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INFLUENCE OF FREQUENCY AND VOLTAGE TO APOKAMP DISCHARGE DYNAMICS AT MODERATE PRESSURES[1]

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Two years ago, we found that an extended diffuse jet is formed at a pulse-periodic discharge approximately perpendicular to the point of bend of the bright current channel. We call this phenomenon apokamp discharge (using the Greek words από (from) and καμπη (bend, turning)). To date, it has been shown that by its properties (spectral, morphological and electrophysical) is similar to the blue jets and starters phenomenon, which have place at moderate and low air pressures of Earth atmosphere [1].

In this paper, we investigated the dynamics of apokamp discharge formation at air pressure of ~ 120 Torr at different voltage pulse frequencies ($10 < f < 56$ kHz) and the values of the voltage amplitude from 6.5 to 10 kV. To do this, we used an installation similar to that described in [1].

The apokamp dynamics was recorded using four-channel high-speed camera with a minimum frame exposure of 3 ns (PCO AG HSFC-PRO). The camera was triggered by pulse generator (BNC 565) with different delays relative to the rise of current in the gap. As a result a new facts about apokamp discharge formation were revealed:

1) increasing of voltage from 6.8 to 8.5 kV leads to increasing of plasma bullets velocity in apokamp from 120 to 170 km/s, respectively (see Fig. 1);

(2) velocity rate of plasma bullets is almost doubled to ~ 220 km/s with a frequency reduction from 56 to 10 kHz.

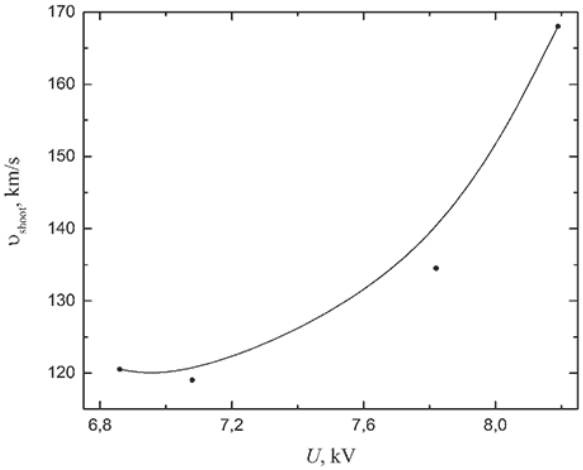

Fig. 1. The dependence of plasma bullets velocity in apokamp on discharge voltage for air pressure of 120 Torr.

The obtained data are in accordance with the results of measurements of the velocities of plasma bullets obtained earlier [1, 2]. In addition, they are a new argument confirming the affinity of apokamp discharge in air at moderate pressures and atmospheric transient luminous phenomena – blue jets, which have place form at the upper boundary of thunderclouds at an altitude of 17 km, reach altitudes from 18.1 to 25.7 km, and propagate at a velocity of 27 to 153 km/s.

This means that in order to obtain long blue jets in the atmosphere, there is no need for increased breakdown frequencies in atmospheric cloud layers.

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[2] *Sosnin E.A., Naidis G.V., Tarasenko V.F., Skakun V.S., Panarin V.A., Babaeva N.Yu. // JETP. – 2017. – Vol.125. – P. 920-925.*

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