

## The effects of anomalous passing of ball lightning through absorbing filters and generation of dark spherical formation

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Set of experiments was performed on interaction of ball lightning with absorbing filters, which made from metal. The phenomenas of anomalous penetration of a ball lightning through absorbing filters and generation of the dark spherical formation at interaction of ball lightning with a thick absorbing filters was revealed. It is suggested that the dark spherical formation appears as a result of interaction of a strong vortex electromagnetic field of ball lightning which penetrates through the absorbing filter with air.

The ball lightning has an ability to penetrate through window panes and metal. Several attempts have been made to explain high penetrating ability of the ball lightning [1]. The experiments were carried out on “Prometheus” installations. A general view of the experimental region for investigation of ball lightning is shown in Fig.1(a). The installation for receiving of ball lightnings consists from the storage condenser, discharge cell (domaintron), diagnostic devices, high-voltage charger and commutation unit. The installation “Prometheus-2” has the following parameters: capacitor charge - 0.48 C, voltage - 50 kV, stored energy - 12 kJ. The peak current in a discharge is equal to 140 kA and the pulse duration is about 100  $\mu$ s. A scheme of the experiments is given in Fig.1(b). The typical wave fronts of voltage and current in domaintron, the probe potential and the current in collector circuit for “Prometheus” installations are given in [2,3].

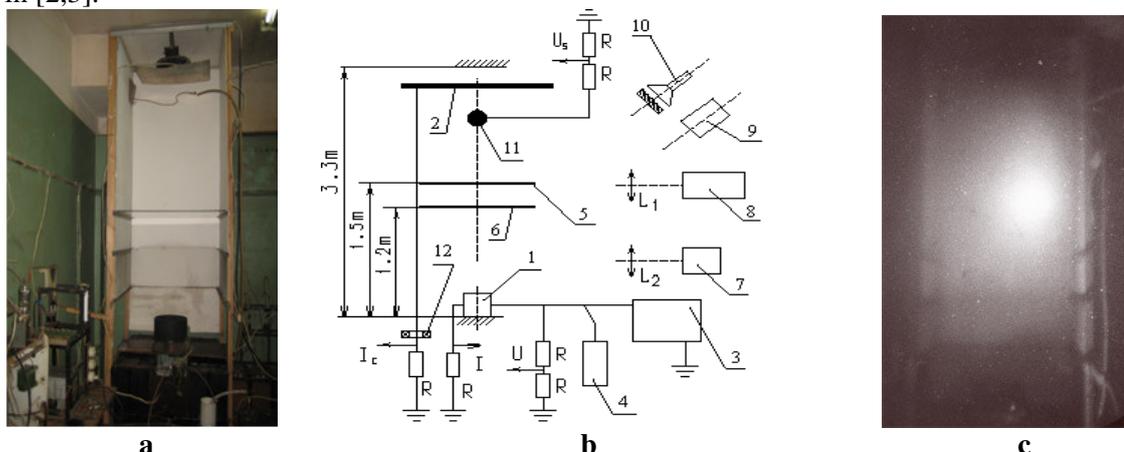


Fig.1.General view of the experimental region for generation of the ball lightning – (a); the scheme of experiments - (b); an images of the ball lightning on the installation “Prometheus-2” in the absence of the absorbing filters – (c). Designation: 1-discharge cell (domaintron); 2- collector under the lab ceiling; 3-main storage condenser; 4-start unit; 5, 6-absorbing filters; 7- electron-optical converter; 8- electron-optical camera; 9- X-rays detector; 10- detector of microwave radiation with teflon absorber; 11-potential probe; 12- Rogowski loop; L- lense.

