Emissions Testing for Information Technology Equipment – EN 55022:2006 and Requirements for Measurements above 1 GHz

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Manufacturers of Information Technology Equipment (ITE) intended for sale in the European Union should take note of some important changes that are slated to go into effect with regard to their EMC testing requirements under emissions standard EN55022:2006.

In November 2008 the European Union's Official Journal (OJ) published lists of standards for the Electromagnetic Compatibility (EMC) Directive and Radio and Telecommunications Terminal Equipment Directive (R&TTED). Both lists include references to EN 55022:2006 and its amendment A1, released in 2007.

EN 55022:2006 will supersede EN 55022;1998 and become the requirement for Information Technology Equipment (ITE) sold into the European Union after October 1st 2009[1] , with the requirements of Amendment A1:2007 coming into force one year later on October 1st 2010. What are the differences between the 1998 and 2006 versions of the standard and what new requirements will be introduced by A1:2007?

Let's begin by reviewing the history of CISPR 22 from 1997 onwards. International Standard CISPR 22 is the basis for not only EN 55022 but also for many of the other national versions of standards for ITE.

CISPR 22 Edition 3

CISPR 22:1997 was the first version of CISPR 22 that required a measurement of the emissions on telecommunications interfaces, such as DSL and Ethernet interfaces. EN 55022:1998 is based on this version of CISPR 22.

Amendment A1 to CISPR 22:1997 was issued in 2000 and adopted into EN 55022 in the same year. This amendment added the use of ferrite clamps on all cables that leave the test site (i.e. those cables connecting to remote support equipment) when measuring the radiated emissions from table-top equipment. The purpose was to improve the repeatability of measurements between test sites by reducing the effects of the remote support equipment and long cable lengths.

Amendment A2, issued in 2002 (EN 55022 A2 issued in 2003), clarified issues related to multi-function equipment.

CISPR 22 Edition 4

In 2003, CISPR 22 Edition 4 was released. The major change in this version of the standard was to modify the specifications for the test equipment (Impedance Stabilization Networks, ISNs) used to make the measurements on emissions on the telecommunications interface ports. There was no version of EN 55022 released based on this version of the standard.

[1] Until 2009 manufacturers have the choice of declaring compliance with either EN 55022:1998 (with or without its amendments) or EN 55022:2006

CISPR 22 Edition 5

In 2005, CISPR 22 Edition 5 was released. The major change in this version was to remove the requirement for the ferrite clamps to be used on cables exiting the test site. EN 55022:2006 is based on this standard.

The big change came with amendment A1, issued by CISPR in 2005 with the EN 55022 version released in 2007. A1 added requirements for testing above 1GHz.

CISPR 22 – Measurements Above 1GHz

For those familiar with testing for the North American market on the surface it would appear that many of the requirements match those of the FCC. The most significant difference comes in the test site to be used.

The FCC rules require the use of a test site that meets the requirements for making measurements below 1GHz as detailed in ANSI C63.4:2003 (i.e a test site with a ground plane). CISPR 22 (and, therefore, EN 55022) references a test site described in CISPR 16-1-4. The CISPR 16-1-4 test site for testing above 1 GHz is designed to simulate a free-space environment, so the ground plane needs to be covered with rf-absorbing material to suppress any reflections. In addition the specifications require a very low reflection from around the EUT. This means that a test site used for FCC measurements above 1 GHz and CISPR measurements below 1GHz cannot be used without modifications when making CISPR 22 measurements above 1GHz. Further, the specifications for the test site as detailed in CISPR 16-1-4 may require significant changes to an existing test site prior to be considered suitable for such measurements[2].

As to the limits in CISPR 22, the following is a comparison between the limits for digital devices required by FCC Part 15 and the latest CISPR 22/EN 55022 limits.

Frequency Range	Class A Limits		Class B Limits	
	FCC[Note 1]	CISPR	FCC	CISPR
1 – 3GHz	Avg 60dBuV/m Pk 80dBuV/m	Avg 56dBuV/m Pk 76dBuV/m	Avg 54dBuV/m Pk 74dBuV/m	Avg 50dBuV/m Pk 70dBuV/m
3 – 6GHz	Avg 60dBuV/m Pk 80dBuV/m	Avg 60dBuV/m Pk 80dBuV/m	Avg 54dBuV/m Pk 74dBuV/m	Avg 54dBuV/m Pk 74dBuV/m
6 – 40 GHz	Avg 60dBuV/m Pk 80dBuV/m	No requirement	Avg 54dBuV/m Pk 74dBuV/m	No requirement Note 3

Note 1: The limit above has been extrapolated from 10m (as detailed in FCC rules) to 3m. The 10m limits are 49.5dBuV/m for average and 69.5dBuV/m for peak.
Note 2: Pk indicates the peak limit and Avg indicates the average limit. There are some differences in the specifications for the detectors used to make peak and average measurements between FCC/ANSI and CISPR standards.
Note 3: Work is in progress to extend the frequency range to 18 GHz

[2] Elliott's 5 and 10m chambers have been updated to meet the requirements.

