Electronics - INFN

Goals:

- Provide a reference readout system for prototypes performance assessment
- Developed a generic DAQ system compatible with the Consortium needs
- Test applications with innovative sensors (SiPM)

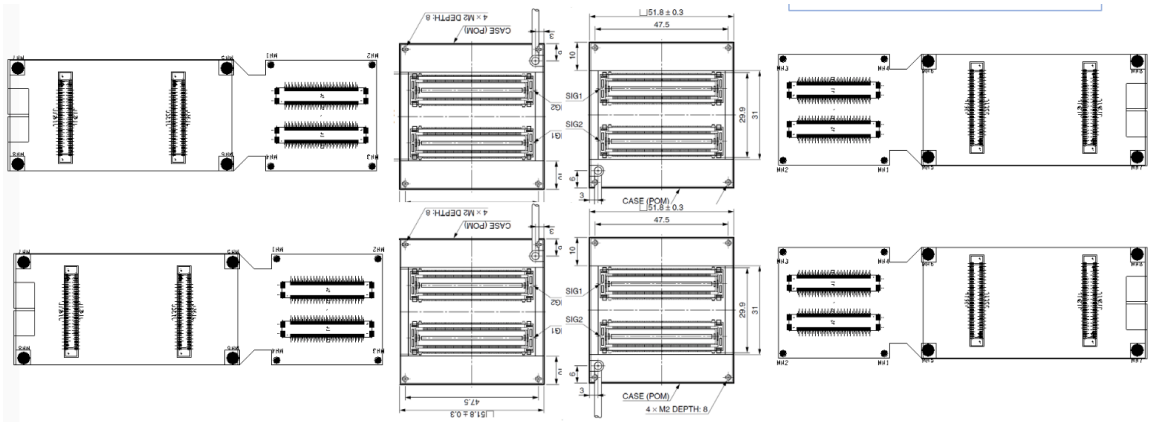
Middle-term program:

- 3 mm^2 pixel compatibility (H13700 and SiPM)
- Pulsed laser test beanches for detailed characterization
- Radiation tolerance study for SiPM

H13700 Readout

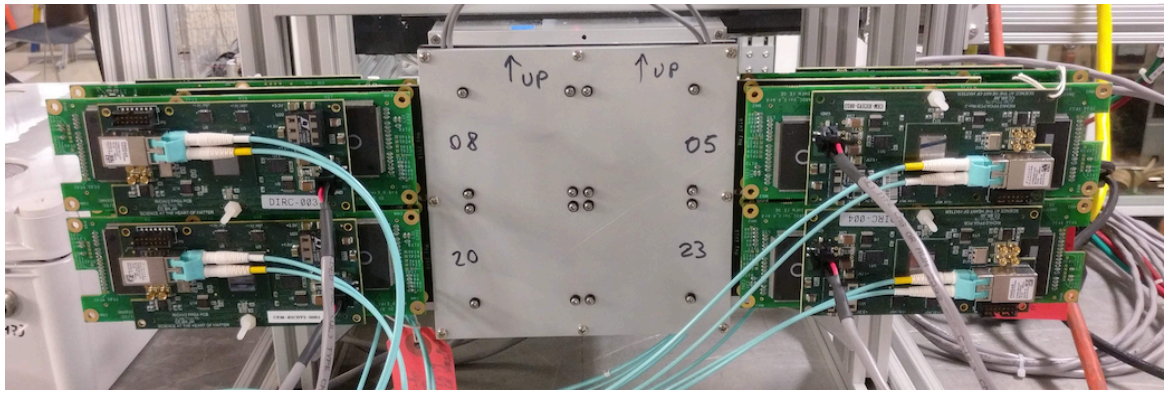
Derived from CLAS12 RICH readout:

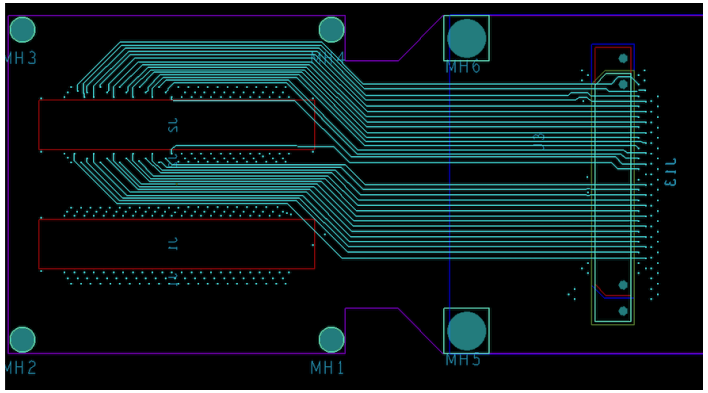
- 1024 channels
- MAROC 64 channel parallel digitalization
- FPGA generated 1 ns timestamp
- DAQ protocol based on VME/VSX SSP



