

INTERACTION OF HIGH POWER LASER  
BEAMS WITH PLASMAS

by

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## ABSTRACT

This thesis presents an investigation of the excitation of an electron plasma wave by two Gaussian laser beams at the difference frequency of two laser beams. Such beams are commonly used in laser plasma interaction experiments. It is seen that the cross focusing of two laser beams play an important role in the excitation of the electron plasma wave. The presence of the static magnetic field considerably affects the cross-focusing and excitation of electron plasma wave. Further the self-focusing of a Gaussian beam in extraordinary mode, excitation of plasma wave at twice the pump wave frequency, harmonic generation have also been studied. This is short duration EM pulses are also used in interaction experiments. The transient ponderomotive nonlinearity in a collisionless magnetoplasma has been studied and so also the self-focusing of the pulse and nonlinear scattering. It has been concluded that the self-focusing of the pulse does not depend only on the instantaneous value of the pulse intensity but also on its past history. The generation of an upper hybrid pulse and second harmonic EM pulse by an EM pulse in ordinary mode has also been investigated.

It is concluded from the present work that the transient setting of ponderomotive nonlinearity and

consequently transient effects on electrostatic pulses are very important. Further the beat heating of plasmas may be considered as an efficient technique for heating the plasmas upto thermonuclear temperatures.

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