CISPR 32: New International Standard on Electromagnetic Emissions from Multimedia Equipment

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In late 2011, The International Standards Commission's (IEC's) Special Committee on Electromagnetic Interference (CISPR) passed a Final Draft International Standard (FDIS) which had been under development for a number of years. The FDIS was actually developed by CISPR's Subcommittee I - Electromagnetic Compatibility of Information Technology Equipment, Multimedia Equipment and Receivers. The Standard is called "CISPR 32" and it is titled: *Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements.* This article outlines the contents of the New Standard and describes some of its specific criteria.

OUTLINE OF THE STANDARD

The layout of the standard follows the normal paragraph/clause orientation of most International Standards. That is: Scope, Normative References, Classification of Equipment, Requirements, Measurements, Equipment Documentation, Applicability, Test Report, Compliance with this Publication, and Measurement Uncertainty.

SCOPE

CISPR 32 applies to Multimedia Equipment (MME) having a rated Alternating Current or Direct Current supply voltage not exceeding 600 Volts. The standard is written for equipment that will be tested in an EMC Testing Laboratory.

It does contain the following two objectives:

1. To establish requirements which provide an adequate level of protection of the radio spectrum, allowing radio services to operate as intended in the frequency range 9 kHz to 400 GHz.

2. To specify procedures to ensure the reproducibility of measurements and the repeatability of results from one testing laboratory to another.

NORMATIVE REFERENCES

The Normative References mentioned in CISPR 32 include: CISPR 16-1-1: 2010, CISPR 16-1-2:2003, CISPR 16-1-4:2010, CISPR 16-2-1:2008, CISPR 16-2-3:2010, CISPR 16-4-2:2011, CISPR/TR 16-4-3:2004, IEC 60050-161:1990, IEC 61000-4-6:2008, ISO/IEC 17025:2005, IEEE 802.3, and ANSI C63.5:2006.

TERMS, DEFINITIONS AND ABBREVIATIONS

Some key definitions in the standard include:

3.1.6 - Audio Equipment - Equipment which has a primary function of either (or a combination of) generation, input, storage, play, retrieval, transmission, reception, amplification, processing, switching or control of audio signals

3.1.7 - Broadcast Receiver Equipment - Equipment containing a tuner that is intended for the reception of broadcast

services

3.1.15 - Entertainment Lighting Control Equipment - Equipment generating or processing electrical signals for controlling the intensity, color, nature or direction of the light from a luminaire, where the intention is to create artistic effects in theatrical, televisual or musical productions and visual presentations

3.1.20 - Information Technology Equipment (ITE) - Equipment having a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer

3.1.29 - Video Equipment - Equipment which has a primary function of either (or a combination of) generation, input, storage, display, play, retrieval, transmission, reception, amplification, processing, switching, or control of video signals.

3.1.23 - MultiMedia Equipment (MME) - Equipment that is Audio Equipment, Broadcast Receiver Equipment, Entertainment Lighting Control Equipment, Information Technology Equipment, and Video Equipment

There are 67 abbreviations listed that are used in the Standard.

CLASSIFICATION OF EQUIPMENT

The standard defines two classes of equipment associated with two types of end-user environment.

Class B requirements are intended to offer adequate protection to broadcast services within the residential environment. Equipment intended primarily for use in a residential environment shall meet the Class B limits.

Note that all Broadcast receiver equipment is considered to be Class B equipment.

Class A requirements are for all non-Class B equipment; Class A equipment shall comply with the more relaxed Class A limits.

REQUIREMENTS

The requirements are covered in Annex A of the standard.

MEASUREMENTS

This part of the standard defines the measurement facilities and measurement instrumentation specific to the investigation of electromagnetic emissions from MultiMedia Equipment. The philosophy of the standard is that, unless otherwise specified, the basic international standards (for example, the CISPR 16 series of documents) shall be used for all measurement details.

The procedures to be used for measurement of emissions include: (1) the type of Equipment Under Test (EUT), (2) the type of port, (3) the types of cables used, (4) the frequency range, and (5) the mode of operation. Where a port is specified for use with both shielded and unshielded cables, the port shall be tested with both cable types.

