

Numerical simulation of Trichel pulses in air for the needle-plane geometry

Peyman Dordizadeh*, Kazimierz Adamiak, G.S. Peter Castle
University of Western Ontario
e-mail: pdordiza@uwo.ca*

Abstract—Investigation of Trichel pulse formation in negative DC corona discharge will be presented in the paper. Needle-plane geometry surrounded by atmospheric pressure air will be considered. Needle is placed 6mm away and perpendicular to the ground plane. Its tip radius is 35 μ m. Special attention is given to the distributions of basic charged species during different stages of the pulse. Proposed model is a 2D axisymmetric and the Finite Element Method is used for solving three continuity equations for charged species and Poisson's equation for the electric field. The voltage on the needle is varied in the range of -3.5kV to -12kV. Trichel pulses begin approaching each other if the voltage is high enough and finally at -12kV the glow discharge is reached. The simulation results in the range of -3.5kV to -5kV were compared with experimental data and the agreement was acceptable.