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Development of a Gas Filter against Wire Chamber Ageing for the MDT Chamber in ATLAS

The Monitored Drift Tube chambers (MDT) of the ATLAS muon system have been constructed and partly installed in the ATLAS cavern at CERN with the required mechanical precision and spatial resolution. The main challenge at LHC will be the high dose of radiation. Therefore it is essential to avoid any pollution, since it can cause severe ageing effects in a short period of time. Despite the use of safe construction materials and care taken during production, impurities of tiny amounts of silicone compounds remain a serious concern due to the large number of commercial components in the system. Detailed ageing studies carried out in Freiburg confirm this worry. Therefore a gas filter based on a zeolite has been developed which removes these pollutions effectively. The performance of the filters have been studied with a calibrated silicone source which can inject silicone pollutions of different levels into the drift tubes. The high absorption capacity of a single filter ensures a reliable the operation of the ATLAS Muon spectrometer for many years assuming typical pollutions as expected from greased O-rings or gas valves. Measurements of temperature effects on the filter adsorption show that no measurable distortions in the drift time spectra are expected during ATLAS operation. These zeolite filter can be used for other gas detectors in order to avoid chamber ageing at high radiation.

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