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RF breakdown in low pressure gases between small (millimetric) gap parallel plate electrodes with surface structures BORIS LEGRADIC, ALAN HOWLING, CHRISTOPH HOLLENSTEIN, EPFL — We present an experimental investigation into RF breakdown for electrodes with holes or protrusions, approximating the situation in real reactors and providing a benchmark for fluid simulations. RF breakdown curves (voltage vs. pressure) generally show a steep left-hand branch at low pressures and a flatter right hand branch at higher pressures. Introducing protrusions or holes in parallel plate electrodes will lower the breakdown voltage in certain conditions. Yet experiments show that the breakdown curves are not perceptibly influenced by the increased electric field at sharp edges or ridges. Instead, both experiments and simulation show that breakdown at high pressure will occur at the protrusion providing the smallest gap, while breakdown at low pressure will occur in the aperture providing the largest gap. This holds true as long as the feature in question is wide enough: Features that are too narrow will lose too many electrons due to diffusion, either to the walls of the apertures or to the surroundings of the protrusion, which negates the effect on the breakdown voltage. The simulation we developed presents a tool to aid the design of complex RF parts for dark-space shielding.

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