

EXCITATION OF ELECTRON PLASMA OSCILLATIONS BY
THE INTERACTION OF AN ION BEAM WITH A PLASMA

by

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Abstract

The interaction of an infinite homogeneous monochromatic ion beam with an infinite homogeneous cold plasma without a magnetic field leads theoretically to the excitation of waves at the electron plasma frequency. In the experiment a beam of either H^+ , H_2^+ , or H_3^+ penetrates a chamber filled with hydrogen gas with a pressure between $5 \cdot 10^{-5}$ and $2 \cdot 10^{-3}$ torr. The beam ionizes the neutral gas and creates a plasma with which it can interact. A probe near the end of the chamber detects waves whose frequencies increase linearly with the pressure. Under the assumption of homogeneous plasma density in the region of the beam and a logarithmic radial density profile cavity measurements give a density and a plasma frequency in the beam region, which corresponds to the detected frequencies.