Custom adapter boards

- Compact distribution
- Use of existing MAROC boards
- Light and gas tightness





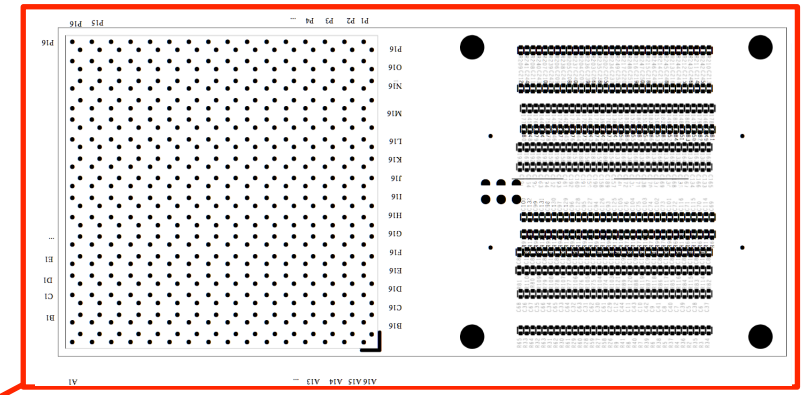
SiPM Readout

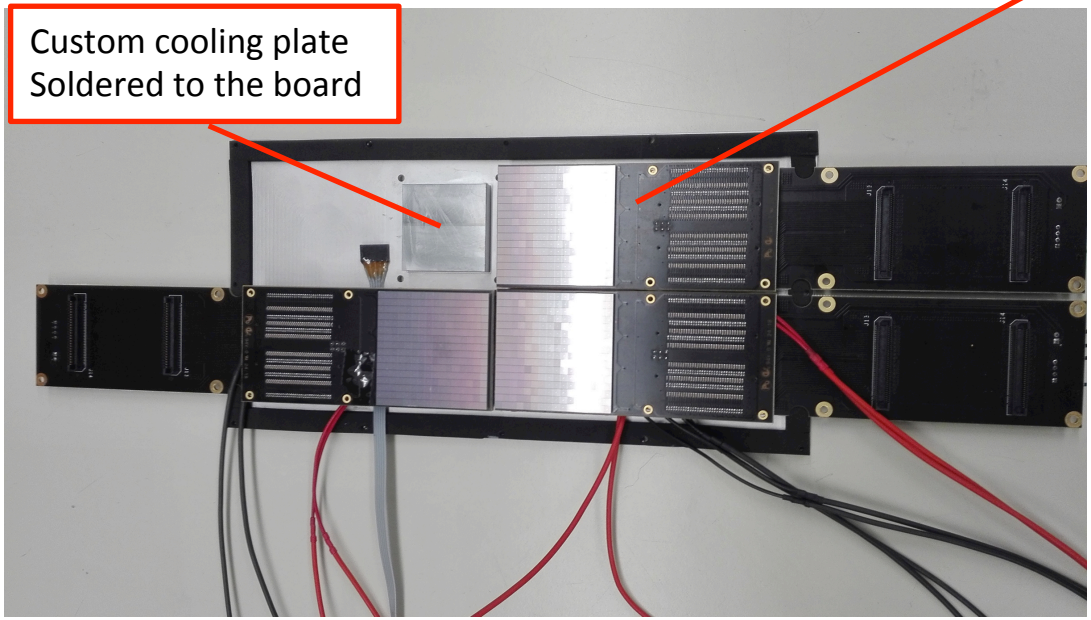
SiPM might offer a cheaper and more efficient solution, expecially in a longer time perspective for other sectors

