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ATLAS MDT chamber behaviour after neutron irradiation and in a high rate background of photons and neutrons

Many of the physics processes of interest at Large Hadron Collider (LHC) will involve muon production in the final state. The Monitored Drift Tube (MDT) chambers, the precision tracking elements of the ATLAS muon spectrometer, are the main tools for the muon identification and measurement. They will operate in the harsh background environment imposed by the LHC conditions, mainly due to photons and neutrons. Despite the detection efficiencies for neutrons and photons are very low, the low-energy particle background will dominate the counting rate in most areas of the spectrometer, where an overall maximum counting rate of 500 Hz/cm² is expected. The upgrade to Super-LHC will involve fluxes ten times higher. To study the behaviour of MDT chambers under massive neutron irradiation at the level of Super-LHC, an extensive test was performed at the "Tapiro" Neutron Facility of the ENEA "La Casaccia" Research Center, irradiating a test detector during 2005. The MDT chamber performances have been monitored by the analysis of the accumulated charge spectra and the study of drift properties. Moreover, the measurement of the effects on the gas gain and the tracking efficiency, due to neutron and photon high rate, has been performed. Results are here presented.

Author: POLICICCHIO, Antonio (Universita degli Studi della Calabria)

Presenter: POLICICCHIO, Antonio (Universita degli Studi della Calabria)