FOCUSING AND GUIDING CHARGED PARTICLES BY A SUPERCONDUCTING TUBE

C.Gh. Buzea[1], M. Agop[2], N. Rezlescu[1]
[1] Institute of Technical Physics, D. Mangeron 47, 6600-Iasi, Romania
[2] Technical University "Gh. Asachi", D. Mangeron, 6600-Iasi, Romania

9.7 cm

Based on Roth's first limiting case (model A), we give an analytical solution for the nonlinear equation of motion of an electron in the radial direction of a superconducting tube. This solution, expressed in terms of the Jacobian elliptic function cn(x,s), is obtained for electrons moving close to the tube axis. Consequently, we deduce a general expression for the focusing length in dependence on the parameters of the superconducting tube and the electron stream. Our calculated focusing length proves to be inverse proportional to x0 (initial values of the electron trajectories). Moreover, a focal length typically measured in inventive experiments performed by Matsuzawa et al. for high-T_C superconductors coated lenses is obtained for a beam as large as the radius of the superconducting tube and increases with the contraction of the beam. Only, assuming the narrow electron beam condition, it results in the Supertrons coated with perfect monocrystalline superconductors (model A) the focusing length must be much larger than the focusing length in the Supertrons coated with high-T_C superconductors (model B).We finally analyze some interesting oscillation modes of the beam on external driven small perturbations.

13.4 cm

Subject category :

1. Correlated Electrons and High Temperature Superconductors

Presentation mode :
poster

Corresponding author :
Dr. Calin Gh. Buzea

Address for correspondence :
Superconductivity Research Laboratory
Institute of Technical Physics
D. Mangeron 47,
Iasi - 6600, Romania
Tel : +40-32-130680
Fax : +40-32-231132

Email address :
picardout@phys-iasi.ro