ANALYSIS OF the RADIATION FROM LONG-LIVED PLASMA FORMATIONS IN THE VISIBLE wavelength RANGE

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The paper presents the results of optical radiation processing of long-lived plasma formations (LPF). Experiments on the formation of LPF were carried out in a free atmosphere by electroexplosion of a conducting diaphragm located horizontally in a plasma gun by a current pulse of up to 16 kA, with a duration of 70 to 100 ms and an input energy of 50 kJ. The design of the plasma gun is an electrode system of the "ring-pin"type. This system of current leads provides the necessary configuration of the magnetic field in the discharge gap [1]. The electric energy pulse generated by the inductive storage device [2] transfers the material of the conducting diaphragm in the form of a circle to the state of low-temperature plasma. The characteristic size of the LPF is 35–40 cm.

During the experiments, the radiation in the range from 400 to 760 nm was recorded on the color film "Kodak-400". At the time of photography, the supply of electricity from the outside is stopped and the formation of the LPF is completed. The resulting LPF is observed in photographs and video frames in the form of a flattened ball surrounded by burning particles of the condensed dispersed phase (KDPh). Depending on the experimental conditions and the stage of development of radiation in the visible wavelength range changes color from white-yellow to dark red.

The paper solves the problem of determining the LPF surfaces emitting in a particular range of wavelengths. To solve it, a computer analysis of the photograph was carried out using the software "Adobe Photoshop 5". With the help of red, green and blue filters, the corresponding wavelength range is highlighted. As a result of computer processing, the regions of the radiating surface of the LPF depending on the wavelength are determined. In the longer wavelength region of the spectrum the object under study takes a spherical shape. In the area of "green" wavelengths radiating surface takes the form of "mushroom".

According to the data obtained, it is possible to determine the surface temperature of the object. As expected, the Central region has the highest surface temperature. Specially conducted measurements showed that DPO has a brightness temperature of 4500 °C at a wavelength of   
550 nm.

References

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2. Kunin V.N., Konopasov N.G., Pleshivtsev V.S., Instruments and Experimental Techniques, 1988, No. 3. P. 103.