

Electric relays - Part 22: Electrical disturbance tests for measuring relays and protection equipment - Section three: Radiated electromagnetic field disturbance tests

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RAPPORT
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Relais électriques

Vingt-deuxième partie:

Essais d'influence électrique concernant les relais de
mesure et dispositifs de protection

**Section trois — Essais de susceptibilité aux
(champs électromagnétiques)**

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Electrical relays

Part 22:

Electrical disturbance tests for measuring relays
and protection equipment

Section Three — Radiated electromagnetic field
disturbance tests



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL RELAYS

Part 22: Electrical disturbance tests for measuring relays
and protection equipment

Section Three - Radiated electromagnetic field disturbance tests

FOREWORD

- 1) The formal decisions or agreements of the IEC 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 IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

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This report has been prepared by Sub-Committee 41B: Measuring relays and protection equipment, of IEC Technical Committee No. 41: Electrical relays.

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

Six Months' Rule	Report on Voting
41B(C0)46	41B(C0)49

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

ELECTRICAL RELAYS

Part 22: Electrical disturbance tests for measuring relays
and protection equipment

Section Three - Radiated electromagnetic field disturbance tests

1: Scope and object

This report is based on IEC 801-3 and it refers to that publication where applicable.

The purpose is to gain experience with the three tests described in this publication, and, if possible, to determine a test method suitable for use in a future standard.

This report outlines general requirements for a radiated electromagnetic field disturbance test of static measuring relays and protection equipment with or without output contacts.

The object of the test is to confirm that the equipment under test will not maloperate when energized and subjected to an electromagnetic field from a radiating source, in particular transceivers operating within the frequency range 27 MHz to 500 MHz.

The requirements are applicable only to relays and protection equipment in a new condition.

The tests outlined in this report are type tests.

Note. - The test may also, where appropriate, be applied to electro-mechanical relays, for example high-speed or high-sensitivity electromechanical relays.

The object of this report is to state:

- 1) definitions of terms used;
- 2) test severity classes;
- 3) test methods;
- 4) test conditions;
- 5) test procedures, and
- 6) criteria for acceptance.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid international standards.

- IEC 255-6 (1988): Electrical relays, Part 6: Measuring relays and protection equipment.
- IEC 801-3 (1984): Electromagnetic compatibility for industrial-process measurement and control equipment, Part 3: Radiated electromagnetic field requirements.

3 Definitions

For definitions of general terms, reference should be made to the IEC International Electrotechnical Vocabulary (IEV) (IEC 50). For special terms used, reference is made to Clause 4 of IEC 801-3.

4 Radiated electromagnetic field disturbance test

4.1 Test severity classes

To cover different field conditions, this report includes different severity classes.

General guidance for the selection of severity class is given under Sub-clause 4.1.2 below.

4.1.1 Severity classes

The test severity class shall be chosen from the following table. In this report the test field strength is expressed in volts per metre.

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Class	Test field strength (V/m)
0	-
I	1
II	3
III	10

4.1.2 Guide for selection of severity class

The severity class should be chosen such that the expected level of disturbance field strength does not exceed the test field strength of the class chosen. The following text gives situations where the field strength of the various severity classes may occur.

Class 0

Environment where the electromagnetic radiation is kept negligible.

Class I

Low level electromagnetic radiation environment, for example, levels typical of local radio/television stations located more than 1 km from the equipment and levels typical of low power transceivers.

Class II

Moderate electromagnetic radiation environment, for example, medium power portable transceivers that can be operated relatively close to the equipment, but not closer than 1 m.

Class III

Severe electromagnetic radiation environment, for example, levels typical of high power transceivers that can be operated close to the equipment, but not closer than 0.5 m.

For situations involving very severe electromagnetic radiation environment, testing with higher field strength levels than specified in Class III is subject to agreement between the user and manufacturer or as defined by the manufacturer.

For further information regarding the likely field strength as a function of distance and radiated power see Annex A of IEC 801-3.

4.2 *Test methods*

The following three alternative test methods are included in this report:

- A. Test in a shielded room;
- B. Test in a stripline, and
- C. Test with a portable transmitter.

These three test methods are not considered directly equivalent. The reason for this is explained in Annex B.

4.3 *Test conditions*

4.3.1 *Test electric field parameters*

- Waveform: Sinusoidal
- Frequency: For test methods A and B: as a sweep through the entire frequency range 27 MHz - 500 MHz. For test method B the useful upper frequency limit determined by the stripline geometry has to be considered. See Sub-clause 6.3 of IEC 801-3.

For test method C: at three discrete frequencies, each chosen within one of the following frequency bands:

- a) 68 MHz - 87 MHz;
- b) 146 MHz - 174 MHz, and
- c) 420 MHz - 470 MHz.

Discrete frequencies outside the specified frequency bands may be agreed between the user and manufacturer or as defined by the manufacturer.

- Frequency sweep rate: 1.5×10^{-3} decades/s or slower for test methods A and B.
- Test field strength value: According to Sub-clause 4.1.1.

4.3.2 Test equipment recommendations

4.3.2.1 Test method A (test in a shielded room)

- Shielded room with a size adequate to maintain at least 1 m distance between the radiating antenna and the equipment under test. Other distances according to values given in Figure 1.
- Signal generator covering the necessary frequency range having sweep capability with the prescribed sweep rate.
- Power amplifier to amplify the signal and provide antenna drive if signal generator is incapable.
- Antennas covering the frequency range 27 MHz to 500 MHz (for example biconical dipole antenna for 27 MHz to 200 MHz and conical logarithmic spiral antenna for 200 MHz to 500 MHz).
- Coaxial switch for switching of antennas.
- Instruments for measuring the field strength.
- Filters on the external leads are recommended to reduce conducted emission from affecting the external test instrumentation.
- Equipment to energize and monitor the equipment under test.

4.3.2.2 Test method B (test in a stripline)

- Stripline according to IEC 801-3 (Figures 2, 3, 4 and 5).
- Signal generator covering the necessary frequency range and having sweep capability with the prescribed sweep rate.
- Power amplifier to amplify the signal and provide stripline drive if signal generator is incapable.
- Instruments for measuring field strength.
- Appropriate load impedance for the input and output of the stripline.
- Filters (ferrite rings) on the external leads are recommended to reduce conducted emission from affecting the external test instrumentation.
- Equipment to energize and monitor the equipment under test.