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Development of silicon detector and readout electronics for the FoCal

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Forward Calorimeter (FoCal) is a proposed silicon-tungsten (Si-W) sampling type electromagnetic calorimeter as a part of the ALICE collaboration's upgrade program at CERN. For the active silicon layers in FoCal, a large area (~ 40 cm2) silicon pad sensor with an individual pad size of ~ 1 cm2 is proposed with challenging requirements like low leakage current and high breakdown voltage. Moreover, Si-W based EM calorimeter involves particle shower formation and dissolution, which put forward the simultaneous requirement of low power, low noise and wide dynamic range FEE (Front End Electronics). A 6x6 array of silicon pad detectors on a 4-inch wafer and two different FEE ASICs, namely ANUSANSKAR and ANUINDRA, are developed and tested towards these goals. ANUSANSKAR, designed initially in 0.7 µm CMOS technology, is a low power, low noise FEE ASIC with a dynamic range of +/- 600 fC. Later, to cater for the still higher dynamic range requirement, a new ASIC, namely ANUINDRA with a dynamic range of ~ 2.6 pC, was designed in 0.35 µm CMOS technology. The silicon pad sensors and the FEE ASICs have been used to build a series of FoCal prototypes, undergone beamline validation, and led to improved readout methodology and better performance. This talk will present the research and development work of the silicon detector, and its readout electronics carried out in India for the proposed FoCal detector.

What is your experiment?

Forward Calorimeter, ALICE

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