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INTERNATIONAL STANDARD

CONSOLIDATED VERSION

**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**

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CONTENTS

FOREWORD 5
INTRODUCTION 7
INTRODUCTION to Amendment 7
1 Scope 8
2 Normative references 8
3 Terms and definitions 9
4 Physical background 11
5 Principle of the test methods 11
5.1 General 11
5.2 Transfer impedance 12
5.3 Screening attenuation 12
5.4 Coupling attenuation 13
6 Test procedure 14
6.1 General 14
6.2 Tube in tube procedure 14
6.3 Test equipment 15
6.4 Calibration procedure 15
6.5 Connection between extension tube and device under test 16
6.6 Dynamic range respectively noise floor 16
6.7 Impedance matching 17
6.8 Influence of adapters 17
7 Sample preparation 18
7.1 Coaxial connector or device 18
7.2 Balanced or multiconductor device 18
7.3 Cable assembly 20
8 Measurement of transfer impedance 20
8.1 General 20
8.2 Principle block diagram of transfer impedance 20
8.3 Measuring procedure – Influence of connecting cables 21
8.4 Measuring 21
8.5 Evaluation of test results 21
8.6 Test report 22
9 Screening attenuation 22
9.1 General 22
9.2 Impedance matching 22
9.2.1 General 22
9.2.2 Evaluation of test results with matched conditions 23
9.2.3 Measuring with mismatch 24
9.2.4 Evaluation of test results 24
9.3 Test report 24
10 Coupling attenuation 25
10.1 General 25
10.2 Procedure for testing connectors 25
10.3 Procedure for testing cable assemblies 26
10.4 Evaluation of test results when using a balun 27
10.5 Evaluation of test results when using a multiport VNA 27

10.6 Test report 28
Annex A (normative) Determination of the impedance of the inner circuit 29
Annex B (informative) Example of a self-made impedance matching adapter 30
Annex C (informative) Measurements of the screening effectiveness of connectors and cable assemblies 32
C.1 General 32
C.2 Physical basics 32
C.2.1 General coupling equation 32
C.2.2 Coupling transfer function 34
C.3 Triaxial test set-up 36
C.3.1 General 36
C.3.2 Measurement of cable assemblies 37
C.3.3 Measurement of connectors 38
C.4 Conclusion 41
Annex D (informative) Influence of contact resistances 42
Annex E (informative) Direct measurement of screening effectiveness of connectors 44
E.1 Scope 44
E.2 Test set-up 44
E.3 Construction details of test set-up 45
Annex F (normative) Mixed mode S-parameters 47
F.1 General 47
F.2 Definition of mixed mode S-parameters 47
F.3 Reference impedance of a VNA 50
Annex G (normative) Accessories for measuring coupling attenuation 51
G.1 TP connecting unit 51
G.2 Termination of the DUT 51
G.3 Test adapter 52
G.3.1 General 52
G.3.2 Direct feeding with coaxial cables 52
G.3.3 Balanced feeding cable 53
G.3.4 Movable short circuit 53
Annex H (informative) Low frequency screening attenuation 55
Annex I (normative) Coupling attenuation of unscreened single or multiple pairs 56
I.1 General 56
I.2 Coupling attenuation of unscreened connector 56
I.3 Coupling attenuation of unscreened cable assembly 57
I.4 Coupling attenuation of long unscreened cable assembly 57
I.5 Alternative coupling attenuation test method for cable assembly 58
Annex J (normative) Low frequency coupling attenuation (LFCA) 59
J.1 General 59
J.2 Test procedure 59
J.3 Sample preparation 59
J.4 Set-up verification and measurement uncertainties 59
J.5 Expression of the test results 60
Annex K (normative) Coupling attenuation expressed by mixed mode scattering parameter and an envelope line 61
K.1 General 61
K.2 Coupling attenuation expressed by mixed mode scattering parameter 61

K.3 Envelope line of coupling attenuation 61
Annex L (normative) Measurement of screening attenuation at higher frequencies 63
L.1 General 63
L.2 Cut-off frequencies of higher order modes (HOM) 63
L.3 The effect of acting higher order modes in the measurements 65
L.4 Suppression of higher order modes with magnetic absorbers 65
L.5 Evaluation of results 66
L.6 Further considerations 66
Bibliography 67

