

| | | |
|------------|--|--|
| STN | Elektromagnetická kompatibilita (EMC) Časť 4-3: Metódy skúšania a merania Skúška odolnosti proti vyžarovanému vysokofrekvenčnému elektromagnetickému poľu | STN EN IEC 61000-4-3 33 3432 |
|------------|--|--|

Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 01/21

Obsahuje: EN IEC 61000-4-3:2020, IEC 61000-4-3:2020

Oznámením tejto normy sa od 13.10.2023 ruší
STN EN 61000-4-3 (33 3432) z apríla 2007

132308

EUROPEAN STANDARD

EN IEC 61000-4-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2020

ICS 33.100.20

Supersedes EN 61000-4-3:2006, EN 61000-4-3:2006/IS1:2009 and all of its amendments and corrigenda (if any)

English Version

Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3:2020)

Compatibilité électromagnétique (CEM) - Partie 4-3 :
Techniques d'essai et de mesure - Essai d'immunité aux
champs électromagnétiques rayonnés aux fréquences
radioélectriques
(IEC 61000-4-3:2020)

Elektromagnetische Verträglichkeit (EMV) - Teil 4-3: Prüf-
und Messverfahren - Prüfung der Störfestigkeit gegen
hochfrequente elektromagnetische Felder
(IEC 61000-4-3:2020)

This European Standard was approved by CENELEC on 2020-10-13. 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 61000-4-3:2020 (E)**European foreword**

The text of document 77B/830/FDIS, future edition 4 of IEC 61000-4-3, prepared by SC 77B "High frequency phenomena" of IEC/TC 77 "Electromagnetic compatibility" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61000-4-3:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2021-07-13 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2023-10-13 document have to be withdrawn

This document supersedes EN 61000-4-3:2006 and all of its amendments and corrigenda (if any).

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61000-4-3:2020 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

| | | |
|---------------------|------|---|
| IEC 61000-4 series | NOTE | Harmonized as EN 61000-4 series |
| IEC 61000-4-6 | NOTE | Harmonized as EN 61000-4-6 |
| IEC 61000-4-20:2010 | NOTE | Harmonized as EN 61000-4-20:2010 (not modified) |
| IEC 61000-4-21 | NOTE | Harmonized as EN 61000-4-21 |
| IEC 61000-4-22 | NOTE | Harmonized as EN 61000-4-22 |
| IEC 61000-4-39 | NOTE | Harmonized as EN 61000-4-39 |
| CISPR 16-1-4 | NOTE | Harmonized as EN IEC 55016-1-4 |

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 60050-161 | - | International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility | - | - |



IEC 61000-4-3

Edition 4.0 2020-09

INTERNATIONAL STANDARD



**Electromagnetic compatibility (EMC) –
Part 4-3: Testing and measurement techniques – Radiated, radio-frequency
electromagnetic field immunity test**





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 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.

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.



IEC 61000-4-3

Edition 4.0 2020-09

INTERNATIONAL STANDARD



**Electromagnetic compatibility (EMC) –
Part 4-3: Testing and measurement techniques – Radiated, radio-frequency
electromagnetic field immunity test**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.100.20

ISBN 978-2-8322-8678-4

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

| | |
|---|----|
| FOREWORD | 6 |
| INTRODUCTION | 8 |
| 1 Scope | 9 |
| 2 Normative references | 9 |
| 3 Terms, definitions and abbreviated terms | 9 |
| 3.1 Terms and definitions | 9 |
| 3.2 Abbreviated terms | 13 |
| 4 General | 14 |
| 5 Test levels and frequency ranges | 14 |
| 5.1 Selection of test level | 14 |
| 5.2 Test frequency ranges | 16 |
| 6 Test equipment | 17 |
| 6.1 Test instrumentation | 17 |
| 6.2 Description of the test facility | 17 |
| 6.3 Uniform field area (UFA) | 18 |
| 6.3.1 Characteristics of the UFA | 18 |
| 6.3.2 Constant field strength level setting method | 23 |
| 6.3.3 Constant power level setting method | 24 |
| 7 Test setup | 25 |
| 7.1 General | 25 |
| 7.2 Arrangement of table-top equipment | 26 |
| 7.3 Arrangement of floor-standing equipment | 28 |
| 7.4 Arrangement of wiring | 29 |
| 7.5 Arrangement of human body-mounted equipment | 30 |
| 8 Test procedure | 30 |
| 8.1 General | 30 |
| 8.2 Laboratory reference conditions | 30 |
| 8.2.1 General | 30 |
| 8.2.2 Climatic conditions | 30 |
| 8.2.3 Electromagnetic conditions | 30 |
| 8.3 Execution of the test | 30 |
| 8.4 Step sizes | 32 |
| 9 Evaluation of test results | 32 |
| 10 Test report | 32 |
| Annex A (informative) Rationale for the choice of modulation for tests related to the protection against RF emissions from digital radio services | 34 |
| A.1 Summary of available modulation methods | 34 |
| A.2 Experimental results | 35 |
| A.3 Secondary modulation effects | 38 |
| A.4 Conclusion | 38 |
| Annex B (informative) Field generating antennas | 39 |
| B.1 Biconical antenna | 39 |
| B.2 Log-periodic antenna | 39 |
| B.3 Combination antennas | 39 |
| B.4 Horn antenna and double ridge wave guide antenna | 39 |

