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Upgrade of the CMS Electromagnetic Calorimeter for High-Luminosity LHC Operation

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The Electromagnetic Calorimeter (ECAL) of the Compact Muon Solenoid (CMS) experiment at the LHC is a hermetic, fine grained, homogeneous calorimeter, comprising 75,848 lead tungstate scintillating crystals, located inside the CMS superconducting solenoidal magnet. It was designed to operate for a minimum of ten years at the LHC, with an instantaneous luminosity of 2x10^34/cm^2/s and for an integrated luminosity of 500/fb. The high luminosity LHC (HL-LHC) is expected to provide an instantaneous luminosity of around 5 x 10^34/cm^2/s and integrate a total luminosity of around 3000/fb by about 2035 (ten years of data taking). The evolution of the CMS ECAL at HL-LHC is being assessed. We present results of an intensive campaign of component irradiations and ageing studies, complemented by simulations of the physics performance of the aged detector. Several upgrade options are shown, including replacements of the electronics to provide greater triggering flexibility, and new endcap detectors. The latter is the subject of much ongoing R&D and several potential technologies are presented here.

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