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2P37 - Multipactor in Coaxial Transmission Lines

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Despite decades of research, understanding and prediction of multipactor in complex geometries remains predominantly empirical. This results in large safety margins in RF design, driving up production and deployment costs to prevent costly operating disruptions or complete device failure.
As part of a Multi-University Research Initiative (MURI) led by Michigan State University, the University of Michigan is investigating multipactor discharges in coaxial geometry. The asymmetric field intensity of coaxial geometry results in different transit times for electrons born on the inner or outer surface of the coaxial line, altering the resonant conditions typically observed in parallel plate multipactor. Minimal experimental data on coaxial multipactor exists in the public domain [1,2]. The published data are for a limited set of materials, and for frequency-gap products, fd, below 3 GHz-mm.
To characterize and mitigate multipactor, we have built a coaxial test chamber comprised of OFHC copper tubing with a replaceable test region. The inner conductor is increased in diameter in the test region using ¼-wave step transformers to allow a range of gap distances, d, to be explored. Coupled with frequencies, f, ranging from 0.9 to 2.835 GHz, this test setup will acquire multipactor susceptibility information for fd > 3 GHz-mm, validating concurrent analytic and computational work. Initial coaxial multipactor susceptibility data will be presented.

[1] R. Woo, "Multipacting Discharges between Coaxial Electrodes,"Journal of Applied Physics, vol. 39, no. 3, pp. 1528–1533, Feb. 1968.
[2] T. P. Graves, "Experimental investigation of electron multipactor discharges at very high frequency,"Ph.D. Thesis, Massachusetts Institute of Technology, 2006.

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