Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Current gain of a pulsed dc discharge in low-pressure gases VALERIY LISOVSKIY, Kharkov National University, 61022, Kharkov, Svobody Sq. 4, Ukraine, POLINA OGLOBLINA, Instituto de Plasmas e Fuso Nuclear, Instituto Superior Tcnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisbon, Portugal, STANISLAV DUDIN, VLADIMIR YEGORENKOV, ALEXANDER DAKHOV, Kharkov National University, 61022, Kharkov, Svobody Sq. 4, Ukraine
— Current and voltage waveforms of a pulsed gas discharge have been measured in a wide frequency range (20 to 300 kHz) for the two pressure values of 0.1 and 1 Torr using four different technology-relevant gases: nitrogen, oxygen, carbon tetrafluoride and sulfur hexafluoride. It is shown that the current can be substantially increased in the pulsed dc discharge, especially with electronegative gases, as compared with the discharge current relating to the same but constant voltage. The maximum 9-fold current gain is obtained with sulfur hexafluoride. Carbon tetrafluoride furnishes up to 4-fold gain, while nitrogen and oxygen show the typical current gain of 1–2. We suggest the physical explanation of the current gain phenomenon in the pulsed discharge according to which the current gain at the start of the plasma phase of the pulsed discharge is observed due to the diffusion filling of the cathode sheath with charged particles in the afterglow phase. The current gain increase in electronegative gases is attributed to the slower plasma decay rate in this case because of the lower value of the ambipolar diffusion coefficient in the plasma with negative ions.

Valeriy Lisovskiy
Kharkov National University, 61022, Kharkov, Svobody Sq. 4, Ukraine

Date submitted: 04 Jun 2016 Electronic form version 1.4