

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



BASIC EMC PUBLICATION  
PUBLICATION FONDAMENTALE EN CEM

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

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



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 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 la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://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 corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

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 It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

- Catalogue des publications de la CEI: [www.iec.ch/searchpub/cur\\_fut-f.htm](http://www.iec.ch/searchpub/cur_fut-f.htm)

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: [www.iec.ch/webstore/custserv/custserv\\_entry-f.htm](http://www.iec.ch/webstore/custserv/custserv_entry-f.htm)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tél.: +41 22 919 02 11  
Fax: +41 22 919 03 00

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

BASIC EMC PUBLICATION  
PUBLICATION FONDAMENTALE EN CEM

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

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 33.100.20

ISBN 978-2-88910-374-4

## Publication IEC 61000-4-3 (Edition 3.0 – 2008) I-SH 01

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

#### INTERPRETATION SHEET 1

This interpretation sheet has been prepared by SC 77B: High frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
77B/568/ISH	77B/573/RVD

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

IEC 61000-4-3 contains quick checks embedded in the field calibration process (subclause 6.2), in which the operator tests whether the amplifier is able to produce the desired RF power without saturation.

Step j) of the calibration process as per 6.2.1 describes this check for the constant field strength calibration method:

- j) *Confirm that the test system (e.g. the power amplifier) is not in saturation. Assuming that  $E_c$  has been chosen as 1,8 times  $E_t$ , perform the following procedure at each calibration frequency:*
  - j-1) *Decrease the output from the signal generator by 5,1 dB from the level needed to establish a forward power of  $P_C$ , as determined in the above steps (-5,1 dB is the same as  $E_c / 1,8$ );*
  - j-2) *Record the new forward power delivered to the antenna;*
  - j-3) *Subtract the forward power measured in step j-2 from  $P_C$ . If the difference is between 3,1 and 5,1 dB, then the amplifier is not saturated and the test system sufficient for testing. If the difference is less than 3,1 dB, then the amplifier is saturated and is not suitable for testing.*

The corresponding check within the constant power calibration method as per 6.2.2 is defined as step m):

- m) *Confirm that the test system (e. g. the power amplifier) is not in saturation. Assuming that  $E_c$  has been chosen as 1,8 times  $E_t$ , perform the following procedure at each calibration frequency:*
  - m-1) *Decrease the output from the signal generator by 5,1 dB from the level needed to establish a forward power of  $P_C$ , as determined in the above steps (-5,1 dB is the same as  $E_c / 1,8$ );*

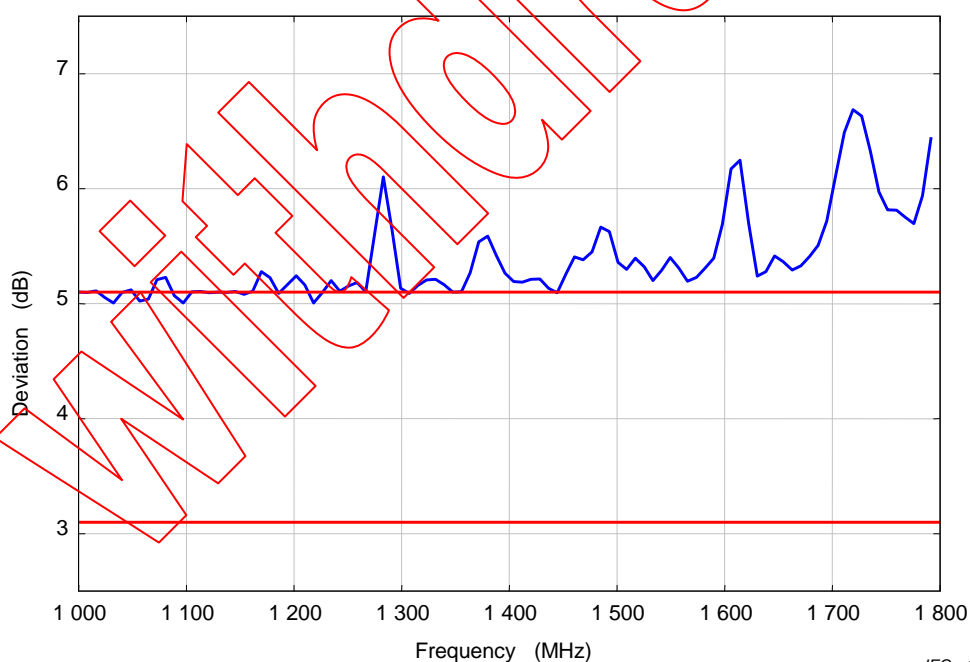
*m-2) Record the new forward power delivered to the antenna;*

