Experiments on plasma behaviour in a stationary cusp-field combined with a theta-pinch*

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THE plasma behaviour in a stationary cusp field combined with a θ-pinch in the ring cusp region has been investigated. In a field combination of this type plasma acceleration as well as confinement and heating is possible. Acceleration experiments by means of a three-stage arrangement have shown that directed kinetic energies up to 42 keV can be achieved.

The plasma which is confined in the system is subject to an oscillatory motion between the spindle cusps synchronously with the ringing current in the theta-coil. The behaviour of the plasma in such a system was compared with that of a plasma in a stationary cusp field. Preliminary results show that in a single stage arrangement confinement times are equal. The advantage of the system with the superimposed θ-pinch is that a higher temperature can be maintained for a longer time. In addition it was found that the axial cusp losses due to the action of the theta-pinch are enhanced and because of the equal confinement time it can be concluded that the radial cusp losses are reduced. In a system of more stages the axially 'lost' plasma can be captured in the next stage and, therefore, a prolongation of the confinement time seems possible.

* Presented by H. SCHINDLER. Paper is available as an internal report.

Ponderomotive action of light*

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IF A plasma is produced by laser radiation, or if it, for other reasons, is exposed to intense light, then this light will in general exert mechanical forces on the plasma. It is shown that such a force is not only connected with the absorption, but that any spatial variation of the intensity of the light and/or of the refractive index of the plasma causes such a force. It can, under certain circumstances, contribute appreciably to the high speeds, which are, for example, observed in laser produced plasmas. This effect can also cause a self-collimation of a narrow bundle of laser light.

* Presented by the author. Full text of paper not available.

Study of torsional Alfvén waves in inhomogeneous plasmas*

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THE propagation of torsional Alfvén waves in a current-carrying inhomogeneous hydrogen plasma was investigated. The plasma is generated by a longitudinal discharge in a glass tube. The maximum current is 4·2 kA. The tube is designed as a waveguide. The initial gas pressure is approximately 0·1 mm Hg. A quasi-stationary longitudinal magnetic field up to 5 kG is applied. The device is described in Rept. No. 3-12 (September, 1966), Institut für Plasmaforschung, Stuttgart.

The Alfvén waves were excited by a short current pulse over a secondary electrode ($m = 0$ mode), or a single loop coil ($|m| = 1$ mode) and were detected by magnetic probes. The probe signals were Fourier analysed to obtain the dispersion relation. By this method, the dispersion curve was measured in a frequency range from 100 kc/s up to 1 Mc/s. The measured phase velocities are in the range of 10^7 cm/sec and the damping constant is about 10^{-1} cm^{-1}.

The inhomogeneity of the plasma density leads to non-uniform phase velocity and damping over the cross section of the plasma column. This is observed experimentally.

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