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Radiation damage of the optical components of the ATLAS TileCal calorimeter at the High-Luminosity LHC

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The TileCal is a hadronic calorimeter and an essential part of the ATLAS experiment at the LHC. The active material is made of plastic scintillating tiles. The light is produced in the scintillators and transmitted to the photomultiplier tubes by optical fibres.

The current plans foresee a second high luminosity LHC phase where the luminosity can reach a value seven times higher than the one that the TileCal was designed for. Two critical points that affect the detector performance are the increased exposure to radiation that will degrade the TileCal optics and natural ageing. Since the optic components of the TileCal can not be replaced, the radiation damage must be evaluated. A previous study as shown that the Laser calibration systematics are contributing to limiting the precision of the evaluation of the optics radiation damage and need careful understanding. The evaluation of the Laser systematics led to an improvement in the precision, about 20% for the Long Barrel and 50% for Extended Barrel.

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