

Noise suppression sheet for digital devices and equipment —

Part 2: Measuring methods

ICS 29.100.10

National foreword

This British Standard is the UK implementation of EN 62333-2:2006+A1:2015. It is identical to IEC 62333-2:2006+A1:2015. It supersedes BS EN 62333-2:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/51, Transformers, inductors, magnetic components and ferrite materials.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Noise suppression sheet for digital devices and equipment
Part 2: Measuring methods
(IEC 62333-2:2006)

Plaque réduisant le bruit des dispositifs
et appareils numériques
Partie 2: Méthodes de mesure
(CEI 62333-2:2006)

Rauschunterdrückungsschicht für
digitale Geräte und Einrichtungen
Teil 2: Messverfahren
(IEC 62333-2:2006)

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CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 51/853/FDIS, future edition 1 of IEC 62333-2, prepared by IEC TC 51, Magnetic components and ferrite materials, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62333-2 on 2006-06-01.

This Standard is to be used in conjunction with EN 62333-1.

The following dates were fixed:

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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62333-2:2006 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 51/1068/CDV, future IEC 62333-2:2006/A1, prepared by IEC/TC 51 "Magnetic components and ferrite materials" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62333-2:2006/A1:2015.

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the document have to be withdrawn (dow) 2018-09-09

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The text of the International Standard IEC 62333-2:2006/A1:2015 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62333-1	- ¹⁾	Noise suppression sheet for digital devices and equipment Part 1: Terms and definitions	EN 62333-1	2006 ²⁾
CISPR 16-1	Series	Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus	EN 55016-1	Series
CISPR 22 (mod)	- ¹⁾	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EN 55022	2006 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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NOISE SUPPRESSION SHEET FOR DIGITAL DEVICES AND EQUIPMENT –

Part 2: Measuring methods

1 Scope

This part of IEC 62333 specifies the methods for measuring the electromagnetic characteristics of a noise suppression sheet. Those methods are intended to provide useful and repeatable measurements to characterize the performance of the noise suppression sheets, so that manufacturers and their customers are able to obtain the same results.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

IEC 62333-1, *Noise suppression sheet for digital devices and equipment – Part 1: Definitions and general properties*

CISPR 16-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 General

Electromagnetic interference between electronic devices, and emission of radiation from electronic devices are caused, in part, by RF current generated by active devices which are driven at high frequency. Printed-circuit board (PCB), devices mounted on the PCB, and all other connected circuits or cables can act as antennas to radiate the RF noise. Levels of the electromagnetic interference and the emission are proportional to the RF current, and are also affected significantly by PCB design, radiation efficiency of the antennas, and noise coupling coefficients between the devices and the antennas.

The noise suppression sheet (NSS) is used for decoupling of the noise path, suppressing RF noise current, and reducing radiation. The noise suppression effect of the NSS can be evaluated by four parameters. They are defined as intra-decoupling ratio (R_{da}), inter-decoupling ratio (R_{de}), transmission attenuation power ratio (R_{tp}) and radiation suppression ratio (R_{rs}).

A pair of antennas is held close to each other for the measuring intra-decoupling ratio (R_{da}) and inter-decoupling ratio (R_{de}). One antenna acts as a noise source and another one as a receiver. Both decoupling ratios are derived from comparison before and after the NSS is installed nearby the antennas. These measuring procedures represent practical configurations of the NSS. Practically, the NSS is installed near the noise source or the noise interfered part, inside of the electronic equipments.

A micro-strip line (MSL) test fixture is used for the measuring transmission attenuation power ratio (R_{tp}) as a transmission line that would be a noise path. The ratio is derived from comparison before and after the NSS installation. This measuring procedure represents another practical configuration that the NSS is utilized for reducing the RF current along the transmission line.

The MSL test fixture is also used for measuring radiation suppression ratio (R_{rs}) as the antenna. The ratio is derived from a comparison before and after the NSS installation. This measuring procedure represents another practical configuration that the NSS is utilized for reducing the radiation from the antenna.

4 Measuring methods

4.1 Intra-decoupling ratio: R_{da}

4.1.1 Principle

The following measuring method is applied for evaluating a reduction of coupling between lines or circuit boards on one side of the NSS, from 100 MHz to 6 GHz.

A pair of loop antennas is employed. One is for noise source and the other one for receiver. They are simulating a general electromagnetic interference situation that often exists inside electronic equipment (see Figure 1).

The NSS is placed so that the centre of the antenna pair comes to the centre of the NSS. The coupling between two antennas with the NSS is measured, as well as the coupling without the NSS as a reference value. Consequently, intra-decoupling ratio R_{da} (dB) can be obtained.

