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Parametric study of the breakdown of high intensity discharge lamps filled with xenon[1] MARTIN WENDT, MANFRED KETTLITZ, DETLEF LOFFHAGEN, INP Greifswald, Felix-Hausdorff-Str. 2, 17489 Greifswald, Germany, SILKE PETERS, PTB, Bundesallee 100, 38116 Braunschweig, Germany — A parametric study of model results on the breakdown of high intensity discharge lamps filled with xenon at pressures between 0.1 and 5 bar is presented. The results are compared with experimental measurements of voltage and current waveforms obtained for voltage rates of increase from 5 mV/ns to 100 V/ns. Specially designed lamps ensure a volume breakdown of the gas. The time-dependent, spatially one-dimensional model comprises the Poisson equation, electron energy balance and species continuity equations using the drift-diffusion approximation for the fluxes. The set of equations is solved on an inhomogeneous grid using the cubic interpolated propagation scheme with an adaptive time step. The electron transport parameters were used as function of the local mean electron energy. They were determined by solving the homogeneous Boltzmann equation. The breakdown voltages obtained by the model increase with growing pressure and voltage rate and are in good agreement with the experiments. A cathode-directed ionization front is found whose velocity increases with rising voltage rate and falling pressure.

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