
Preskusne metode za kovinske kable in druge pasivne komponente - 4-15. del: Elektromagnetna združljivost (EMC) - Preskusna metoda za meritve prenosne impedance in zaslonskega slabljenja ali sklopnega slabljenja s triosno celico (IEC 62153-4-15:2021)

Metallic cables and other passive components test methods - Part 4-15: Electromagnetic compatibility (EMC) - Test method for measuring transfer impedance and screening attenuation - or coupling attenuation with triaxial cell (IEC 62153-4-15:2021)

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Prüfverfahren für metallische Kommunikationskabel - Teil 4-15: Elektromagnetische Verträglichkeit (EMV) - Prüfverfahren zur Messung des Kopplungswiderstandes und der Schirmdämpfung oder der Kopplungsdämpfung mit der Triaxialen Zelle (IEC 62153-4-15:2021)

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Méthodes d'essais des câbles métalliques et autres composants passifs - Partie 4-15 : Compatibilité électromagnétique (CEM) - Méthode d'essai pour le mesurage de l'impédance de transfert et de l'affaiblissement d'écran - ou de l'affaiblissement de couplage avec cellule triaxiale (IEC 62153-4-15:2021)

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33.120.10	Koaksialni kabli. Valovodi	Coaxial cables. Waveguides

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EUROPEAN STANDARD

EN IEC 62153-4-15

NORME EUROPÉENNE

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English Version

Metallic cables and other passive components test methods -
Part 4-15: Electromagnetic compatibility (EMC) - Test method for
measuring transfer impedance and screening attenuation - or
coupling attenuation with triaxial cell
(IEC 62153-4-15:2021)

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composants passifs - Partie 4-15 : Compatibilité
électromagnétique (CEM) - Méthode d'essai pour le
mesurage de l'impédance de transfert et de
l'affaiblissement d'écran - ou de l'affaiblissement de
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Prüfverfahren für metallische Kommunikationskabel - Teil 4-
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und der Schirmdämpfung oder der Kopplungsdämpfung mit
der Triaxialen Zelle
(IEC 62153-4-15:2021)

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EN IEC 62153-4-15:2021 (E)**European foreword**

The text of document 46/814/FDIS, future edition 2 of IEC 62153-4-15, prepared by IEC/TC 46 “Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62153-4-15:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-06-07 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-09-07 document have to be withdrawn

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61196-1	-	Coaxial communication cables - Part 1:- Generic specification - General, definitions and requirements		-
IEC TS 62153-4-1	2014	Metallic communication cable test methods- - Part 4-1: Electromagnetic compatibility (EMC) - Introduction to electromagnetic screening measurements		-
IEC 62153-4-3	-	Metallic communication cable test methods- - Part 4-3: Electromagnetic compatibility (EMC) - Surface transfer impedance - Triaxial method		-
IEC 62153-4-4	2015	Metallic communication cable test methods- - Part 4-4: Electromagnetic compatibility (EMC) - Shielded screening attenuation, test method for measuring of the screening attenuation a_S up to and above 3 GHz		-
IEC 62153-4-7	-	Metallic cables and other passive components - Test methods - Part 4-7: Electromagnetic compatibility (EMC) -Test method for measuring of transfer impedance Z_T and screening attenuation a_S or coupling attenuation a_C of connectors and assemblies - Triaxial tube in tube method	EN IEC 62153-4-7	-
IEC 62153-4-8	-	Metallic cables and other passive- components - Test methods - Part 4-8: Electromagnetic compatibility (EMC) - Capacitive coupling admittance		-
IEC 62153-4-9	2018	Metallic communication cable test methods - Part 4-9: Coupling attenuation of screened balanced cables, triaxial method		-

EN IEC 62153-4-15:2021 (E)

IEC 62153-4-10	-	Metallic communication cable test methods - Part 4-10: Electromagnetic compatibility (EMC) - Transfer impedance and screening attenuation of feed-throughs and electromagnetic gaskets - Double coaxial test method	-
IEC 62153-4-16	-	Metallic cables and other passive-components test methods - Part 4-16: Electromagnetic compatibility (EMC) - Extension of the frequency range to higher frequencies for transfer impedance and to lower frequencies for screening attenuation measurements using the triaxial set-up	-

