Test of New Fast Muon Drift Tube Detectors in a High-Intensity Proton Beam

Abstract

Monitored drift tube chambers are used as precision tracking detectors in the muon spectrometer of the ATLAS experiment at the Large Hadron Collider (LHC) at CERN. The chambers provide a spatial resolution of 40 μm and a tracking efficiency of close to 100% up to background rates of 0.5 kHz/cm^2. At high rates it deteriorates due to space-charge effects and the latter due high occupancy for the drift time of 700 ns.

For high-luminosity upgrades of the LHC faster drift-tube chambers have been developed using drift tubes with a diameter of 15 mm instead of 30 mm. The higher granularity and shorter drift time of about 200 ns raise the rate capability to more than 10 kHz/cm^2 while retaining the spatial resolution.

We present measurements of the response of the drift tubes to highly ionizing radiation (protons) at the Van-der-Graaf-Tandem accelerator of the Meier-Leibnitz-Laboratory (MLL) at Garching, Germany. The single tube efficiency and resolution were measured as a function of the proton rate.