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## The CMS ECAL Laser Monitoring system: study of crystal transparency loss and proposed upgrade for the High-Luminosity LHC

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The Electromagnetic Calorimeter (ECAL), one of the main subsystems of the CMS detector, measures the energies of electrons and photons. The ECAL is made of 75848 lead tungstate ( $\text{PbWO}_4$ ) crystals. The transparency of crystals is affected by irradiation and the laser monitoring system is designed to measure the transparency changes for each ECAL crystal over time. The aging of the light distribution system under irradiation is also taken into account. In the future, the High-Luminosity LHC upgrade will increase the integrated luminosity of the LHC, providing a much larger dataset for physics to the LHC experiments. This upgrade will lead to higher radiation damage in all the components of the CMS detector. The mitigation of aging is an important goal for the upgrade of the laser light monitoring system. In this talk we report crystal transparency results based on Run 2 data, and we describe the proposed upgrade for the light distribution system.

**Author:** LENZI, Bruno (Université Paris-Saclay (FR))

**Presenter:** LENZI, Bruno (Université Paris-Saclay (FR))

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