Use of Mode-Stirred Reverberation Chamber (MSRC) as test facility for studying field inside loaded equipment cavity

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The aim of this paper is to correlate properties of the field inside a cavity with some electrical properties of its loads. Decrease of volume available for resonance, resonance mode density alteration, modification of amplitude distribution laws, decrease of the Q factor due to the power absorbed in loading objects were suspected to be of great influence. Experiments were done to measure influence of these parameters. Power loss in the wall and due to aperture leakage or power dissipated through loads of wire are not considered here. We assume that for small loading factor and for small wavelength, fields inside a MSRC are statically similar to those inside equipment. For example, with a χ^2 distribution law of each component of the field, the amplitude distribution is of a Rayleigh form. With conductive objects inside the MSRC, the density of mode resonance decrease dramatically at a fixed frequency, and amplitude law tend to be a Rician one:

$$p(r) = r(2+\beta)\exp\left(-\frac{r^2(2+\beta)+\beta}{2}\right)I_0\left(r\sqrt{\beta(2+\beta)}\right)$$

Equation 1: Rician law

For an empty cavity, or for large volume available, β tend to be zero and the law is Rayleigh. For a loaded cavity, or for undermoded cavity, β tend to infinity and law tends to be a dirac with only a few mode resonance:

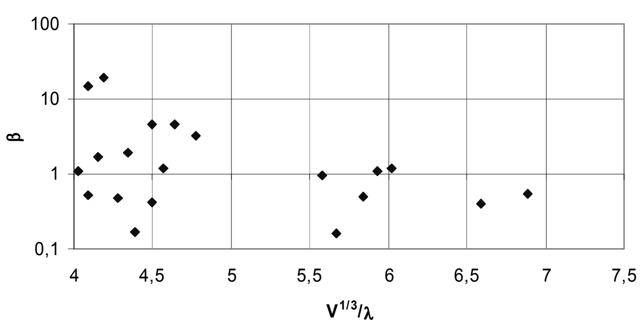

Figure 1: β vs volume available

Other experiments were done to measure decrease of Q factor with lossy object in the cavity. A good accuracy were found with the relation between Q and shielding effectiveness SE:

$$SE = \sqrt{\frac{\sigma_t \lambda Q}{2\pi V}}$$

Equation 2

Studies are performed to verify this relation for more complex configurations.