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Study of the Void-Induced Plasma Emission in Capacitively-coupled RF Complex Plasmas ALEKSANDR PIKALEV, German Aerospace Center (DLR), Institute of Materials Physics in Space, IGOR SEMENOV, Leibniz Institute for Plasma Science and Technology, MIKHAIL PUSTYLNIK, CHRISTOPH RÄTH, HUBERTUS THOMAS, German Aerospace Center (DLR), Institute of Materials Physics in Space — Complex or dusty plasma is a medium containing ionized gas and micron-sized solid particles. A Void — a microparticle-free area — can disturb the microparticle suspension homogeneity. The void also determines the nanoparticle generation cycle in plasma reactors. Although the void formation has been studied for decades, understanding of its behaviour is still incomplete. We experimentally demonstrate that the void in the RF discharge complex plasma can exist in two qualitative different regimes. The "bright" void is characterized by bright plasma emission associated with the void, whereas the "dim" void possesses no emission feature. The transition from the dim to the bright regime occurs with the increase of the discharge power and has a threshold character. The threshold is manifested by a kink in the void size power dependencies. We reproduce the bright void by a simplified time-averaged 1D fluid model. To reproduce the dim void, we artificially include the radial ion diffusion into the continuity equation for ions, which allows to mechanically stabilize the void boundary due to very week electrostatic forces. The electric field at the void boundary occurs to be so small that it, in accord with the experimental observation, causes no void-related emission feature.

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