The difference between two types of systems is covered in this clause. EUTs are either (1) a host system or (2) a modular system.

> *When the EUT is a host, it will be configured with modules so that the resulting system is representative of typical use.*
>
> **When the EUT is a modular system; it can be comprised of different types of modules; (1) External (infra-red remote control), (2) Internal (computer hard-disk), (3) Plug-In (memory stick), and (4) Mounted (sound or video card).** *Modules intended to be marketed and/or sold separately from a host shall be assessed with at least ONE representative host system. The ports of any module tested shall be terminated in accordance with Annex D of the standard.*

Measurements shall be performed using appropriate tables, annexes, and guidelines from the Standard. Prescan measurements shall be used to determine the cable arrangement giving the maximum emission level.

EQUIPMENT DOCUMENTATION

The standard requires that documentation shall contain details of any special measures required to be taken by the user of the EUT to assure compliance with the standard requirements.

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 108$ MHz	1 GHz
108 MHz $< F_x \leq 500$ MHz	2 GHz
500 MHz $< F_x \leq 1$ GHz	5 GHz
$F_x > 1$ GHz	$5 \times F_x$ up to a maximum of 6 GHz
NOTE 1 For FM and TV broadcast receivers, F_x is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.	
NOTE 2 F_x is defined in 3.1.19.	

Table 1. *Required highest frequency for radiated measurements in the standard is shown.*

Class A equipment must have the following warning statement in the user instructions:

WARNING: This equipment is compliant with Class A of CISPR 32. In a residential environment, this equipment may cause radio interference.

APPLICABILITY

If a manufacturer determines, from the electrical characteristics and intended usage of the EUT, that one or more measurements are unnecessary; the decision and justification for the decision shall be recorded in the test report.

TEST REPORT

The requirements for a test report that documents the results of testing to CISPR 32 are consistent with Clause 5.10 of ISO/IEC 17025. Reproducibility of the measurements is a key element of the test report and, where appropriate, photographs of the measurement configuration shall be included in the report.

The test report shall state: (1) the mode of operation, (2) how the EUT's ports were exercised (using Annex B as a guide), and (3) the product compliance status relative to Class A or Class B limits.

The measurement results of at least the six highest emissions from the type of port being assessed relative to the limit shall be recorded in the report unless they are 10 dB or more below the limit. The results shall include the following information for each emission: (1) the port assessed, (2) for AC power line measurements, the line under test, (3) frequency and amplitude of the emission, (4) margin with respect to the specified limit, (5) the limit at the frequency of the emission, and (6) the detector used.

Additional information that shall be included in the report includes:

(1) the frequency of the highest internal frequency source unless radiated emissions are measured up to 6 GHz

(2) the calculated instrumentation measurement uncertainty for each measurement type unless U_{CISPR} is not defined for the relevant measurement type

(3) the category of the cable simulated by the Asymmetric Artificial Network (AAN), where emissions from wired network ports are measured using an AAN

(4) the measurement distance for radiated emission measurements as defined in appropriate tables in the standard. If a non-standard measurement distance is used, the report shall include a description of how the limits were calculated.

COMPLIANCE WITH THIS PUBLICATION

Compliance with CISPR 32 requires that the EUT has emissions either below Class A (more relaxed)limits or Class B (more stringent) limits. An Equipment Under Test that satisfies the requirements in Annex A of the standard is determined to fulfill the requirements in the entire frequency range from 9 kHz to 400 GHz.

Table clause	Frequency range MHz	Measurement		Class A limits dB(μV/m)
		Distance m	Detector type/ bandwidth	OATS/SAC (see Table A.1)
A2.1	30 – 230	10	Quasi Peak / 120 kHz	40
	230 – 1 000			47
A2.2	30 – 230	3		50
	230 – 1 000			57
NOTE Apply only A2.1 or A2.2 across the entire frequency range.				

