

Measurements of Electric Field Distribution in a Reverberation Chamber with Multi-frequency Systems

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The US national toxicology program (NTP) has published the results of an animal study on the carcinogenicity of 2G frequency bands [1]. This study is meaningful in electromagnetic field exposure using experimental animals; however, additional research is needed as it does not reflect current mobile communication frequencies. In this study, we measure the electric field distribution of the RF simultaneous exposure system designed for animal experiments, which can supply three frequencies from 4G and 5G frequency bands to a single reverberation chamber concurrently. The reverberation chamber is equipped with vertical and horizontal mode stirrers to maintain a homogeneous electric field distribution [2].

Figure 1 shows the FL7006 3-axis electric field probe mounted on the cage rack. To measure the electric field distribution in the reverberation chamber, the field probe recorded 1-minute time-averaged values of the electric field components (E_x , E_y , E_z) and the vector sum components (E_{total}) at 150 ($5 \times 5 \times 6$) measurement points within a measurement volume of $1.5 \text{ m} \times 1.5 \text{ m} \times 1.3 \text{ m}$, inside a reverberation chamber of dimensions $2.5 \text{ m} \times 4.0 \text{ m} \times 2.0 \text{ m}$. Measurement were conducted under four conditions: 900 MHz, 2.12 GHz, 3.65 GHz, and a simultaneous exposure condition.

As shown in Figure 1, the electric field distribution is uniform, with a normalized standard deviation from 1.2 to 2.4 V/m across all frequencies when measured without cage racks. The measured electric field is normalized to 1 W. Although the difference in normalized standard deviation among the frequencies are small or insignificant, the magnitude of E_{total} varies with frequency due to the use of independent antennas for each frequency. Further research is needed involving experiments in which experimental animals in the reverberation chamber are exposed to both 4G and 5G frequency bands.

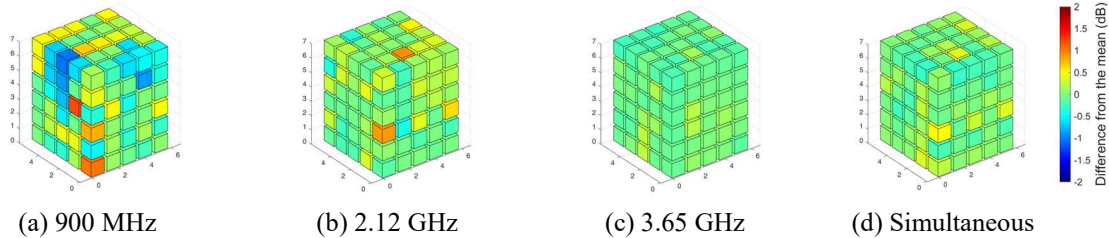


Figure 1. Measured electric field distribution on the measurement volume.

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References

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