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The Monitoring System of the EndCap Calorimeter in the Belle2 experiment

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The Belle II experiment is presently under construction at the SuperKEKB electron-positron collider in KEK (Tsukuba, J). The detector is a major upgrade of the Belle experiment at the KEKB collider and it is optimized for the study of rare B decays. The new design makes it also sensitive to signals of New Physics beyond the Standard Model, including studies of the dark sector.

The Electromagnetic Calorimeter (ECL) is based on CsI(Tl) scintillation crystals. It splits in a barrel and two annular endcap regions, these latter named Forward and Backward, according to the asymmetric design of the collider.

CsI(Tl) crystals deliver a high light output at an affordable cost, however their yield changes with temperature and can be permanently damaged by humidity, due to the strong chemical affinity for moisture. Each ECL region is then equipped with thermistors and humidity probes to monitor environmental data. While sensors and cabling have been inherited from the original Belle design, the ECL monitoring system has been fully redesigned. In this paper, we present hardware and software architecture deployed for the 2112 CsI(Tl) crystals arranged in the Forward and Backward endcaps. Single-Board Computers (SBCs) have been designed ad-hoc for embedded applications. For sensor read-out, a data-acquisition system based on 24-bit ADCs with local processing capability has been realized and interfaced with the SBCs. EPICS applications send data across the Local Area Network for remote control and display. We discuss sources of error, design strategies and performance achieved, which rivals that of lab-grade equipment.

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Description

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