Know Your Standards

We are now on the last lap of our first look at the IEC 61000 series of EMC standards. This time, it's the Generic standards for various EMC environments.

So what is a Generic standard?

IEC/CISPR EMC standards, for emissions and immunity, come in 3½ varieties:

- Generic standards, that apply to products that have no Product or Product-family standard: these are the IEC 61000-6 series. They also act as benchmarks for the requirements in other EMC standards; any relaxation from the Generic requirements has to be justified;

- Basic standards, that give methods of measurement. They may *suggest* performance requirements, but not impose them: these are CISPR 16 and the IEC 61000-4 series. Test procedures can conform to these standards, but products cannot;

- Product standards, that apply to a specified type of product and set performance requirements for emissions or immunity or both: these are CISPR standards excluding CISPR 16, 17 and 18 and some others, and a number of immunity standards produced by product committees;

- Product-family standards (this is the '½' variety), which are like Product standards but apply to a range of product types, maybe a very large range – IEC 61000-3-2 applies to anything that can be connected to the public mains supply and draws 16 A or less per phase.

For Europe, all these standards are adopted as ENs and all, *except* Basic standards, are normally 'notified' under the EMC Directive as offering a *prima facie* assumption, if conformed to, of compliance with the Directive.

Generic standards

These are Sections of Part 6 of IEC 61000, and at present there are six of them. They are produced by a number of different IEC and CISPR committees but the CISPR ones don't have CISPR publication numbers.

IEC 61000-6-1 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments
This is produced by IEC TC77. It has been quite frequently updated since its original publication, but there are still questions of principle about it. There are real EMC-related differences between the three environments, and EMC standards in some countries, such as USA, recognize this. The justification for treating them all the same is that the propagation of EM disturbances doesn't respect human segregation of residential area from others, and in many places there *is* no segregation.

IEC 61000-6-2 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
This is also produced by IEC TC77. 'Industrial' means 'heavy industrial', not a unit workshop on a 'industrial estate'. It should be noted that the requirements are related only to the hardware and do not address functional safety issues.

IEC 61000-6-3 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
This is produced by CISPR sub-committee H (CISPR/H). It is clearly a very important standard, because it established the general requirements for the protection of radio (in the widest sense) and telecommunications services. It is more important than the following standard because:

- the number of potential interference sources is huge;

- the sources and victims are geographically entwined.

IEC 61000-6-4 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
This standard is also produced by CISPR/H, and, like the immunity standard IEC 61000-6-2, it applies to 'heavy' industry only.

IEC/TS 61000-6-5 Electromagnetic compatibility (EMC) - Part 6-5: Generic standards - Immunity for power station and substation environments
This is another CISPR/H publication, but it's a Technical Specification – a sort of 'pre-standard' issued to check it against real life. It will become a standard at the next revision. Clearly, these environments may entertain large electric and magnetic fields, but the first draft was criticized for making insufficient distinction between the very high levels that may occur in power stations and the much lower levels present in substations.

IEC 61000-6-6 Electromagnetic compatibility (EMC) - Part 6-6: Generic standards - HEMP immunity for indoor equipment
This standard is produced by IEC SC77C, and is *not* about the potential effects of interesting plants grown in secret on the associated electrical equipment. HEMP is 'High (altitude) ElectroMagnetic Pulse', originally associated with nuclear explosions and very rare astronomical events. There is more about this in the September 2012 issue of the Journal. It appears now that some terrorist organizations might have the resources to generate an HEMP and the effect on telecommunications , and maybe power systems, could be very serious, so they need to be hardened.

What is in a Generic standard?

Sections 5 and 6 are a bit specialized, of course, but the others are more uniform. Beyond the usual 'housekeeping' clauses of

Scope and Normative references, there is an extensive list of definitions, one of the most important being that of ‘port’ – any place where the product interfaces with the EM environment. Thereafter, emission and immunity standards differ, as shown in the table.

Emission standards	Notes	Immunity standards	Notes
General requirements for testing		'Performance criteria' These are the 'pass' criteria and there are three of them: a) for continuous disturbances, no effect; b) for transient disturbances: no effect after the transient; c) for transient disturbances: no unrecoverable effect.	The actual wording for each criterion is very carefully judged. Some other standards define four criteria.
Product documentation Information on any special measures to preserve EMC, such as the use of screened cables.		General requirements for testing	
Applicability – establishes that the standard has to be interpreted correctly for a given product and allows justified exemption from some tests		Documentation of the manufacturer's acceptable EMC performance	
Emission requirements – refers to tables that follow the two succeeding clauses		Applicability – establishes that the standard has to be interpreted correctly for a given product and allows justified exemption from some tests	
Application to volume-produced products – the 80-80 rule; a statistical procedure that ensures with 80% confidence that 80% of products meet the requirements.		Tables of disturbances and levels to be applied at each port, the Basic standard specifying the test procedure and the 'pass' criterion	Some tables have much supplementary information.
Measurement uncertainty The calculated uncertainty is not applied to the results of measurements but has to be reported with the results	This does raise philosophical issues when the reproducibility of the measurements is comparable with, or worse than the calculated uncertainty.		

Next time, we will look at what has changed since the first of this series.

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