

**Methods of measurement for digital network -  
Performance characteristics of terrestrial digital  
multimedia transmission network (IEC 62553:2012)**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 62553:2013 sisaldab Euroopa standardi EN 62553:2013 ingliskeelset teksti.	This Estonian standard EVS-EN 62553:2013 consists of the English text of the European standard EN 62553:2013.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 08.02.2013.	Date of Availability of the European standard is 08.02.2013.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 33.170

### Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Aru 10, 10317 Tallinn, Eesti; [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

### The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:  
Aru 10, 10317 Tallinn, Estonia; [www.evs.ee](http://www.evs.ee); phone 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

**Methods of measurement for digital network -  
Performance characteristics of terrestrial digital  
multimedia transmission network  
(IEC 62553:2012)**

Méthodes de mesure applicables  
aux réseaux numériques -  
Caractéristiques de performance  
des réseaux de transmission  
numériques multimédia terrestres  
(CEI 62553:2012)

Messverfahren für digitale Netze -  
Leistungsdaten von terrestrischen  
digitalen Multimedia-Sendernetzen  
(IEC 62553:2012)

This European Standard was approved by CENELEC on 2013-01-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 103/89/CDV, future edition 1 of IEC 62553, prepared by IEC/TC 103 "Transmitting equipment for radiocommunication" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62553:2013.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-10-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-01-01

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

## Endorsement notice

The text of the International Standard IEC 62553:2012 was approved by CENELEC as a European Standard without any modification.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62273-1	2007	Methods of measurement for radio transmitters - Part 1: Performance characteristics of terrestrial digital television transmitters	EN 62273-1	2007
ISO/IEC 13818-1	2007	Information technology - Generic coding of moving pictures and associated audio information: Systems	-	-
+ A1	2007			
+ A2	2008			
+ A3	2009			
+ A4	2009			
+ A5	2011			
+ A6	2011			
ETSI TR 101 190	-	Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial services; Transmission aspects	-	-
ETSI TS 101 191	-	Digital Video Broadcasting (DVB); DVB mega-frame for Single Frequency Network (SFN) synchronization	-	-
ETSI TR 102 377	-	Digital Video Broadcasting (DVB); DVB-H Implementation Guidelines	-	-
ARIB STD-B31	-	Transmission system for digital terrestrial television broadcasting	-	-

## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	7
3 Terms and abbreviations .....	8
4 General conditions of measurement .....	9
4.1 Definitions and classifications of digital terrestrial TV transmission network .....	9
4.1.1 General .....	9
4.1.2 Network classification for transmitting frequencies.....	10
4.1.3 Network classification on useable contribution links for signal transport system between stations .....	11
4.2 Signal form.....	11
4.2.1 TS signal form .....	11
4.2.2 IF signal form .....	11
4.3 Test signals and auxiliary signals for measurement .....	11
4.3.1 Test signals .....	11
4.3.2 Auxiliary signals for measurement .....	12
5 Methods of measurement for signal delay time .....	12
5.1 Scope.....	12
5.2 Definition of signal delay time.....	13
5.2.1 Delay time .....	13
5.2.2 Relative delay time difference.....	13
5.3 Direct/indirect measurement.....	13
5.3.1 General .....	13
5.3.2 Direct measurement system .....	14
5.3.3 Indirect measurement system .....	14
5.4 Measurement place .....	14
5.5 Classification of measurement system.....	15
6 Methods of measurement for performances of radio wave relay station .....	17
6.1 Scope.....	17
6.2 Measurement diagram and measurement items.....	17
6.2.1 General .....	17
6.2.2 Measurement diagram .....	17
6.2.3 Measurement items .....	18
6.3 Methods of measurement .....	18
6.3.1 General .....	18
6.3.2 BER (case 2).....	19
6.3.3 Equivalent noise degradation (END) .....	20
6.3.4 Amplitude frequency characteristics .....	21
6.3.5 Delay profile .....	22
6.3.6 Phase jitter .....	22
7 Methods of measurement for performances of signal quality improvement instrument used in radio wave relay station .....	24
7.1 General.....	24
7.2 Classification of signal quality improvement instrument .....	25
7.3 Measurement diagram and measurement condition .....	25
7.4 Common measurement items .....	25