You will note that the CISPR 22/EN 55022 limits are 4dB lower than the FCC limits for measurements below 3GHz and identical above 3GHz. You might expect that measurements made using the CISPR method should be lower than those made using the FCC/ANSI method because there should be no reflected signal from the ground plane to add to the signal transmitted directly between the product under test and the measurement antenna. However, our experience has been that there is very little difference between the results obtained with the two methods.

From what we have seen, if you have 4dB or more margin to the FCC limit your product will likely also meet the CISPR requirements. If you have less than 4dBof margin we would strongly recommend you start testing your products you intend to sell past October 2010 against the new CISPR requirements to determine if redesign is necessary.

As with FCC rules, the upper frequency of the measurement range for the CISPR 22/EN 55022 measurements is a function of the highest frequency generated within the product, as summarized below.

Highest Frequency Generated Note 1	FCC Part 15 Digital Device	CISPR 22 EN 55022
< 108 MHz	1000 MHz	1000 MHz
108 – 500 MHz	2000 MHz	2000 MHz
500 – 1000 MHz	5000 MHz	5000 MHz
> 1GHz	5x the frequency but no higher than 40 GHz	5 x the frequency but no higher than 6 GHz
Note 1: This highest frequency includes signals generated within processors and other ICs.		

Validity of Existing Test Data and Reports

Many products will have been tested against the requirements of EN 55022:1998 (with or without amendments A1 and A2) or EN 55022:2006 without its amendment. As the significant difference between EN 55022:1998 (without amendments) and EN 55022:2006 are in the specifications for the ISNs, it is likely that results from tests conducted per the older versions can continue to be used to help support your Declaration of Conformity to the EMC or R&TTE Directives when the transition period to EN 55022:2006 ends in October 2009 and its amendment 1 in October 2010. To see what tests may need to be repeated we need to look at each of the different tests in turn – AC power port conducted emissions, telecommunications ports conducted emissions, radiated emissions below 1GHz and radiated emissions above 1GHz.

Radiated Emissions, 30 – 1000 MHz

• **Difference:** EN 55022:1998 amendment A1 required the use of ferrite clamps on any cables going to remote support equipment.
• **Equipment affected:** Table-top equipment that were tested against the requirements of EN 55022;1998 with amendment A1 and that were configured with remote support equipment**.**
• **Impact on test results:** The use of the ferrite clamps could cause a reduction in the levels of radiated emiss-

ions compared with results taken without the clamps, primarily for emissions radiated by the interface cables to the remote equipment. Re-evaluation without the ferrite clamps is needed.

AC Power Port emissions, 0.15 – 30 MHz

• **Difference:** No change
• **Equipment affected:** None
• **Impact on test results:** None

Telecom port emissions

• **Difference:** EN 55022:1998 standard uses a different specification for the ISN.
• **Equipment affected:** Devices with telecommunications ports (ethernet, DSL etc) that were tested using the ISN method
• **Impact on test results:** While we expect that the use of the new ISNs will produce a lower measurement than the Edition 3 ISN, you should consider the impact the change in ISN might have on the compliance status of your products.

Radiated emissions above 1GHz

• **Difference:** EN 55022:1997 and EN 55022:2006 have no requirements for measurements above 1GHz.
• **Equipment affected:** Equipment with internally-generated frequencies above 108 MHz
• **Impact on test results:** Testing required against the limits of EN 55022:2006 Amendment A1 if equipment will be sold into the EU after October 2010. While test data taken against FCC rules is not valid for formal CISPR 22 measurements (and vice versa), existing FCC test data could be used to determine if your product might need modifications to meet the CISPR 22 limits.

Conclusion

The changes to EN 55022 over the last 9 years have seen some new measurement methods introduced and in some cases, removed again. Changes in test equipment requirements have also created issues with how to determine if measurements made to one version of the standard can still be used to demonstrate compliance with another. Hopefully this article clarifies what has changed and what steps you need to take to ensure continued compliance of your ITE products with the European Directives beyond the October 2009 and October 2010 implementation dates.

Elliott Laboratories is currently equipped to conduct the EU free space testing above 1 GHz per EN55022:2006 + A1 and/or CISPR 22:2005 + A1 in all emissions chambers at our Fremont facility. For more information about how this change affects your products or for a price quote to test your product, please contact us at info@elliottlabs.com or call at 408-245-7800.

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