

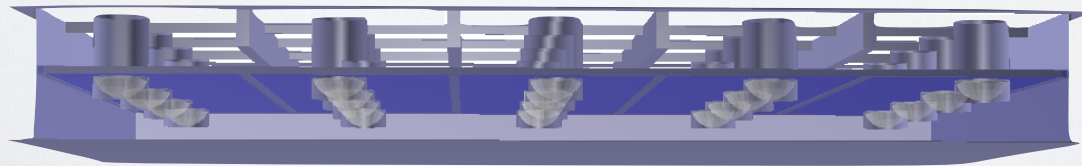
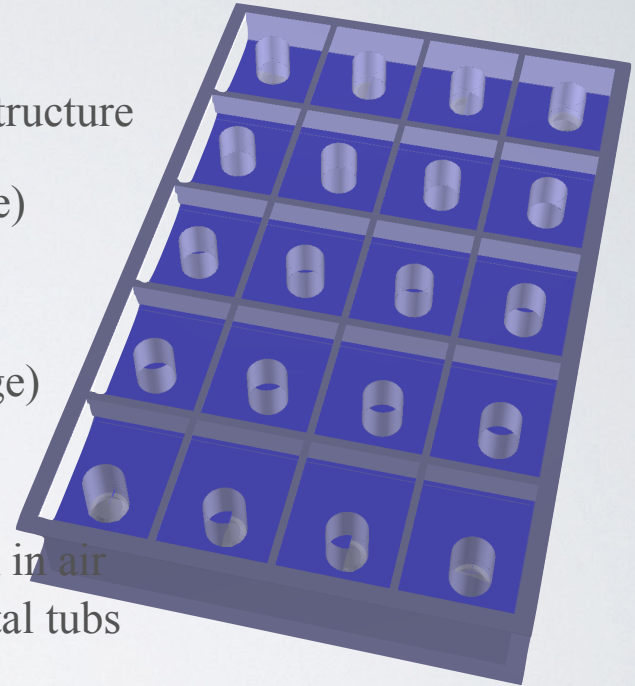
MUONS VETO
INSTALLATION
AND
COMMISSIONING

