INTERACTION DYNAMICS OF A POWERFUL PLASMA FLOW WITH A GAS JET IN A MAGNETIC FIELD [[1]](#footnote-1)\*)

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The results of studying the interaction of a powerful plasma flow with a pulsed gas jet are presented. The experimental data are analyzed together with the performed theoretical and computational modeling. The results obtained can be of interest, both from a fundamental point of view, and for solving some applied problems (for example, for the development of the ITER dissipative divertor and laboratory modeling of stellar jets penetrating into intergalactic gas).

A plasma flow with a speed of (4 ÷ 6) × 107 cm/s and an energy content of up to 40 kJ was created by a pulsed electrodynamic accelerator at the MKT facility (TRINITI). Hydrogen, nitrogen and neon were used as plasma gases. The density of ions in the plasma flow was (2 ÷ 4) × 1015 cm-3. The plasma flow was transported in a longitudinal magnetic field with an induction of 1÷2 T. A supersonic gas jet of nitrogen or neon was formed using a flat Laval nozzle. The maximum density in the gas jet reached 1017 cm-3 with a jet thickness of ≈ 5 cm and a width of ≈ 15 cm. The gas jet was injected at a distance of ≈ 3 m from the exit of the accelerator perpendicular to the magnetic field and, accordingly, to the direction of the plasma flow motion.

Informative 2D images of the plasma-gas interaction region were obtained with X-ray framing MCP camera. Measurements carried out with X-ray photodiodes covered with various filters showed that when a plasma flow collides with the gas jet, pulses of soft X-ray radiation (photon energy ≤ 0.4 keV) with duration of 10÷15 μs are generated. The registration of radiation spectra in the range of 1÷70 nm with spatial and temporal resolution was carried out by a spectrometer with a transmission grating and a framing MCP camera.

To simulate the process of interaction of a powerful plasma flow with a gas jet, an MHD program has been developed that includes calculations of the intensity and spectral composition of the generated soft X-ray radiation. The calculation results are compared with experimental data.

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