

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital terrestrial television receivers for the DTMB system

Récepteurs de télévision numérique terrestre pour système DTMB





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.



IEC 62753

Edition 1.0 2015-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital terrestrial television receivers for the DTMB system

Récepteurs de télévision numérique terrestre pour système DTMB

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.160; 33.170

ISBN 978-2-8322-8095-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	10
2 Normative references	10
3 Abbreviations and symbols	10
4 Summary of DTMB transmission system.....	12
4.1 General.....	12
4.2 Processing of DTMB transmitter.....	12
4.3 Processing of DTMB receiver.....	13
5 Receiver capabilities	13
5.1 Frequency spectrum	13
5.1.1 Frequency range	13
5.1.2 Channel bandwidth	13
5.1.3 Frequency acquisition range.....	13
5.2 Power supply requirements.....	13
5.3 Interface requirements	13
5.4 Working modes	14
5.5 Program search and tuning	14
5.5.1 General	14
5.5.2 Receive quality display	14
5.5.3 Automatic search.....	15
5.5.4 Manual search.....	15
5.5.5 Modulation parameters change.....	15
5.6 Demultiplex characteristics	15
5.6.1 General	15
5.6.2 TS data rate	15
5.6.3 STC recovery.....	15
5.6.4 Error control	15
5.6.5 PID filters	15
5.6.6 Multi-component programs	15
5.7 Transport stream decoding characteristics	16
5.7.1 Service and program information	16
5.7.2 EPG	18
5.7.3 Presentation of subtitle	18
5.8 Function requirements	18
5.8.1 General	18
5.8.2 Software version update	19
5.8.3 Chinese graphical operation interface.....	19
5.8.4 Service list.....	19
5.8.5 Status bar.....	20
5.8.6 User parameter settings and storage	20
5.8.7 Power failure memory	20
5.8.8 Restore factory settings	21
5.8.9 Real time clock	21
6 Video and audio system characteristics	21
6.1 Video system characteristics.....	21

6.1.1	General	21
6.1.2	Fast acquisition	21
6.1.3	Still images	21
6.1.4	Baseband video input format	21
6.2	Audio system characteristics	22
7	RF part and channel decoder	22
7.1	RF port	22
7.1.1	RF input port	22
7.1.2	RF loop output port	22
7.2	Performance	23
7.2.1	Failure point criteria	23
7.2.2	Carrier to noise ratio threshold	23
7.2.3	Minimum signal input levels	23
7.2.4	Maximum signal input level	23
7.2.5	Immunity to analogue signals in an adjacent channel	23
7.2.6	Immunity to co-channel analogue signals	24
7.2.7	Immunity to digital signals in an adjacent channel	24
7.2.8	Immunity to co-channel digital signals	25
7.2.9	Resistance to 0 dB echo	25
7.2.10	Resistance to dynamic multipath channel	26
7.2.11	Resistance to pulse noise interference	26
8	Test method	26
8.1	RF demodulation and channel decoding	26
8.1.1	General	26
8.1.2	Frequency range	27
8.1.3	Frequency acquisition range	27
8.1.4	Program search and tuning	27
8.1.5	Return loss of RF input port	28
8.1.6	C/N threshold of Gaussian	29
8.1.7	Signal input level range	29
8.1.8	Immunity to analogue signals in adjacent channels	30
8.1.9	Immunity to analogue signals in a co-channel	30
8.1.10	Immunity to digital signals in adjacent channels	31
8.1.11	Immunity to digital signals in a co-channel	31
8.1.12	Resistance to 0 dB echo	32
8.1.13	Resistance to a dynamic multipath channel	32
8.1.14	Resistance to pulse noise interference	33
8.2	Demultiplex characteristics	33
8.2.1	TS data rate	33
8.2.2	STC recovery	34
8.2.3	Error control	34
8.2.4	PID filters	35
8.2.5	Multi-component programs processing	35
8.3	Transport stream decoding	35
8.3.1	Service and program information	35
8.3.2	EPG	36
8.3.3	Presentation of text	36
8.4	Power endurance	36
8.4.1	Power voltage endurance	36

