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Design development and R&D for CERN's HL-LHC external beam dump

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The energy contained in the LHC's two beams must be safely absorbed in external beam dumps (TDE). High Luminosity (HL) is a future upgrade which will increase this stored energy to 700 MJ, compared to 150 MJ in Run 1. The TDE design has changed little since Run 1; it is a cylindrical stainless-steel vessel with a core made of graphite. During long shutdown 2 (LS2), upgrades were made to the TDEs to address issues found during Run 2 and to prepare for the higher intensity of Run 3. Further upgrades will be needed for HL, due to three key challenges, i.e., a) increased vessel vibration will lead to higher stresses; b) graphitic materials able to withstand energy densities up to 5.7 kJ/g (as determined by FLUKA Monte Carlo simulations) are required; c) a new TDE cooling system is necessary, so that temperature build up following consecutive dumps will not affect the LHC's availability. This paper describes work completed to develop a conceptual design of the HL TDE and the planned future work. Results of Finite Element (FE) simulations of the TDE's response to the beam energy deposition and Computational Fluid Dynamics (CFD) simulations of the cooling system will be presented.

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Footnotes

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Yes

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