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Multipactor dynamics under obliquely incident rf electric field

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It is well known that single-surface multipactor discharges have a negative effect the electromagnetic wave transmission in high power microwave devices. In this work, we examine the single surface-multipactor dynamics under obliquely incident rf electric field, such as occurs in TM waveguide modes, using particle-in-cell simulation. The results show that the oblique angle, θ, between the electric field and the dielectric surface has a strong effect on the multipactor discharge, and significantly reduced multipactor is found with increasing θ from 0 to 0.15π. In addition, in the base case θ = 0, the time-dependent electron number has two identical oscillations over one rf period. However, one of these two oscillations decreases in magnitude at θ = 0.05π and disappears at θ = 0.15π, because the perpendicular component of the rf electric field alternately reinforces and reduces the restoring field, increasing and decreasing the oscillation of the electron impact energy, respectively. In addition, the electrons are forced into a few branches in the phase space of velocity and position. Finally, we develop a simple dynamic model to investigate the multipactor suppression, and the susceptibility diagram shows the upper and lower boundaries get close, implying no multipactor develops at large oblique angles.
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