Secretaría de Estado de Telecomunicaciones y para la Sociedad de la Información (State Secretariat for Telecommunications and Information Society)

Foro de la TV de Alta Definición

(TVAD - High-definition Television Forum)

UNIFIED RECOMMENDATIONS ABOUT MINIMUM REQUIREMENTS FOR RECEIVERS

Version 1.0

Prepared by:

Technical Group of the High-Definition Television Forum in Spain

Coordinated by:
AETIC

March 2008

TABLE OF CONTENTS

1 Purpose

This document is aimed at offering information about the minimum requirements that should be met by High Definition Television receivers in Spain, the concept of "receiver" including set top boxes (STBs) and integrated digital television sets.

It is a horizontal document prepared by the Technical Group, which comprises all the requirements applicable to receivers depending on the services provided through the different transmission media (IPTV, DTT, cable or satellite).

2 Introduction

The document describes some requirements so that the receivers may provide a high-definition (HD) service with the quality expected by the user, though at a reasonable quality-cost ratio that guarantees service success, several times conditioned by the cost barrier of the user's equipment.

The minimum requirements recommended for receivers –suitable for different types of network or platform- should be oriented to fit in the markets where such receivers will be sold. Thus, in the current state of affairs, the recommendations for DTT and for satellite free-to-air broadcast operate on the basis of a horizontal market in which receivers will be directly sold by the manufacturers through their different sales distribution channels. This is why such recommended minimum requirements are mostly limited to the aspects that guarantee the reception of high definition television services and interoperability.

Moreover, different recommendations will have to be made for IPTV, cable and satellite television in case of vertical markets in which operators or service providers define the specifications of the receivers used for their services and are responsible for selling them to end users or subscribers.

Should this situation change in the future, the recommendations put forward in this document should be adapted accordingly to the new scenario.

The document is divided into several sections giving recommendations for each requirement. Each requirement has been divided into several features, identifying how compulsory they are for each transmission type:

- ***Obligatory***
  It is mandatory for providing a suitable service quality level.

- ***Optional***
  It is recommended to provide a service of higher quality or to grant the flexibility needed by the service provider to make it better. It considers the quality-cost ratio.

- ***Upgradable***
  It means that, although it provides functionalities that are not expected for use in the short term, service and technology evolution indicate that it might be necessary in the long term. This type of requirements will be included in the document for information purposes and to avoid, as much as possible, future undesired upgrades or renewals of the receivers installed.

- ***N/A***

  It is used with requirements that do not apply for a specific transmission medium, but that might be applicable for others.

Finally, it should be said that the European Information & Communications Technology Industry Association (EICTA) is currently working on the review of international standard IEC 62216-1, on the specifications for the basic DVB-T receiver and commonly known as "E-Book" in order to update it to the new needs imposed by high definition TV.

3 Legislation and basic regulations that are applicable to the equipment

- **General regulatory aspects** that are to be complied with by all receivers (obligatory European directives that are transposed into the legal frameworks of the Member States):

  - ✓ **EMC Directive**: DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

  - ✓ **LVD Directive:** DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

  - ✓ **Telecommunications Directive:** DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

  - ✓ **WEEE Directive:** DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE)and Directive 2003/108/EC of the European Parliament and of the Council of 8 December 2003 amending Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).

  - ✓ **RoHS Directive [1]:** DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

  - ✓ **EuP Directive:** DIRECTIVE 2005/32/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 July 2005 establishing a framework for the setting of ecodesign requirements for energy using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council

[1] The exceptions made in the Annex to the Restrictions on Hazardous Substances (RoHS) Directive and annex II of RD 208/2005 have been expanded by the decisions of the European Commission of October 21, 2005; of April 21, 2006; and October 12, 2006.

- **Regulatory aspects, directives and decisions affecting the audiovisual sector specifically**.

  - ✓ Royal Decree 1/1997, of 31 January, by means of which the Spanish law includes Directive 95/47/CE of the European Parliament and of the Council of 24 October on the use of standards for the transmission of television signals, and additional measures are approved of for sector liberalisation.

