

**Effects of the Transverse-Longitudinal Coupling on the Strong Focusing of Charged Beams for ICF, M. DE MAGISTRIS, L. DE MENNA, G. MIANO,**

Dipartimento di Ingegneria Elettrica - Università di Napoli Federico II - It is a widespread need in the design of final focusing systems for ion driven ICF to have very effective concentration of beams, in order to achieve the proper energy deposition power consistently with beam emittance limitations. Such requirement has stimulated new effort in the magnetic lenses design; in particular plasma lenses are considered good candidates for this task. In the strong focusing of beams, when large convergence angles and small spot sizes have to be reached, the effects of transverse-longitudinal coupling have to be considered in order to establish fundamental limitations in the focusing process. In fact, as long as the converging angle increases, the condition for para-axial approximation in the description of the particles trajectories weakens and the arise of some kind of aberration is expected. In this work we develop a study, starting from the complete equation of motion for the beam particle in an axial symmetric azimuthal magnetic field (like that produced in a plasma lens), which takes into account in exact way the transverse-longitudinal coupling for the determination of their effects on the focusing properties of such symmetric structures. This analysis can be extended to more general situations where the transverse-longitudinal coupling effects cannot be neglected. As result we describe the limitation in the beam size reduction ratio due to such coupling effects in relationship to other fundamental focusing limitations like emittance, chromatic and spherical aberrations.