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TEMPORAL STUDY OF DUAL FREQUENCY MULTIPACTOR ON A DIELECTRIC

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Multipactor [1] is a nonlinear phenomenon in which an electron avalanche driven by a high frequency rf field sustains itself by an exponential charge growth through secondary electron emission from surfaces. This work investigates the time dependent physics [2] of multipactor discharge on a single dielectric surface by a novel multiparticle Monte Carlo simulator [3] with adaptive time steps. This model is advantageous over previous models as it can estimate the particle flight durations exactly, offering better statistics than the single macroparticle model [4,5], yet less computationally costly than models with growing number of particles over time [2].

The study shows that the presence of a second carrier frequency [6] of the rf electric field changes the saturation level and temporal oscillation pattern of the normal surface field. It is found that in the parameter regime of our investigation, the instantaneous normal surface field and the multipactor electron population remains at a lower value for a longer duration within an rf period for dual tone operation than for single tone operation.

[1] P.T. Farnsworth, J. Frankl. Inst. 218, 411 (1934).

[2] H.C. Kim and J.P. Verboncoeur, Phys. Plasmas 12, 123504 (2005).

[3] A. Iqbal, J. Verboncoeur, and P. Zhang, Phys. Plasmas, 26, 024503 (2019).

[4] R.A. Kishek and Y.Y. Lau, Phys. Rev. Lett. 80, 193 (1998).

[5] P. Zhang, Y. Y. Lau, M. Franzi and R. M. Gilgenbach, Phys. Plasmas, 18, 053508 (2011).

[6] A. Iqbal, J. Verboncoeur, and P. Zhang, Phys. Plasmas 25, 043501 (2018).

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