  - ✓ Act 37/1995, of December 12, regulating satellite telecommunications, included into the Spanish legislation the modifications made in the Community regulations and the approval by the Commission of Directive 94/46/CE, of 31 October, which amended Commission Directives 88/301/CEE, of 16 May, on competition of telecommunications markets and 90/388/CEE, of 16 May, on the same issue.

  - ✓ Moreover, the European Community has acknowledged the strategic importance of advanced television services and high definition television by means of numerous regulations, among which Council Decision 89/337/EEC of 27 April 1989 on high-definition television should be highlighted.

  - ✓ Council Decision 93/424/EEC of 22 July 1993 on an action plan for the introduction of advanced television services in Europe, Directive 95/47/EC of the European Parliament and of the Council of 24 October 1995 on the use of standards for the transmission of television signals, which have been included into the Spanish legal system through this Royal Decree.

  - ✓ Directive 98/48/, amending DIRECTIVE 98/34/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services.

  - ✓ Single standard on production with international scope: Council Decision 89/360/EEC of 7 December 1989 on the common action to be taken by the Member States with respect to the adoption of a single worldwide high-definition television production standard by the Plenary Assembly of the International Radio Consultative Committee (CCIR) in 1990 [Official Journal L 363 of 13 December, 1989].

- **Non-regulatory, voluntary functional aspects,** though critical to guarantee the quality of products and highlighted in reply to the current complaints filed by users and the problems found in some laboratories for some market equipment.

The reason for highlighting and promoting these aspects with this document is not to limit the free market but to reward those that assure product quality.

  - ✓ Environmental aspects:

    It is recommended that the devices keep all their functionalities at ambient temperatures between 5ºC and 45ºC.

  - ✓ Applicable European and international standards:

    - ETS 300 019-1-1 to ETS 300 019-1-8
    - IEC 68-2-1, IEC 68-2-2, IEC 60068-2-78

  - ✓ Power-related aspects:

The device power consumption will guarantee compliance with UNE-EN 62087.

- ✓ Aspects related to integrated receivers:

If colourimetry is to be respected in accordance with UNE-EN 61966, luminosity should be assured:

  - in LCD in compliance with EN 61747
  - in plasma in compliance with standard UNE-EN 61988

4 HW Requirements

The following sections summarise the overall requirements for hardware, interfaces and device control and display hardware elements for each transmission medium. The specific document for each sub-group will provide details of those aspects that are typical of the requirements imposed for each transmission medium.

4.1 *CPU*

4.1.1 CPU Requirements

Below are the requirements for each central processing unit.

Table 1.1

	Id	IPTV	DTT	Cable	Satellite
CPU	H.1	>=300DMIPS	N/A	>=300DMIPS	>=300DMIPS
CPU for applications	H.2	>=200DMIPS	N/A	>=200DMIPS	>=200DMIPS
SDRAM	H.3	>=128MB	N/A	>=128MB	>=128MB
Flash memory	H.4	>=48MB	N/A	>=48MB	>=48MB
Firmware or HW video / audio decoding	H.5	Obligatory	Optional	Obligatory	Obligatory
Production kernel remote upgrades, compatible with previous versions	H.6	Obligatory	Optional	Obligatory	Obligatory VM Optional HM

VM: Vertical Market
HM: Horizontal Market

4.1.2 Storage and PVR systems

The following table shows the requirements for storage systems.

Table 1.2

	Id	IPTV	DTT	Cable	Satellite
Internal HDD	H.7	Optional	Optional	Optional	Optional
HDD noise level	H.8	<28 dBa	<28 dBa	<28 dBa	<28 dBa
External HDD (USB 2.0)	H.9	Upgradable	Optional	Optional	Upgradable VM Optional HM
Upgrade PVR/HDD through USB 2.0	H.10	Upgradable	Optional	Optional	Optional

VM: Vertical Market
HM: Horizontal Market

4.2 *Physical video and audio interfaces*

4.2.1 Requirements for physical video and audio interfaces

Below are the requirements for video/audio input/output interfaces.