*m-3) Subtract the forward power measured in step m-2 from  $P_C$ . If the difference is between 3,1 dB and 5,1 dB, then the amplifier is not saturated and the test system is sufficient for testing. If the difference is less than 3,1 dB, then the amplifier is saturated and is not suitable for testing.*

Some amplifiers show deviations of more than 5,1 dB without causing any problems during testing. That behaviour is caused by their special functional principle (above all travelling wave tube amplifiers). Figures 1 and 2 show some measurement results obtained from a semiconductor amplifier as well as from a TWT amplifier.

The text described in j-3, respectively m-3, unfortunately gives no clear answers on the usability of these amplifiers.

After discussion at the 20<sup>th</sup> meeting of SC 77B/WG 10 on October, 22 - 26, 2007, the experts of WG 10 unanimously expressed their opinion that j-3 and m-3 are to be interpreted such that amplifiers showing a deviation of more than 5,1 dB are suitable for testing. E.g. the amplifiers having a characteristic as shown in Figures 1 and 2 can be used to perform tests according to IEC 61000-4-3.



IEC 1342/08

Target field strength is 30 V/m.

**Figure 1 – Deviation as defined in step j-3 for a 200 W TWT-amplifier**

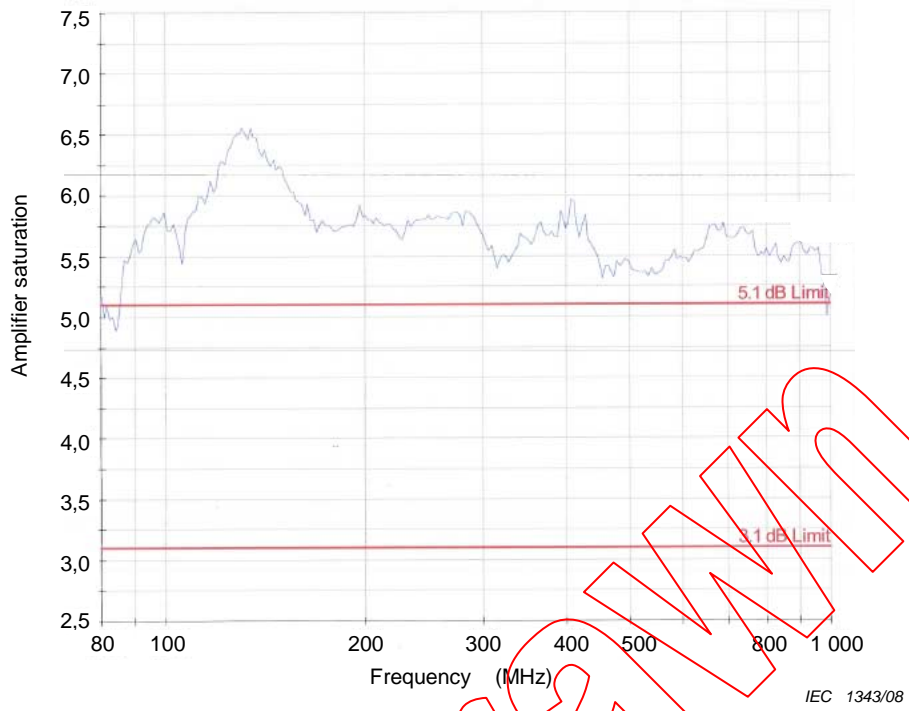


Figure 2 – Deviation as defined in step j-3 for a semiconductor amplifier

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope and object.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 General .....	11
5 Test levels.....	11
5.1 Test levels related to general purposes .....	12
5.2 Test levels related to the protection against RF emissions from digital radio telephones and other RF emitting devices .....	12
6 Test equipment.....	13
6.1 Description of the test facility .....	13
6.2 Calibration of field .....	14
7 Test setup .....	19
7.1 Arrangement of table-top equipment.....	19
7.2 Arrangement of floor-standing equipment.....	19
7.3 Arrangement of wiring .....	20
7.4 Arrangement of human body-mounted equipment.....	20
8 Test procedure .....	20
8.1 Laboratory reference conditions .....	20
8.2 Execution of the test.....	21
9 Evaluation of test results .....	22
10 Test report.....	22
Annex A (informative) Rationale for the choice of modulation for tests related to the protection against RF emissions from digital radio telephones .....	31
Annex B (informative) Field generating antennas .....	36
Annex C (informative) Use of anechoic chambers .....	37
Annex D (informative) Amplifier non-linearity and example for the calibration procedure according to 6.2 .....	40
Annex E (informative) Guidance for product committees on the selection of test levels .....	45
Annex F (informative) Selection of test methods .....	48
Annex G (informative) Description of the environment.....	49
Annex H (normative) Alternative illumination method for frequencies above 1 GHz (“independent windows method”) .....	54
Annex I (informative) Calibration method for E-field probes.....	57
Annex J (informative) Measurement uncertainty due to test instrumentation .....	72
Figure 1 – Definition of the test level and the waveshapes occurring at the output of the signal generator.....	24
Figure 2 – Example of suitable test facility .....	25
Figure 3 – Calibration of field.....	26
Figure 4 – Calibration of field, dimensions of the uniform field area .....	27
Figure 5 – Example of test setup for floor-standing equipment.....	28
