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The Physics of Precision Timing in CMS using the MIP Timing Detector

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As part of the Phase II upgrade program for HL-LHC, the CMS Detector will be instrumented with a new precision timing layer (the MIP Timing Detector), dedicated to providing timing information (with resolution of ~30-40 ps) for charged particles. This upgrade will reduce the effects of pile-up expected at the HL-LHC and will bring new and unique capabilities to the CMS detector. We will discuss precision timing as a pathfinder for new physics in both the multi-TeV and low energy ranges. In this context, we will present prospects for long-lived particles in various BSM theoretical models and low energy precision particle identification, for example in the Higgs and heavy flavor sectors. An overview of the instrumentation challenges for precision timing systems at the HL-LHC will be discussed. The talk also will discuss performance as a function of precision and applications of precision timing beyond collider physics.

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