| | |
|---|----|
| Annex C (informative) Use of anechoic chambers | 40 |
| C.1 General anechoic chamber information | 40 |
| C.2 Use of ferrite-lined chambers at frequencies above 1 GHz | 40 |
| C.2.1 Problems caused by the use of ferrite-lined chambers for radiated field immunity tests at frequencies above 1 GHz | 40 |
| C.2.2 Solutions to reduce reflections | 41 |
| Annex D (informative) Amplifier compression and non-linearity | 42 |
| D.1 Objective of limiting amplifier distortion | 42 |
| D.2 Possible problems caused by harmonics and saturation | 42 |
| D.3 Limiting the harmonic content in the field | 42 |
| D.4 Effect of linearity characteristic on the immunity test | 43 |
| D.4.1 General | 43 |
| D.4.2 Evaluation method of the linearity characteristic | 43 |
| Annex E (informative) Guidance for product committees on the selection of test levels | 47 |
| E.1 General | 47 |
| E.2 Test levels related to general purposes | 47 |
| E.3 Test levels related to the protection against RF emissions from digital radio telephones | 48 |
| E.4 Special measures for fixed transmitters | 49 |
| Annex F (informative) Selection of test methods | 50 |
| Annex G (informative) Cable layout details | 52 |
| G.1 Intentions of EUT setup for radiated immunity test | 52 |
| G.2 Cable in the field | 52 |
| G.3 Cables leaving the test area | 52 |
| G.4 Turning the EUT cabinets | 52 |
| Annex H (informative) Examples of test setups for large and heavy EUTs | 54 |
| H.1 EUTs with bottom fed cables | 54 |
| H.2 EUTs with overhead cables | 55 |
| H.3 EUTs with multiple cables and AEs | 56 |
| H.4 Large EUTs with side fed cables and multiple UFA windows | 57 |
| Annex I (informative) Testing with multiple signals | 58 |
| I.1 General | 58 |
| I.2 Intermodulation | 58 |
| I.3 Power requirements | 59 |
| I.4 Level setting requirements | 60 |
| I.5 Linearity and harmonics checks | 60 |
| I.6 EUT performance criteria with multiple signals | 60 |
| Annex J (informative) Measurement uncertainty due to test instrumentation | 61 |
| J.1 General | 61 |
| J.2 Uncertainty budgets for level setting | 61 |
| J.2.1 Definition of the measurand | 61 |
| J.2.2 MU contributors of the measurand | 61 |
| J.2.3 Calculation examples for expanded uncertainty | 62 |
| J.2.4 Explanation of terms | 63 |
| J.3 Application | 64 |
| J.4 Reference documents | 64 |
| Annex K (informative) Calibration method for E-field probes | 65 |
| K.1 Overview | 65 |

| | | |
|-------|---|----|
| K.2 | Probe calibration requirements | 65 |
| K.2.1 | General | 65 |
| K.2.2 | Calibration frequency range | 65 |
| K.2.3 | Frequency steps | 65 |
| K.2.4 | Field strength | 66 |
| K.3 | Requirements for calibration instrumentation | 66 |
| K.3.1 | General | 66 |
| K.3.2 | Harmonics and spurious signals | 66 |
| K.3.3 | Linearity check for probe | 67 |
| K.3.4 | Determination of the gain of the standard horn antennas | 68 |
| K.4 | Field probe calibration in anechoic chambers | 69 |
| K.4.1 | Calibration environments | 69 |
| K.4.2 | Validation of anechoic chambers for field probe calibration | 69 |
| K.4.3 | Probe calibration procedure | 75 |
| K.5 | Other probe calibration environments and methods | 77 |
| K.5.1 | General | 77 |
| K.5.2 | Field probe calibration using TEM cells | 77 |
| K.5.3 | Field probe calibration using waveguide chambers | 78 |
| K.5.4 | Field probe calibration using open-ended waveguides | 79 |
| K.5.5 | Calibration of field probes by gain transfer method | 79 |
| K.6 | Reference documents | 79 |
| | Bibliography | 81 |

| | | |
|------------|---|----|
| Figure 1 | – Definition of the 80 % amplitude modulated (AM) test signal and the waveshapes occurring | 16 |
| Figure 2 | – Example of suitable test facility | 18 |
| Figure 3 | – Level setting setup | 19 |
| Figure 4 | – Dimensions of sixteen-point uniform field area | 20 |
| Figure 5 | – Minimum UFA size having a fifth grid point in the centre | 21 |
| Figure 6 | – Measuring setup | 23 |
| Figure 7 | – Example of EUT setup and cable layout for table top EUT having a cable that leaves the test setup | 26 |
| Figure 8 | – Example of EUT setup (top view) | 28 |
| Figure C.1 | – Multiple reflections in an existing small anechoic chamber | 41 |
| Figure C.2 | – Most of the reflected waves are eliminated (applies for top and side view) | 41 |
| Figure D.1 | – Amplifier linearity measurement setup | 44 |
| Figure D.2 | – Example of linearity curve | 45 |
| Figure D.3 | – Example of gain deviation | 45 |
| Figure H.1 | – Example of a test setup for EUT with bottom fed underground cables (CMADs not shown) | 54 |
| Figure H.2 | – Example of a test setup for EUTs with overhead cables | 55 |
| Figure H.3 | – Example of a setup of EUTs with multiple cables and AEs | 56 |
| Figure H.4 | – Large EUTs with side fed cables and multiple UFAs | 57 |
| Figure I.1 | – Test frequencies f_1 and f_2 and intermodulation frequencies of the second and third order | 58 |
| Figure J.1 | – Example of influences upon level setting | 62 |
| Figure K.1 | – Example of linearity for probe | 68 |