Figure 1 – Definition of Z_T 9
Figure 2 – Principle of the test set-up to measure transfer impedance and screening or coupling attenuation of connectors with tube in tube 12
Figure 3 – Principle of the test set-up to measure transfer impedance and screening attenuation of a cable assembly 14
Figure 4 – Principle set-up for verification test 17
Figure 5 – Preparation of balanced or multiconductor connectors 20
Figure 6 – Test set-up (principle) for transfer impedance measurement according to test of IEC 62153-4-3 with load resistor in inner circuit and without damping resistor in outer circuit 21
Figure 7 – Measuring the screening attenuation with tube in tube with impedance matching device 23
Figure 8 – Coupling attenuation, principle test set-up with 2-port VNA and balun 25
Figure 9 – Coupling attenuation, principle set-up with multiport VNA and TP-connecting unit 26
Figure 10 – Coupling attenuation, principle test set-up with multiport VNA and TP-connecting unit for measuring complete cable assemblies 26
Figure 11 – Coupling attenuation, principle test set-up with multiport VNA and TP-connecting unit for measuring halved cable assemblies 27
Figure 12 – Typical measurement of a connector of 0,04 m length with 1 m extension tube 28
Figure B.1 – Attenuation and return loss of a 50 Ω to 5 Ω impedance matching adapter, log scale 30
Figure B.2 – Attenuation and return loss of a 50 Ω to 5 Ω impedance matching adapter, lin scale 31
Figure C.1 – Equivalent circuit of coupled transmission lines 33
Figure C.2 – Summing function S 34
Figure C.3 – Calculated coupling transfer function (l = 1 m; e_{r1} = 2,3; e_{r2} = 1; Z_F = 0) 35
Figure C.4 – Triaxial set-up for the measurement of the screening attenuation a_S and the transfer impedance Z_T 36
Figure C.5 – Simulation of a cable assembly (logarithmic scale) 38
Figure C.6 – Simulation of a cable assembly (linear scale) 38
Figure C.7 – Triaxial set-up with extension tube for short cable assemblies 39
Figure C.8 – Triaxial set-up with extension tube for connectors 39
Figure C.9 – Simulation, logarithmic frequency scale 40
Figure C.10 – Measurement, logarithmic frequency scale 40
Figure C.11 – Simulation, linear frequency scale 40
Figure C.12 – Measurement, linear frequency scale 40

Figure C.13 – Simulation, logarithmic frequency scale 41
Figure C.14 – simulation, linear frequency scale 41
Figure D.1 – Contact resistances of the test set-up 42
Figure D.2 – Equivalent circuit of the test set-up 42
Figure E.1 – Principle of the test set-up to measure transfer impedance and screening attenuation of a connector 44
Figure E.2 – Principle of the test set-up to measure transfer impedance and screening attenuation of a cable assembly 45
Figure E.3 – Example of sample preparing 45
Figure E.4 – Screening tube with separate nut 46
Figure E.5 – Screening fixed with associated nut 46
Figure F.1 – Common two-port network 47
Figure F.2 – Common four port network 47
Figure F.3 – Physical and logical ports of a VNA 48
Figure F.4 – Nomenclature of mixed mode S-parameters 48
Figure F.5 – Measurement configuration, single ended response 49
Figure F.6 – Measurement configuration, differential mode response 50
Figure G.1 – Termination of the device under test, principle 52
Figure G.2 – Balunless measurement of coupling attenuation of a balanced connector, direct feeding, principle 53
Figure G.3 – Balunless measurement of coupling attenuation of a cable assembly using balanced feeding cable, principle 53
Figure G.4 – Balunless measurement of coupling attenuation of a cable assembly using adapters with implemented short circuit, principle 54
Figure H.1 – Example for a screening attenuation test result of a cable assembly with a test length of 2 meters 55
Figure I.1 – Coupling attenuation of unscreened balanced pairs/cables 56
Figure I.2 – Coupling attenuation of an unscreened connector 57
Figure I.3 – Coupling attenuation of unscreened cable assembly 57
Figure I.4 – Coupling attenuation of long unscreened cable assembly 58
Figure I.5 – Coupling attenuation of connected ends 58
Figure J.1 – Example of reflected mode conversion S_{cd11} 60
Figure K.1 – Example of coupling attenuation with envelope line 62
Figure L.1 – Basic triaxial test procedure 63
Figure L.2 – Screening attenuation of an RG 214 up to 9 GHz 64
Figure L.3 – Shielding attenuation measurements including higher order modes when the CUT is mounted in 4 different radial positions 65
Figure L.4 – Comparison of shielding attenuation results obtained when narrow stripe of sheet absorbers are applied 66
Figure L.5 – Shielding attenuation results when two stripes of sheet absorbers are applied and 4 CUT positions were measured 66

