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Scintillating sampling ECAL technology for the Upgrade II of LHCb

The aim of the LHCb Upgrade II is to operate at a luminosity in the range of 1 to $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ to collect a data set of 300 fb^{-1} . This will require a substantial modification of the current LHCb ECAL due to high radiation doses in the central region and increased particle densities. The ECAL has to provide good energy and position resolutions in these conditions. Timing capabilities with tens of picoseconds precision for neutral electromagnetic particles and increased granularity with denser absorber in the central region are needed for pile-up mitigation.

Several scintillating sampling ECAL technologies are currently being investigated for this purpose: Spaghetti Calorimeter (SpaCal) with garnet scintillating crystals and tungsten absorber, SpaCal with scintillating plastic fibres and tungsten or lead absorber, and Shashlik with polystyrene tiles, lead absorber and fast WLS fibres. Results from an ongoing R&D campaign to optimise the Upgrade II ECAL are shown. This includes studies of radiation-hard scintillation materials, performance optimisation using detailed simulations and test beam measurements. The presentation also includes an overview of the overall plans for the Upgrade II of the LHCb ECAL.

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