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Localized and distributed behavior of nanosecond pulse-periodic discharge in air ANDREY NIKIPELOV, ILYA POPOV, SERGEY PANCHESHNYI, ANDREY STARIKOVSKIY, NEQLAB TEAM — Three different regimes of nanosecond pulse-periodic discharge development in different geometries were investigated with nanosecond temporal resolution: streamer corona, localized nanosecond spark and distributed spark. Kinetic and gasdynamic effects that control the transition from streamer to spark discharge were demonstrated. Significant radial inhomogeneity of streamer channels parameters (electrons and excited particle density, specific energy release) leads to decreased plasma channel diameters for each following pulse in a sequence. This self-focusing of the plasma channel leads to the local overheating and ionization of the gas and provokes the breakdown of the gap. Transition from localized to distributed (rotating) spark can be achieved increasing the repetition rate of pulses. Distributed spark demonstrates the highest efficiency for plasma-assisted applications compared to localized spark and streamer corona.

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