INVESTIGATION OF COLLISIONLESS HEATING PROCESSES BY MEANS OF LASER SCATTERING.

by

O. Theimer, H. Röhr, B. Kronast
Institut für Plasmaphysik, Garching bei München

Abstract:

It is proposed to investigate processes by which the energy of external fields is transformed into the thermal energy of a plasma via drift-excited, instable plasma-ion waves. The quantities to be measured by means of light scattering are the time dependent values of the electron drift velocity $\underline{W}$, the ion and electron temperatures T_i and T_e, and the mean amplitude squares $|n_{\underline{k}}(\omega)|^2$ of longitudinal plasma waves with wave vector $\underline{k}$ and frequency ω . The relevant results of the light scattering theory and their limitations in case of exponentially growing waves are summarized and are used to estimate the possibilities for studying collisionless heating processes by means of light scattering. Scattering spectra obtained by 90^o scattering and forward scattering from a theta pinch are presented and shown to contain fine structure which may be sufficient for a determination of drift velocities and of an anomalous excitation of plasma ion waves. This cautiously optimistic evaluation of the experimental possibilities is derived from the calculated properties of light scattering by drift excited ion waves.