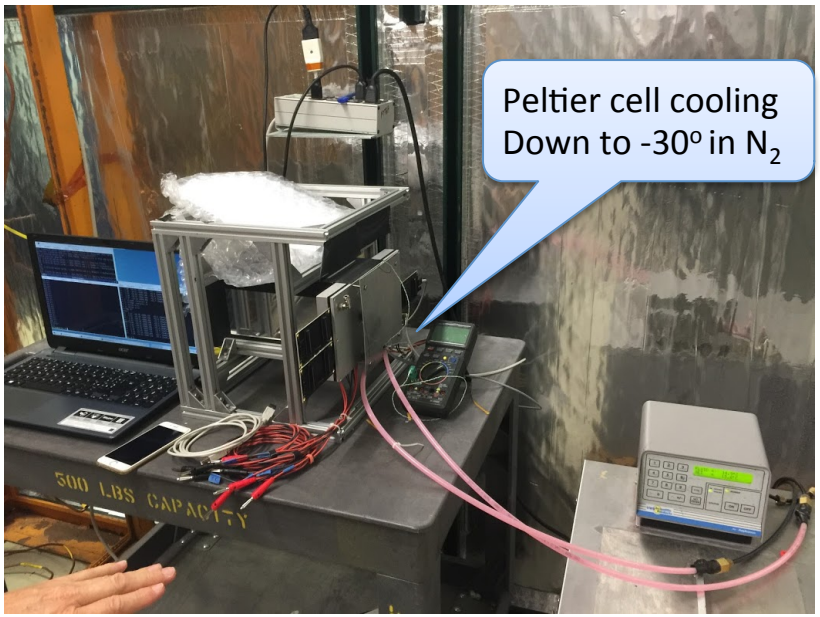
Robust device with low sensitivity to magnetic field
Fast improvement in dark rate and cost
but so far missing radiation hardness

