



Cryogenic Penning Trap at VECC

The development of Cryogenic Penning trap at VECC has reached an advanced stage and the system would soon be commissioned. In this work, we shall describe the simulation, design, and fabrication of a Cryogenic Penning trap system and study its applications. The Penning trap assembly and its associated electronics will be housed in the liquid helium filled bore of a 5-Tesla superconducting solenoid magnet. The Penning trap assembly will comprise a 5-pole open end-cap, orthogonalized, cylindrical Penning trap, associated electronics and its corresponding hanging assembly. A cloud of electrons will be trapped and the eigen-motions of the electrons will be detected by Fourier Transform-Ion Cyclotron Resonance (FT-ICR) method for successful commissioning. The feasibility of trapping high energy electrons in a Penning trap and to measure the relativistic mass increase of such electrons to determine the kinetic energy of individual electrons with very high precision has been studied. The work has the potential to improve the present accuracy of measuring kinetic energy of the end-point of a beta decay spectrum and thus increasing the sensitivity of the electron-antineutrino mass measurement. The idea and technical challenges in experimental realization, to trap and measure the mass of the high energy electrons in VEC-TRAP has been discussed in this work.

Summary

We have presented the status of Cryogenic Penning Trap at VECC. Various challenges taken up in the process of development has been discussed. The idea of trapping high energy electrons in a Penning trap and to measure the relativistic mass increase of such electrons to determine the kinetic energy with very high precision has been described briefly.

Primary author: Mr SIKDAR, Arindam Kr. (Variable Energy Cyclotron Centre)

Co-authors: Prof. RAY, Amlan (Variable Energy Cyclotron Centre); Mr REZA, Ashif (Variable Energy Cyclotron Centre); Dr DAS, Parnika (Variable Energy Cyclotron Centre)

Presenter: Mr SIKDAR, Arindam Kr. (Variable Energy Cyclotron Centre)