DYNAMICS OF A PLASMA IN A HIGH FREQUENCY THETA-PINCH DISCHARGE.

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Abstract

Some experiments will be described, in which the magnetic field of the theta pinch discharge oscillates with a frequency of about 1 Mc. The amplitude of the magnetic field (some kΓ) and the filling pressure of the gas ($\approx$ 0,1 Torr) are such that the compression and oscillation times of the produced plasma are roughly of the same magnitude as the half period of the magnetic field. These conditions may arise during the preionization of a gas by a theta pinch discharge.

It is found that a dynamic confinement of the plasma may be achieved if filling pressure, frequency and amplitude of the magnetic field are properly chosen. Otherwise the plasma will heavily touch the walls and impurities will be introduced into the plasma.

Three models are applied to get a description of the plasma dynamics: The snow plough model shows how the compression velocities depend on the discharge parameters. Another simple model is applied to obtain the oscillations of a plasma column in a high frequency magnetic field. Finally some experimental results are compared with the solutions of a magnetohydrodynamic three-fluid-model.