Challenge: cooling integrated into the sensitive readout

Dedicated board for readout and cooling of a surface Mounting SiPM Matrix







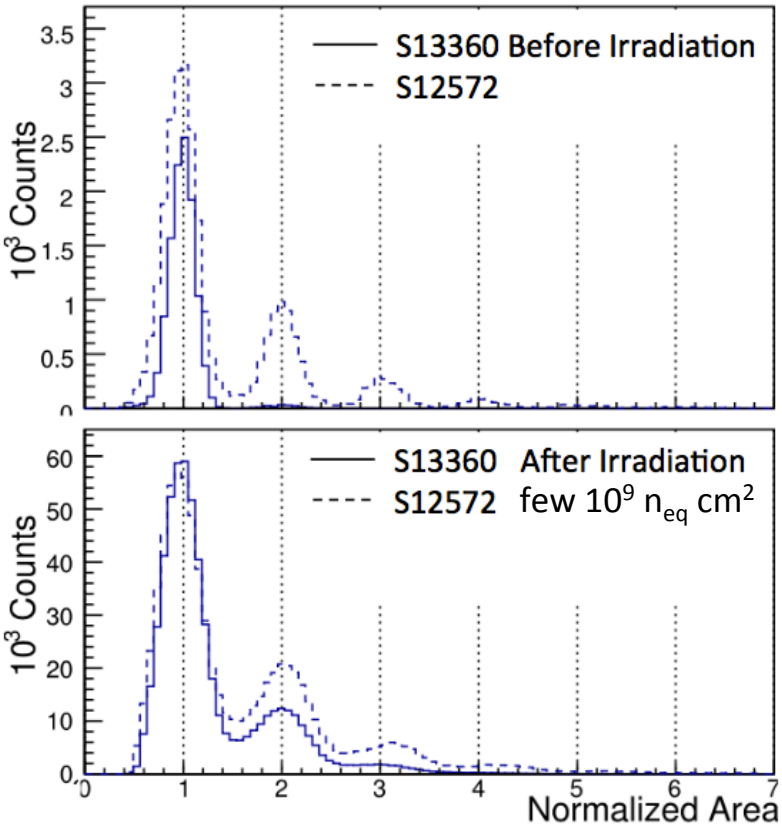
SiPM Radiation Tolerance

I. Balossino, NIMA 876 (2017) 89

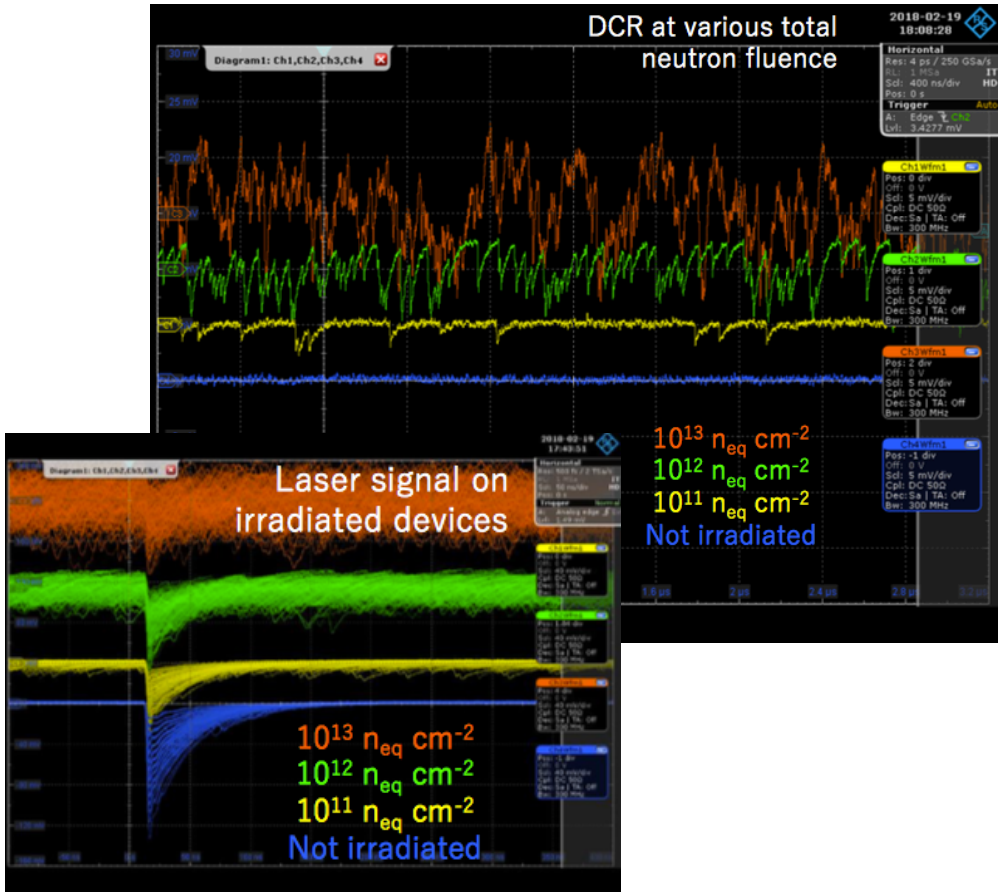
Single-photon capability after irradiation ?

S12572 standard technology
S13360 trench technology

T = 0 °C



Paolo Carniti @ RICH 2018



SiPM: Hamamatsu S13360-1350CS (50 µm cells)

Temperature: –30 °C

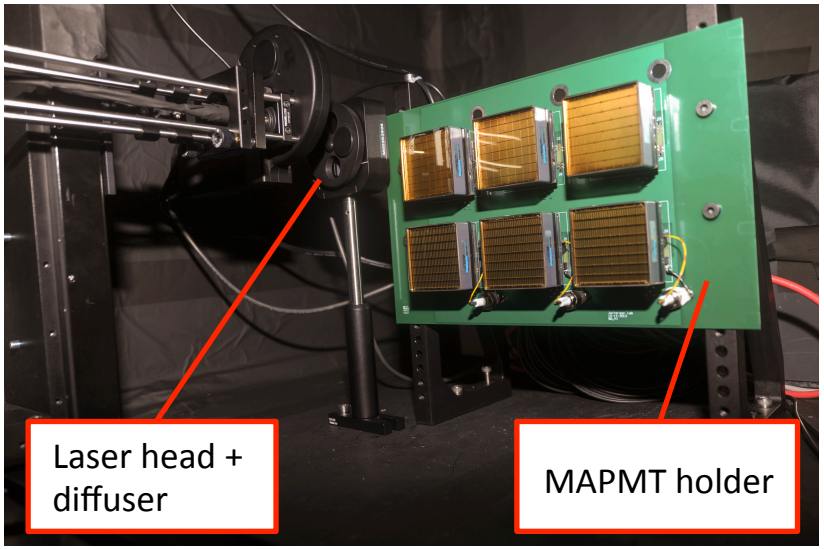
Bias: V_{BR} + 1.5 V

Pulsed Laser Tests

Detailed characterization
Sensors: gain, efficiency, cross-talk, radiation tolerance
Electronics: gain, cross-talk, thresholds, time resolution

JLab

632 nm picosecond pulsed laser light
Light diffuser to illuminate the whole MAPMT surface
Standardized system with CLAS12 electronics
H8500 6x6 mm^2 pixel sensor so far



Ferrara

632 nm and 407 nm picosecond pulsed laser light
Light concentrator to scan the pensor surface
Flexible layout supporting various sensors and Front-End electronics