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EVOLUTION OF ENERGY DISTRIBUTION OF HIGH-CURRENT RELATIVISTIC ELECTRON BEAM DURING GENERATION OF POWERFUL TERAHERTZ RADIATION IN A MAGNETIZED PLASMA COLUMN *)

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The studies of a high-current relativistic electron beam (REB) interaction with a magnetized plasma is carried out at the specialized GOL-PET facility in the BINP SB RAS. Currently, these studies are focused on the mechanisms of generation in such a beam-plasma system of directed fluxes of terahertz (0.1–1 THz) electromagnetic (EM) radiation with a multi-megawatt pulse power. At this generation process, the electron beam serves as an energy source for pumping plasma upper-hybrid oscillations, which are then transformed into a flux of EM radiation [1, 2]. One of the key objectives of these studies is to measure changes in the energy distribution function of the beam electrons as they pass through the plasma column under conditions of intense beam-plasma interaction in correlation with changes of the spectral composition of the generated EM radiation flux. The establishment of these correlations will help to clarify the details of the physical mechanisms underlying the generation of so powerful fluxes of terahertz radiation in a beam-plasma system.

Measurements of the electron distribution function of a high-current REB at the exit from a plasma column were carried out in a series of recent experiments at the GOL-PET facility. This function was registrated with use of a 10-channel multi-foil analyzer covering the energy range from 0.1 to 0.8 MeV [3]. Simultaneously the terahertz radiation spectra in frequency range of 0.1-0.6 THz was measured by a polychromator created of the 8 frequency-selective channels.

The dynamics of changes of the beam electron energy distribution function, measured in experiments at the GOL-PET facility, will be discuss in the framework of this report. The experimental results will be compared with changes in time of the electron energy distribution function obtained in computer calculations of the beam-plasma interaction process.

References

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