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Energy deposition challenges for the HL-LHC beam dump

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The LHC beam dump system has the task of safely and reliably disposing of the extracted beams from 450 GeV to 7 TeV. The present dump assembly consists of a multi-segment graphite core, which is contained in a duplex stainless steel vessel with titanium windows. To reduce the energy deposition density in the core and windows, the extracted beams are swept across the dump front face with dedicated dilution kickers. In the High Luminosity-LHC (HL-LHC) era, the dump must withstand beams with a significantly higher stored energy (about 700 MJ) than has been achieved so far (380 MJ). The high temperatures and vibrations generated in the core and vessel require a redesign of the dump assembly to ensure safe operation with HL-LHC beams. This work presents energy deposition studies for the different dump components in case of regular dumps and possible dilution kicker failure scenarios during HL-LHC operation. The impact of different design choices, such as the dump core segmentation, on the energy deposition and the leakage of particles from the dump is discussed.

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Footnotes

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Yes

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