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New opportunities in heavy ion physics at HL-LHC with a Mip Timing Detector at CMS

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The Compact Muon Solenoid (CMS) detector at the CERN Large Hadron Collider (LHC) is undergoing an extensive Phase II upgrade program to prepare for the challenging conditions of the High-Luminosity LHC (HL-LHC). A new timing layer is designed to measure minimum ionizing particles (MIPs) with a time resolution of ˜30 ps and hermetic coverage up to a pseudo-rapidity of $|\eta|$=3. The precision time information from the mip timing detector (MTD) will serve as an excellent time-of-flight detector for particle identification in QCD and heavy ion physics. Together with the wide coverage of tracker and calorimetry, the MTD will enable a broad range of new and unique opportunities in heavy ion physics at CMS. We present the current status and ongoing R&D of the MTD and performance of extending heavy ion physics program at CMS with particle identification, such as heavy flavor hadron reconstruction over wide rapidity down to very low transverse moment.

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