Strong RF Heating in a Mirror Trap During Plasma Build-up

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A heating method of partially ionized plasma has been described in Ref. [1]. It exploits the collisional damping of the fast waves that is high owing to the large cross section of charge exchange collisions. Since the time of heating is limited by the duration of neutral gas ionization, the heating should be strong enough to achieve a high final ion temperature.

This heating method has been studied numerically in the framework of the MHD approximation in inhomogeneous cylindrical plasma. The influences of the ratio of the mean free path of the neutral atoms to the plasma radius, the initial ions concentration, the characteristics of the interaction of the neutral atoms with the chamber wall and of other parameters of the problem on the plasma heating dynamics are examined. A scenario of RF plasma heating in one of the central cells of the multi-mirror device GOL-3 (Novosibirsk, Russia) is developed, in which the final ion temperature exceeds the ion oscillation energy in the RF field by one order of magnitude. The energy efficiency is high: only a small portion of the power is transferred by the neutral atoms to the chamber wall.

[1] V.E. Moiseenko Sov. J. Plasma Phys. **12**, 427 (1986).