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Test Beam Studies Of Silicon Timing for Use in Calorimetry

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The high luminosity upgrade of the Large Hadron Collider (HL-LHC) at CERN is expected to provide instantaneous luminosities of 5 × 10^34 cm−2 s−1. The high luminosities expected at the HL-LHC will be accompanied by a factor of 5 to 10 more pileup compared with LHC conditions in 2015, causing general confusion for particle identification and event reconstruction. Precision timing allows to extend calorimetric measurements into such a high density environment by subtracting the energy deposits from pileup interactions. Calorimeters employing silicon as the active component have recently become a popular choice for the HL-LHC and future collider experiments which face very high radiation environments. We present studies of basic calorimetric and precision timing measurements using a prototype composed of tungsten absorber and silicon sensor as the active medium. We show that for the bulk of electromagnetic showers induced by electrons in the range of 20 GeV to 30 GeV, we can achieve time resolutions better than 25 ps per single pad sensor.

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