Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Pulsed picosecond and nanosecond discharge development in liquids with various dielectric permittivity constants ANDREY STARIKOVSKIY, Princeton University — The dynamics of pulsed picosecond and nanosecond discharge development in liquid water, ethanol and hexane were investigated experimentally. It is shown that the dynamics of discharge formation fundamentally differ between liquids with low and high dielectric permittivity coefficients. The difference in the nanosecond discharge development in liquid dielectrics may be explained by the formation of micro-discontinuities in the media during the electrostriction compression/rarefaction stage in liquids with high dielectric permittivity. Three possible mechanisms for the propagation of discharge in liquids play a different role depending on the pulse duration. The first is the formation of low density channels in liquid. In the second case the electrostatic forces support the expansion of nanoscale voids behind the front of the ionization wave; in the wave front the extreme electric field provides a strong negative pressure in the dielectric fluid due to the presence of electrostriction forces, forming the initial micro-voids in the continuous medium. Finally, in the third case, when a picosecond electric pulse is utilized, the ionization in the liquid phase occurs as a result of direct electron impact without undergoing a phase transition.

Andrey Starikovskiy
Princeton University

Date submitted: 13 Jun 2016 Electronic form version 1.4