications are developed in the ETSI/EBU/CENELEC Joint Technical Committee 'Broadcast', based on proposals from the Digital Video Broadcasting Project (DVB), an industry-led consortium.

The second generation Digital Video Broadcasting by Satellite (DVB-S2) is defined in European Standard EN 302 307-1, which details these improved modulation and coding schemes, enhancing the efficiency of the space segment and giving the basis for providing interactive services.

The extensions of the DVB-S2 system, defined to enlarge the fields of applicability of the DVB-S2 standard, are identified by the S2X denomination, DVB-S2X has been defined in EN 302 307 -2. With DVB-S2 standard, the system has been optimized for the following broadband satellite applications:

- Broadcast Services (BS) Digital multi-programme Television (TV)/High Definition Television (HDTV).
- Interactive Services (IS) Interactive data services including Internet access.
- Digital TV Contribution and Satellite News Gathering (DTVC/DSNG).
- Data content distribution/trunking and other professional applications (PS) These services are mainly point-to-point or point-to-multipoint, including interactive services to professional head-ends, which re-distribute services over other media.

Satellite TV Reception

1. To receive all kinds of wireless broadcasts, an antenna is necessary.
The type of antenna varies with the kind of broadcast to be received. Satellite broadcasts require a special satellite antenna called "dish" or "satellite dish".

2. Currently satellite broadcasts use two different frequency bands: C-Band with a frequency range from 3.7 to 4.2GHz and Ku-Band, which is divided in a low band from 10.7GHz to 11.7GHz (Lo: 9.75 GHz) and a high band
from 11.7GHz to 12.75GHz (Lo: 10.6GHz). * Lo = Local Oscillation

3. The satellite signal is reflected from the dish to the Freed-Horn and from there directed to the LNB (Low Noise Block Down Converter).

4. The LNB detects the signal relayed from the feed, converts it to an electrical current, amplifies it and lowers its frequency. The output level of a typical LNB is around 55-65dBuV.

5. The European satellite TV system:
Low band: 10.7GHz - 11.7GHz (Lo: 9.75GHz)
High band: 11.7GHz - 12.75GHz (Lo: 10.6GHz)

Therefore the frequency range from the LNB for the Low band is: 950MHz-1950MHz (10.7GHz minus 9.75GHz) to (11.7GHz minus 9.75GHz) and for the High band:
1100MHz-2150MHz (11.7GHz minus 10.6GHz) to (12.75GHz minus 10.6GHz)

6. To avoid interference between odd and even numbered channels, adjacent frequencies are polarized in opposite directions. Satellites usually broadcast signals with either vertical, horizontal, left hand circular (counter-clockwise rotation) and right hand circular (clockwise rotation) polarization.

7. The receiver uses different voltages to signal the LNB to select between vertical (V) and horizontal (H) satellite signals.

8. The voltage used by the receiver to signal the LNB to choose between vertical and horizontal signals is 12-14V for vertical and 15-18V for horizontal mode. Therefore multi-switches usually operate at a voltage range of 14.6V+/-0.3V.

Satellite TV Reception cont.

9. Currently LNBs can be divided into "Universal" LNB, "Twin LNB" (Universal Twin LNB) and "Quattro LNB".
What is a "Universal LNB" ?

LNB's Lable :
One Outlet
Lo band (10.7-11.7GHz)
Hi band (11.7GHz-12.75GHz) LO (9.75GHz + 10.6GHz)
1x H+V

Note:
Only one F-type outlet
Can receive two bands, analog Lo band and digital Hi band.
Two oscillation frequencies for Lo and Hi band. 1 (one F-type outlet), H (horizontal), V (vertical).

This type of LNB has one F-type outlet and can receive "Lo band H+V" and "Hi band H+V". It is often used for normal family type setups.

What is a "Twin LNB" (Universal Twin LNB)?
An "Universal Twin LNB" is two "Universal LNBs" in a twin box (for both Hi and Lo band). A "Twin LNB" or "Analog Twin LNB" is two analog LNBs in a twin box (only analog Lo band). See also ASTRA webpage.