Table 2.1

	Id	IPTV	DTT	Cable	Satellite
STB FRONT END					
DVB-S receiver	E/S.1	Optional	Optional	Optional	Obligatory
DVB-S2 receiver	E/S.2	Optional	Optional	Optional	Obligatory
DVB-T receiver	E/S.3	Obligatory	Obligatory	Optional	Optional
DVB-C receiver	E/S.4	Optional	Optional	Obligatory	Optional
DOCSIS / EURODOCSIS receiver	E/S.5	N/A	N/A	Optional	N/A
IR Protocol 4PPM 56 kHz	E/S.6	Optional	Optional	Optional	Optional
IR support for keyboard codes	E/S.7	Obligatory	Optional	Optional	Optional
IR support for RCU codes	E/S.8	Obligatory	N/A	Optional	Optional
IR or bluetooth remote control device	E/S.9	Obligatory	Obligatory	Obligatory	Obligatory
RF output (not applicable for IDTVs)	E/S.10	Obligatory	Optional	Obligatory	Optional
Transmodulated RF output	E/S.11	N/A	N/A	Optional	N/A
Communications					
Ethernet 10/100 Mbits (RJ45)	E/S.12	Obligatory	Optional	Optional	Optional
USB2.0 2 female connector	E/S.13	Optional	Optional	Optional	Optional
Audio					
Coaxial RCA or optical S/PDIF digital audio output	E/S.14	Obligatory	Obligatory	Obligatory	Obligatory
RCA stereo output	E/S.15	Optional	Optional	Optional	Optional
Minijack stereo output	E/S.16	Optional	Optional	Optional	Optional
Mic mono input (minijack)	E/S.17	Optional	Optional	Optional	Optional
Video (Associated audio)					

HD digital input or output (HDMI 1.1 or above)[2]	E/S.18	Obligatory	Obligatory	Obligatory	Obligatory
HD analog output (Y/Pb/Pr)	E/S.19	Optional	Optional	Optional	Optional
SCART 1 connector	E/S.20	Obligatory	Obligatory	Obligatory	Obligatory
SCART 2 connector	E/S.21	Optional	Optional	Optional	Optional
RCA composite video	E/S.22	Optional	Optional	Optional	Optional
S-Video minidin	E/S.23	Optional	Optional	Optional	Optional
Other					
Smart card reader ISO-7816 Parts 1 to 6	E/S.24	Obligatory	Optional	Obligatory	Obligatory
EMV Level 1 certification (of exclusive application on advanced services)[3]	E/S.25	Obligatory	Obligatory	Obligatory	Obligatory

4.2.2 Use cases

The following table gives details on the use cases that must be present depending on the services used. (The **use case** technique is used in software and systems engineering to capture the functional requirements of a system.)

Table 2.2

	Id	IPTV	DTT	Cable	Satellite
2 simultaneous IP streams	H.1	Optional	N/A	N/A	N/A
2 simultaneous IP and DVB-T streams	H.2	Optional	Optional	N/A	N/A
2 simultaneous DVB-T streams	H.3	Optional	Optional	N/A	Optional
2 simultaneous DVB-C streams	H.4	N/A	N/A	Optional	N/A
2 simultaneous DVB-S / DVB-S2 streams	H.5	Optional	N/A	N/A	Optional
Simultaneous DVB-C and DVB-T streams	H.6	N/A	N/A	Optional	N/A
Simultaneous DVB-C and DVB-S / DVB-S2 streams	H.7	N/A	N/A	Optional	N/A

[2] The HDMI output is used for STBs. The HDMI input is used for iDTVs.

[3] Advanced services: All services based on monetary and ID transactions (based on healthcare applications or T-Administration services). There will always have to be a smart card reader and a return channel. EMV stands for the Europay MasterCard Visa consortium.