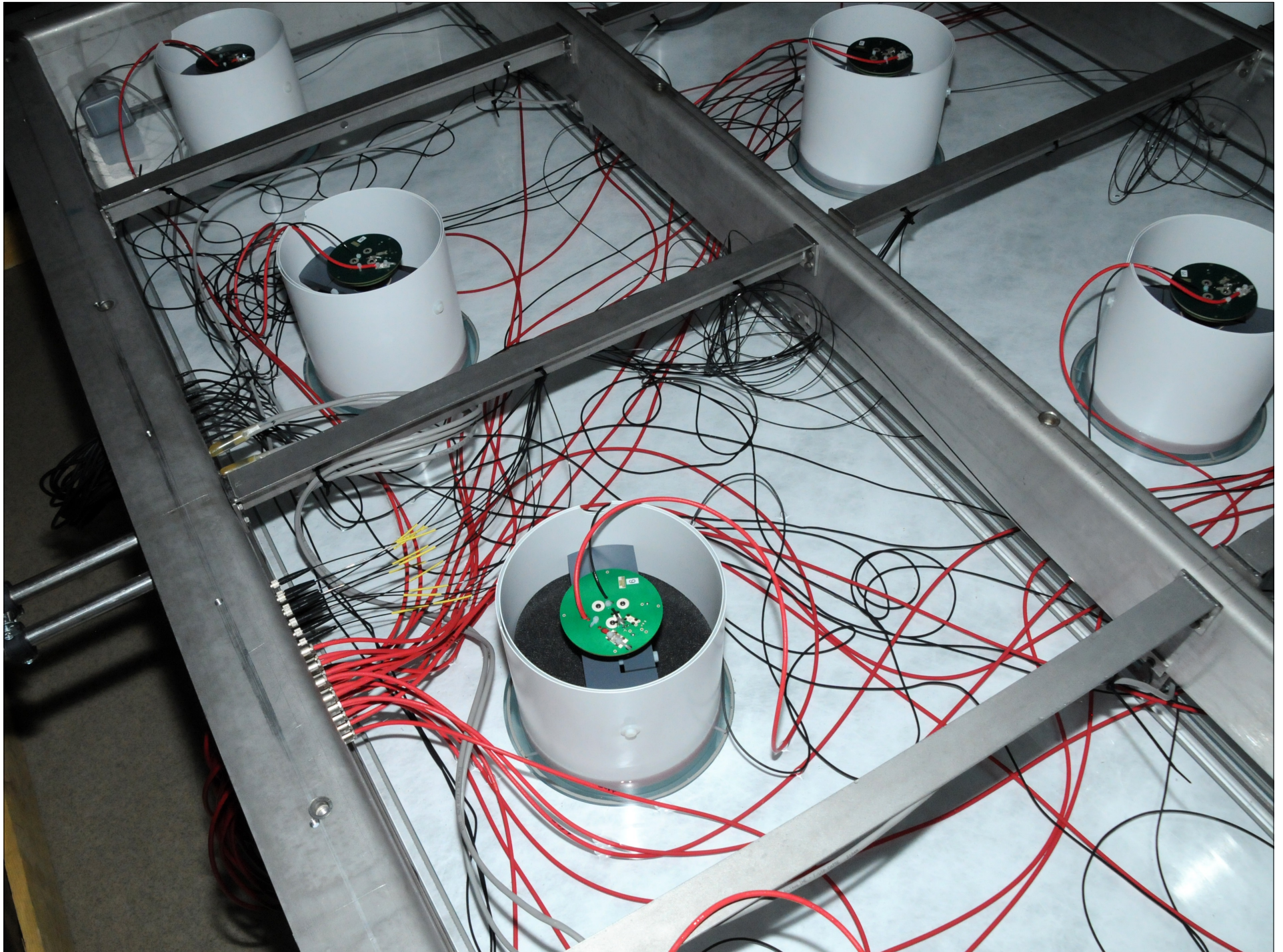
J.S. Real

October 12 2016

SCHEMATIC LAYOUT

- Volume of water : 396 x 240 x 25.9 cm³ (2500 l) fit the stereo structure
- Pure water (18 M Ω) with 4MU at 6 ppm (4 Methylumbelliferone)
- 20 PM with 2 layers of μ -metal
 - dL=85 cm (28 cm from edge) dW=63.3 cm (25 cm from edge)
- Tyvek 1059B for the wrapping on bottom and side
- On top : PMMA between water and air (total reflection) + Tyvek in air for normal incidence. PMMA used to carry the PMTs and μ -metal tubs
- 12 optical fibers to calibrate gain of the PMTs (PE measurement)



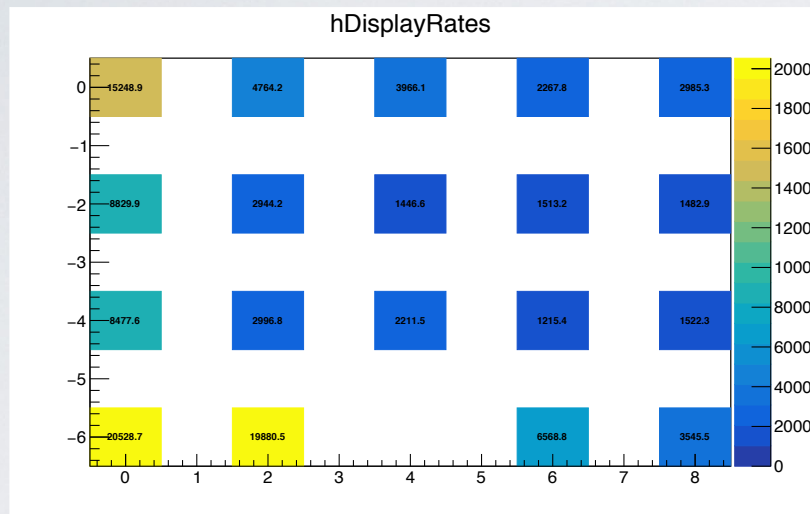




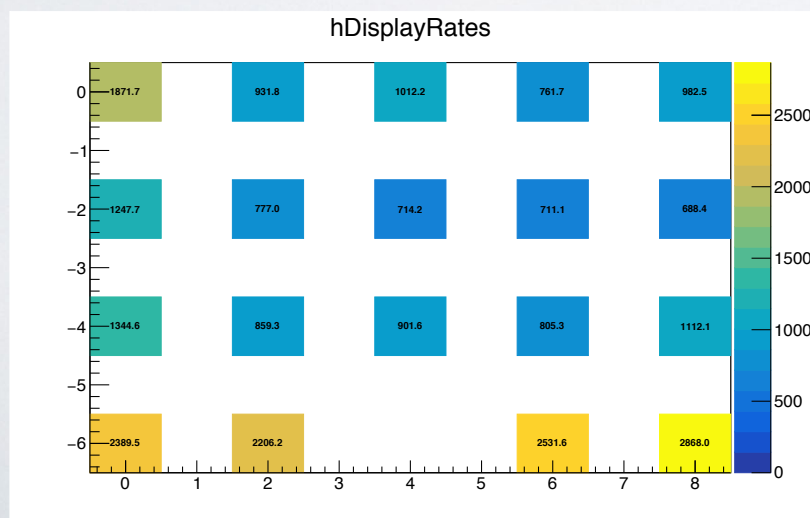
STATUS

- 2 PMTs died.
 - - 1 before move has been changed as well as the basis few days after. New basis show unexpected behaviour over time with small current (and gain) increase.
 - - 1 after move. we need to live with it.
- 09/18 Veto filled with pure water
- Commissioning reactor ON:
 - Trigger rates (with expected threshold) 10 times larger than the muon rate expected! (5 kHz vs 500 Hz)
 - dead time issue.
 - Background correlated to D19 and IN20 running conditions (trigger and single rates)