What is a "Quattro LNB"?
This type of LNB is used in SMATV systems. It has four F-type connectors: "Lo band V", "Lo band H", "Hi band V", "Hi band H" and is often used with a 5xn or 9xn multiswitch.

* "Quattro LNB" is also called "Quattro-band LNB" or "Quad LNB", see also ASTRA webpage.

10. 3x4 or 2x4 multiswitches are used with Twin LNBs. When more than two receivers share one satellite dish multiswitches are also necessary.

Useful sites for finding specific satellite TV channels frequency details are King of Sat and Lyng-sat.

References:
ETSI: www.etsi.org
King of Sat: www.kingofsat.net
Lyngsat: www.lyngsat.com

Abbreviations Used in DVB Transmissions

For the purposes of the present document, the following list of abbreviations may help:

1PPS	One-pulse-per-second (signal from GPS receiver or other timing reference)
ACE	Active Constellation Extension
AGC	Automatic Gain Control
ASI	Asynchronous Serial Interface
AWGN	Additive White Gaussian Noise
BCH	Bose-Chaudhuri-Hocquenghem multiple error correction binary block code
BER	Bit Error Ratio
BPSK	Binary Phase Shift Keying
BUFS ISSY	variable indicating the maximum size of the requested receiver buffer to com ensate delay variations
CA	Conditional Access
CDS	Carrier-Distribution Sequence
COFDM	Coded Orthogonal Frequency Division Multiplexing CP Continual Pilot
CPE	Common Phase Error
CSI	Channel State Information
CSP	Common Simulation Platform
CW	Continuous Wave
DFT	Discrete Fourier Transform
DJB	De-Jitter Buffer
EIT	Event Information Table
FEC	Forward Error Correction
FEF	Future-Extension Frame
FFT	Fast Fourier Transform
FIFO	First-In First-Out buffer
FPGA	Field Programmable Gate Array

NOTE: Also known as highest common factor.

GCS	Generic Continuous Stream
GFPS	Generic Fixed Packet size Stream
GIF	Guard-Interval Fraction (TG/TU)
GPS	Global Positioning System
GSE	Generic Stream Encapsulated
HEM	High Efficiency Mode
I/L	Frame InterLeaving Frame
IC	Integrated Circuit
ICI	Inter-Carrier Interference
ID	Iterative Demapping
IFFT	Inverse Fast Fourier Transform
ISI	Intersymbol Interference

Abbreviations cont.

ISSY	Input Stream SYnchronizer
LDPC	Low Density Parity Check (codes)
LLR	Log Likelihood-Ratio
MER	Modulation Error Ratio
MFN	Multiple Frequency Network
MIMO	Multiple Input Multiple Output
MIP	Megaframe Initialisation Packet
MODCOD	MODulation and CODing

NOTE: This term is used to refer to a particular combination of constellation, LDPC code rate and block length.

NIT	Network Information Table
NM	Normal Mode
NPD	Null-Packet Deletion
OFDM	Orthogonal Frequency Division Multiplexing PAPR Peak-to-Average Power Ratio
PAT	Program Association Table
PCR	Programme Clock Reference
PCT	Parity and Column Twist
PLP	Physical Layer Pipe
PN	Pseudo Noise
PSI/SI	Program Specific Information / Service Information
QEF	Quasi-Error-Free
QPSK	Quaternary Phase Shift Keying
RF	Radio Frequency
RMS	root mean square
SDT	Service Description Table
SFN	Single-Frequency Network
SI	Service Information
SNR	Signal-to-Noise Ratio
SP	Scattered Pilot
Statmux	Statistical multiplex
SYNCD	the distance in bits from the beginning of the DATA FIELD of a BBFRAME to be ginning of the first transmitter User Packet that starts in the DATA FIELD
T2dsd	DVB-T2 delivery system descriptor
T2-MI	DVB-T2 Modulator Interface
TDI	Time De-Interleaver
TFS	Time Frequency Slicing
TI-block	Time-Interleaving block
TR	Tone Reservation
TS	Transport Stream
UHF	Ultra High Frequency (band)
VBR	Variable Bit Rate