Table 1 – IEC 62153, Metallic communication cable test methods – Test procedures with triaxial test set-up 11
Table G.1 – TP-connecting unit performance characteristics (100 kHz to 2 GHz) 51

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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

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IEC 62153-4-7 edition 3.1 contains the third edition (2021-07) [documents 46/812/FDIS and 46/820/RVD] and its amendment 1 (2025-11) [documents 46/1061/FDIS and 46/1070/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

IEC 62153-4-7 has been prepared by IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories. It is an International Standard.

This third edition cancels and replaces the second edition published in 2015 and its Amendment 1:2018. This edition constitutes a technical revision.

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

The document is revised and updated. It now includes IEC 62153-4-7:2015/COR1:2016 and IEC 62153-4-7:2015/AMD1:2018. Furthermore, the changes of the revised IEC 62153-4-9:2018 are included.

Measurements of the coupling attenuation can be achieved now by using a mixed mode network analyser (virtual balun). The following new annexes have been added:

– Annex E contains informative information about the direct measurement of screening effectiveness of connectors;
– Annex F gives normative information about mixed mode parameters;
– Annex G contains normative information about accessories for measuring coupling attenuation;
– Annex H discusses the low frequency screening attenuation.

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

FDIS	Report on voting
46/812/FDIS	46/820/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 parts of the IEC 62153 series, under the general title *Metallic cables and other passive components test methods* can be found on the IEC website.

The committee has decided that the contents of this document and its amendment 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,
– withdrawn, or
– revised.

INTRODUCTION

The shielded screening attenuation test set-up according to IEC 62153-4-3 and IEC 62153-4-4 have been extended to take into account the particularities of electrically short elements like connectors and cable assemblies. Due to the concentric outer tube of the triaxial set-up, measurements are independent of irregularities on the circumference and outer electromagnetic fields.

With the use of an additional resonator tube (inner tube respectively tube in tube), **a system is** created where the screening effectiveness of an electrically short device is measured in **realistic and controlled conditions.** Also, a lower cut off frequency for the transition between electrically short (transfer impedance Z_T) and electrically long (screening attenuation a_S) can be achieved.

A wide dynamic and frequency range can be applied to test even super screened connectors and assemblies with normal instrumentation from low frequencies up to the limit of defined transversal waves in the outer circuit at approximately 4 GHz.

INTRODUCTION to Amendment

The goal of this amendment is:

– to extend coupling attenuation measurements to unscreened connectors and cable assemblies

– to extend coupling attenuation measurements of connectors and cable assemblies to low frequencies by introducing the LFCA

– to extend 10.5, expression of results by a conversion formula between scattering parameter and coupling attenuation

– to introduce the application of a 20 dB/dec envelope curve for coupling attenuation

– to introduce the effect and the mitigation techniques of higher order modes when doing high frequency measurements beyond the higher order mode cutoff-frequency of the triaxial outer system

1 Scope

This part of IEC 62153 deals with the triaxial tube in tube method. This triaxial method is suitable to determine the surface transfer impedance and/or screening attenuation and coupling attenuation of mated screened connectors (including the connection between cable and connector) and cable assemblies. This method could also be extended to determine the transfer impedance, coupling or screening attenuation of balanced or multipin connectors and multicore cable assemblies. For the measurement of transfer impedance and screening- or coupling attenuation, only one test set-up is needed.

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 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, *Metallic communication cable test methods – Part 4-4: Electromagnetic compatibility (EMC) –Test method for measuring of the screening attenuation as up to and above 3 GHz, triaxial 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 62153-4-9:2018/AMD1:2020
IEC 62153-4-9:2018/AMD2:2024

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 62153-4-15:~~2015~~2021, *Metallic ~~communication~~ cables and other passive components test methods - Part 4-15: Electromagnetic compatibility (EMC)~~ –~~ related test method for measuring transfer impedance and screening attenuation~~ –~~ or coupling attenuation with triaxial cell*
IEC 62153-4-15:2021/AMD1:2024

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*

EN 50117-9-2:2019, *Coaxial cables – Part 9-2: Sectional specification for coaxial cables for analogue and digital transmission – Indoor droop cables for systems operating at 5 MHz – 3 000 MHz*

