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2P39 - Suppressing single-surface multipactor discharges using non-sinusoidal electric field

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Multipactor discharge is a major concern in a multitude of electromagnetic devices, often requiring suppression to properly operate devices and avoid damage. The factors affecting multipactor discharges are mainly from the dielectric window properties and the field distribution. Modifying the window geometry including periodic grooves on the window surface in rectangular or triangular shape, and applying an external dc electric field pointing into the dielectric window or an external dc magnetic field parallel to the surface (perpendicular to the tangential rf field) were discovered to effectively reduce multipactor in the previous studies [1-4]. In our work, both particle-in-cell (PIC) and Monte-Carlo simulations demonstrate that applying a temporal Gaussian-type electric field can suppress single surface-multipactor discharge. Decreasing the half peak width of the Gaussian electric field can reduce the time-averaged multipactor intensity by an order of magnitude at fixed input power. PIC simulation reveals the underlying physical mechanism by examining the electron
impact energy and angle distribution, as well as the dynamic secondary electron yield (SEY). At smaller half peak width, more electrons striking the surface have energies below the first crossover energy of the SEY curve, and a small fraction of electrons have energies higher than the second crossover of the SEY curve with fixed input power, giving rise to weaker secondary electrons emission and a weaker multipactor discharge.
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