Simultaneous DVB-S / DVB-S2 and DVB-T streams	H.8	Optional	N/A	N/A	Optional
Simultaneous DVB-IPTV and DVB-S / DVB-S2 streams	H.9	Optional	N/A	N/A	Optional
Simultaneous DVB-C and DOCSIS streams	H.10	N/A	N/A	Optional	N/A
Simultaneous DVB-T and DOCSIS streams	H.11	N/A	Optional	Optional	N/A

4.3 *Buttons and LEDS*

Below are the requirements for the device physical interface.

For operation and maintenance purposes as well as on the basis of the experience of the users, it has been established that these requirements should be as standardised as possible.

Table 3

	Id	IPTV	DTT	Cable	Satellite
Front "on" LED	B/L.1	Obligatory	Obligatory	Optional	Obligatory
Front upgrading LED	B/L.2	Obligatory	Optional	Optional	Obligatory VM Optional HM
IR status information at the front	B/L.3	Obligatory	Obligatory	Optional	Obligatory
Front HDD status LED	B/L.4	Optional	Optional	Optional	Optional
4-digit display at the front	B/L.5	Optional	Optional	Optional	Optional
Local keyboard	B/L.6	Obligatory	Obligatory	Optional	Obligatory
HW reset button	B/L.7	Optional	Optional	Optional	Optional
Personalised power switch in the back	B/L.8	Optional	Optional	Optional	Optional

VM: Vertical Market
HM: Horizontal Market

5 Video Requirements

The following table shows the video requirements.

Table 4

	Id	IPTV	DTT	Cable	Satellite
SDTV					
PAL-BG	V.1	Obligatory	Obligatory	Obligatory	Obligatory
PAL-M	V.2	Optional	Optional	Optional	Optional
PAL-N	V.3	Optional	Optional	Optional	Optional
4:3 and 16:9	V.4	Obligatory	Obligatory	Obligatory	Obligatory
576i 50Hz	V.5	Obligatory	Obligatory	Obligatory	Obligatory
MPEG2 MP@ML video decoding	V.6	Obligatory	Obligatory	Obligatory	Obligatory
MPEG4 AVC MP@L3.0 video decoding	V.7	Obligatory	Obligatory	Obligatory	Obligatory
HDTV					
720p50, 1080i25	V.8	Obligatory	Obligatory	Obligatory	Obligatory
MPEG2 MP@HL video decoding	V.9	Optional	Optional	Optional	Optional
MPEG4 AVC MP@L4.0 video decoding	V.10	Obligatory	Obligatory	Obligatory	Obligatory
MPEG4 AVC HP@L4.0 video decoding	V.11	Obligatory	Obligatory	Obligatory	Obligatory
MPEG4 AVC MP or HP@L4.2 video decoding	V.12	Optional	Optional	Optional	Optional
AP@HL VC-1 video	V.13	Optional	Optional	Optional	Optional
Image formats: jpeg, gif, png and animated gif	V.14	Obligatory	Optional	Obligatory	Obligatory
Video Control					
Channel switch in less than 2 seconds[4]	V.15	Optional	Optional	Optional	Optional
Trick mode transitions in less than 0.5 seconds	V.16	Optional	Optional	Optional	Optional
***UP/Downconversion* Converting SD-HD- and HD-SD-supported formats on SCART and HDMI interfaces**	V.17	Obligatory	Obligatory	Obligatory	Obligatory
If the receiver enables Overscan, this may be configured by the user	V.18	Obligatory	Obligatory	Obligatory	Obligatory
OSD					
At least one application layer and one video layer	V.19	Obligatory	Obligatory	Obligatory	Obligatory

[4] This is the desirable time for the most critical case, which is switching between different multiplex services and different formats.

overlapping and see-through. SD application layer					
At least one application layer and one video layer overlapping and see-through. HD application layer	V.20	Optional	Optional	Optional	Optional
Minimum colour depth of 16 bits	V.21	Obligatory	Obligatory	Obligatory	Obligatory
The video layer must enable redimensioning and location anywhere on screen through HW	V.22	Obligatory	Obligatory	Obligatory	Obligatory

5.1 *Specific requirements for decoders supporting videoconference services*

	Id	IPTV	DTT	Cable	Satellite
H.261 video (coding and decoding)	V.23	Obligatory	Optional	Optional	Optional
H.263 video (coding and decoding)	V.24	Obligatory	Optional	Optional	Optional

6 Audio Requirements

The following table shows the audio requirements.

