

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC
801-3**

Première édition
First edition
1984

TROISIÈME IMPRESSION 1992

THIRD IMPRESSION 1992

**Compatibilité électromagnétique pour
les matériels de mesure et de commande
dans les processus industriels**

Partie 3:

Prescriptions relatives aux champs
de rayonnements électromagnétiques

**Electromagnetic compatibility for
industrial-process measurement
and control equipment**

Part 3:

Radiated electromagnetic field requirements



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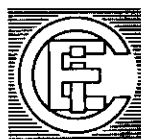
Radiated electromagnetic field requirements

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CONTENTS

	Page
FOREWORD	5
PREFACE	5
Clause	
1. Scope	7
2. Object	7
3. General	7
4. Definitions/Terminology	9
5. Severity levels	13
6. Selection of test methods	15
7. Test equipment	17
8. Test set-up	17
8.1 Shielded room	19
8.2 Stripline circuit	19
9. Test procedures	19
9.1 Shielded room	21
9.2 Stripline circuit	21
9.3 Evaluation of the test results	21
FIGURES	24
APPENDIX A — Field intensity and radiated power from antennae in free space	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC COMPATIBILITY
FOR INDUSTRIAL-PROCESS MEASUREMENT
AND CONTROL EQUIPMENT****Part 3: Radiated electromagnetic
field requirements**

FOREWORD

- 1) The formal decisions or agreements of the I E C on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the I E C expresses the wish that all National Committees should adopt the text of the I E C recommendation for their national rules in so far as national conditions will permit. Any divergence between the I E C recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by I E C Technical Committee No. 65: Industrial-process Measurement and Control.

It forms Part 3 of I E C Publication 801.

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

Six Months' Rule	Report on Voting
65(CO)28	65(CO)31

Further information can be found in the Report on Voting indicated in the table above.

ELECTROMAGNETIC COMPATIBILITY FOR INDUSTRIAL-PROCESS MEASUREMENT AND CONTROL EQUIPMENT

Part 3: Radiated electromagnetic field requirements

1. Scope

This part is applicable to the susceptibility of industrial-process measurement and control instrumentation to radiated electromagnetic energy. It additionally establishes severity levels and the required test procedures.

2. Object

The object of this part is to establish a common reference for evaluating the performance of industrial-process measurement and control instrumentation when subjected to electromagnetic fields such as those generated by portable radio transceivers (walkie-talkies) or any other device that will generate continuous wave radiated electromagnetic energy.

Note. — Test methods are defined in this part for measuring 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 are structured for the primary objective of establishing adequate repeatability of results at various test facilities for qualitative analysis of effects.

These differences shall be taken into account when verification testing is conducted.

3. General

Most electronic equipment is in some manner affected by electromagnetic radiation. This radiation is frequently generated by the small hand-held radio transceivers that are used by operating, maintenance and security personnel. The susceptibility of industrial-process measurement and control instrumentation to the radiation of the hand-held transceiver is the primary concern of this part.

However, other sources of electromagnetic radiation are involved, such as fixed station radio and television transmitters, vehicle radio transmitters and various industrial electromagnetic sources.

In addition to the continuous form of electromagnetic energy deliberately generated, there is also spurious radiation caused by devices such as welders, thyristors, fluorescent lights, switches operating inductive loads, etc. For the most part, this interference manifests itself as conducted electrical interference and, as such, is dealt with in other parts of the standard. Methods employed to prevent effects from continuous radiation will normally also reduce the effects from these sources.

The electromagnetic environment is determined by the strength of the electromagnetic field (field strength in volts per metre). The field strength is not easily measured without sophisticated instrumentation nor is it easily calculated by classical equations and formulae because of the effect of surrounding structures or the proximity of other equipment that will distort and/or reflect the electromagnetic waves.

4. Definitions/Terminology

4.1 *Antenna*

A transducer which either emits radio frequency power into space from a signal source or intercepts an arriving electromagnetic field, converting it into an electrical signal.

4.2 *Broad-band emission*

An emission having a spectral energy distribution sufficiently broad, uniform, and continuous for the response of the measuring receiver in use, not to vary significantly when tuned over a specified number of receiver impulse bandwidths.

