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A New ATLAS ZDC for the High Radiation Environment at the LHC

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Increases in luminosity at the LHC will lead to higher radiation exposure of detectors located along the beam-line. This problem is especially acute for the Zero Degree Calorimeters (ZDCs) in ATLAS, which are exposed to dosages on the order of 10 Grad/yr during p+p running. We have systematically studied the damage this radiation has caused in our current detector, while at the same time explored potential upgrade options. One particularly promising option would be based around recent, experimental results suggesting transmission loss saturation in ultra-pure, amorphous quartz rods at very high radiation exposure. If this effect can be harnessed, it may be possible to construct a highly radiation-tolerant quartz-tungsten sampling calorimeter. Our R&D aims to understand the physical defects created in quartz and methods by which these defects can be annealed or controlled. Spectrometric analysis of irradiated quartz rods will be presented and implications will be discussed for calorimetry design in extreme radiation environments.

Secondary topics

Applications

Primary topic

Cherenkov

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