Peculiarities of the Plasmoids Formation and Evolution in the Conditions of a High-frequency Capacitive Type *Discharge in a Gas Flow*

A.S.Pashchina, V.I.Nikolaeva, M.K.Sidorenko, V.A.Prudchenko
Joint Stock Company " Scientific Research Institute of Radio Device Instruments ", 80, Leningradsky prospect, Moscow, Russia, 125178

Experimental researches of the plasmoids formation and evolution in the conditions of the high-frequency capacitive type discharge in a gas flow have been carried out. The capacitive type discharge ignition was carried out by means of a helical waveguide in the frequency range of 1...10 MHz.

The gas flow injection into the discharge area causes the formation of the essentially nonuniform extensive plasma area consisting of a threadlike fine-scale structures, oriented on a gas flow direction. The magnification of the gas flow velocity above some threshold value is accompanied by the large-scale plasmoids formation that looks like a linear lightning and oriented in a transverse direction to a gas flow axis. The basis of large-scale plasmoids is localized on a plasma area surface. The variation of a gas flow velocity causes the change of the plasmoids space localization place on a plasma area surface.

Existence of the resonator wave impedance minimum value since that the gas flow injection into the discharge volume accompanied by the large-scale plasmoids (a linear lightning type) formation is revealed. Thus the magnification of the resonator wave impedance over the range 2,3...6,4 kOhm is accompanied by the characteristic sizes of the large-scale plasmoids magnification. The same effect can be reached by the gas flow velocity magnification in a neighborhood of a high-voltage electrode.

It was revealed, that the spatial domain with the peak value of pressure in the injected gas flow appears to be a preferable place of the plasmoids localization. The direction of the plasmoids propagation is spotted by the plus pressure gradient, and the stability of the plasmoid channel attitude depends on a pressure gradient value.

Possibility of the plasmoid localization in the given spatial domain by the mean of a method, used the charged particles flow organization in the dielectric channel, is shown. This method allows to implement the continuous conditions of the plasmoid existence, which duration matches to a maintenance time of a charged particles flow in the channel.

This work is executed at the support of the Russian Foundation for Basic Research, the project 07-02-12029.