a coaxial accelerator as Plasma source for GDT [[1]](#footnote-1)\*)

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In this paper, a plasma jet source for transverse plasma injection into the GDL is considered. To penetrate the plasma into the trap during injection perpendicular to the magnetic field lines, the pressure of the plasma jet must be of the order of the pressure of the magnetic field of the trap. This imposes requirements on the minimum specific energy of the plasma jet.

A plasma jet is created and accelerated using a coaxial pulsed accelerator, also known as a Marshall gun.

The parameters of the plasma jet were measured using a Michelson interferometer. Using two optical windows and two interferometers, the density and velocity of the jet were measured simultaneously. The density was measured by the phase shift in the interferometer, the velocity was estimated by the time delay between the flight of the plasma past the optical windows located sequentially in the path of the plasma at a distance of 20 cm. At the exit of the accelerator channel, a piezo sensor was placed in the path of the jet, which made it possible to directly observe the pressure of the jet. In addition, a calorimeter in the form of a copper cone with a thermistor was used to estimate the total energy of the jet.

The results of simultaneous measurements by the interferometer and the piezoelectric sensor revealed the arrival of a shock effect on the piezoelectric sensor earlier than the plasma passes the optical windows for the interferometer. Two optical windows are located closer to the plasma source at a distance of 20 cm from each other, and the piezo sensor is located after them at a distance of 35 cm from the last window. In addition, the signal to the piezoelectric element comes with a delay of about 10 microseconds due to a ceramic rod 10 cm long through which the shock from the plasma is transmitted to the piezo crystal. Thus, the signal on the piezo sensor appears much earlier than the ionized plasma crosses the interferometer beam. This indicates the presence of a component in the jet that contains a significant proportion of energy, but is invisible on the interferometer. It is most likely that this component is neutralized plasma —accelerated ions that have captured an electron.

Measurements of the total energy content of a jet of matter give a lower estimate for an energy efficiency about 20-30%.

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