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Radiation damage of the optical components in Scintillator Detector: from the ATLAS/LHC Tile Calorimeter to future experiments

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TileCal, a sampling hadronic calorimeter, is an essential component of the ATLAS detector at the LHC. The active material, made of plastic scintillating tiles, produces light when traversed by ionising particles. The light is transmitted to photomultiplier tubes by wavelength shifting fibres.

The High Luminosity-LHC (HL-LHC) program will extend the TileCal lifetime for 20 years more than originally designed. The detector performance is affected by the increased exposure to radiation that will degrade the TileCal optics and by natural ageing. Since the TileCal's optical components cannot be replaced, their radiation hardness must be evaluated with precision. In addition, the experience gained with a real detector under harsh radiation conditions for long time and the search for new material more capable to handle the radiation will be invaluable for the design of future detectors at FCC or other detectors.

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