Measurements with silicon photomultipliers of dose-rate effects in the radiation damage of plastic scintillator tiles in the CMS hadron endcap calorimeter

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Abstract

Measurements are presented of the reduction of signal output due to radiation damage for two types of plastic scintillator tiles used in the hadron endcap (HE) calorimeter of the CMS detector. The tiles were exposed to particles produced in proton-proton (pp) collisions at the CERN LHC with a center-of-mass energy of 13 TeV, corresponding to a delivered luminosity of 50 fb(-1) . The measurements are based on readout channels of the HE that were instrumented with silicon photomultipliers, and are derived using data from several sources: a laser calibration system, a movable radioactive source, as well as hadrons and muons produced in pp collisions. Results from several irradiation campaigns using Co-60 sources are also discussed. The damage is presented as a function of dose rate. Within the range of these measurements, for a fixed dose the damage increases with decreasing dose rate.

Keywords

Author Keywords: Large detector systems for particle and astroparticle physics; Scintillators, scintillation and light emission processes (solid, gas and liquid scintillators)

KeyWords Plus: POLYMER DEGRADATION; RATE DEPENDENCE; RECOVERY; DISCOLORATION; STABILITY; READOUT

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