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Method of measuring conducted disturbance using both capacitive voltage probe and current probe

Yoshiharu HIROSHIMA, Seiichi MIYASHITA, and Nobuo KUWABARA
NTT Multimedia Networks Laboratories
9-11 Midori-Cho 3-Chome Musashino-Shi, Tokyo 180 Japan
Tel. +81-422-59-2444 Fax. +81-422-59-3314 E-mail: hirosima@ntttqn.tnl.ntt.co.jp

1. Introduction

In CISPR 22[1], conducted disturbances at the telecommunication ports of information technology equipment (ITE) are generally measured using an impedance stabilization network (ISN). When a suitable ISN is not available, CISPR 22 specifies an alternative method to measure both the voltage and current of the disturbance. However, a voltage probe appropriate for this method has not been reported, and the correlation between this method and the one using an ISN is not clear in CISPR 22.

2. Configuration

We developed a capacitive voltage probe with an electrostatic shield which can measure the common-mode voltage for any kind of cable[2]. The configuration of the capacitive voltage probe is shown in Fig. 1. It consists of two coaxial electrodes, a cable fixture, and a high-input-impedance amplifer operated by a battery. The outer electrode is used as an electrostatic shield. When a voltage appears between the cable and ground, an induced voltage occurs between its inner electrode and electrostatic shield. The induced voltage depends on the kind of cable, so the input-output factor of the probe is needed for every cable. Fig. 2 shows an example of the input-output factor relating to a twisted pair cable.

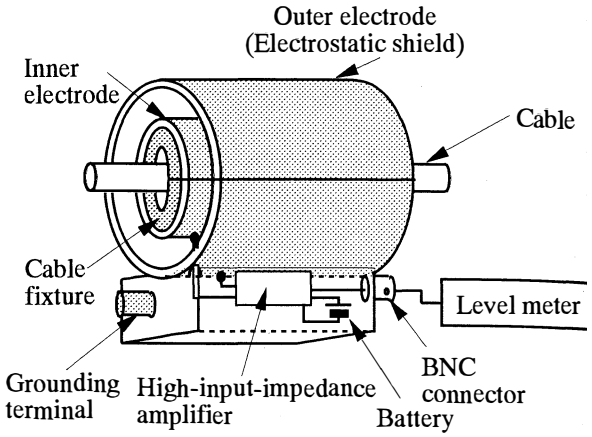

Fig. 1 Capasitive voltage probe.

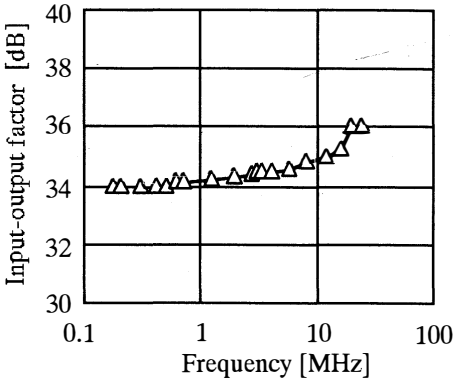

Fig. 2 Input-output factor

3. Performance

We measured the common-mode voltage of a telecommunication equipment using the capacitive voltage probe and an ISN with the setup according to CISPR22. The set-up used to measure the voltage is shown in Fig. 3. Measurement results are shown in Fig. 4. The common-mode voltage measured by the capacitive voltage probe is nearly equal to that measured by the ISN, within 3 dB.

In the future, it will be necessary to investigate about the averaged deviation of measured voltage level using the capacitive voltage probe and an ISN.

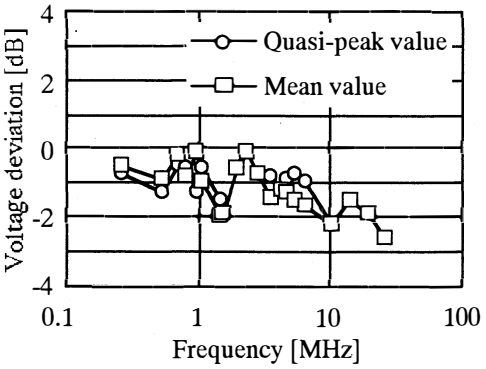

Fig. 4 Deviation between levels measured using ISN and the capacitive probe.

Reference

[1] CIPR Pub. 22, 1997.
[2] R. Kobayashi, N. Kuwabara, and M. Hattori, "A method for determinating the transmission direction of common-mode electromagnetic noise by measuring its energy flow", 12th International Zurich Symp. 38G5, Feb. 1997.

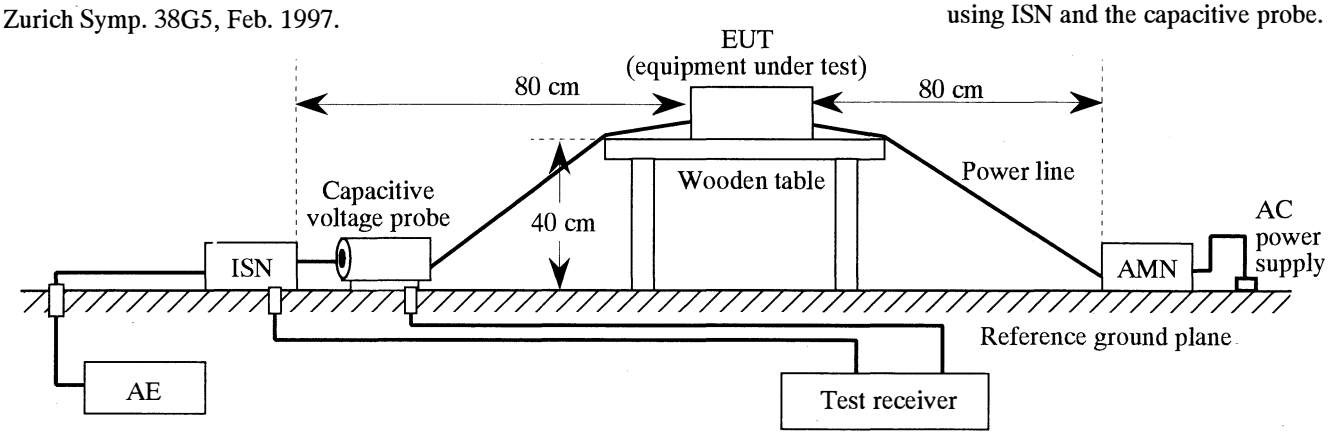

Fig. 3 Measurement setup of capacitive disturbance.