IEC 61000-4-3

Edition 3.0 2010-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC EMC PUBLICATION

PUBLICATION FONDAMENTALE EN CEM

AMENDMENT 2

AMENDEMENT 2

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

IEC 61000-4-3:2006/A2:2010

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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

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 It also gives information on projects, withdrawn and replaced publications.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

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

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

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
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

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

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

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

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
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

IEC 61000-4-3

Edition 3.0 2010-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC EMC PUBLICATION

PUBLICATION FONDAMENTALE EN CEM

AMENDMENT 2

AMENDEMENT 2

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

PRICE CODE
CODE PRIX F

ICS 33.100.20

ISBN 978-2-88910-373-7

FOREWORD

This amendment has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

The text of this amendment is based on the following documents:

FDIS	Report on voting
77B/626/FDIS	77B/629/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability 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.

CONTENTS

Add the title of Annex J as follows:

Annex J (informative) Measurement uncertainty due to test instrumentation

Add, after Annex I, the following new Annex J:

Annex J
(informative)

Measurement uncertainty due to test instrumentation

J.1 General

This annex gives information related to measurement uncertainty (MU) of the test level setting according to the particular needs of the test method contained in the main body of the standard. Further information can be found in [1, 2][1].

This annex shows an example of how an uncertainty budget can be prepared based upon level setting. Other parameters of the disturbance quantity such as modulation frequency and modulation depth, harmonics produced by the amplifier may also need to be considered in an appropriate way by the test laboratory. The methodology shown in this annex is considered to be applicable to all parameters of the disturbance quantity.

The uncertainty contribution for field homogeneity including test site effects is under consideration.

J.2 Uncertainty budgets for level setting

J.2.1 Definition of the measurand

The measurand is the hypothetical test electric field strength (without an EUT) at the point of the UFA selected according to the process of 6.2.1 step a) and 6.2.2 step a) of this standard.

J.2.2 MU contributors of the measurand

The following influence diagram (see Figure J.1) gives an **example** of influences upon level setting. It applies to both calibration and test processes and it should be understood that the diagram is not exhaustive. The most important contributors from the influence diagram have been selected for the uncertainty budget Tables J.1 and J.2. As a minimum, the contributions listed in Tables J.1 and J.2 shall be used for the calculation of the uncertainty budgets in order to get comparable budgets for different test sites or laboratories. It is noted that a laboratory may include additional contributors in the calculation of the MU, on the basis of its particular circumstances.

---

1 Figures in square brackets refer to the reference documents in Clause J.4.

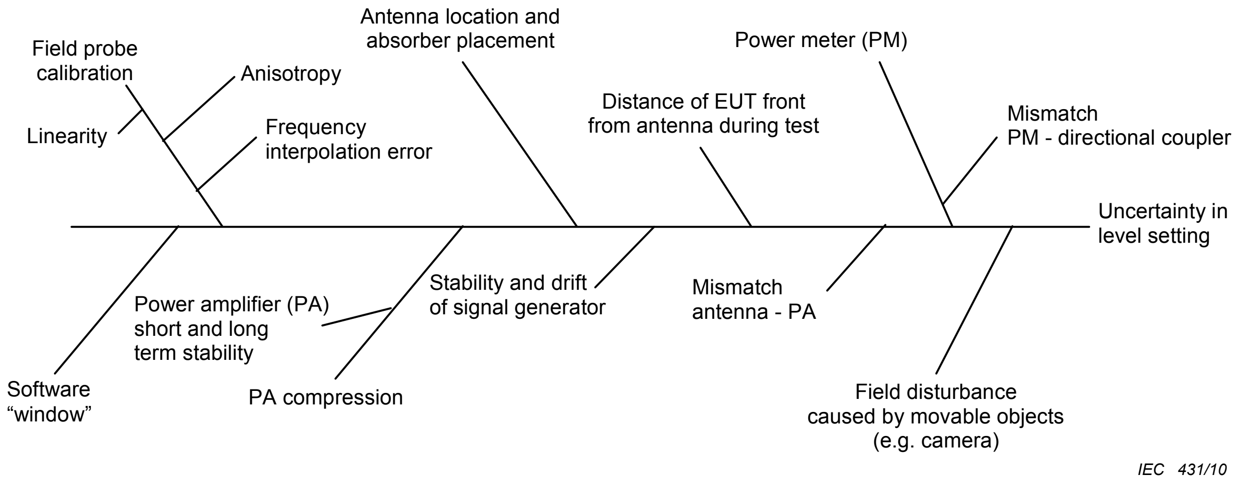

Figure J.1 – Example of influences upon level setting

J.2.3 Calculation examples for expanded uncertainty

It shall be recognized that the contributions that apply for calibration and for test may not be the same. This leads to different uncertainty budgets for each process.

In this basic standard, the field inside the chamber is calibrated before the test upon an EUT. Depending on the test setup, several contributors may not be a factor in calculating MU. Examples include those that are compensated by level control of the amplifier output power or that remain unchanged between calibration and test (e.g. mismatch between antenna and amplifier).

The field probe and the power monitoring instrumentation (repeatability rather than absolute measurement accuracy and linearity) are not included in the level control of the amplifier output power and their contributions shall be considered in evaluating MU.

