Over-Moded Cavity for Wireless Charging Applications

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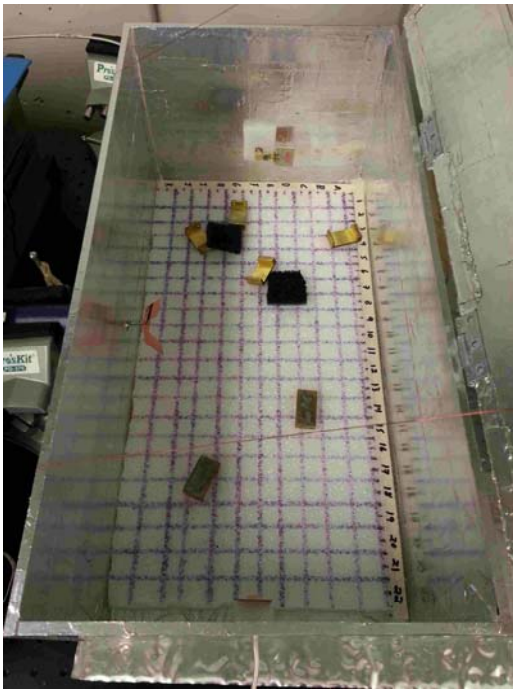
An over-moded cavity wireless charging system is presented. The concept is that of an RF shielded container of a scalable size that can hold multiple devices under charge (DUCs) at a time. A rectification circuit along with power conditioning electronics embedded in the DUCs allows DUCs to charge regardless of orientation or position inside the cavity. Due to the inherent shielding of the cavity, power densities and frequency choices for the RF radiation are no longer design constraints due to limitations imposed by the FCC and IEEE health and safety regulations.



In order to test the design concept, a cavity of dimensions 50cm x 25cm x 20cm is created from Plexiglass and lined on the inside with aluminum tape. RF power is supplied though a patch-type $\lambda/2$ away from the wall. The frequency used for this concept is 10 GHz with an input power of 0.5 watts. This high frequency ensures that thousands of modes are excited within the cavity allowing it to be modeled in a manner to that of a reverberation chamber. Validation methods of stirring the reverberation chamber are outlined. The stirring provides a uniform power density throughout the cavity; independent of polarization, orientation, or position of the recenna element within the cavity. This uniform power density drives the design of the rectenna elements and as more DUCs are added will drop the overall power density thus driving a need more maximum power point tracking (MPPT) circuitry and basic power electronics.