

# APOKAMP DISCHARGE PHENOMENON: LABORATORY STUDIES AND UNEXPECTED APPLICATION FOR ATMOSPHERIC PHYSICS

**Eduard A Sosnin<sup>1,2</sup> and Victor F Tarasenko<sup>1,2</sup>**

<sup>1</sup>Institute of High Current Electronics (IHCE SB RAS), Russia

<sup>2</sup>National Research Tomsk State University, Russia

**A**pokamp discharge is the potential pulsed-periodic discharge, forming a plasma jet propagating transversely to discharge channel. This report provides an overview of laboratory measurements of apokamp characteristics. It is established experimentally that this regime of pulse-periodic discharge is formed stage by stage. At the first stage, in a microsecond discharge of a voltage pulse of positive polarity, a potential spark channel formed during the first pulses between two needle electrodes is transformed into a diffuse channel. At the second stage, a weakly glowing halo is formed near the discharge channel, and a bright offshoot arises near channel. Finally, the offshoot becomes a source of plasma bullets (streamers) moving with a velocity of up to 200 km/s. The measured values are in good agreement with the results of numerical simulation of streamer in air at atmospheric pressure. It is shown that the formation of a jet significantly depends on the air temperature. It is established that apokamp discharge in air at pressures that corresponds to the middle and upper atmosphere of the earth is miniature analogous to a large-scale transient luminous events-blue jets and sprites, namely, the velocities of propagation of apokamps are about the velocities of propagation of starters and blue jets in the atmosphere of the Earth. It was shown that jets (apokamps) with the maximum length are observed in the pressure range corresponding to the altitudes of appearance and propagation of starters and blue jets. In addition, by means of scaling law for gas discharge we estimate experimentally the electrical field strength at altitudes, which corresponds to the formation of blue jets in the middle earth atmosphere. Estimated value lies in a range of  $6 \cdot 10^5$ - $1.9 \cdot 10^6$  V/m which confirms the correct use of streamer model to describe the physical nature of apokamp and blue jets.

badik@loi.hcei.tsc.ru