In experiments were used absorbing filters from glass, organic glass, textolite, aluminum and steel. In all cases the luminosity intensity of ball lightning that passed through the absorbing filter was significantly lower than the luminosity intensity of the ball lightning, which was approaching to the absorbing filter. The region of passage of ball lightning is wittingly overlapped by means of absorbing filters. The absorbing filters were square-shaped with a side of 1 meter. When the ball lightning enters in the absorbing filter the half-sphere is visually observed above it. Maximum of the luminosity is located in the region, which is corresponding to an external spherical layer. With increasing thickness of the absorbing filter the intensity of luminosity reduces and at some thickness in the area over the absorbing filter are seen only an aura. Passage of a ball lightning through an absorbing filter of 2 mm thick from aluminum allows to suggest that the maximum energy of electrons in the external spherical layer is 350

keV. In reality the energy of particles in a ball lightning is much larger than 350 keV. There are reasons to assume that inside the region with surplus positive charge is a circular current of relativistic electrons with a high value of amplitude. The charge particles which are located in the equatorial part of the external spherical layer have the maximal angular velocity. Author supposed that electron current in the spherical external layer considerably exceeds the ion current and generates a poloidal magnetic field. Experiments on the passage of ball lightning through absorbing filters provide a basis assume that the value of the azimuthal component of particles velocity is sufficient to ensure that the resultant of all forces is zero and for long existence of the ball lightning. With increase of a thickness of an absorbing filter the intensity of a luminosity of a passing ball lightning decreases. At some value of a thickness of an absorbing filter it was found, that aura above an absorbing filter completely disappears.

A dark spherical formation (DSF) has been discovered under the ceiling in the experiments with very thick absorbing filter (60 mm polyethylene or 4 mm carbon steel sheet). A dark formation has been clearly seen through a blue filter. The diameter of this formation was approximately equal to the diameter of the ball lightning. Dark spherical formations, which are observed under the ceiling for a very short period do not have luminosity. The usage of the electron-optical converter is useless. If crosswise the direction of motion of the dark spherical formation is installed a small sheet of metal so that it has rotational and vibrational degrees of freedom, i.e. hang it in one point, then the interaction of DSF with a sheet leads to oscillation of this sheet. This means that the particles from which consist DSF possess the impulse, i.e. they has not only speed but also mass. The presence of particles that have mass and also possess a high-penetration ability gives a reason to believe that the dark spherical formation consists from neutrino. In such a way it is possible to receive erroneous result.

In the experiments it was established that at small values of the product of the total absorption coefficient of radiation  $\mu(E)$  and thickness of absorbing filters  $d$  in the circuit of collector there is the current, whereas at high values of  $\mu(E) \cdot d$  the current in the circuit of collector is absent. It means that in case of using thin absorbing filters in the dark spherical formation there are charges and in the case of using of thick absorbing filters the charges are absent.

For phenomenon of anomalous passage of ball lightning through the metallic absorbing filter can be given the next explanation. A ball lightning has its own poloidal magnetic field. When approaching a ball lightning to absorbing filter the magnetic field penetrate into it. The electrons of the ball lightning at the entrance in the absorbing filter interact with electron shells and nucleuses of atoms. As a result of electron interaction with atoms of absorbing filter the bremsstrahlung appears. The interaction of bremsstrahlung quanta with a substance in the known processes: photoeffect, Compton effect and effect of electron-positron pairs origin can lead to appearing above the absorbing filter, respectively photoelectrons, recoil electrons or electron-positron pairs. The vortex electromagnetic fields of the ball lightning entering in the absorbing filter promotes the appearance of the outgoing ball lightning. There is reason to believe that the intensity of electric and the induction of magnetic fields is sufficient to ionize the air above the absorbing filter. A process of charge separation occurs also in this region because of diffusion of charge particles crosswise the non-uniform field. The electrons in a process of diffusion move towards the region with weaker magnetic field faster than ions which are produced by these electrons in the region of passing. The electrons and ions rotate by azimuth and create above the absorbing filter a so-called passing ball lightning, which is observed in experiments. At certain value of thickness of the absorbing filter the hard quanta are practically absent in the bremsstrahlung spectrum. It is connected with a decrease of the electron output due to the hardening of a spectrum. At some value of the product of the total absorption coefficient of radiation  $\mu(E)$  and thickness of absorbing filters  $d$  the luminosity of ball lightning above an absorbing filter completely disappears and leaves only a dark spherical formation.

## References

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