8.4.2	Power frequency endurance	37
Annex A (normative)	Acceptable error free.....	38
Annex B (normative)	Multipath channel models.....	39
B.1	Rayleigh channel model.....	39
B.2	Rice channel model	39
B.3	Dynamic multipath channel model.....	40
Annex C (informative)	Guide to the implementing of a DRA audio decoder in a DTMB receiver	41
C.1	General.....	41
C.2	Outline, terms and definitions.....	41
C.2.1	Outline.....	41
C.2.2	Terms and definitions	43
C.3	DRA syntax structure	45
C.3.1	General	45
C.3.2	DRA bit stream	45
C.3.3	Frame.....	45
C.3.4	Frame header	46
C.4	Semantic.....	47
C.4.1	General	47
C.4.2	Bit stream	47
C.4.3	Frame.....	47
C.4.4	Frame header	48
C.4.5	Unpacking window sequence bits	52
C.4.6	Unpacking Huffman code book selection and application range bits.....	54
C.4.7	Unpacking quantization index bits of subband samples.....	54
C.4.8	Unpacking quantization stepsize index bits.....	54
C.4.9	Unpacking sum/difference coding decision bits	54
C.4.10	Unpacking joint intensity coding scale factor bits	55
C.4.11	Unpacking padding bits	55
C.4.12	Unpacking auxiliary data.....	55
C.5	Decoding	55
C.5.1	Channel arranging and configuration	55
C.5.2	Downmixing.....	57
C.5.3	De-interleaving	58
C.5.4	Reconstruction of the number of quantification units.....	59
C.5.5	Dequantizer	59
C.5.6	Joint intensity decoding	60
C.5.7	Sum/difference decoding	60
C.5.8	Variable resolution synthesis filter bank.....	60
C.5.9	Reconstruction of the short/brief window function sequence	63
Bibliography	64
Figure 1	– Diagram of DTMB transmitter processing	12
Figure 2	– Diagram of DTMB receiver processing	13
Figure 3	– Test set-up for frequency range	27
Figure 4	– Test set-up for program search and tuning.....	28
Figure 5	– Test set-up for return loss	29
Figure 6	– Test set-up for C/N threshold of Gaussian.....	29

Figure 7 – Test set-up for signal input level range.....	29
Figure 8 – Test set-up for immunity to analogue signals in adjacent channels.....	30
Figure 9 – Test set-up for immunity to digital signals in adjacent channels.....	31
Figure 10 – Test set-up for resistance to 0 dB echo.....	32
Figure 11 – Test set-up for immunity to pulse noise interference.....	33
Figure 12 – Test set-up for TS data rate.....	33
Figure 13 – Test set-up for STC recovery.....	34
Figure 14 – Test set-up for power voltage and frequency endurance.....	36
Figure C.1 – Decoder.....	42
Table 1 – Power supply requirements.....	13
Table 2 – Requirements of interface.....	14
Table 3 – Required working modes.....	14
Table 4 – Requirements of EPG supporting.....	18
Table 5 – Supporting functions.....	19
Table 6 – Video parameters.....	21
Table 7 – Video format.....	22
Table 8 – C/N for reference AEF.....	23
Table 9 – Minimum received signal level.....	23
Table 10 – Immunity to analogue signals in a $N - 1$ adjacent channel.....	24
Table 11 – Immunity to analogue signals in a $N + 1$ adjacent channel.....	24
Table 12 – Immunity to co-channel analogue signals.....	24
Table 13 – Immunity to digital signals in an adjacent channel.....	25
Table 14 – Immunity to co-channel digital signals.....	25
Table 15 – Requirements of delay to 0 dB echo.....	25
Table 16 – Requirements of C/N thresholds to 30 μ s echo.....	26
Table 17 – Resistance to dynamic multipath channel.....	26
Table 18 – Requirements of pulse noise interference length.....	26
Table B.1 – Rayleigh channel model (static).....	39
Table B.2 – Rice channel model (static).....	40
Table B.3 – Dynamic multipath channel model.....	40
Table C.1 – Frame structure.....	47
Table C.2 – Data structure of a normal channel.....	48
Table C.3 – Data structure of LFE channel.....	48
Table C.4 – Frame header type.....	49
Table C.5 – Difference between two types of frame headers.....	49
Table C.6 – Number of bits used for decoding the length of audio data frame.....	49
Table C.7 – Sampling frequency supported by this annex.....	50
Table C.8 – Number of bits used for decoding the number of normal channels.....	50
Table C.9 – Number of bits used for decoding the number of LFE channels.....	51
Table C.10 – Channel configuration auxiliary information decision.....	51
Table C.11 – Sum/difference coding decision.....	51
Table C.12 – Intensity joint coding decision.....	51

