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Transmission systems and multiplexing equipment

Interference from external sources

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NOTES

- 1 Supplement 27 to the G-series Recommendations was approved in Málaga-Torremolinos (1984) and published in Fascicle III.3 of the *Red Book*. This file is an extract from the *Red Book*. While the presentation and layout of the text might be slightly different from the *Red Book* version, the contents of the file are identical to the *Red Book* version and copyright conditions remain unchanged (see below).
- 2 In this Supplement, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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INTERFERENCE FROM EXTERNAL SOURCES

(Malaga-Torremolinos, 1984)

(referred to in Recommendations G.221 and G.950)

This Supplement contains information which was collected during the study of Question 12/XV (1981-1984) and which seems of general interest. Two aspects are covered:

- measures to reduce effects from interference; and
- measuring methods.

a) *Measures to reduce effects from interferences*

There exists a great number of possible actions to reduce the effect of interference. Therefore, the following list is in fact incomplete and can only be used as a guide when looking for the optimum solution for a particular case of interference.

Only those measures are mentioned which can be applied when a case of interference is encountered in practice, i.e., when the equipment is already existing.

Possible measures to reduce interference are:

- additional screening of equipments or parts of it by metallic boxes, frames or plates;
- low impedance interconnection of all metallic parts of the equipment to form a Faraday Cage;
- suppression of out-of-band interference signals by using band limitation filters (bandpass, low pass);
- preventing earthing loops by using separation transformers or earth-free input or output transformers;¹⁾
- using twisted pairs of wires or coaxial pairs for interconnecting equipment units;
- using double-screened or cables with magnetic screens for the station cabling;
- using a clear star-formed earthing scheme for the equipment;¹⁾
- applying a low-pass filtering at the equipment input of the power distribution lines;
- reducing repeater sections in areas of high interference level;
- using metallic pipes as cable ducts.

b) *Measuring methods*

Administrations are using different methods for carrying out interference tests. The following two methods were described by two Administrations and are reproduced for information only.

The CCITT decided not to recommend a certain measuring method because of the great variety of situations encountered in practice.

Further measuring methods for the field strength can be found also in CISPR Publication 16, § 3.

¹⁾ CCITT Manual *Earthing of Telecommunication Installations*, ITU, Geneva, 1976.

1 Introduction

This contribution deals mainly with measurements in repeater stations and with methods for testing the extent to which new equipment is affected by these interfering fields and currents.

2 Measurements made in repeater stations

2.1 Field strength measurements

The measuring equipment consists of a small ferrite antenna coupled to a selective measuring device.

An important conclusion that could be drawn from measurements is the difference in attenuation of the EM fields inside the building, depending on the type of building. In a repeater station in a concrete building, the field strength near the equipment racks is roughly 30 dB lower than outside the building. In a repeater station in a brick building, the field strength near the equipment racks is roughly 10 dB lower than outside the building.

2.2 Current measurements

The EM fields that penetrate into a repeater station will cause disturbing currents in the outer conductor or screening of the station cabling.

The measuring equipment consists of a current probe (clip-on current transformer) coupled to a selective measuring device.

If the transfer impedance of cables, connectors, etc. is not sufficiently low, these currents cause interference in telephone channels.

3 Test methods

3.1 Influence of EM fields

In the laboratories of the Netherlands PTT, the following measuring set-up is used: a very large-dimension transmission line arrangement consisting of two parallel metal plates is at one end connected to a signal generator and at the other end terminated with a matching load resistor. Between these two metal plates the required uniform EM field is propagated in a TEM mode (see Figure 1).

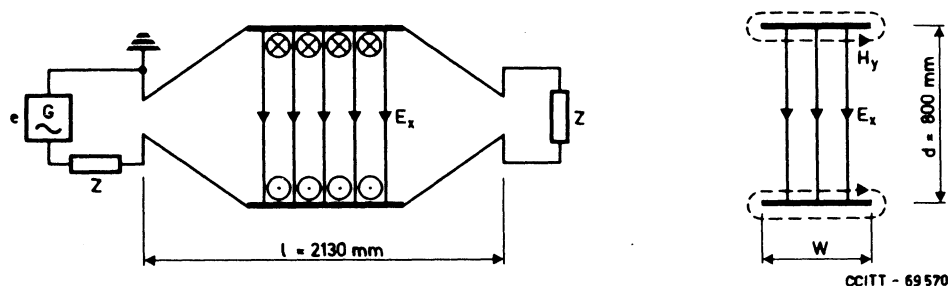


FIGURE 1

Electric field (full lines) and magnetic field (dashed lines)
in the measuring arrangement

The relation between the field strength E_x , the input voltage (e) and the distance (d) between the plates is given by:

$$E_x = c \frac{e}{d} \text{ (V/m)}$$