CONTENTS

FOREWORD 5
INTRODUCTION 7
INTRODUCTION to Amendment 7
1 Scope 8
2 Normative references 8
3 Terms and definitions 9
4 Physical background 11
5 Principle of the test methods 11
5.1 General 11
5.2 Transfer impedance 12
5.3 Screening attenuation 12
5.4 Coupling attenuation 13
6 Test procedure 14
6.1 General 14
6.2 Tube in tube procedure 14
6.3 Test equipment 15
6.4 Calibration procedure 15
6.5 Connection between extension tube and device under test 16
6.6 Dynamic range respectively noise floor 16
6.7 Impedance matching 17
6.8 Influence of adapters 17
7 Sample preparation 18
7.1 Coaxial connector or device 18
7.2 Balanced or multiconductor device 18
7.3 Cable assembly 20
8 Measurement of transfer impedance 20
8.1 General 20
8.2 Principle block diagram of transfer impedance 20
8.3 Measuring procedure – Influence of connecting cables 21
8.4 Measuring 21
8.5 Evaluation of test results 21
8.6 Test report 22
9 Screening attenuation 22
9.1 General 22
9.2 Impedance matching 22
9.2.1 General 22
9.2.2 Evaluation of test results with matched conditions 23
9.2.3 Measuring with mismatch 24
9.2.4 Evaluation of test results 24
9.3 Test report 24
10 Coupling attenuation 25
10.1 General 25
10.2 Procedure for testing connectors 25
10.3 Procedure for testing cable assemblies 26
10.4 Evaluation of test results when using a balun 27
10.5 Evaluation of test results when using a multiport VNA 27

10.6 Test report 28
Annex A (normative) Determination of the impedance of the inner circuit 29
Annex B (informative) Example of a self-made impedance matching adapter 30
Annex C (informative) Measurements of the screening effectiveness of connectors and cable assemblies 32
C.1 General 32
C.2 Physical basics 32
C.2.1 General coupling equation 32
C.2.2 Coupling transfer function 34
C.3 Triaxial test set-up 36
C.3.1 General 36
C.3.2 Measurement of cable assemblies 37
C.3.3 Measurement of connectors 38
C.4 Conclusion 41
Annex D (informative) Influence of contact resistances 42
Annex E (informative) Direct measurement of screening effectiveness of connectors 44
E.1 Scope 44
E.2 Test set-up 44
E.3 Construction details of test set-up 45
Annex F (normative) Mixed mode S-parameters 47
F.1 General 47
F.2 Definition of mixed mode S-parameters 47
F.3 Reference impedance of a VNA 50
Annex G (normative) Accessories for measuring coupling attenuation 51
G.1 TP connecting unit 51
G.2 Termination of the DUT 51
G.3 Test adapter 52
G.3.1 General 52
G.3.2 Direct feeding with coaxial cables 52
G.3.3 Balanced feeding cable 53
G.3.4 Movable short circuit 53
Annex H (informative) Low frequency screening attenuation 55
Annex I (normative) Coupling attenuation of unscreened single or multiple pairs 56
I.1 General 56
I.2 Coupling attenuation of unscreened connector 56
I.3 Coupling attenuation of unscreened cable assembly 57
I.4 Coupling attenuation of long unscreened cable assembly 57
I.5 Alternative coupling attenuation test method for cable assembly 58
Annex J (normative) Low frequency coupling attenuation (LFCA) 59
J.1 General 59
J.2 Test procedure 59
J.3 Sample preparation 59
J.4 Set-up verification and measurement uncertainties 59
J.5 Expression of the test results 60
Annex K (normative) Coupling attenuation expressed by mixed mode scattering parameter and an envelope line 61
K.1 General 61
K.2 Coupling attenuation expressed by mixed mode scattering parameter 61

K.3 Envelope line of coupling attenuation 61
Annex L (normative) Measurement of screening attenuation at higher frequencies 63
L.1 General 63
L.2 Cut-off frequencies of higher order modes (HOM) 63
L.3 The effect of acting higher order modes in the measurements 65
L.4 Suppression of higher order modes with magnetic absorbers 65
L.5 Evaluation of results 66
L.6 Further considerations 66
Bibliography 67

