

Development of the **FoCal-E PAD** detector and its electronics for the **LHC-ALICE** experiment

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We have a plan to install the forward calorimeter (FoCal) in the ALICE experiment at LHC during the LHC long shutdowns, LS2 and LS3.

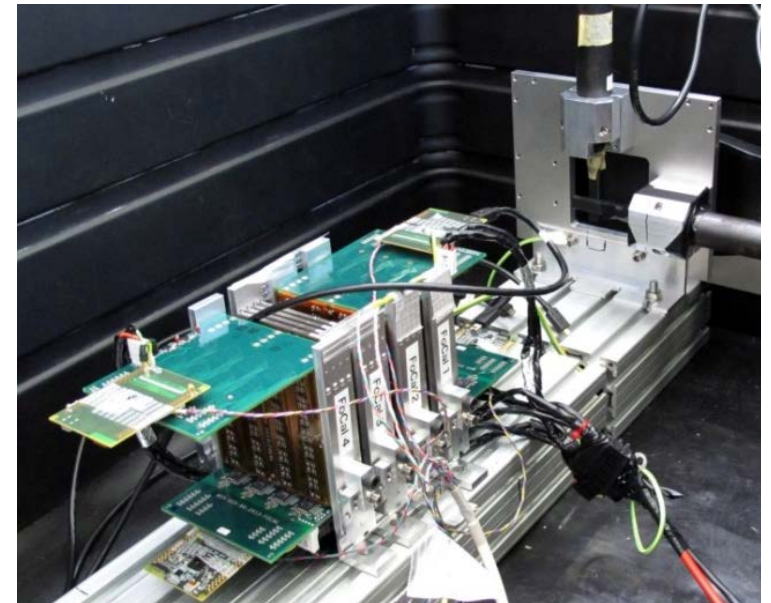
FoCal {
The electromagnetic calorimeter (FoCal-E)
The hadron calorimeter (FoCal-H)

The low-granularity silicon-pad (PAD) detectors
(University of Tsukuba, et al.)

The high-granularity silicon-pixel (MAPS) detectors
(Universiteit Utrecht, et al.)

Last year, we developed the following circuits for the first beam test.

1. **The temperature monitor with precision digital thermo-sensors** to manage the temperature-sensitive photodiodes of PAD,
2. **The trigger signal converting circuit** to make the trigger signal with the timing and channel information,
3. **The FPGA-based trigger signal processor** for the arbitrary trigger signal processing,
4. **The low-ripple independent regulated low-voltage power circuits** to improve the signal-to-noise ratio (S/N) of PAD,
5. **The isolated high-voltage generators** to improve S/N of PAD by cutting off an electric noise from the GND lines.



A prototype of the PAD detector

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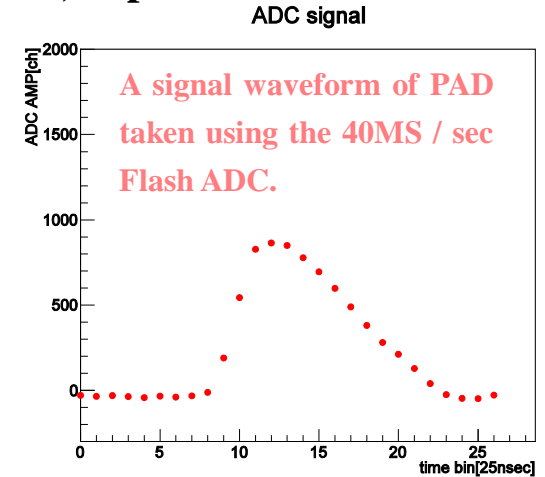
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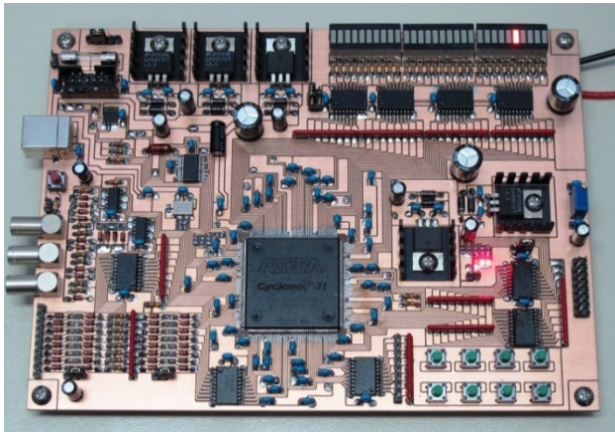
I designed and fabricated these circuits using the printed circuit board development facility at Tsukuba University of Technology in Japan.

Last year, we carried out the first beam test of FoCal-E at CERN PS and SPS test beam lines, and we could see the first signal of the FoCal-E PAD detector as shown in the right figure.

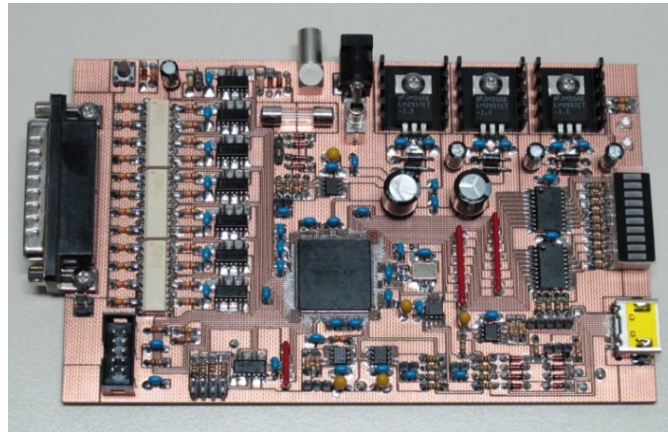
We will measure the energy resolution in detail at a beam test foreseen in October.



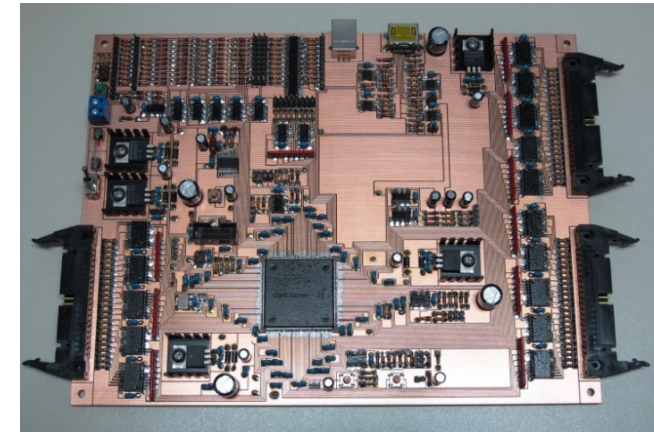
A signal waveform of PAD



The temperature monitor



The trigger signal converting circuit



The trigger signal processor