



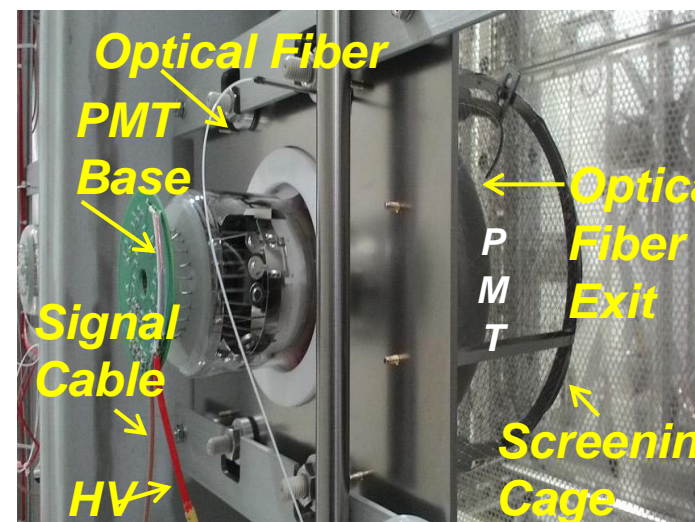
Status of ICARUS PMT System

Gian Luca Raselli
for the INFN ICARUS-Pavia Group

Intense meeting
28th November 2022

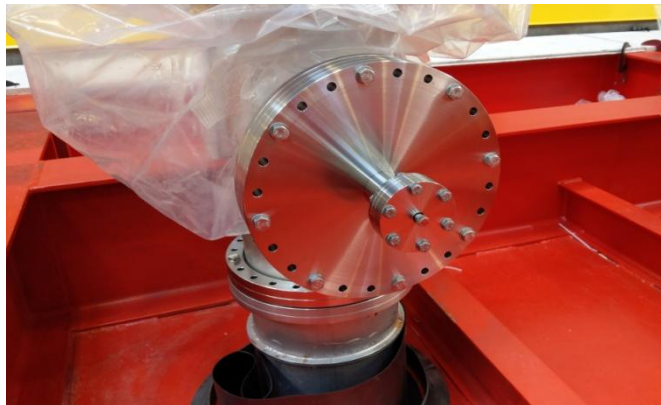
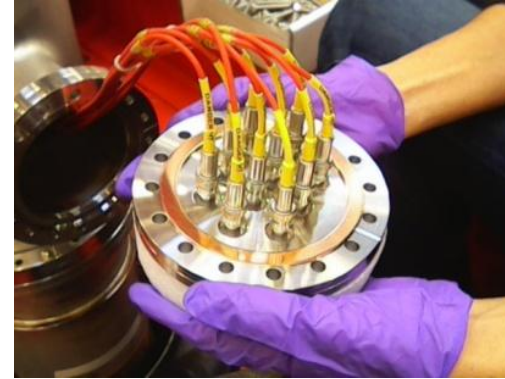
Light detection system: internal

- The new light collection system consists of 360 PMTs 8" **HAMAMATSU R5912-MOD** coated with $\sim 200 \text{ mg/cm}^2$ of Tetra-Phenyl-Butadiene to detect $\lambda = 128 \text{ nm}$ LAr scintillation, 90 PMTs per TPC installed behind wire planes, inside a wire screening cage to prevent pulse induction on facing TPC wires;
- M.C. calculations indicate a **5 % photo-cathode coverage of TPC wire area** and a **low energy event detection ($< 100 \text{ MeV}$)** with fairly high threshold/multiplicity (**15 phe/MeV light collection**);
- This PMT deployment offer an event longitudinal localization better than 0.5 m and an initial classification of different interaction topologies (μ -tracks vs e.m. showers);
- PMT timing/gain equalization is performed by Laser light pulses (Hamamatsu PLP10, $\lambda = 405 \text{ nm}$, FWHM $< 100 \text{ ps}$, peak power $\sim 400 \text{ mW}$) sent to photocathodes by 50 mm optical fibers.



