improved retarding field analyzer for studyies of particle fluxes in the gdt facility

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Measurement of ion current density and ion energy distributions is often important for plasma processes in research devices. The new scheme of the device combines simplicity design of retarding grid analyzer with the possibility immediate registration of energy spectrum ions. Analysis of the numerical simulation results of motion particles, taking into account their spatial charge, allowed us to choose optimal geometry of the analyzer and minimize FWHM. The new analyzer will be used for measuring the longitudinal distribution ambipolar potential in the GDT expander tank.

The original idea of the geometric separation of particles by energy was described in [1]. Peculiarity of the GDT experiment consists in a narrow range of the angular distribution of particles leaving the expander tank along the magnetic field lines. This made it possible to abandon spherical grids and significantly simplify analyzer design. The design of the analyzer consists of a first gap in which the cutoff of particles with energies less than E0. The design of the analyzer consists of a first gap in which the particles are cut with energy less than E0. In the gap, some particles are decelerated to energies close to zero and fall into the energy separating volume where their trajectories are deflected by a relatively weak electric field. In the second gap, these particles are accelerated and collected by the detector. High-energy particles with energy Eh > E0 do not change direction and are captured by the target. By cutting out the fast part, only a narrow energy bend reaches the detector.

References

1. P. Staib, An improved retarding field analyser, Max-Planck Institute for Plasmaphysik, Germany, Journal of physics E, Scientific Instruments, May 1972, Vol. 5, No. 5, P. 389–496.