Cooling of the zone of discharges sliding over the surface of a dielectric [[1]](#footnote-1)\*)

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Practical interest in discharges sliding over dielectic surface is associated with the problem of isolation (increase in electrical strength of a surface), exclusion of the conditions for the appearance of the discharge plasma (for instance on a skin of aircraft), with the possibility of using a surface discharge to control high-speed fluid flows both in combustion chambers and on streamlined surfaces.

When looking at a discharge sliding over a dielectric surface one has to take into account the substrate material, wettability and conductivity of its surface. Main reasons for the deterioration of external insulation (decrease in breakdown voltage) are dielectric surface contaminations, the role of which are especially noticeable in a presence of moisture.

In this work, the following conditions for the development of discharges were studied:

1. Discharge sliding over the surface of a dielectric near dielectric insert on a horizontal surface of a plasma sheet; 30 mm in length.

2. Vertical column-shaped discharge near the discharge chamber window (volume discharge contraction mode), 24 mm in height

Shooting was carried out through the quartz windows of the discharge chamber of the shock tube.

Shadow high-speed shooting made it possible to register cylindrical shock waves from the area of pulsed linear energy storage near vertical and horizontal walls, to measure the velocity [1].

Sequential images of infrared fields heated by nanosecond-duration discharges of the chamber walls were obtained, the relaxation time of thermal radiation of the walls near a dielectric insert in the form of a rectangular parallelepiped measuring 6 × 2 × 48 mm3 was investigated. It is shown that the cooling time of the textolite wall area heated by plasma can last up to 30 ms and significantly exceeds the cooling time of the quartz wall (up to 4 ms).



Fig. 1. Infrared survey of the heated wall on the left and the camera window on the right

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References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Pt/ru/GD-Znamenskaya.docx) [↑](#footnote-ref-1)