Figure 6 – Example of test setup for table-top equipment.....	29

Figure 7 – Measuring setup .....	30
Figure C.1 – Multiple reflections in an existing small anechoic chamber.....	38
Figure C.2 – Most of the reflected waves are eliminated .....	39
Figure D.1 – Measuring positions of the uniform field area.....	42
Figure H.1 – Examples of division of the calibration area into 0,5 m × 0,5 m windows .....	55
Figure H.2 – Example of illumination of successive windows.....	56
Figure I.1 – Example of linearity for probe .....	60
Figure I.2 – Setup for measuring net power to a transmitting device .....	62
Figure I.3 – Test setup for chamber validation test.....	64
Figure I.4 – Detail for measurement position $\Delta L$ .....	64
Figure I.5 – Example of data adjustment .....	65
Figure I.6 – Example of the test layout for antenna and probe.....	66
Figure I.7 – Test setup for chamber validation test.....	67
Figure I.8 – Example alternative chamber validation data .....	67
Figure I.9 – Field probe calibration layout .....	68
Figure I.10 – Field probe calibration layout (Top view).....	68
Figure I.11 – Cross-sectional view of a waveguide chamber .....	70
Figure J.1 – Example of influences upon level setting.....	73
Table 1 – Test levels related to general purpose, digital radio telephones and other RF emitting devices.....	11
Table 2 – Requirements for uniform field area for application of full illumination, partial illumination and independent windows method.....	15
Table A.1 – Comparison of modulation methods .....	32
Table A.2 – Relative interference levels.....	33
Table A.3 – Relative immunity levels.....	34
Table D.1 – Forward power values measured according to the constant field strength calibration method.....	43
Table D.2 – Forward power values sorted according to rising value and evaluation of the measuring result.....	43
Table D.3 – Forward power and field strength values measured according to the constant power calibration method.....	44
Table D.4 – Field strength values sorted according to rising value and evaluation of the measuring result .....	44
Table E.1 – Examples of test levels, associated protection distances and suggested performance criteria.....	47
Table G.1 – Mobile and portable units.....	51
Table G.2 – Base stations.....	52
Table G.3 – Other RF devices.....	53
Table I.1 – Calibration field strength level .....	58
Table I.2 – Example for the probe linearity check.....	59
Table J.1 – Calibration process.....	74
Table J.2 – Level setting.....	74

## 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 phenomenon, 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, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*.

The test frequency range may be extended up to 6 GHz to take account of new services. The calibration of the field as well as the checking of power amplifier linearity of the immunity chain are specified.

This consolidated version of IEC 61000-4-3 consists of the third edition (2006) [documents 77B/485/FDIS and 77B/500/RVD], its amendment 1 (2007) [documents 77B/546/FDIS and 77B/556/RVD], its amendment 2 (2010) [documents 77B/626/FDIS and 77B/629/RVD] and its interpretation sheet 1 of August 2008.

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 3.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site 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.

**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 publication using a colour printer.**

Withhold