TECHNICAL RECOMMENDATIONS

Digital Satellite Receiver Front-End

This technical recommendation for the Digital Satellite Receiver Front-End defines the minimum parameters that a Digital Satellite Receiver Front-End is required to meet for the DTH reception of DVB signals transmitted via the ASTRA Satellite System.

Tuner

The following characteristics are required for the tuner:

No.	Parameter		Value			Unit
			Min.	Typ.	Max.	
1	IF Input Frequency Range			950 to 2150		MHz
2	RF Input Level			-65 to -25		dBm
3	Input Impedance			75		Ω
4	Return Loss		8			dB
5	Connector			IEC 169-2 or 169-24 (F-type) female		-
6	IF Output Frequency Range			950 to 2150		MHz
7	Output Impedance			75		Ω
8	Return Loss		8			dB
9	Connector			IEC 169-2 or 169-24 (F-type) female		-
10	Conversion Gain Variation				3	dB
11	AGC Control Range		45			dB
12	Lock Time				100	ms
13	Phase Noise	At 1 kHz offset			-50	dBc/Hz
		At 10 kHz offset			-75	dBc/Hz
		At 100 kHz offset			-95	dBc/Hz
		At 1 MHz offset			-105	dBc/Hz
		At ≥ 10 MHz offset			-115	dBc/Hz
14	LNB Supply Voltage (Control Signal)	Vertical Polarisation (Signal Ca)	12.5		14.0	V
		Horizontal Polarisation (Signal Cb)	17.0		19.0	V
15	High Band Selection (Control Signal Cc)	Frequency	20	22	24	kHz
		Duty Cycle	40	50	60	%
		Peak to Peak Voltage	0.4	0.6	0.8	V
		Transition Time	5	10	15	µs
		Output Impedance at 22 kHz			50	Ω
16	LNB Current Power Supply		350			mA

Table 1: Tuner Characteristics

Parameter notes:

14 Margins has been taken in comparison with the threshold used by the LNB to cope with the possible voltage drop between the receiver and the LNB.

14, 15 The control signal criteria are described in the [3] EN 61319-1 specification.

16 The LNB current power supply shall be protected for overload and for short circuit.

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The IF filter of the IRD shall be designed in such a way that the IRD achieves the satellite L band loop back performance as given in Table 2 in presence of adjacent channels (see [4] SES ASTRA Technical Recommendations – Polarisation Planes and Frequency Allocations) with a level of up to 4 dB higher than the selected channel.

An IF loop-through should be implemented to allow the inclusion of the digital receiver between the antenna and an existing analogue receiver. The IF loop-through shall be active when the IRD is in stand-by mode. A DC connection from IF output to IF input shall also be available in stand-by mode to allow an analogue receiver to control the outdoor unit.

DVB-S Demodulator

The demodulator shall comply with [1] EN 300 421.

The following characteristics are required for the demodulator:

No.	Parameter		Value			Unit
			Min.	Typ.	Max.	
17	Modulation Type			Gray coded QPSK		-
18	Pulse Shaping			Square root raised cosine		-
19	Roll Off Factor			0.35		-
20	Minimum Symbol Rate				16	Mbaud
21	Maximum Symbol Rate		30			Mbaud
22	Symbol Rate	At 26 MHz/-1 dB channel bandwidth		22.0		Mbaud
		At 33 MHz/-1 dB channel bandwidth		27.5		Mbaud
		At 36 MHz/-1 dB channel bandwidth		30.0		Mbaud
23	Convolutional Code Rates			1/2, 2/3, 3/4, 5/6, 7/8		-
24	Required Eb/No for BER = 2 x 10^{-4} after Viterbi (Quasi-Error-Free after RS)	1/2			4.5	dB
		2/3			5.0	dB
		3/4			5.5	dB
		5/6			6.0	dB
		7/8			6.4	dB

Table 2: DVB-S Demodulator Characteristics

Parameter note:

20, 21 In order to provide flexibility with regard to future transmissions and alternative satellite distribution systems, equipment manufacturers should consider the implementation of a variable symbol rate technology.

The demodulator may be able to process QPSK signals with both a 'normal' and an 'inverted' spectrum. To minimise the channel acquisition time, the receiver shall be capable of memorising the spectrum status in an appropriate manner.

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DVB-S2 Demodulator

The demodulator shall support DVB-S2 Non Backwards Compatible Broadcast Services (NBC-BS) as defined in [2] EN 302 307.

The following characteristics are required for the demodulator:

No.	Parameter		Value			Unit
			Min.	Typ.	Max.	
25	Modulation Type			QPSK, 8PSK		-
26	Pulse Shaping			Square root raised cosine		-
27	Roll Off Factor			0.2, 0.25, 0.35		-
28	Minimum Symbol Rate				16	Mbaud
29	Maximum Symbol Rate		30			Mbaud
30	Symbol Rate	At 26 MHz/-1 dB channel bandwidth		22.0		Mbaud
		At 33 MHz/-1 dB channel bandwidth		27.5		Mbaud
		At 36 MHz/-1 dB channel bandwidth		30.0		Mbaud
31	LDPC Code Rates	QPSK		1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10		-
		8PSK		3/5, 2/3, 3/4, 5/6, 8/9, 9/10		-
32	Required Es/No for PER = 10^{-7} in IF-loop (Quasi-Error-Free after BCH)	QPSK 1/2			1.2	dB
		QPSK 3/5			2.5	dB
		QPSK 2/3			3.2	dB
		QPSK 3/4			4.2	dB
		QPSK 4/5			4.8	dB
		QPSK 5/6			5.4	dB
		QPSK 8/9			6.3	dB
		QPSK 9/10			6.6	dB
		8PSK 3/5 With Pilots			5.9	dB
		8PSK 2/3 With Pilots			6.8	dB
		8PSK 3/4 With Pilots			8.1	dB
		8PSK 5/6 With Pilots			9.6	dB
		8PSK 8/9			11.0	dB
		8PSK 9/10			11.3	dB

Table 3: DVB-S2 Demodulator Characteristics

Parameter notes:

28, 29 In order to provide flexibility with regard to future transmissions and alternative satellite distribution systems, equipment manufacturers should consider the implementation of a variable symbol rate technology.

32 The power ratios in the table above shall be valid for an IF-loop setup.

DVB-S2 receivers shall also be able to receive DVB-S transmissions according to [1] EN 300 421.

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Acronyms

AGC	Automatic Gain Control
BCH	Bose-Chaudhuri-Hocquenghem multiple error correction binary block code
BER	Bit Error Ratio
CENELEC	Comité Européen de Normalisation Electrotechnique
DC	Direct Current
DVB	Digital Video Broadcasting
DVB-S	Digital Video Broadcasting for Satellite
DTH	Direct To Home
ETSI	European Telecommunications Standard Institute
FEC	Forward Error Correction
IF	Intermediate Frequency
IRD	Integrated Receiver Decoder
ISO	International Organization for Standardization
LDPC	Low-Density Parity Check
LNB	Low Noise Block converter
PER	(MPEG TS) Packet Error Rate
PSK	Phase Shift Keying
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RS	Reed-Solomon
SES	Société Européenne des Satellites
SMATV	Satellite Master Antenna TeleVision

References

ETSI Publications

[1] EN 300 421

Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services

[2] EN 302 307

Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications

CENELEC Publication

[3] EN 61319-1

Interconnections of satellite receiving equipment: Part 1: Europe

SES ASTRA Publication

[4] SES ASTRA Technical Recommendations – Polarisation Planes and Frequency Allocations

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