Effect of power state on the absorption cross section of personal computer electronics

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ABSTRACT

Knowledge of the shielding effectiveness (SE) of an enclosure is important for the electromagnetic compatibility of electronic systems. The SE of an enclosure depends on the absorption cross section (ACS) of its contents, the circuit cards, disk drives etc. In most published work, the ACS measurements were performed when the contents were unpowered. We expected that the ACS would be different when a circuit is powered as many of the active devices would be biased into conduction. Also we have observed in previous work that the switching activity causes a circuit to act as a modulated scatterer [1]. In this work we compare the measured ACS of the contents of a PC in powered and unpowered state.

The measurements were performed in a reverberation chamber and the configuration can be seen in Figure 1. The monitor, keyboard and mouse of the computer were removed. To guarantee a full exposure of the PC's internal contents to the radiation, the side panel was removed thus negating the enclosure SE. A vector network analyzer was used to collect *S* parameters. The ACS was calculated by using the time domain method [2] and the measurement uncertainty was calculated to be less than 2.5% [3]. The ACS of the unpowered and powered computer was measured three times alternatively. Here powered means the Windows system was activated. To make the computer run at full capacity, stress test software, HeavyLoad, was used. It tests the CPU, GPU and hard drive simultaneously. In addition, a music CD was played in the CD-ROM by Windows media player.

Figure 2 shows the measurement results. It can be seen that the ACS of the computer fluctuates around $0.02m^2$. All six measurements produced similar outcomes. Although they are not identical, their general features are the same and fall within the measurement uncertainty. This suggests that the power state does not have a significant influence on the ACS of the computer. This brings convenience to similar ACS measurements since there is no need to consider power supply of the equipment under test.

It has been shown that the ACS of the contents and the SE of the empty enclosure to determine the SE of the populated enclosure [4]. Also, the total transmission cross section of the apertures in the enclosure can be estimated by the contents' ACS and the SE of the empty and populated enclosure.

REFERENCE

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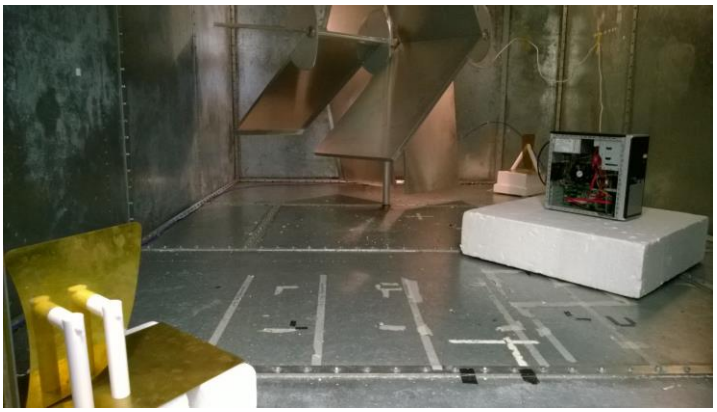

Fig.1. The configuration of the ACS measurement

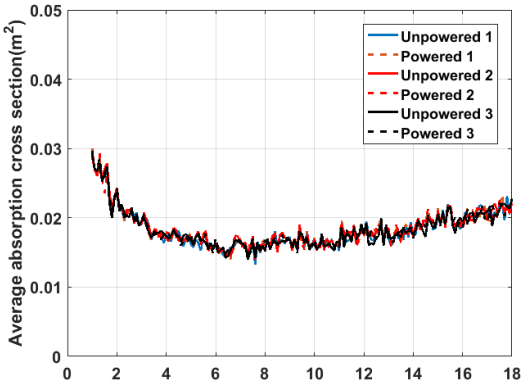

Fig. 2. Measured ACS of the PC contents