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IEC 62153-4-15

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**Metallic cables and other passive components test methods –
Part 4-15: Electromagnetic compatibility (EMC) – Test method for measuring
transfer impedance and screening attenuation – or coupling attenuation with
triaxial cell**

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**Méthodes d'essais des câbles métalliques et autres composants passifs –
Partie 4-15: Compatibilité électromagnétique (CEM) – Méthode d'essai pour
le mesurage de l'impédance de transfert et de l'affaiblissement d'écran –
ou de l'affaiblissement de couplage avec cellule triaxiale**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**METALLIC CABLES AND OTHER PASSIVE
COMPONENTS TEST METHODS –****Part 4-15: Electromagnetic compatibility (EMC) – Test method for
measuring transfer impedance and screening attenuation –
or coupling attenuation with triaxial cell**

FOREWORD

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International Standard IEC 62153-4-15 has been prepared by IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) measurement of coupling attenuation of balanced connectors, assemblies and components with balun and balunless added;
- b) application of a test adapter was added;
- c) application of a moveable shorting plane;

- d) application of the triaxial "absorber" cell;
- e) correction of test results in the case that the receiver input impedance R is higher than the characteristic impedance of the outer circuit Z_2 .

The text of this International Standard is based on the following documents:

FDIS	Report on voting
46/814/FDIS	46/822/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all the parts in the IEC 62153-4 series, published under the general title *Metallic communication cable test methods – Electromagnetic compatibility (EMC)*, can be found on the IEC website.

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

- reconfirmed, <https://standards.itih.ai/catalog/standards/sist/4f5214ec-73f2-417c-b591-7d6fd9f4074/sist-en-iec-62153-4-15-2021>
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- replaced by a revised edition, or
- amended.

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METALLIC CABLES AND OTHER PASSIVE COMPONENTS TEST METHODS –

Part 4-15: Electromagnetic compatibility (EMC) – Test method for measuring transfer impedance and screening attenuation – or coupling attenuation with triaxial cell

1 Scope

This part of IEC 62153 specifies the procedures for measuring with triaxial cell the transfer impedance, screening attenuation or the coupling attenuation of connectors, cable assemblies and components, for example accessories for analogue and digital transmission systems, and equipment for communication networks and cabling.

Measurements can be achieved by applying the device under test directly to the triaxial cell or with the tube-in-tube method in accordance with IEC 62153-4-7.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61196-1, *Coaxial communication cables – Part 1: Generic specification – General, definitions and requirements*

IEC TS 62153-4-1:2014, *Metallic communication cable test methods – Part 4-1: Electromagnetic Compatibility (EMC) – Introduction to electromagnetic screening measurements*

IEC 62153-4-3, *Metallic communication cable test methods – Part 4-3: Electromagnetic compatibility (EMC) – Surface transfer impedance – Triaxial method*

IEC 62153-4-4:2015, *Metallic communication cable test methods – Part 4-4: Electromagnetic compatibility (EMC) – Test method for measuring of the screening attenuation a_S up to and above 3 GHz, triaxial method*

IEC 62153-4-7, *Metallic communication cable test methods – Part 4-7: Electromagnetic compatibility (EMC) – Test method for measuring the transfer impedance Z_T and the screening attenuation a_s or coupling attenuation a_c of connectors and assemblies up to and above 3 GHz – Triaxial Tube in tube method*

IEC 62153-4-8, *Metallic cables and other passive components – Test methods – Part 4-8: Electromagnetic compatibility (EMC) – Capacitive coupling admittance*

IEC 62153-4-9:2018, *Metallic communication cable test methods – Part 4-9: Electromagnetic compatibility (EMC) – Coupling attenuation of screened balanced cables, triaxial method*

IEC 62153-4-10, *Metallic communication cable test methods – Part 4-10: Electromagnetic compatibility (EMC) – Transfer impedance and screening attenuation of feed-throughs and electromagnetic gaskets – Double coaxial test method*

IEC 62153-4-16, *Metallic communication cable test methods – Part 4-16: Electromagnetic compatibility (EMC) – Extension of the frequency range to higher frequencies for transfer impedance and to lower frequencies for screening attenuation measurements using the triaxial set-up*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61196-1 and the following apply.

