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Harmonic generation in multipactor-induced plasma ionization breakdown[1] DE-QI WEN, Michigan State Unversity, PENG ZHANG, JANEZ KREK, YANGYANG FU, JOHN VERBONCOEUR, Michigan State University — Multipactor and plasma ionization breakdown near a single dielectric surface frequently occur in high power microwave transmission devices and high field microwave discharges. The harmonics can cause coupling of modes and other adverse signal effects in practical devices. In this work, we report observations of higher harmonics generation of the normal electric field in multipactor-induced plasma ionization breakdown in argon using kinetic particle-in-cell simulations. The observed harmonic frequency is around ten times the fundamental microwave frequency, but is significantly lower than the electron plasma frequency. A theoretical model reveals that two-stream instability is the fundamental mechanism of higher harmonics generation in the collisional regime. Higher harmonics are reduced at higher pressure. Similar higher harmonics are also demonstrated in ionization breakdown processes in helium and xenon. Additionally, a propagating double layer-like structure is observed for helium. The physical mechanism is attributed to the response of light ions to two neighboring reversed normal electric fields and the localized space charge effect.

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