measurement of LINear plasma density in the GDT expander using a 4mm microwave interferometer

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Longitudinal particle and energy losses through magnetic mirrors are the main problem in open traps physics. The flow of cold electrons from the expanding field region is the basic mechanism limiting the target plasma heating in the central cell of the gas-dynamic trap (GDT). One of the main sources of cold electrons can be a residual neutral gas in the expander. The interaction of gas and plasma leads to its ionization and the emerging of cold electrons, which can penetrate through the magnetic mirror to the central cell of the device.

Apparently, the interaction of cold gas with plasma in the expander leads to producing of warm Franck-Condon atoms, which because of the scattering process form the gas shell on the periphery that makes a shielding effect. Ion current sensors radially located on plasma absorber in the expander are able to cover only the area up to the limiter. A new 4 mm interferometer is used to find out what occurs in the area behind the limiter.

Thus, it is supposed to use the 4 mm microwave interferometer to measure the linear plasma density in the GDT expander. Its principle of operation is based on the measurement of the microwave radiation phase shift after passing through the plasma. The one-way pass scheme is realized. The interferometer was installed in the west expander but it becomes clear that there is a limitation for the magnetic fields for the device to work correctly. It is expected that data obtained during the experiment would be used to build a mathematical theory of processes, occurring in the GDT expander.