	Id	IPTV	DTT	Cable	Satellite
MPEG1 layer 1 and 2 decoding	A.1	Obligatory	Obligatory	Obligatory	Obligatory
MPEG1 layer 3 decoding	A.2	Upgradable	Optional	Upgradable	Upgradable VM Optional HM
AC3 decoding	A.3	Obligatory	Obligatory	Obligatory	Obligatory
E-AC3 decoding	A.4	Upgradable	Obligatory[5]	Upgradable	Upgradable
HE-AAC v2 audio decoding	A.5	Upgradable	Obligatory	Upgradable	Upgradable VM Obligatory HM
WMA decoding	A.6	Optional	Optional	Optional	Optional
AC3 passthrough (SPDIF and HDMI)	A.7	Obligatory	Obligatory	Obligatory	Obligatory
AAC/HE-AAC transcoding to AC3 or DTS (SPDIF and HDMI)	A.8	Upgradable	Obligatory	Upgradable	Upgradable VM Obligatory HM

VM: Vertical Market
HM: Horizontal Market

6.1 *Specific requirements for decoders supporting videoconferencing*

	Id	IPTV
GSM 6.10 and G.711 audio coding and decoding	A.9	Obligatory
AMR audio coding and decoding	A.10	Upgradable
G.723-1 audio coding and decoding	A.11	Upgradable
G.729 audio coding and decoding	A.12	Upgradable
Echo cancelling device to locate USB microphone near TV set with at least 30 dB TCL	A.13	Obligatory

(TCL: Terminal Coupling Loss)

[5] Only for new receivers.

7 Management Requirements

The following table shows the management requirements.

Table 6

	Id	IPTV	DTT	Cable	Satellite
DHCP [RFC 2131]	G.1	Obligatory	Optional	Optional	Optional
SNMP [RFC 1157]	G.2	Optional	N/A	Optional	Optional
MHP 1.0.3 (browser included)	G.3	Upgradable	Optional	Optional	Optional
MHP 1.1.3, Interactive Broadcast Profile 2	G.4	Upgradable	Optional	Optional	Optional
TR-069 (STM profile) including WT-106 and WT-135 extensions of the DSL Forum	G.5	Upgradable	N/A	N/A	Optional
UpnP support	G.6	Upgradable	N/A	Optional	Optional
DLNA support	G.7	Upgradable	N/A	Optional	Optional

8 Transport Protocols

The following table shows the requirements for transport protocol that have to be supported.

Table 7

	Id	IPTV	DTT	Cable	Satellite
DVB-T [DVB EN 300 744]	PT.1	Obligatory	Obligatory	Optional	Optional
DVB-S [DVB EN 300 421]	PT.2	Optional	Optional	Optional	Obligatory
DVB-C [DVB EN 300 429]	PT.3	N/A	N/A	Obligatory	Optional
DVB-S2 [DVB EN 302 307]	PT.4	Optional	Optional	Optional	Obligatory
DVB-IP	PT.5	Obligatory	Optional	N/A	Optional
DOCSIS /EuroDOCSIS 2.0	PT.6	N/A	N/A	Optional	Optional
IGMP2 [RFC 2236]	PT.7	Obligatory	N/A	Optional	Optional
IGMP3 [RFC 2236]	PT.8	Upgradable	N/A	Optional	Optional
RTSP [RFC 2326]	PT.9	Obligatory	N/A	Optional	Optional
SIP [RFC 3261]	PT.10	Obligatory	N/A	Optional	Optional
SSL 3.0 / HTTPS	PT.11	Obligatory	N/A	Optional	Optional
HTTP1.1	PT.12	Obligatory	N/A	Optional	Optional
MPEG-TS over UDP	PT.13	Obligatory	N/A	Optional	Optional
MPEG-TS over RTP over UDP	PT.14	Upgradable	N/A	Optional	Optional