Table C.13 – Window function index	52
Table C.14 – Number of transient clusters	53
Table C.15 – Implicit length of a transient cluster of a stationary frame	53
Table C.16 – Starting location of the first transient cluster and the location where the first transient occurs	53
Table C.17 – Variables used to decode sum/difference coding decision	54
Table C.18 – All unused sum/difference coding decision	55
Table C.19 – Sum/difference coding decision	55
Table C.20 – Default normal channel configuration	56
Table C.21 – Presentation of a normal channel configuration	56
Table C.22 – Audio data arranging the order of each channel in the audio frame	56
Table C.23 – Arranging the order of audio data for 5.1 channel surround sound in the audio frame	57
Table C.24 – Subband samples arranged in a natural order	58
Table C.25 – Subband samples arranged in interleaving order	59
Table C.26 – Optional window function around the transient location	63

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DIGITAL TERRESTRIAL TELEVISION RECEIVERS
FOR THE DTMB SYSTEM**
FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62753 has been prepared by technical area 1: Terminals for audio, video and data services and contents of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

CDV	Report on voting
100/2108/CDV	100/2429A/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This International Standard contains baseline specifications and test methods of receivers for the DTMB system. The DTMB (Digital Terrestrial/Television Multimedia Broadcasting) is the digital television terrestrial broadcasting standard of China published in August 2006. The main technologies adopted in this standard are: frame header design and guard interval padding with pseudo-random noise sequences, which can be used for fast synchronization and high-efficiency channel estimation/equalization, low-density parity-check channel coding, spread spectrum transmission of system information. This standard can support payload data rate ranging from 4,813 Mbit/s to 32,486 Mbit/s, standard-definition TV and high-definition TV services, mobile and stationary receptions, multiple frequency network and single frequency network.

- Digital television, as a new generation of TV technology, can improve the transmission quality and make it possible to provide more services. With the worldwide transition from the analogue TV to digital TV, the developing prospect of the DTMB system can be expected in the future.

DIGITAL TERRESTRIAL TELEVISION RECEIVERS FOR THE DTMB SYSTEM

1 Scope

This International Standard specifies the basic functions, interfaces, performance requirements and test methods of the receivers for the Digital Terrestrial/Television Multimedia Broadcasting (DTMB) system. This standard can be applied to digital television terrestrial receivers carrying multiple SDTV programs or HDTV programs for both mobile and stationary receptions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61937-12, *Digital audio –Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 12: Non-linear PCM bitstreams according to the DRA formats*

ISO/IEC 13818-1, *Information technology – Generic coding of moving pictures and associated audio information: Systems*

ISO/IEC 13818-2, *Information technology – Generic coding of moving pictures and associated audio information: Video*

ISO/IEC 13818-3, *Information technology – Generic coding of moving pictures and associated audio information –Part 3: Audio*

ETSI ETR 154, *Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications*

ETSI TS 102 366, *Digital Audio Compression (AC-3, Enhanced AC-3) Standard*

3 Abbreviations and symbols

For the purposes of this document, the following abbreviations apply.

AEF	Acceptable Error Free
BCH	Bose-Chaudhuri-Hocquenghem code
CA	Conditional Access
CAT	Conditional Access Table
C/N	Carrier-Noise ratio
Demux	Demultiplexer
DRA	Dynamic Resolution Adaptation
DTMB	Digital Terrestrial/Television Multimedia Broadcasting
ECM	Entitlement Control Message
EIT	Event Information Table