RF magnetic field raised by one antenna is coupled with another one (see Figure 2a). By setting the NSS, the antennas (see Figure 2b), a part of the magnetic flux is led to the NSS, and the coupling is reduced by electromagnetic loss in the material.

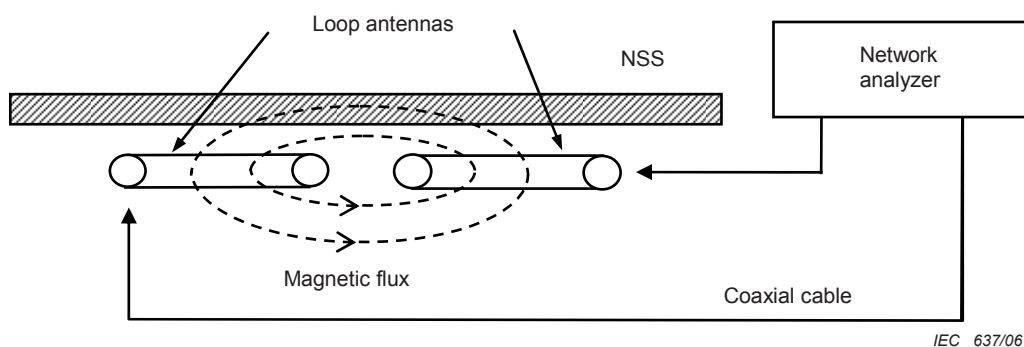
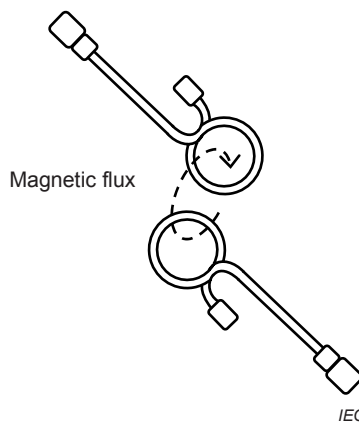
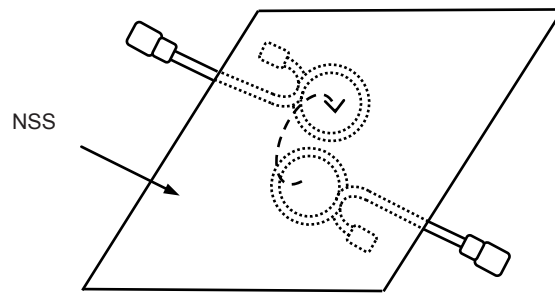


Figure 1 – Schematic diagram of a pair of antennas and NSS under test



IEC 638/06

Figure 2a – Loop antennas



IEC 639/06

Figure 2b – NSS under test

Figure 2 – A pair of antennas and NSS under test

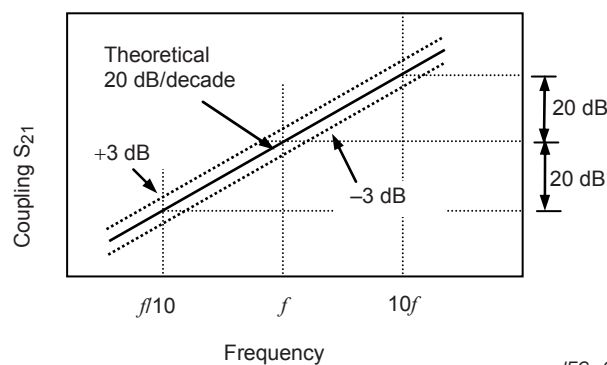
4.1.2 Apparatus

Figure 1 shows the schematic diagram of the measuring method of intra-decoupling ratio.

NOTE The test sample and the loop antennas are set at least 30 mm away from any other material except for the coaxial cable, using low dielectric and low loss material such as the styrene foam and air gap.

Small loop antennas shall be used for the generation of the RF magnetic field and the detection of the magnetic flux.

The S_{21} of the ideal loop antenna pair is proportional to the frequency. This means that S_{21} increases 20 dB with the decade of frequency. The usable frequency range of the loop antenna is defined by the deviation of S_{21} from the theoretical value. The deviation should be less than ± 3 dB as shown in Figure 3.



IEC 640/06

Figure 3 – Frequency response of coupling between a pair of antennas

Several loop antenna designs shown in Figure 4 are capable of achieving the 20 dB/decade frequency response that defines a valid R_{da}/R_{de} measurement.

4.1.2.1 Loop antenna

Recommended examples of the small antennas are shown in Figure 4. Merits and limitations of recommended examples of the antennas are described in Table 1.