EXPERIMENTAL DEVICES "BOGEN" AND "EIERUHR" FOR THE PRODUCTION OF HIGH DENSITY STEADY STATE PLASMA IN THE TEMPERATURE RANGE ABOVE 10 eV

by

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Abstract

The maximum temperature that can be obtained in steady state high pressure arc discharges is limited by the radial heat conduction losses. The application of a strong axial magnetic field to such discharges reduces thermal conductivity of the plasma provided $\omega\tau > 1$. As a result of this, the temperature of the plasma increases appreciably over the value that corresponds to zero magnetic field, even though the power input required per unit length of the discharge column remains the same or decreases. Furthermore, the magnetic field causes a radial pressure increase towards the axis of the discharge column.

The effects of the magnetic have been investigated in two different experiments. In the first experiment ("Bogen") an arc discharge has been maintained for a few seconds a hydrogen flow at total current values up to 3 kA and magnetic induction field strengths up to 30 kΓ. In the second experiment ("Eieruhr"), an impulse discharge of 1 msec duration is produced in a closed vessel filled with hydrogen or helium. In this the total current and the magnetic induction could be varied up to 5 kA and 80 kΓ, respectively.

In both experiments, the plasma is clearly separated from the wall and is free from impurities. Temperatures up to 4.10^5 °K and particle densities up to 2.10^{16} cm^{-3} have been measured.