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Modeling of High-Power Gas Switch for Electric Grid System
ALEXANDER V. KHRABROV, JOHAN CARLSSON, IGOR D. KAGANOVICH, Princeton Plasma Phys Lab, TIMOTHY SOMMERER, SERGEY ZALUBOVSKY, GE Research — There has been recent interest in utilizing gas switches in high-power AC/DC conversion for the purpose of power transmission over long distances. These devices would be based on a glow discharge with magnetically insulated cold cathode [1]. Their operation is similar to sputtering magnetrons [2,3], but at much higher pressures (0.1 to 1 Torr) in order to achieve high current densities. We present results of numerical (the particle-in-cell code EDIPIC 1d3v PIC [4]) and analytical investigation of a gas switch in the conduction phase. The important properties of the high-pressure magnetron discharge are a very narrow cathode sheath and a considerable voltage drop in the magnetized pre-sheath where most of the ionization takes place due to Joule heating. *The information, data, or work presented herein was funded in part by the Advanced Research Projects Agency-Energy (ARPA-E), U.S. Department of Energy, under Award Number DE-AR0000298.

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