Figure 1 – Definition of Z_T 9
Figure 2 – Principle of the test set-up to measure transfer impedance and screening or coupling attenuation of connectors with tube in tube 12
Figure 3 – Principle of the test set-up to measure transfer impedance and screening attenuation of a cable assembly 14
Figure 4 – Principle set-up for verification test 17
Figure 5 – Preparation of balanced or multiconductor connectors 20
Figure 6 – Test set-up (principle) for transfer impedance measurement according to test of IEC 62153-4-3 with load resistor in inner circuit and without damping resistor in outer circuit 21
Figure 7 – Measuring the screening attenuation with tube in tube with impedance matching device 23
Figure 8 – Coupling attenuation, principle test set-up with 2-port VNA and balun 25
Figure 9 – Coupling attenuation, principle set-up with multiport VNA and TP-connecting unit 26
Figure 10 – Coupling attenuation, principle test set-up with multiport VNA and TP-connecting unit for measuring complete cable assemblies 26
Figure 11 – Coupling attenuation, principle test set-up with multiport VNA and TP-connecting unit for measuring halved cable assemblies 27
Figure 12 – Typical measurement of a connector of 0,04 m length with 1 m extension tube 28
Figure B.1 – Attenuation and return loss of a 50 Ω to 5 Ω impedance matching adapter, log scale 30
Figure B.2 – Attenuation and return loss of a 50 Ω to 5 Ω impedance matching adapter, lin scale 31
Figure C.1 – Equivalent circuit of coupled transmission lines 33
Figure C.2 – Summing function S 34
Figure C.3 – Calculated coupling transfer function (l = 1 m; e_{r1} = 2,3; e_{r2} = 1; Z_F = 0) 35
Figure C.4 – Triaxial set-up for the measurement of the screening attenuation a_S and the transfer impedance Z_T 36
Figure C.5 – Simulation of a cable assembly (logarithmic scale) 38
Figure C.6 – Simulation of a cable assembly (linear scale) 38
Figure C.7 – Triaxial set-up with extension tube for short cable assemblies 39
Figure C.8 – Triaxial set-up with extension tube for connectors 39
Figure C.9 – Simulation, logarithmic frequency scale 40
Figure C.10 – Measurement, logarithmic frequency scale 40
Figure C.11 – Simulation, linear frequency scale 40
Figure C.12 – Measurement, linear frequency scale 40

Figure C.13 – Simulation, logarithmic frequency scale 41
Figure C.14 – simulation, linear frequency scale 41
Figure D.1 – Contact resistances of the test set-up 42
Figure D.2 – Equivalent circuit of the test set-up 42
Figure E.1 – Principle of the test set-up to measure transfer impedance and screening attenuation of a connector 44
Figure E.2 – Principle of the test set-up to measure transfer impedance and screening attenuation of a cable assembly 45
Figure E.3 – Example of sample preparing 45
Figure E.4 – Screening tube with separate nut 46
Figure E.5 – Screening fixed with associated nut 46
Figure F.1 – Common two-port network 47
Figure F.2 – Common four port network 47
Figure F.3 – Physical and logical ports of a VNA 48
Figure F.4 – Nomenclature of mixed mode S-parameters 48
Figure F.5 – Measurement configuration, single ended response 49
Figure F.6 – Measurement configuration, differential mode response 50
Figure G.1 – Termination of the device under test, principle 52
Figure G.2 – Balunless measurement of coupling attenuation of a balanced connector, direct feeding, principle 53
Figure G.3 – Balunless measurement of coupling attenuation of a cable assembly using balanced feeding cable, principle 53
Figure G.4 – Balunless measurement of coupling attenuation of a cable assembly using adapters with implemented short circuit, principle 54
Figure H.1 – Example for a screening attenuation test result of a cable assembly with a test length of 2 meters 55
Figure I.1 – Coupling attenuation of unscreened balanced pairs/cables 56
Figure I.2 – Coupling attenuation of an unscreened connector 57
Figure I.3 – Coupling attenuation of unscreened cable assembly 57
Figure I.4 – Coupling attenuation of long unscreened cable assembly 58
Figure I.5 – Coupling attenuation of connected ends 58
Figure J.1 – Example of reflected mode conversion S_{cd11} 60
Figure K.1 – Example of coupling attenuation with envelope line 62
Figure L.1 – Basic triaxial test procedure 63
Figure L.2 – Screening attenuation of an RG 214 up to 9 GHz 64
Figure L.3 – Shielding attenuation measurements including higher order modes when the CUT is mounted in 4 different radial positions 65
Figure L.4 – Comparison of shielding attenuation results obtained when narrow stripe of sheet absorbers are applied 66
Figure L.5 – Shielding attenuation results when two stripes of sheet absorbers are applied and 4 CUT positions were measured 66