9 Requirements for additional service components

9.1 *Teletext*

Receivers must comply with the following European standard published by *ETSI*:

- **EN 300 472** "Specification for conveying ITU-R System B Teletext in DVB bitstreams"

9.2 *Subtitles*

Receivers must comply with the following European standard published by *ETSI*:

- **EN 300 473** "Subtitling systems"

9.3 *Applications*

Below are details of some of the requirements to be complied with by the STB to facilitate application development.

Table 8

	Id	IPTV	DTT	Cable	Satellite
MHP 1.1.3 (browser included)	AP.1	Optional	Optional	Optional	Optional
MHP 1.2	AP.2	Optional	Optional	Optional	Optional
HTML 4.0 / XHTML 1.0	AP.3	Obligatory	Optional	Optional	Optional
JavaScript 1.5	AP.4	Obligatory	Optional	Optional	Optional
Flash Macromedia 4.0/5.0	AP.5	Upgradable	Optional	Optional	Optional
DVB-HTML (for MHP)	AP.6	Upgradable	Optional	Optional	Optional
Virtual Java machine (2)	AP.7	Upgradable	Optional	Optional	Optional
MPEG4- BIFS	AP.8	Optional	Optional	Optional	Optional

10 Service Information Requirements

Receivers must comply with the following European standards (EN) or technical specifications (TR) published by *ETSI*:

- **EN 300 468** "Specification for Service Information (SI) in DVB Systems"
- **TR 101 162** "Allocation of Service Information and Data Broadcasting codes for Digital Video Broadcasting (DVB) Systems"
- **TR 101 211** "Guidelines on implementation and Usage of Service Information"
- **TR 101 154** "Digital Video Broadcasting (DVB): Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream"

10.1 *SDT Table*

In order to guarantee interoperability, receivers must be compliant with the specific descriptors for high definition services and may appear in SDT tables.

These descriptors can be found in standard TR 101 154 "Digital Video Broadcasting (DVB): Implementation guidelines for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream"

11 Restricted Access and Security Systems

The following table shows the requirements for transport protocol that have to be supported.

Table 9

	Id	IPTV	DTT	Cable	Satellite
CAS Integration	ACSS.1	Obligatory	Optional	Obligatory	Obligatory VM Optional HM
Macrovision 7.01	ACSS.2	Obligatory	Optional	Optional	Optional
HDCP1.1 technology in HDMI	ACSS.3	Obligatory	Obligatory and initial status: disabled	Obligatory and initial status: disabled (can be enabled per event)	Obligatory and initial status: Enabled (VM) Disabled (HM)
DES (for PVR)	ACSS.4	Obligatory	Obligatory	Optional	Optional
AES (for PVR)	ACSS.5	Obligatory	Optional	Optional	Obligatory VM Optional HM

VM: Vertical Market
HM: Horizontal Market

12 Languages

It is highly recommendable for the receivers to have menus in the Spanish co-official languages (Catalan, Galician, Valencian and Basque) as well as in Spanish.

With respect to language descriptors, international standard ISO-639 will be used except for the Valencian, in which the desccriptor "VAL" will be used[6].

[6] The Valencian language descriptor does not appear univocally in international standard ISO-639, but as part of Catalan in the label *CAT=Catalán / Valenciano*. This means that if a transmission is labelled "CAT", then "Catalán" will be displayed. Efforts are being made so that the abovementioned ISO standard includes language code *VAL=Valenciano*.

ANNEX 1: BIBLIOGRAPHY

- Legal standards and regulations mentioned in the document

- EBU Tech 3307. *Service Requirements for Free-to-Air High Definition Television Receivers.* European Broadcasting Union. May 2005