Table A.2. *Requirements for radiated emissions at frequencies up to 1GHz for Class A equipment.*

Table clause	Frequency range MHz	Measurement		Class A limits dB(μV/m)
		Distance m	Detector type/ bandwidth	FSOATS (see Table A.1)
A3.1	1 000 – 3 000	3	Average / 1 MHz	56
	3 000 – 6 000			60
A3.2	1 000 – 3 000		Peak / 1 MHz	76
	3 000 – 6 000			80
NOTE Apply A3.1 and A3.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.				

Table A.3. *Requirements for radiated emissions at frequencies above 1GHz for Class A equipment.*

Where CISPR 32 gives options for testing particular requirements with a choice of test methods, compliance can be shown by applying any one of the test methods using the appropriate limit.

Determination of compliance with CISPR 32 shall be based solely on contributions from the Equipment Under Test. Also, compliance can be shown by measuring the EUT's emission when operating its functions simultaneously, individually in turn, or any combination thereof.

MEASUREMENT UNCERTAINTY

Calculation of the measurement instrumentation uncertainty is done in accordance with CISPR 16-4-2:2011 - *Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, Statistics and Limit Modeling - Measurement Instrumentation Uncertainty.*

However, measurement uncertainty shall not be taken into account in the determination of compliance.

ANNEX A - REQUIREMENTS (NORMATIVE)

The requirements for equipment covered under CISPR 32 are given in Tables A.1 through A.12 in Annex A of the newest CISPR document.

Compliance with the radiated emission requirements may only be proven at measurement distances for which compliant-facility or site-validation results exist for the measurement location being used for the radiated emission test.

The requirements for Class A equipment are shown in Tables A.2 and A.3 from the standard, as shown below. Note that Class A equipment may be measured at a 3 or 10-meter horizontal measurement distance at frequencies below 1 GHz.

The requirements for Class B equipment are shown in Tables A.3 and A.5 from CISPR 32.

The requirements for Class B equipment for conducted emissions on the Alternating Current power lines are shown in Table A.9, as below, and graphically displayed in the amplitude versus frequency plot following the Table.

ANNEX B - EXERCISING THE EUT DURING MEASUREMENT AND TEST SIGNAL SPECIFICATIONS (NORMATIVE)

This Annex of the CISPR 32 standard specifies the methods for exercising the EUT during the emission measurements. The EUT shall be operated in the selected mode(s) while the ports are exercised in accordance with this annex.

Clause B.2 is one of the more controversial parts of the standard since the standard (as specified in Table B.1) will require labs to test the video displays with both (1) standard TV color bar signals and (2) scrolling H characters. This will double the length of the test.

Table clause	Frequency range MHz	Measurement		Class B limits dB(μV/m)
		Distance m	Detector type/ bandwidth	OATS/SAC (see Table A.1)
A4.1	30 – 230	10	Quasi Peak / 120 kHz	30
	230 – 1 000			37
A4.2	30 – 230	3		40
	230 – 1 000			47
NOTE Apply only table clause A4.1 or A4.2 across the entire frequency range.				

Table A.4. *Requirements for radiated emissions at frequencies up to 1GHz for Class B equipment.*

Table clause	Frequency range MHz	Measurement		Class B limits dB(μV/m)
		Distance m	Detector type/ bandwidth	FSOATS (see Table A.1)
A5.1	1 000 – 3 000	3	Average/ 1 MHz	50
	3 000 – 6 000			54
A5.2	1 000 – 3 000		Peak/ 1 MHz	70
	3 000 – 6 000			74
NOTE Apply A5.1 and A5.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.				

Table A.5. *Requirements for radiated emissions at frequencies above 1GHz for Class B equipment.*

Applicable to 1. AC mains power ports (3.1.1)				
Table clause	**Frequency range** MHz	**Coupling device** (see Table A.7)	**Detector type / bandwidth**	**Class B limits dB(μV)**
A9.1	0,15 – 0,5	AMN	Quasi Peak / 9 kHz	66 – 56
	0,5 – 5			56
	5 – 30			60
A9.2	0,15 – 0,5	AMN	Average / 9 kHz	56 – 46
	0,5 – 5			46
	5 – 30			50
NOTE Apply A9.1 and A9.2 across the entire frequency range.				