Table 1 – IEC 62153, Metallic communication cable test methods – Test procedures with triaxial test set-up 11
Table G.1 – TP-connecting unit performance characteristics (100 kHz to 2 GHz) 51

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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

FOREWORD

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IEC 62153-4-7 edition 3.1 contains the third edition (2021-07) [documents 46/812/FDIS and 46/820/RVD] and its amendment 1 (2025-11) [documents 46/1061/FDIS and 46/1070/RVD].

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

IEC 62153-4-7 has been prepared by IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories. It is an International Standard.

This third edition cancels and replaces the second edition published in 2015 and its Amendment 1:2018. This edition constitutes a technical revision.

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

The document is revised and updated. It now includes IEC 62153-4-7:2015/COR1:2016 and IEC 62153-4-7:2015/AMD1:2018. Furthermore, the changes of the revised IEC 62153-4-9:2018 are included.

Measurements of the coupling attenuation can be achieved now by using a mixed mode network analyser (virtual balun). The following new annexes have been added:

– Annex E contains informative information about the direct measurement of screening effectiveness of connectors;
– Annex F gives normative information about mixed mode parameters;
– Annex G contains normative information about accessories for measuring coupling attenuation;
– Annex H discusses the low frequency screening attenuation.

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

FDIS	Report on voting
46/812/FDIS	46/820/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 parts of the IEC 62153 series, under the general title *Metallic cables and other passive components test methods* can be found on the IEC website.

The committee has decided that the contents of this document and its amendment 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,
– withdrawn, or
– revised.

INTRODUCTION

The shielded screening attenuation test set-up according to IEC 62153-4-3 and IEC 62153-4-4 have been extended to take into account the particularities of electrically short elements like connectors and cable assemblies. Due to the concentric outer tube of the triaxial set-up, measurements are independent of irregularities on the circumference and outer electromagnetic fields.

With the use of an additional resonator tube (inner tube respectively tube in tube), **a system is** created where the screening effectiveness of an electrically short device is measured in **realistic and controlled conditions.** Also, a lower cut off frequency for the transition between electrically short (transfer impedance Z_T) and electrically long (screening attenuation a_S) can be achieved.

A wide dynamic and frequency range can be applied to test even super screened connectors and assemblies with normal instrumentation from low frequencies up to the limit of defined transversal waves in the outer circuit at approximately 4 GHz.

INTRODUCTION to Amendment

The goal of this amendment is:

– to extend coupling attenuation measurements to unscreened connectors and cable assemblies

– to extend coupling attenuation measurements of connectors and cable assemblies to low frequencies by introducing the LFCA

– to extend 10.5, expression of results by a conversion formula between scattering parameter and coupling attenuation

– to introduce the application of a 20 dB/dec envelope curve for coupling attenuation

– to introduce the effect and the mitigation techniques of higher order modes when doing high frequency measurements beyond the higher order mode cutoff-frequency of the triaxial outer system

1 Scope

This part of IEC 62153 deals with the triaxial tube in tube method. This triaxial method is suitable to determine the surface transfer impedance and/or screening attenuation and coupling attenuation of mated screened connectors (including the connection between cable and connector) and cable assemblies. This method could also be extended to determine the transfer impedance, coupling or screening attenuation of balanced or multipin connectors and multicore cable assemblies. For the measurement of transfer impedance and screening- or coupling attenuation, only one test set-up is needed.

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 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, *Metallic communication cable test methods – Part 4-4: Electromagnetic compatibility (EMC) –Test method for measuring of the screening attenuation as up to and above 3 GHz, triaxial 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 62153-4-9:2018/AMD1:2020
IEC 62153-4-9:2018/AMD2:2024

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 62153-4-15:2021, *Metallic cables and other passive components test methods - Part 4-15: Electromagnetic compatibility (EMC) related test method for measuring transfer impedance and screening attenuation or coupling attenuation with triaxial cell*
IEC 62153-4-15:2021/AMD1:2024

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*

EN 50117-9-2:2019, *Coaxial cables – Part 9-2: Sectional specification for coaxial cables for analogue and digital transmission – Indoor droop cables for systems operating at 5 MHz – 3 000 MHz*