2nd Generation Satellite

The workhorse of the global satellite industry

What is DVB-S2?

DVB-S2 (EN 302 307) is a digital satellite transmission system developed by the DVB Project. It makes use of sophisticated modulation and coding techniques, reliably covering the needs of the global satellite industry. Satellite transmission was the first area addressed by the DVB Project in 1993 and DVB standards form the basis of most satellite broadcast and data services around the world today. DVB-S2 has today mostly replaced DVB-S, as HD and UHD services entice users and operators to upgrade receivers to more efficient DVB-S2 models.

Background

The world's first digital satellite TV services were launched in Thailand and South Africa at the end of 1994 and both used the newly released DVB-S system. Over time it became the most popular system for the delivery of digital satellite television, with well over 100 million receivers deployed around the world. Nonetheless, with the system being more than ten years old, it was not surprising that the industry decided the time was right to update. Thus DVB-S2 was developed around 2003, with the DVB Technical Module sub-group responsible for the work being chaired by Dr. Alberto Morello of RAI. The work took advantage of advanced techniques for channel coding, modulation and error correction to create a system that made a range of new services commercially viable for the first time, e.g., when combined with the latest video compression technology, DVB-S2 enabled the widespread commercial launch of HDTV services.

How does it work?

The original DVB-S system, on which DVB-S2 is based, specifies the use of QPSK modulation along with various tools for channel coding and error correction. Further additions were made with the emergence of DVB-DSNG (Digital Satellite News Gathering), for example allowing the use of 8PSK and 16QAM modulation. DVB-S2 benefits from more recent developments and has the following key technical characteristics:

- There are **four modulation modes** available, with QPSK and 8PSK intended for broadcast applications in non-linear satellite transponders driven close to saturation. 16APSK and 32APSK, requiring a higher level of C/N, are mainly targeted at professional applications such as news gathering and interactive services.
- DVB-S2 uses a very powerful **Forward Error Correction** scheme (FEC), a key factor in allowing the achievement of excellent performance in the presence of high levels of noise and interference. The FEC system is based on concatenation of BCH (Bose-Chaudhuri-Hcquengham) with LDPC (Low Density Parity Check) inner coding.
- **Adaptive Coding and Modulation** (ACM) allows the transmission parameters to be changed on a frame by frame basis depending on the particular conditions of the delivery path for each individual user. It is mainly targeted to unicasting interactive services and to point-to-point professional applications.
- DVB-S2 offers **optional backwards compatible** modes that use hierarchical modulation to allow legacy DVB-S receivers to continue to operate, whilst providing additional capacity and services to newer receivers.

Satellite EIRP (dBW)	51		53.7	
System	**DVB-S**	**DVB-S2**	**DVB-S**	**DVB-S2**
Modulation & Coding	QPSK 2/3	QPSK 3/4	QPSK 7/8	8PSK 2/3
Symbol Rate (Mbaud)	27.5 (α = 0.35)	30.9 (α = 0.2)	27.5 (α = 0.35)	29.7 (α = 0.25)
C/N (in 27.5MHz) (dB)	5.1	5.1	7.8	7.8
Useful Bitrate (Mbit/s)	**33.8**	**46 (gain = 36%)**	**44.4**	**58.8 (gain = 32%)**

Figure 1. Example comparison between DVB-S and DVB-S2 for TV broadcasting (Source: EBU Technical Review 10/04)

How does it work? (continued)

DVB-S2 delivers excellent performance. It can operate at carrier-to-noise ratios from -2dB (i.e., below the noise floor) with QPSK, through to +16dB using 32APSK. The table overleaf (Figure 1) shows the improvements in efficiency that DVB-S2 delivers when compared to DVB-S with typical TV broadcast parameters, with gains in the useful bitrate of more than 30% in each case.

Market Deployment

Having been formally published as an ETSI standard in March 2005, DVB-S2 was quickly adopted by the industry for the delivery of new services. Practically all major satellite broadcasters around the world use DVB-S2, in conjunction with advanced video coding standards, for the delivery of HDTV and now also UHD services.

Two significant factors contributed to the success of DVB-S2. Firstly, in August 2006 the ITU's (International Telecommunications Union) study group on satellite delivery issued a recommendation that DVB-S2 alone be adopted as the preferred option for a "Digital Satellite Broadcasting System with Flexible Configuration (Television, Sound and Data)" (ITU recommendation number BO.1784).

Secondly, late in 2006, an announcement from the holders of key DVB-S2 intellectual property rights indicated that licensing costs for manufacturers of DVB-S2 equipment would not exceed $1.00 per consumer device, or $0.50 for quantities exceeding 500,000. The certainty granted by this announcement fostered the rapid adoption of DVB-S2 by the global satellite broadcasting and telecommunications industries.

DVB-S2 has also been adopted for professional applications of all kinds including broadcast contribution and data trunking.

Next Steps

In 2014, DVB released DVB-S2X, an extension of the DVB-S2 specification that provides additional technologies and features. DVB-S2X has been published as ETSI EN 302 307 part 2, with DVB-S2 being part 1. S2X offers improved performance and features for the core applications of DVB-S2, including Direct to Home (DTH), contribution, VSAT and DSNG. The specification also provides an extended operational range to cover emerging markets such as mobile applications. (See separate fact sheet.)

Links

www.dvb.org/standards	DVB-S2 standard and implementation guidelines