



Date

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IEEE EMCS TC 7 Members

On the Aim and Scope of TC 7 – document for the TC 7 Inaugural Annual Meeting 2012

The aim and scope of [TC 7](#) was discussed at the SC 2 meeting in 16 August 2011. Please see [Minutes of the meeting](#).

Present [Charter of TC 7](#) is:

“This technical committee is concerned with low-frequency EMC including Power Quality in electric power systems. The committee is focusing on application of fundamental EMC concepts also to low frequency conducted disturbances. EMC in power systems is expected to be increasingly important. This is due to increased use of electronics in renewables, electric vehicles, energy efficient technologies and Smart Grid applications.”

This charter will be discussed during the TC 7 annual meeting in Pittsburgh.

Within the IEC, see e.g. [Guide 107](#), low-frequency phenomena are defined up to and including 9 kilohertz frequencies. Consequently, high-frequency phenomena are defined above that frequency.

Within IEC the TC 77 Electromagnetic compatibility has its scope presented in http://www.iec.ch/dyn/www/f?p=103:7:0:::FSP_ORG_ID:1265. As can be seen, in addition to low frequency emission (up to and including 9 kHz), also some high frequency phenomena are included: “emission in the high frequency range ($f > 9$ kHz): disturbances not covered by CISPR 10 (1992), in co-ordination with CISPR (e.g. mains signalling)”.

As pointed out by Dr. Alex McEachern (see comments attached to this document), there are ongoing IEC work within TC 77 that are considering phenomena up to and including 150 kilohertz, e.g. 61000-4-19 and 61000-4-30.

Following the views of SC 1 chair Don Heirman (see attached comments), my recommendation is to limit the TC 7 scope to conducted electromagnetic phenomena up to and including 150 kilohertz. Even though that would mean that low frequency will have a different definition in comparison with IEC.

Strong liaison with SC 1 is most important in order to foster a fruitful collaboration.

Best regards

[Magnus Olofsson](#), TC 7 Chair

Attachment: Some compiled discussions

William Bush 01/May/2012

This is a tough one since there are several variables including electrical vs. physical length and waveform rise/fall time - these besides any band designated as "low frequency." Then there is the designator "high-speed" used within the signal integrity community. Does high-speed indicate high-frequency?

From a number of reputable resources, electrical vs. physical structure dimensions usually points to a maximum of 1/10 wavelength at the highest frequency of interest. This ensures the phasing around the circuit is always within 36 degrees. In many instances, wavelengths of 1/20 or much smaller are recommended to ensure even closer approximation to a "lumped circuit." The highest frequency of interest may need to be determined from the Fourier (usually discrete) breakdown of the current (signal). For this reason, there can be a relatively slow signal frequency but the frequency of interest could be many times higher due to quite high (such as nanosecond) rise/fall times for that signal. I believe this is the case for repetitive fast transient burst testing.

The FCC placed the demarc for conducted emissions at around 30 MHz which seemed to account for the predominance of conducted emissions for the typical equipment physical size and the attached cabling. Even in this case, the frequency of interest would be determined by the rise/fall time of the currents - not just the fundamental frequency of 30 MHz.

In another IEEE group, IEEE 1050 indicates grounding of cable shields, etc., should be shifted to a multi-point topology at around 10 KHz. Within 1050 the term high-frequency also appears within this context.

So there seems to be case for delegating the terms low and high frequency based upon the relative situation involved: the electrical size of the conductors and the rise/fall time of the currents on those conductors.

Users of the assembled document will already have formed an idea of what high or low frequency means to them - based upon their industry sector and the impact from other documents and marketing materials.

Perhaps we should entertain some type of informative Annex that describes these issues and how the targeted new document arrived at its determinations for "low frequency" band allocation.

Alex McEachern 01/May/2012

The IEC has settled on the frequency range "2 kHz ~ 150 kHz" for conducted low-frequency immunity/emissions. Perhaps that information would be useful in this discussion?