7.5 Methods of measurement for each kind of compensator .....	26
Annex A (informative) Examples of measurement methods for signal delay .....	27
Annex B (informative) Examples of measurement methods for signal quality of relay stations .....	38
Annex C (normative) Principle and methods of measurement of compensators .....	45
Figure 1 – Example of transmission network .....	10
Figure 2 – Delay time and relative delay time difference definitions .....	13
Figure 3 – Direct and indirect measurement method .....	14
Figure 4 – Measurement diagram of received signal of relay station (case a)) .....	17
Figure 5 – Measurement diagram of relay station (case b)) .....	17
Figure 6 – BER- Measurement method .....	20
Figure 7 – Definition of END .....	21
Figure 8 – Measurement diagram of amplitude-frequency characteristics .....	22
Figure 9 – Measurement block diagram of delay profile .....	22
Figure 10 – Reference model .....	23
Figure 11 – Conceptual diagram of relay station using a compensator .....	25
Figure A.1 – General measurement system for cases 1 to 3 .....	27
Figure A.2 – Example of frame sync signal extracting part .....	28
Figure A.3 – Example of OFDM demodulator for frame timing extraction .....	29
Figure A.4 – Block diagram of direct measurement methods for time delay of OFDM signal .....	30
Figure A.5 – Example of frequency characteristics of combined signal .....	31
Figure A.6 – Example of delay profile of combined signal .....	31
Figure A.7 – General measurement system for cases 5,6,13 and 14 .....	32
Figure A.8 – Timing chart for signal delay measurement .....	32
Figure A.9 – Principle of measurement using 1 pps signal .....	33
Figure A.10 – General measurement system for cases 7, 8 and 15,16 .....	34
Figure A.11 – Measurement system for delay time (time reference is 1pps signal of GPS) .....	35
Figure A.12 – Timing relation of each signals .....	36
Figure A.13 – Delay profile of OFDM signal .....	37
Figure B.1 – BER measurement conceptual diagram for Null Packet method .....	39
Figure B.2 – Examples of measurement result by Null Packet method .....	39
Figure B.3 – Method to compare the data before/after correction .....	40
Figure B.4 – Superimposed C/N measurement system .....	41
Figure B.5 – Inherent degradation of OFDM demodulator measurement system .....	43
Figure B.6 – Calculation process of delay profile .....	44
Figure C.1 – Example of measurement block diagram for performances of loop-back canceller .....	46
Figure C.2 – Example of measurement block diagram for performances of diversity reception equipment .....	48
Figure C.3 – Example of measurement block diagram for performances of co-channel interference canceller .....	50

Figure C.4 – Example of measurement block diagram for performances of C/N Reset equipment..... 52

Table 1 – Classification of contribution link .....	11
Table 2 – Parameter set of OFDM signal for test in ISDB-T system.....	11
Table 3 – Parameter set of OFDM signal for test in DVB-T/H system .....	12
Table 4 – Combination of signal type .....	13
Table 5 – Classification of measurement system for signal delay time .....	16
Table 6 – An example of measurement items for Relay station .....	18
Table 7 – Example of the parameter set of spectrum analyzer .....	22
Table 8 – Compensators used in digital terrestrial broadcasting relay network.....	25
Table 9 – Examples of measurement items for signal quality improvement instrument .....	26
Table A.1 – Signal format and timing extraction of each case .....	27
Table A.2 – Equipment list for measurement.....	30
Table A.3 – Equipment list for delay time measurement.....	35
Table B.1 – Definition of Null Packet (in case of ISDB-T).....	38
Table B.2 – Example of noise power measurement parameters (6 MHz ISDB-T).....	42
Table B.3 – Example of signal power measurement parameters (6 MHz ISDB-T).....	42