Table A.9. *Requirements for conducted emissions from the AC mains power ports of Class B equipment.*

ANNEX C - MEASUREMENT PROCEDURES, INSTRUMENTATION, AND SUPPORTING INFORMATION - NORMATIVE

This Annex provides additional information, measurement procedure, and requirements to supplement the normative references defined in Annex A.

Annex C is divided into 3 main clauses:

(1) Instrumentation and supporting information

(2) General measurement procedures

(3) MME-related measurement procedures

ANNEX D - ARRANGEMENT OF EUT, LOCAL ASSOCIATED EQUIPMENT, AND ASSOCIATED CABLING - NORMATIVE

This Annex in CISPR 32 contains a Table D.1 which covers spacing and distances with associated tolerances for a variety of elements for both conducted and radiated emissions.

ANNEX E - PRESCAN MEASUREMENTS - PRESCAN MEASUREMENTS - INFORMATIVE

The purposes of a prescan are to determine the frequencies at which an EUT produces the highest level of emissions, and to help select the configurations to be used in the formal measurements. Prescan measurements may be performed with spectrum analyzers without pre-selection provided that precautions are used to ensure that the instrument is not overloaded.

ANNEX F - TEST REPORT CONTENTS SUMMARY - INFORMATIVE

Guidance for compiling a test report can be found in ISO/IEC 17025:2005 - General Requirements for the Competence of Testing and Calibration Laboratories. The appropriate clause in 17025 is 5.10 - Reporting the Results. Table F.1 in CISPR 32 summarizes the information to be included in the test report for a CISPR 32 test.

ANNEX G - SUPPORT INFORMATION FOR THE MEASUREMENT PROCEDURES DEFINED IN C.4.1.1 - INFORMATIVE

Annex G has a series of schematic diagrams to assist measurement procedures defined in Annex C of the standard. It includes diagrams for asymmetric artificial networks with various screened and unscreened pairs of wires.

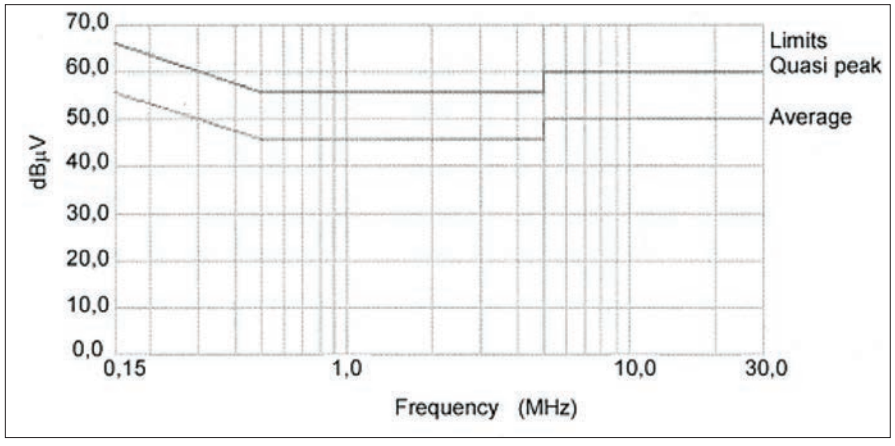

Figure A.1. *Graphical representation of the limits for the AC mains power port defined in Table A.9.*

BIBLIOGRAPHY

The new CISPR 32 standard concludes with an extensive Bibliography of standards and other associated documents.

Daniel Hoolihan *is a past president of the IEEE EMC Society. He has been a member of the Board of Directors since 1987 and has held numerous leadership positions in the society. Hoolihan is also active on the ANSI Accredited Standards Committee on EMC, C63 as Chairman. He was co-founder of Amador Corporation (1984-1995). He can be reached at DanHoolihanEMC@aol.com.*