World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:14, No:05, 2020

3D Simulation of the Twin-Aperture IRON Superconducting Quadrupole for Charm-Tau Factory

Authors : K. K. Riabchenko, T. V Rybitskaya, A. A. Starostenko

Abstract : Sper Charm-Tau Factory is a double ring e+e- collider to be operated in the center-of-mass energy range from 2 to 6 GeV, with a peak luminosity of about 1035 cm-2s-1 (Crab Waist collision) and with longitudinally polarized electrons at the IP (interaction point). One of the important elements of the cτ-factory is the superconducting two-aperture quadrupole of the final focus. It was decided to make a full-scale prototype quadrupole. The main objectives of our study included: 1) 3D modeling of the quadrupole in the Opera program, 2) Optimization of the geometry of the quadrupole lens, 3) Study of the influence of magnetic properties and geometry of a quadrupole on integral harmonics. In addition to this, the ways of producing unwanted harmonics have been studied. In the course of this work, a 3D model of a two-aperture iron superconducting quadrupole lens was created. A three-dimensional simulation of the magnetic field was performed, and the geometrical parameters of the lens were selected. Calculations helped to find sources of possible errors and methods for correcting unwanted harmonics. In addition to this, calculations show that there are no obstacles to the production of a prototype lens.

Keywords : super cτ-factory, final focus, twin aperture quadrupole lens, integral harmonics
Conference Title : ICMT 2020 : International Conference on Magnet Technology
Conference Location : Rome, Italy
Conference Dates : May 04-05, 2020