Inherent Uncertainties When Performing a Radiated Susceptibility Test in the Reverberation Chamber

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When performing a Radiated Susceptibility Test (RST) in the Reverberation Chamber (RC) a good measure of the stress we put onto the Equipment Under Test (EUT) is the power measured by a reference antenna placed in the RC. An inherent property of the RC is that the maximum power stressed onto the EUT will differ from the maximum power stressed onto (≡ measured by) the reference antenna. In (M. Höijer, "The Maximum Power Stressed onto the Critical Component in the Equipment Under Test when Performing a Radiated Susceptibility Test in the Reverberation Chamber," *Submitted to IEEE Trans. Electromagn. Compat , 2006*), we show that the maximum power stressed onto the EUT, relative to the maximum power measured by the reference antenna, is a random variable W, with the cumulative distribution function,

$$F_W(w) = N\sum_{m=0}^{N}\sum_{n=0}^{N-1}\binom{N}{m}\binom{N-1}{n}\frac{(-1)^{m+n}}{mw+n+1},$$

where N is the number of independent stirrer positions in use. The blue dashed curves in Fig. 1 show the 5%-percentile as well as the 95%-percentile of W. By only using the maximum value measured by the reference antenna, we do not use all the measurement data efficiently. It is more beneficial to calculate the average power received in the reference antenna, and multiply it by a random variable T. The random variable T has the cumulative distribution function,

$$F_T(t) = \sum_{n=0}^{N}\binom{N}{n}(-1)^n\left(\frac{1}{1+\frac{n}{N}t}\right)^N.$$

The red solid curves in Fig. 1 show the 5%-percentile as well as the 95%-percentile of T. The distances between two corresponding curves in Fig. 1, are 90%-confidence intervals for W and T, respectively. In Fig. 2, those 90%-confidence intervals for W and T are plotted, and we can see a small, but clear, advantage in using the average value method.

Here, we use the convenient quantity power as a measure of the stress we put onto the EUT. It is to be emphasised that similar uncertainties occur if we instead use the quantity electric field.

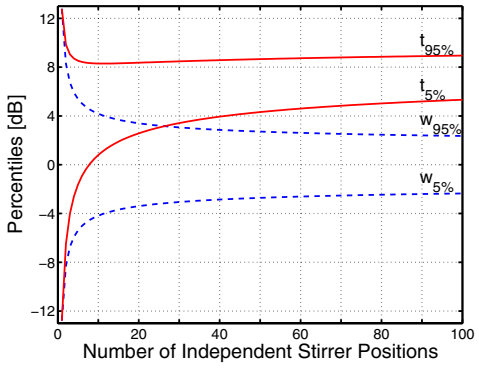

Fig. 1. Radiated susceptibility Testing in the Reverberation Chamber implies inherent uncertainties.

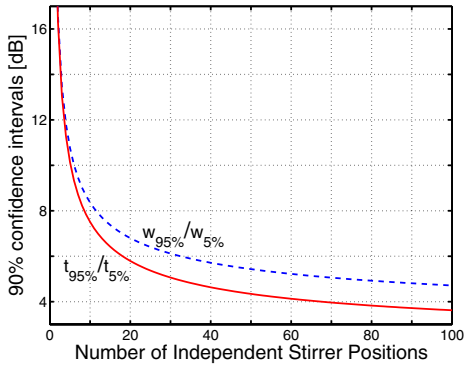

Fig. 2. 90 % confidence intervals of the inherent uncertainty when performing a Radiated Susceptibility Test in the Reverberation Chamber.