Tables J.1 and J.2 give examples of an uncertainty budget for level setting. The uncertainty budget consists of two parts, the uncertainty for calibration and the uncertainty for test.

Table J.1 – Calibration process

Symbol	Uncertainty Source X_i	$U(x_i)$	Unit	Distribution	Divisor	$u(x_i)$	Unit	c_i	$u_i(y)$	Unit	$u_i(y)^2$
FP	Field probe calibration	1,7	dB	normal k =2	2	0,85	dB	1	0,85	dB	0,72
PM_c	Power meter	0,3	dB	rect	1,73	0,17	dB	1	0,17	dB	0,03
PA_c	PA rapid gain variation	0,2	dB	rect	1,73	0,12	dB	1	0,12	dB	0,01
SW_c	SW levelling precision	0,6	dB	rect	1,73	0,35	dB	1	0,35	dB	0,12
				$\Sigma u_i(y)^2$							0,88
				$\sqrt{\Sigma u_i(y)^2}$							0,94
				Expanded uncertainty U(y) (CAL) k =2							**1,88** dB

Table J.2 – Level setting

Symbol	Uncertainty Source X_i	$U(x_i)$	Unit	Distribution	Divisor	$u(x_i)$	Unit	c_i	$u_i(y)$	Unit	$u_i(y)^2$
CAL	Calibration	1.88	dB	normal *k* =2	2.00	0.94	dB	1	0.94	dB	0.89
AL	Antenna location variation and absorber placement	0.38	dB	*k* = 1	1	0.38	dB	1	0.38	dB	0.14
PM_t a)	Power meter	0.3	dB	rect	1.73	0.17	dB	1	0.17	dB	0.03
PA_t	PA rapid gain variation	0.2	dB	rect	1.73	0.12	dB	1	0.12	dB	0.01
SW_t	SW levelling precision	0.6	dB	rect	1.73	0.35	dB	1	0.35	dB	0.12
SG	Signal generator stability	0.13	dB	rect	1.73	0.08	dB	1	0.08	dB	0.01
				$\Sigma u_i(y)^2$							1.20
				$\sqrt{\Sigma u_i(y)^2}$							1.10
				Expanded uncertainty U(y) *k* = 2							**2.19 dB**

a) If a level control of the signal generator output level based on a power meter is used, the PM_t enters into the table, otherwise the stability and drift of the signal generator as well as the power amplifier have to be taken into account. In this example, the power amplifier does not contribute to the uncertainty budget because it is part of the power amplifier output control, therefore it is sufficient to consider the power meter contribution.

J.2.4 Explanation of terms

FP is a combination of calibration uncertainty, field probe unbalance (anisotropy), field probe frequency response and temperature sensitivity. Normally this data can be obtained from the probe data sheet and/or calibration certificate.

$\boldsymbol{PM_c}$ is the uncertainty of the power meter, including its sensors, taken from either the manufacturer's specification (and treated as a rectangular distribution) or a calibration certificate (and treated as a normal distribution). If the same power meter is used for both calibration and test, this contribution can be reduced to the repeatability and linearity of the power meter. This approach is applied within the table.

$\boldsymbol{PA_c}$ is including the uncertainty derived from rapid gain variation of the power amplifier after the steady status has been reached.

$\boldsymbol{SW_c}$ is the uncertainty derived from the discrete step size of the frequency generator and software windows for level setting during the calibration process. The software window can usually be adjusted by the test laboratory.

CAL is the expanded uncertainty associated with the calibration process.

AL is the uncertainty derived from removal and replacement of the antenna and absorbers. Referring to ISO/IEC Guide 98-3, the antenna location variation and absorber placement are type A contributions, that is their uncertainty can be evaluated by statistical analysis of series of observations. Type A contributions are normally not part of the uncertainty of measurement equipment, however, these contributions were taken into account because of their high importance and their close relation to the measurement equipment.

$\boldsymbol{PM_t}$ is the uncertainty of the power meter, including its sensors, taken from either the manufacturer's specification (and treated as a rectangular distribution) or a calibration certificate (and treated as a normal distribution). If the same power meter is used for both calibration and test, this contribution can be reduced to the repeatability and linearity of the power meter. This approach is applied within the table.

This contribution can be omitted if a measuring setup without power amplifier output control is used for the test process (in contrast to Figure 7 of this standard). In this case, the uncertainties of the signal generator and power amplifier have to be reviewed.

$\boldsymbol{PA_t}$ is including the uncertainty derived from rapid gain variation of the power amplifier after the steady status has been reached.

SW_t is the uncertainty derived from the discrete step size of the frequency generator and software windows for level setting during the test process. The software window can usually be adjusted by the test laboratory.

SG is the drift of the signal generator during the dwell time.

J.3 Application

The calculated MU number (expanded uncertainty) may be used for a variety of purposes, for example, as indicated by product standards or for laboratory accreditation. It is not intended that the result of this calculation be used for adjusting the test level that is applied to EUTs during the test process.

J.4 Reference documents

[1] IEC TC77 document 77/349/INF, *General information on measurement uncertainty of test instrumentation for conducted and radiated r.f. immunity tests*

[2] UKAS, M3003, Edition 2, 2007, *The Expression of Uncertainty and Confidence in Measurement*, free download on www.ukas.com

[3] ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement* (GUM:1995)