Light detection system: external

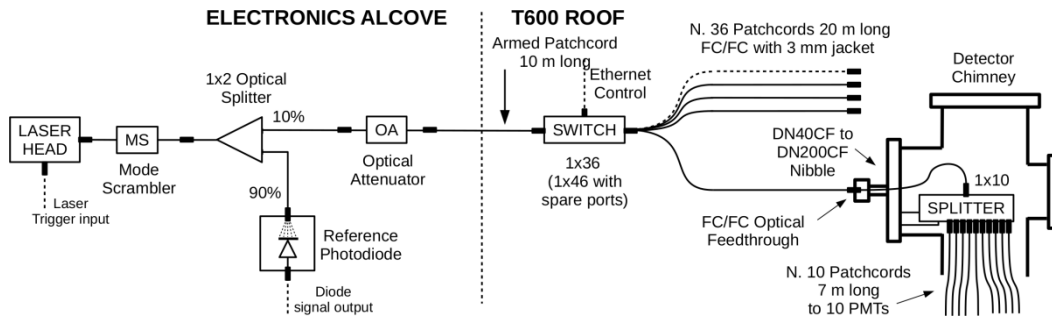
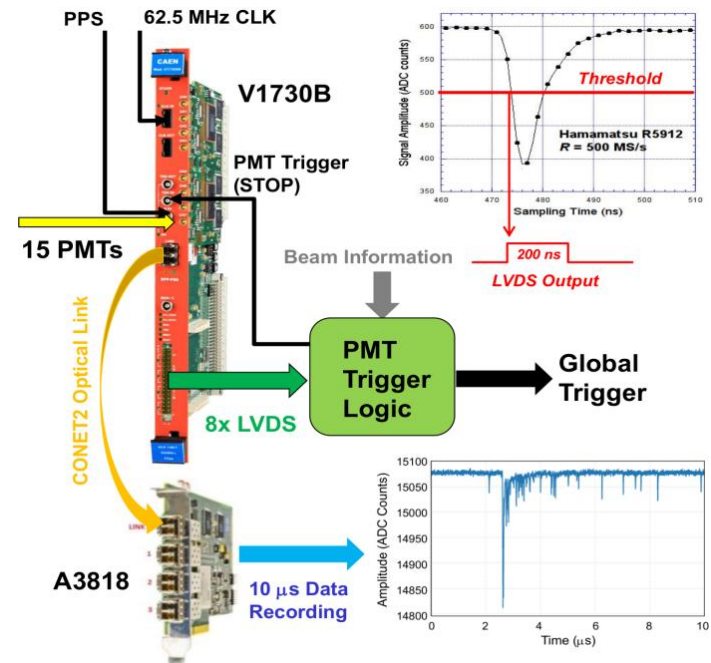
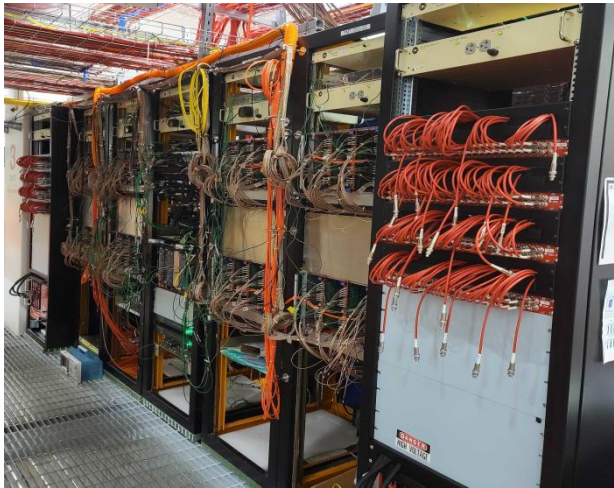
PMT and optical flanges installation.



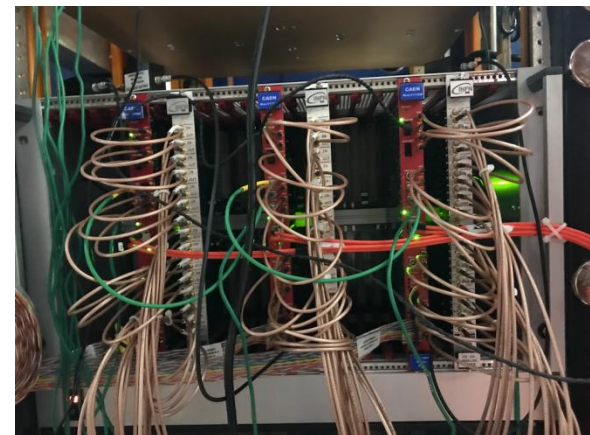
All the flanges have been connected to the electronics placed sideways to the detector.

Light detection system: external

Electronics.



Laser system.



Analog adders.

Conclusions

- ICARUS-T600 is acquiring data regularly.
- The scintillation light detection system is fully operational, allowing the acquisition of LAr scintillation light pulses and their exploitation at the trigger level.
- Thanks to the laser calibration system, PMT gains are equalized at the 1% level with a ≈ 1 ns time resolution.
- The light detection system allows the 3D reconstruction of interaction in the active volume of ICARUS-T600, actively contributing to the selection of genuine neutrino interactions while rejecting the cosmic background.