| | |
|--|----|
| Figure K.2 – Setup for measuring net power to a transmitting device | 70 |
| Figure K.3 – Test setup for chamber validation test..... | 72 |
| Figure K.4 – Detail for measurement position ΔL | 72 |
| Figure K.5 – Example of data adjustment..... | 73 |
| Figure K.6 – Example of the test layout for antenna and probe | 74 |
| Figure K.7 – Test setup for chamber validation test..... | 74 |
| Figure K.8 – Example of alternative chamber validation data | 75 |
| Figure K.9 – Field probe calibration layout..... | 76 |
| Figure K.10 – Field probe calibration layout (top view)..... | 76 |
| Figure K.11 – Cross-sectional view of a waveguide chamber | 78 |
| | |
| Table 1 – Test levels..... | 15 |
| Table 2 – Amplitude modulation characteristics at output of signal generator | 15 |
| Table 3 – Requirements for uniform field area for application of full illumination and partial illumination..... | 22 |
| Table A.1 – Comparison of modulation methods | 35 |
| Table A.2 – Relative interference levels | 36 |
| Table A.3 – Relative immunity levels..... | 37 |
| Table E.1 – Examples of test levels, associated protection distances and performance criteria | 48 |
| Table J.1 – Level setting process | 62 |
| Table J.2 – Test process..... | 63 |
| Table K.1 – Calibration field strength level..... | 66 |
| Table K.2 – Example for the probe linearity check..... | 67 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 4-3: Testing and measurement techniques –
Radiated, radio-frequency electromagnetic field immunity test**

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 61000-4-3 has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms part 4-3 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This fourth edition cancels and replaces the third edition published in 2006, Amendment 1:2007 and Amendment 2:2010. This edition constitutes a technical revision.

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

- a) testing using multiple test signals has been described;
- b) additional information on EUT and cable layout has been added;
- c) the upper frequency limitation has been removed to take account of new services;
- d) the characterization of the field as well as the checking of power amplifier linearity of the immunity chain are specified.

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

| | |
|--------------|------------------|
| FDIS | Report on voting |
| 77B/830/FDIS | 77B/825/RVD |

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

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

A list of all parts in the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, can be found on the IEC website.

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

Part 1: General

General considerations (introduction, fundamental principles)

Definitions, terminology

Part 2: Environment

Description of the environment

Classification of the environment

Compatibility levels

Part 3: Limits

Emission limits

Immunity limits (in so far as they do not fall under the responsibility of the product committees)

Part 4: Testing and measurement techniques

Measurement techniques

Testing techniques

Part 5: Installation and mitigation guidelines

Installation guidelines

Mitigation methods and devices

Part 6: Generic standards

Part 9: Miscellaneous

Each part is further subdivided into several parts, published either as international standards or as technical specifications or technical reports, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

This part is an international standard which gives immunity requirements and test procedures related to radiated, radio-frequency, electromagnetic fields.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field immunity test

1 Scope

This part of IEC 61000 is applicable to the immunity requirements of electrical and electronic equipment to radiated electromagnetic energy. It establishes test levels and the required test procedures.

The object of this document is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to radiated, radio-frequency electromagnetic fields. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against RF electromagnetic fields from RF sources not in close proximity to the EUT. The test environment is specified in Clause 6.

NOTE 1 As described in IEC Guide 107, this is a basic EMC publication for use by product committees of the IEC. As also stated in Guide 107, the IEC product committees are responsible for determining whether this immunity test standard should be applied or not, and if applied, they are responsible for determining the appropriate test levels and performance criteria. TC 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity tests for their products.

NOTE 2 Immunity testing against RF sources in close proximity to the EUT is defined in IEC 61000-4-39.

Particular considerations are devoted to the protection against radio-frequency emissions from digital radiotelephones and other RF emitting devices.

NOTE 3 Test methods are defined in this part for evaluating the effect that electromagnetic radiation has on the equipment concerned. The simulation and measurement of electromagnetic radiation is not adequately exact for quantitative determination of effects. The test methods defined in this basic document have the primary objective of establishing an adequate reproducibility of testing configuration and repeatability of test results at various test facilities.

This document is an independent test method. It is not possible to use other test methods as substitutes for claiming compliance with this document.

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 60050-161, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility* (available at www.electropedia.org)

koniec náhľadu – text ďalej pokračuje v platenej verzii STN