

400MeV H- Beam Profile Measurement at MTA using Chromox-6 Scintillation Screen and CCD Camera

High intensity, low emittance muon beams are essential requirements for Muon Colliders and Neutrino Factories. Low emittance muon beams can be produced by Ionization Cooling process. This consists of passing muon beams through low-Z ionization absorber material (H), to reduce all components momentum and replacing only longitudinal momentum using RF cavity. In the same time to keep muon beam focused, both the absorbing material and RF cavity are placed inside strong magnetic field provided by superconducting solenoid. One of the beam cooling schemes is under development at MuCool Test Area (MTA), Fermilab using highly pressurized hydrogen gas RF cavity. Experiment has been done to study the Beam loading effect in High Pressure RF (HPRF) cavity with 400 MeV H- beam. When the energetic proton beam passes through the cavity, it ionizes the inside gas and produces the electrons. These electrons consume RF power inside the cavity. Number of electrons produced per cm inside the cavity (at 950 psi Hydrogen gas) per incident proton is ~ 1200 . The measurement of beam position and profile are essential requirement in this experiment. MTA is flammable gas (Hydrogen) hazard zone and no energized beam monitor device can be use when magnet is ON due to safety reason. We have developed a passive beam diagnostic system using Chromox-6 scintillation screen and CCD camera. This paper shall present quantitative information about beam position and beam profile. Neutral density filter was used to avoid saturation of CCD camera. Image data is filtered and fitted with Gaussian function to compute the beam size. The beam profile obtained from scintillation screen shall be compared with multi-wire beam profile.

Primary author: Dr JANA, Mukti (Fermi National Accelerator Laboratory)

Presenter: Dr JANA, Mukti (Fermi National Accelerator Laboratory)