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Front-end Electronics for LHCb Upgrade II

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After a very successful upgrade during LS2, mainly focused on making possible the new flexible fully software trigger, a second upgrade is planned for LHCb during LS4 to fully profit from the HL-LHC. Considering the steep increase in pile-up and occupancy under the new conditions, one of the themes of this upgrade is the integration of time measurements in different sub-systems to contribute to tackling the combinatorial explosion during event reconstruction.
The LHCb-IFIC Group contributes since 2018 to the development of PicoCal, an heterogeneous sampling calorimeter using various absorber and scintillating materials as well as configurations. Two separate ASICs provide a 20ps resolution time measurement (SPIDER) and a 10bit resolution energy measurement (ICECAL65). The group had a direct contribution to the design of ICECAL65, whose first prototype is to be produced during Q4 2025. Additionally, a COTS circuit (PAC) is under development at IFIC, integrated in the Front-End Boards and dedicated to the acquisition of the signal from the fotosensors and it adaptation to the ASIC inputs.
The LHCb-IFIC Group already had a relevant role during the development of PACIFIC, the SiPM readout ASIC installed in the SciFi Tracker. Towards Upgrade II, the SciFi Tracker plans to update this chip to PACIFIC++, a circuit integrating functionality previously performed in an FPGA and a new time measurement with <1ns resolution. The talk will cover the contributions to the analog readout chain for the first prototype that is planned to go to production during next year.

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