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ABSTRACTS

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H-18

PMMA RADIATION EXCITED BY ELECTRON BEAM WITH ENERGY OF 2.7 MeV

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The radiation of different PMMA specimens under excitation by a 2.7 MeV electron beam was studied. The specimens had different thicknesses (1, 4, and 10 mm) and different transmittance spectra. The radiation spectra of these specimens in the UV and visible regions were obtained at various angles of specimen's inclination relative to the direction of electron beam propagation. A numerical simulation of the generation of optical radiation under the experimental conditions on the GEANT4 computer platform was carried out. It is shown that the Cherenkov radiation (CR) dominates in the optical emission of all the study specimens. The dependences of the CR energy on the angle of specimen inclination with respect to the direction of electron beam propagation are obtained. The form of these dependences changes with the thickness of the specimen, which is explained by an increase the scattering of electrons in the specimen material with an increase its thickness.

The obtained results can be used to create CR detectors with PMMA radiators for medical dosimetry devices.

H-19

HYPOTHESIS ABOUT THE INFLUENCE OF THE SPATIAL POSITION OF THE APOKAMP ON THE DYNAMICS OF ITS PROPAGATION

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This article continues the cycle of our studies of a new discharge phenomenon – the expansion of the glowing structure at a bend in the channel of a pulsed high voltage discharge in air. This phenomenon was called the apokamp discharge, and the structure was called the apokamp [1, 2]. In previous studies, it was noted that the direction of propagation of the plasma plume is mainly determined by the field strength at the points of bending of the plasma channel and is not determined by convective processes. Therefore, to control the spatial position of the apokamp, it is necessary and sufficient to change the orientation of the electrodes.

In this work, using high speed shooting, we measured the propagation velocities of the apokamp at an air pressure of 760 Torr and a peak voltage of 10.7 kV of positive polarity, at various positions "up" (0°), "down" (180°) and sideways (90°). When changing from 0° to all others, the stability of the position of the apokamp fell. Therefore, the experiment was carried out by additionally placing a grounded plate at a distance of 5.5 cm from the electrodes. In this case, the spread decreased, and the average values of the velocities at positions 0, 180, 90° were 148, 120, and 189 km/s with dispersions of 27.3, 21.14, and 15, respectively.

A theoretical model of the phenomenon, which makes it possible to vary the main parameters of the discharge, external field, and convective flows, provides an explanation for the observed regularities.

Thus, the fact of a change in the velocity of propagation of the apokampic discharge plume at different orientations in space has been experimentally discovered and its theoretical interpretation has been given. The authors thank E.Kh. Baksht for help in high speed shooting of the apokamp.

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H-20

OPTICAL EMISSION OF FUSED SILICA AND KBr PLATES IN THE UV AND VISIBLE REGIONS UNDER IRRADIATION WITH 2.7 MeV ELECTRONS

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The results of experimental studies and numerical simulation on the GEANT4 computer platform of the optical emission of fused silica and KBr samples under irradiation with a 2.7 MeV e-beam are presented. The optical emission spectra of the samples have been obtained in the UV and visible regions under various conditions. In contrast to KBr, which have intense cathode luminescence under the e-beam irradition, practically all the optical emission of fused silica was Cherenkov radiation for a wide range of angles of the plate inclination relative to the electron beam axis. The energy distribution of the beam electrons and their angular distribution have been calculated depending on the penetration depth of the electrons into the irradiated sample. The effect of e-beam scattering on the angular distribution of Cherenkov radiation in fused silica samples with thicknesses exceeding the electron path length is shown.

H-21

ELECTRON ACCELERATOR WITH OPEN CIRCUIT VOLTAGE UP TO 1 MV FOR STUDYING THE LIGHT EMISSION OF VARIOUS MATERIALS

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The design and the test results of a subnanosecond accelerator are presented. The accelerator consists of three sections (a double forming line, a ferrite line, and a line with variable characteristic impedance) and a gas filled diode with the possibility of evacuation and operation in the vacuum diode mode. The accelerator e-beam current of up to 5 kA and the pulse duration of ~ 0.4 ns (FWHM) were obtained. The voltage across the gap of the diode in the matched mode was ~ 450 keV, and the e-beam energy was ~ 0.5 J. The accelerator allowed registering and studying the Cherenkov radiation, as well as the pulsed cathodoluminescence in the samples of KU-1 fused silica, polymethyl methacrylate, and KBr.

H-22

STREAMER BREAKDOWN IN A SHARPLY INHOMOGENEOUS ELECTRIC FIELD

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Diffuse discharge in atmospheric pressure gases is a source of low temperature nonequilibrium plasma. It can be used to treat gases, liquids, medical instruments, food, packaging products. Diffuse