ecma INTERNATIONAL

Standard ECMA-358

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ICT Product Radiated Emissions: 1–6 GHz

Standard

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Brief history

A special working group within Ecma TC20 has prepared this Standard. It integrates the existing requirements from CISPR 22 for general test setup and the current work from CISPR/A on measurement methods and test site validation methods above 1 GHz. This document also establishes limits from 1 to 6 GHz, which provide reasonable protection to communication services while remaining technically feasible and economically viable.

This Ecma Standard has been adopted by the General Assembly of December 2004.

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1 Scope

This Standard specifies measurement methods and limits for radiated emissions from Information and Communication Technology (ICT) equipment in the frequency range of 1 GHz to 6 GHz. This Standard is based on CISPR 22, which classifies ICT equipment into class A and class B ITE.

This Standard provides:

- Uniform measurement requirements for radiated emissions;
- Standardized operating conditions and interpretation of results;
- Limits of disturbance.

2 Conformance

Radiated emissions from conforming ITE, measured according to the conditions, procedures and requirements specified herein, do not exceed the limits specified in this Standard.

3 References

3.1 Normative references

For application of this Ecma Standard, the latest edition of the documents listed below shall be used.

CISPR 16-1-X series	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus
CISPR 22: 4th Edition:	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement

For application of this Ecma Standard, the published CISPR standards, following approval of the CISPR/A working documents listed below, shall be used.

CISPR/A/485	Receiver Specifications to 18 GHz (proposed amendment to CISPR 16-1-1)
CISPR/A/504	Measurement methods above 1 GHz (proposed amendment to CISPR 16-2-3)
CISPR/A/500	Site Evaluation above 1 GHz
CISPR/A/531	Site Evaluation above 1 GHz (proposed amendment to CISPR 16-1-4)

3.2 Informative references

For emission limits in this Ecma Standard, these CISPR/I documents were used:

CISPR/I/65	Emission limits and methods of measurement from 1 to 6 GHz
CISPR/I/105	Emission limits and methods of measurement form 1 to 6 GHz (proposed amendment to CISPR 22)

4 Definitions

4.1 Equipment Under Test (EUT)

Representative ITE from which radiated emissions are measured.

4.2 Highest internal source frequency (f_s)

The highest frequency generated or used within the EUT or on which the EUT operates or tunes.

4.3 ITE

Information Technology Equipment as defined and classified in CISPR 22.

5 Minimum upper test frequency

Radiated emissions from EUT shall be measured at the minimum upper test frequencies for the highest internal source frequency (fs) as specified in Table 1.

Table 1 - Upper Frequency of Measurement

Highest internal source frequency f_s (MHz)	Radiated Emissions minimum upper test frequency (MHz)
$f_s < 108$	1000
$108 \leq f_s \leq 500$	2000
$500 < f_s \leq 1000$	5000
$f_s > 1000$	the lesser of: $5 \times f_s$ or 6000

6 Limits for radiated emissions in the frequency range of 1 GHz to 6 GHz

Radiated emissions shall not exceed the limits shown in Table 2. The limits are based on a test distance of 3 meters. If the reading on the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 seconds at each measurement frequency; the highest reading shall be recorded, with the exception of any brief isolated high reading, which shall be ignored.

Table 2 - Limits for radiated emissions

Frequency Range (MHz)	Class B ITE		Class A ITE	
	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)
$1000 < f \leq 6000$	70	54	76	60

7 Measurement distance

Radiated emissions limits for frequencies above 1 GHz are based on a measurement distance of 3 meters. Measurements at 3 meters are preferred. Measurements may be made at a distance other than 3 meters provided:

– The measurement distance shall be at least 1 meter but not greater than 10 meters.

– The limits are adjusted assuming free space propagation; that is,

$L_{adj} = L_{3m} + 20 \text{ Log}(3/d)$

where:

L_{adj} = adjusted limit (dBµV/m)

L_{3m} = limit at 3 meter measurement distance (dBµV/m)

d = measurement distance between the periphery of the EUT volume and the receive antenna reference point (meters)

In case of dispute, the measurement distance used during the original assessment of the EUT shall take precedence.

NOTE
Comparison of measurements at different distances extrapolated to a common distance (e.g. 3 meters) will not correlate as well as measurements made at the same test distance.

8 Antenna height requirements and other measurement configuration considerations

The measurement configuration shall be consistent with CISPR/A/504.

9 Measurement instrument detectors

Measurements shall be made with both peak detectors and linear average detectors. Detector specifications shall be in-line with CISPR/A/485 and CISPR/A/504.

9.1 Noise impulse peak detection

The peak detector limits shall not be applied to noise from arcs or sparks that are high-voltage air breakdown events. Such noise arises when EUT contains or controls mechanical switches that control current in inductors, or when EUT contain or control subsystems that create static electricity (such as paper handling devices). The average limits apply to noise from arcs or sparks, and both peak and average limits will apply to other noise from such EUT.

10 Test set-up and operating conditions of the EUT

Test set-ups and operating conditions of the EUT shall be consistent with CISPR/A/504. Consult Annex A for test table material selection.

11 Measurement procedure

It is recommended to perform a preliminary measurement, as described in CISPR/A/504.

12 Final measurement procedure

Final measurements shall be performed as described in CISPR/A/504.

13 Measurement site validation

Site validation shall be performed in accordance with CISPR/A/531.

Annex A
(informative)

Test table considerations

To reduce measurement errors due to reflections from the test table, a low reflectivity material should be used. Test tables made from wood, glass fiber, reinforced plastic are significantly reflective at frequencies above 1 GHz and are therefore not suitable in this application. Materials with a dielectric constant ≤ 1.25 such as expanded polystyrene (Styrofoam™) is recommended.

Table A1 - Dielectric Constants of Various Materials

Material	Min	Max
Air	1.0	1.0
Styrofoam[tm]	1.03	1.03
Wood (dry)	1.4	2.9
Paper	1.5	3.0
Polystyrene	2.4	3.0
Lucite[tm]	2.5	2.5
Polyethylene	2.5	2.5
Amber	2.6	2.7
Plexiglass	2.6	3.5
Ebonite[tm]	2.7	2.7
Polycarbonate	2.9	3.2
Epoxy Resin	3.4	3.7
Polyimide	3.4	3.5
Formica[tm]	3.6	6.0
Glass	3.8	14.5
Bakelite[tm]	5.0	22.0