

# **Relativistic and Ponderomotive Effects on Cross-Focusing of Hollow Gaussian Laser Beams in Plasma**

**Prerana Sharma<sup>1</sup> and R.P. Sharma<sup>2</sup>**

<sup>1</sup> *Department of Physics, Ujjain Engineering College, Ujjain, M.P.465010, India*

<sup>2</sup> *Centre for Energy Studies, Indian Institute of Technology, New Delhi 110 016, India*

The influence of relativistic and ponderomotive nonlinearities on cross focusing of two high power Hollow Gaussian laser beams is investigated in a collisionless plasma. On account of the nonlinearities present in the plasma the two laser beams affect the dynamics of each other and cross-focusing takes place. A paraxial like approach has been adopted wherein the parameters are expressed, in terms of radial distance from the maximum of irradiance rather than that from the axis. The expressions for the laser beam intensities by using the eikonal method have been derived. To highlight the nature of cross focusing, plot of beam-width parameter vs. dimensionless distance of propagation has been obtained. Finally the behaviour of beam-width parameters with the dimensionless distance of propagation is presented graphically; and the beam width parameter is compared in the case of only relativistic and only ponderomotive nonlinearity. The effect of the order (n) of HGB on the cross- focusing of two beams has been explored in in this work.