And the IEC is making rapid progress on two standards in this area.

IEC Document 77A/783A/Committee Draft "61000-4-19, 2 - 150 kHz immunity testing" is going through its second revision this week at a Working Group meeting in Sardinia, Italy (I am actually on my way to this meeting, writing this email at an airport in Berlin).

IEC Document 77A/787/Committee Draft "Edition 3 of 61000-4-30, Power quality measurement methods" is at the first revision stage, but has an entire new section that defines the measurement method for conducted emissions in the 2 kHz ~ 150 kHz range. This document will next be revised at a Working Group meeting to be held in June at Power Standards Lab in California.

As a Liaison between the IEC and the IEEE, I will inquire if these drafts can be easily shared; if so I will distribute them. But if there is some obstacle, please ask your own National IEC Committee to send you the two documents above for comments.

Donald Heirman 30 April 2012

I think your discussion in Pittsburgh will be very interesting and instructive as we place the EMC Society in the position of helping on EMC issues in all frequency ranges. Committees specializing in certain frequency ranges will bring focus to those ranges and work as complements to other committees we have in the EMCS. SC1 within its scope is ready to coordinate and contribute. SC1 also has membership from are other specialized TCs including for example TC4 which is engaged in EMC design that can be applied to for example Smart grid/meter application.

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The officers of SC1 have had discussions on how we will interact with all the TCs and the Standards Development Committee (SDCom) (which also is where the work on Intentional EMI is in their P1642 standards work). Clearly the work of TC7 is in our thoughts. One aspect is the frequency demarcation. Here is the current thinking of some. Our thinking is that for radiated disturbances which is probably a large issue for products to work in the RF environment (especially Smart Meters), SC1 should be considering such disturbances above 9 kHz (9 kHz is the start of "radio" according to the ITU-R). For conducted disturbances maybe the break is between 100 and 200 kHz between the thrusts of our two committees. This break will indeed be better served in TC7 and the power folks are better able to handle conducted harmonics in the system for example whether it comes from the common power grid or from a renewable energy source.

In any case SC1 stands by ready to coordinate any application from the EMCS TCs and especially that of TC7. I hope that the above has identified better the high and low frequency considerations as seen by the leadership in SC1.

Magnus Olofsson

Thanks for summarizing our thinking regarding frequency. I think there is good rationale for TC 7 to focus on conducted disturbances in the lower frequency domain. As you write there may be a logical upper limit in the range of 100 to 200 kilohertz. Here switched power supplies are common sources of emissions. And immunity is of relevance for various equipment within our electrical systems, including smart meters. The matter of frequency range is clearly on the agenda for our TC 7 annual meeting in Pittsburgh.

Dear Siew,

I welcome your input and will reflect upon it. This and other inputs will be discussed during the TC 7 annual meeting. Coordination with SC 1 is important.

Finally, thanks for supporting TC 7 activities including Low Frequency and Power System EMC during the upcoming APEMC Singapore conference!

Best Regards,

Magnus

DR W H Siew 30 April 2012

I am sorry that I will not be able to attend the Pittsburg meeting.

However, for the purpose of discussion at Pittsburg, I would like to suggest that the TC should not be constrained by frequency limits. I say this because it might be perceived to be duplicating the work of TC10 and maybe of TC4.

We should follow the model of TC5 and define the scope to be technology or system specific. Hence, I suggest that the TC be known as EMC for Renewable Energy Systems. In doing so, although the issues may still be largely due to low frequency disturbance (and not necessarily limited to conducted disturbance), there is scope to include high frequency disturbance depending on where such renewable systems are sited.

Magnus Olofsson 30 April 2012

Thanks for your kind reply. Yes, the TC 7 Low Frequency definition is not yet clarified but likely we will be up to 150 kilohertz. In the kilohertz range there are issues related to smart metering communication and switched power electronics. And EMC is not only about apparatuses. It is as well encompassing systems (fixed installations).