3.1

triaxial cell

rectangular housing in analogy to the principles of the triaxial test procedure, consisting of a non-ferromagnetic metallic material

Note 1 to entry: The triaxial test procedure is described in IEC 62153-4-3 and IEC 62153-4-4.

3.2

surface transfer impedance

Z_T

for an electrically short screen, quotient of the longitudinal voltage U_1 induced to the inner circuit by the current I_2 fed into the outer circuit or vice versa [Ω] (see Figure 1)

Note 1 to entry: The value Z_T of an electrically short screen is expressed in ohms [Ω] or decibels in relation to 1 Ω .

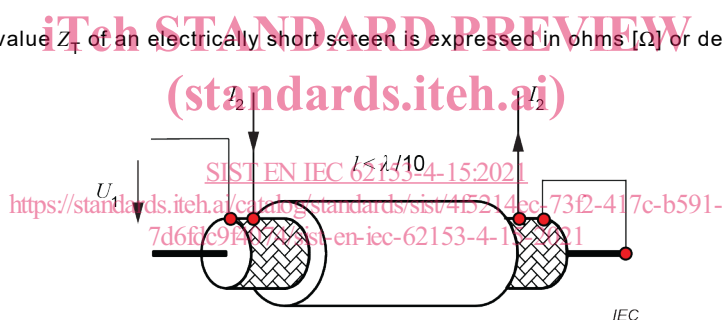


Figure 1 – Definition of Z_T

$$Z_T = \frac{U_1}{I_2} \quad (1)$$

$$Z_T \text{ dB}(\Omega) = 20 \cdot \lg \left(\frac{|Z_T|}{1\Omega} \right) \quad (2)$$

3.3

effective transfer impedance

Z_{TE}

impedance defined as:

$$Z_{TE} = \max |Z_F \pm Z_T| \quad (3)$$

where Z_F is the capacitive coupling impedance

3.4 screening attenuation

a_s

for electrically long devices, i.e. above the cut-off frequency, logarithmic ratio of the feeding power P_1 and the periodic maximum values of the coupled power $P_{r,\max}$ in the outer circuit

$$a_s = 10 \cdot \lg \left(\text{Env} \left| \frac{P_1}{P_{r,\max}} \right| \right) \quad (4)$$

Note 1 to entry: The screening attenuation of an electrically short device is defined as:

$$a_s = 20 \cdot \lg \frac{150 \Omega}{Z_{TE}} \quad (5)$$

where

150 Ω is the standardised impedance of the outer circuit.

3.5 coupling attenuation

a_c

for a screened balanced device, sum of the unbalance attenuation a_u of the symmetric pair and the screening attenuation a_s of the screen of the device under test

Note 1 to entry: For electrically long devices, i.e. above the cut-off frequency, the coupling attenuation a_c is defined as the logarithmic ratio of the feeding power P_1 and the periodic maximum values of the coupled power $P_{r,\max}$ in the outer circuit.

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3.6 coupling length

length of cable that is inside the test jig, i.e. the length of the screen under test

Note 1 to entry: The coupling length is electrically short, if

$$\frac{\lambda_0}{L} > 10 \cdot \sqrt{\varepsilon_{r1}} \quad \text{or} \quad f < \frac{c_0}{10 \cdot L \cdot \sqrt{\varepsilon_{r1}}} \quad (6)$$

or electrically long, if

$$\frac{\lambda_0}{L} \leq 2 \cdot \left| \sqrt{\varepsilon_{r1}} - \sqrt{\varepsilon_{r2}} \right| \quad \text{or} \quad f > \frac{c_0}{2 \cdot L \cdot \left| \sqrt{\varepsilon_{r1}} - \sqrt{\varepsilon_{r2}} \right|} \quad (7)$$

where

L is the effective coupling length, in m;

λ_0 is the free space wavelength, in m;

ε_{r1} is the resulting relative permittivity of the dielectric of the cable;

ε_{r2} is the resulting relative permittivity of the dielectric of the secondary circuit;

f is the frequency, in Hz;

c_0 is the velocity of light in free space, in m/s.