4.3 *Conducted emission*

Desired or undesired electromagnetic energy which is propagated along a conductor. Such an emission is called "conducted interference" if it is undesired.

4.4 *Continuous waves (C.W.)*

Electromagnetic waves, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information.

4.5 *Degradation*

In susceptibility specification testing, degradation is an unwanted change in the operational performance of a test specimen. This does not necessarily mean malfunction or catastrophic failure. The E.M.I. test specification generally requires stating the criteria for degradation of performance.

4.6 *Dipole*

An antenna consisting of a straight conductor (usually not more than a half-wavelength long), divided at its electrical centre for connection to a transmission line.

4.7 *Electromagnetic compatibility (E.M.C.)*

E.M.C. is the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable disturbances to that environment or to other equipment.

4.8 *Electromagnetic interference (E.M.I.)*

E.M.I. electromagnetic disturbance which manifests itself in performance degradation, malfunction, or failure of electrical or electronic equipment.

4.9 *Electromagnetic wave*

The radiant energy produced by the oscillation of an electric charge characterized by oscillation of the electric and magnetic fields.

4.10 *Emission*

Electromagnetic energy propagated from a source by radiation or conduction.

4.11 *Far field*

That region where the power flux density from an antenna approximately obeys an inverse square law of the distance.

For a dipole this corresponds to distances greater than $\lambda/2\pi$ where λ is the wavelength of the radiation.

4.12 *Field strength*

The term "field strength" shall be applied only to measurements made in the far field. The measurement may be of either the electric or the magnetic component of the field and may be expressed as V/m, A/m or W/m²; any one of these may be converted to the others.

Note. – For measurements made in the near field the term "electric field strength" or "magnetic field strength" shall be used according to whether the resultant electric or magnetic field, respectively, is measured.

In this field region the relationship between the electric and magnetic field strength and distance is complex and difficult to predict, being dependent on this specific configuration involved. Inasmuch as it is not generally feasible to determine the time and space phase relationship of the various components of the complex field, the power flux density of the field is similarly indeterminate.

4.13 *Frequency band*

A continuous range of frequencies extending between two limits.

4.14 *Induction field*

The predominant electric and/or magnetic field existing at a distance, $d < \lambda/2\pi$, where λ is the wavelength.

4.15 *Isotropic*

Having properties of equal values in all directions.

4.16 *Monopole*

An antenna consisting of a straight conductor (usually not more than one-quarter-wavelength long) mounted immediately above, and normal to, an imaging (ground) plane. It is connected to a transmission line at its base and behaves, with its image, like a dipole.

4.17 *Polarization*

A term used to describe the orientation of the electric field vector of a radiated field.

4.18 *Radiated emission*

Radiation and induction field components in space.

4.19 *Radiation*

The propagation of a signal or interference from a source other than by conduction.

4.20 Radio environment

The combined effect of the radio emissions that are created at any given location by normally operating authorized transmitters. It has the dimension of field strength and varies with frequency band, geographical location and time.

4.21 Radio-frequency interference (R.F.I.)

R.F.I. used interchangeably with E.M.I. E.M.I. is a later definition which includes the entire electromagnetic spectrum, whereas R.F.I. is more restricted to the radio-frequency band, generally considered to be between 10 kHz and 10 GHz.

4.22 Shielded enclosure

A screened or solid metal housing designed expressly for the purpose of isolating the internal from the external electromagnetic environment.

The purpose is to prevent outside ambient electromagnetic fields from causing performance degradation and to prevent emission from causing interference to outside activities.

4.23 Stripline

Parallel plate transmission line to generate an electromagnetic field for testing purposes.

4.24 Spurious radiation

Any undesired electromagnetic emission from an electrical device.

4.25 Susceptibility

The characteristic of electronic equipment that results in unwanted responses when subjected to electromagnetic energy.

4.26 Sweep

A continuous traverse over a range of frequencies.

4.27 Transceiver

The combination of radio transmitting and receiving equipment in a common housing.

5. Severity levels

Frequency band: 27 MHz to 500 MHz

Level	Test field strength (V/m)
1	1
2	3
3	10
x	Special

Note. – x is an open class.