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RADiCAL: Precision-timing, Ultracompact, Radiation-hard Electromagnetic Calorimetry

To address the challenges of providing high performance calorimetry in future hadron collider experiments under conditions of high luminosity and high radiation (FCC-hh environments), we are conducting R&D on advanced calorimetry techniques suitable for such operation, based on scintillation and wavelength-shifting technologies and photosensor (SiPM and SiPM-like) technology. In particular, we are focusing our attention on ultra-compact radiation hard EM calorimeters, based on modular structures (RADiCAL modules) consisting of alternating layers of very dense absorber and scintillating plates, read out via radiation hard wavelength shifting (WLS) solid fiber or capillary elements to photosensors positioned either proximately or remotely, depending upon their radiation tolerance. The RADiCAL modules provide the capability to measure simultaneously and with high precision the position, energy and timing of EM showers. This paper provides an overview of the instrumentation and photosensor R&D associated with the RADiCAL program.

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