preview generated by EVS



## METHODS OF MEASUREMENT FOR DIGITAL NETWORK –

### Performance characteristics of terrestrial digital multimedia transmission network

#### 1 Scope

When a transmission network for digital terrestrial television broadcasting (DTTB) is being deployed, new networking technologies such as the Single Frequency Network (SFN) can be employed excelling the conventional analogue TV systems. However, new technical evaluation parameters are introduced for installing SFN systems. In addition new quality evaluation methods are also established in order to achieve stable and high-quality broadcasting services avoiding the cliff effect, which is one of the typical phenomena in the digital transmission that the signal quality is abruptly degraded when the received C/N becomes just lower than a specific value representing the system limit.

Given the background described above, this International Standard has the purposes of

- establishing measuring methods that enable the objective evaluation of the performance of transmission networks so as to make stable DTTB services a reality,
- establishing a technical baseline, such as a definition of technical terms, to standardize measuring methods.

The measurement methods described in this standard are intended for digital terrestrial television transmission network test and validation. The measurement methods for digital terrestrial transmitter are not included in this standard. These methods are described in IEC 62273-1.

This standard does not give any regulations and/or mandatory requirements. The specifications and requirements defined for each system have priority over this standard. However, there may be some cases where details are not specified in each individual specification or different systems should be evaluated under a common measurement method. The purpose of this standard is to provide a common technical baseline that makes measurement results comparable in all cases.

#### 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 62273-1:2007, *Methods of measurement for radio transmitters – Performance characteristics of terrestrial digital television transmitters*

ISO/IEC 13818-1:2007, *Information technology – Generic coding of moving pictures and associated audio information: Systems*

Amendments 1 to 6

TR 101 190, *Digital video broadcasting (DVB); implementation guidelines for DVB Terrestrial services; Transmission aspects*

TS 101 191, *Digital video broadcasting (DVB); DVB mega-frame for Single Frequency Network (SFN) synchronization*

TR 102 377, *Digital Video Broadcasting (DVB); DVB-H Implementation Guidelines*

ARIB STD-B31, *Transmission system for digital terrestrial television broadcasting*

### 3 Terms and abbreviations

ADC	Analog to Digital Converter
ARIB	Association of Radio Industries and Businesses
ASI	Asynchronous Serial Interface
ATM	Asynchronous Transfer Mode
BER	Bit Error Ratio
C/N	Carrier to Noise rate
CPU	Central Processing Unit
DTTB	Digital Terrestrial Television Broadcasting
DVB	Digital Video Broadcasting
DVB-H	DVB Handheld
DVB-T	DVB Terrestrial
D/U	Desired to Undesired Signal Ratio
END	Equivalent Noise Degradation
ETSI	European Telecommunication Standards Institute
FFT	Fast Fourier Transform
GPS	Global Positioning System
IF	Intermediate Frequency
IFFT	Inverse Fast Fourier Transform
IIP	ISDB-T Information Packet
IP	Internet Protocol
ISDB-T	Integrated Services Digital Broadcasting – Terrestrial
ISI	Inter Symbol Interference
ISO	International Organization for Standardization
ITU	International Telecommunication Union
JEITA	Japan Electronics and Information Technology Industries Association
MER	Modulation Error Ratio
MFN	Multi-Frequency Network
MIP	Mega-frame Initialization Packet
MMSE	Minimum Mean Square Error
MPEG	Moving Picture Experts Group
OFDM	Orthogonal Frequency Division Multiplex
PCR	Program Clock Reference
PCR_AC	PCR Accuracy
PCR_FO	PCR Offset
PCR_OJ	PCR Overall Jitter
PDH	Plesiochronous Digital Hierarchy