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Electromagnetic compatibility -Emission measurements in fully anechoic chambers

Compatibilité électromagnétique -Emission en chambres anéchoïques entiers Elektromagnetische Verträglichkeit -Störaussendung in Absorberräumen

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CENELEC

European Committee for Electrotechnical Standardization Comité Européen de Normalisation Electrotechnique Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

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Foreword

This Technical Report was prepared by the Technical Committee CENELEC TC 210, Electromagnetic Compatibility (EMC).

This document supersedes R210-010:2002.

In order not to loose the information provided in R210-010:2002, CENELEC TC 210 decided to transfer the content of that document unchanged into a Technical Report. It should be noted that CISPR incorporated a major part of the document R210-010:2002 into the CISPR 16 series and the references to standards were not updated.

The document still provides a comprehensive overview and describes some fundamental items of interest for the appropriate use of fully anechoic chambers. The main reason for keeping the document in the public domain in this new form is that it contains background information that has not been included in EN 55016-1-4.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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1 Scope

This Technical Report applies to emission measurements of radiated electromagnetic fields in Fully Anechoic Rooms (FAR) in the frequency range from 30 MHz to 18 GHz. This Technical Report covers the frequency range from 30 MHz – 1 000 MHz. The frequency range above 1 GHz is under consideration, due to the absence of practical experience.

This Technical Report describes the validation procedure for the Fully Anechoic Room for radiated emission tests and the procedures to carry out the tests (e.g. test set up, EUT position, cable layout and termination, test procedures). Recommendations for the relation between FAR emission limits and common Open Area Test Site (OATS) emission limits given in standards such as EN 55011 and EN 55022 are given in Annex B.

This FAR emission method may be chosen by product committees as an alternative method to emission measurement on an Open Area Test Site (OATS) as described in CISPR 16 series. In such cases, the product committee should also define the appropriate limits. Typical measurement uncertainty values for FARs and OATS are given in Annex C.

2 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 amendments) applies.

EN 50147-1, Anechoic chambers – Part 1: Shield attenuation measurement

EN 55011, Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement (CISPR 11, mod.)

EN 55022:1998¹), Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:1997, mod.)

CISPR 16-1:1999 ²), Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus

CISPR 16-2 ³), Specification for radio disturbance and immunity measuring apparatus and methods – Part 2: Methods of measurement of disturbance and immunity

CISPR 16-3:2000 ⁴), Specification for radio disturbance and immunity measuring apparatus and methods – Part 3: Reports and recommendations of CISPR

CISPR 16-4 series, Specification for radio disturbance and immunity measuring apparatus and methods – *Part 4: Uncertainties, statistics and limit modelling*

IEC 60050-161, International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility

Superseded by EN 55022:2006, Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:2005, mod.).

²⁾ Superseded by CISPR 16-1 series, harmonized as EN 55016-1 series, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus.

³⁾ Superseded by CISPR 16-2 series, harmonized as EN 55016-2 series, Specification for radio disturbance and immunity measuring apparatus and methods – Part 2: Methods of measurement of disturbance and immunity.

⁴⁾ Superseded by CISPR 16-3:2003, Specification for radio disturbance and immunity measuring apparatus and methods – Part 3: CISPR technical reports.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161 and the following apply.

3.1.1

Fully Anechoic Room (FAR)

shielded enclosure whose internal surfaces are lined with radio frequency absorbing material (i.e. RAM), that absorbs electromagnetic energy in the frequency range of interest

NOTE The fully Absorber-Lined Room is intended to simulate free space environment.

3.1.2

Equipment Under Test (EUT)

test sample including connected cables

NOTE The EUT may consist of one or several pieces of equipment.

3.1.3

test volume

region of the room that meets the NSA requirements of this Technical Report and which contains the EUT as fully set up

3.1.4

free space antenna factor (AF_{FS})

antenna factor of an antenna which is not affected by mutual coupling to conducting bodies in the environment of the antenna

NOTE It is also the antenna factor measured when the antenna under test is illuminated by a plane wave, which implies that the source antenna is in the far-field of the antenna under test. Antenna factor is defined as the ratio of the magnitude of the E-field in which the antenna is immersed to the voltage at the antenna output of a given transmission line impedance, usually 50 Ω .

3.1.5

antenna reference point

physical position on the antenna from which the separation distance to the defined reference plane on the EUT is measured

NOTE For dipole and biconical antennas this will be the centre of the antenna in line with the central antenna elements. For an LPDA antenna and a hybrid antenna, the reference point is the mark on the antenna provided by the manufacturer for this purpose. The reference point is approximately at the mid-way point between the array elements that are active at the top and bottom frequencies at which the measurements are being made. Hybrid antenna is here defined as a combination of a biconical and LPDA antenna which has a frequency range including 30 MHz to 1 GHz.

3.1.6

Normalised Site Attenuation (NSA)

site attenuation obtained from the ratio of the source voltage connected to a transmitting antenna and the received voltage as measured on the receiving antenna terminals

NOTE Normalised site attenuation is site attenuation in decibels minus the antenna factors of the transmit and receive antenna factors. *NSA* was first introduced for evaluation of open area test sites with ground planes and was measured by height scanning the receive antenna. In this Technical Report, *NSA* is measured in a quasi-free space environment, and because there is no deliberate ground plane, height scanning is not required.

3.1.7 test distance (*d*_t)

distance measured from the reference point of the antenna to the front of the boundary of the EUT