Susceptibility diagram of multipactor discharge on a dielectric – Effects of an external magnetic field and oblique RF electric field.

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Monte-Carlo simulations have recently been used to construct the susceptibility diagram of multipactor discharge on a dielectric, under the assumption that the RF electric field is parallel to the dielectric surface [1]. This diagram, constructed from kinematic considerations, turns out to be extremely useful in the prediction of the saturation level [2]. Here, we generalize the susceptibility diagram in two aspects: inclusion of an external magnetic field and the effects of an oblique RF electric field.

It is found that the presence of an external magnetic field does not qualitatively change the susceptibility diagram, regardless of the orientation of the magnetic field. This statement holds for all magnetic fields simulated, up to those values whose cyclotron frequency is on the order of the RF frequency.

The effects of an oblique RF electric field show a more significant change on the susceptibility diagram. In general, the lower bound (in RF electric field) of the susceptibility diagram [1] does not suffer a qualitative change as ϕ increases from zero, where ϕ is the angle between the RF electric field and the dielectric surface. However, the upper bound changes markedly once ϕ exceeds about 10 degrees. The overall effects is that nonzero ϕ narrows the range of RF electric field in which multipactor can occur. However, since the saturation of multipactor is determined from the lower boundary of the susceptibility diagram [2], the present study then shows that oblique RF electric field and external magnetic field do not qualitatively affect the existence or the saturation

level. More important, then, is the effect of outgassing that is considered elsewhere [3] in this Conference.

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[1] Kishek and Lau, Phys. Rev. Lett. 80, 193 (1998).
[2] Ang et al., IEEE Trans. Plasma Sci. 26, 290 (1998).
[3] Valfells et al., in this Conference.