SINGLE TRIGGER RATES

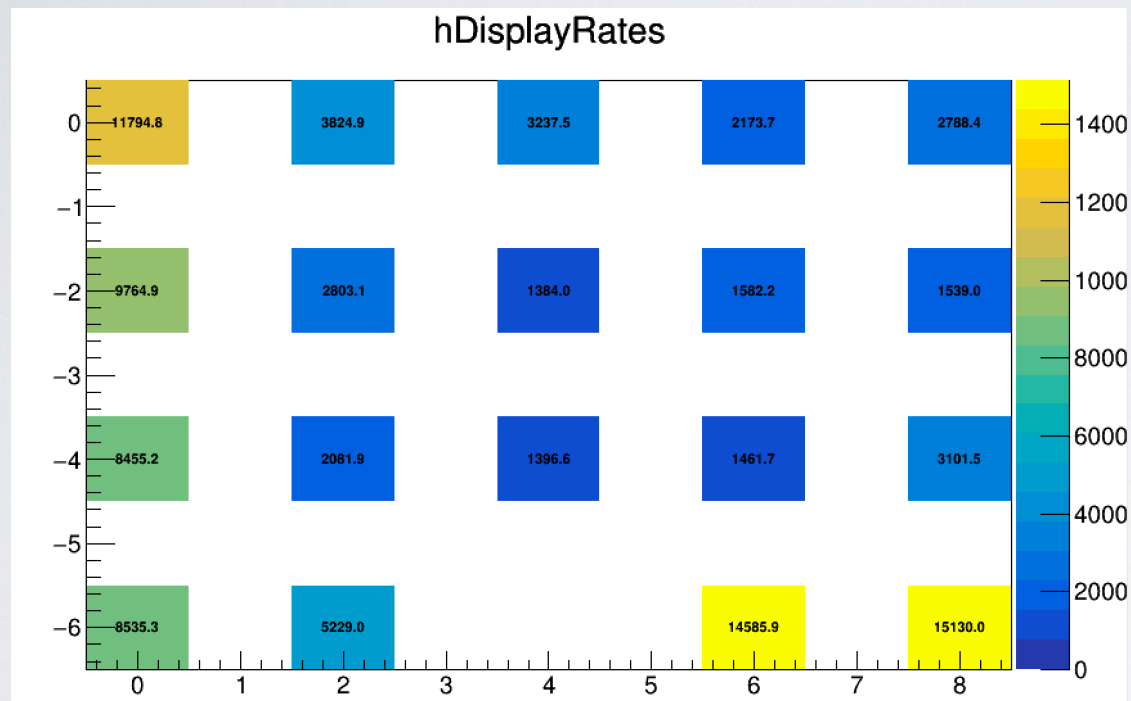


- DI9 and IN20 Running



- DI9 and HI3 closed

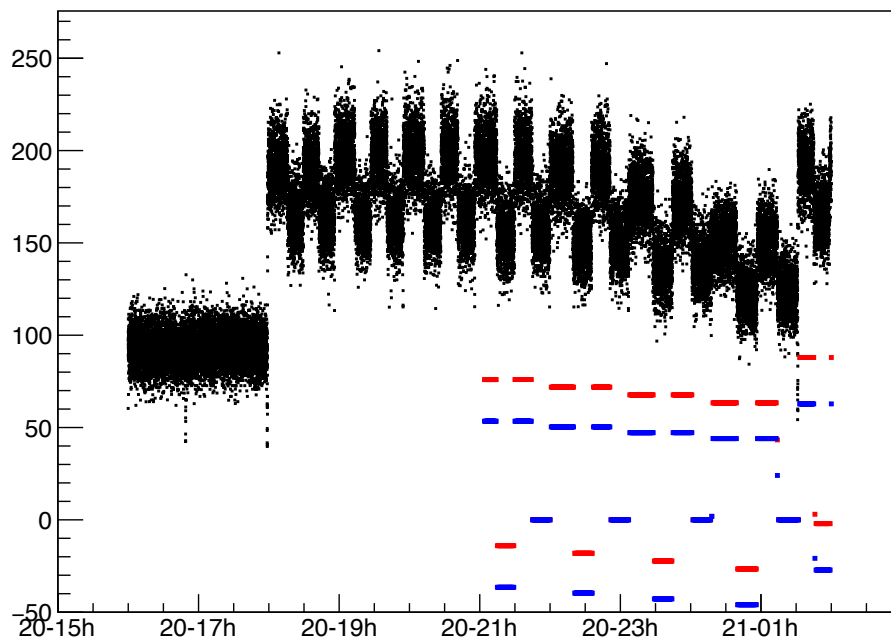
SINGLE TRIGGER RATES



- DI9 and IN20 Running. Different DI9 angle

CORRELATION WITH IN20

- Trigger Fe6 Low (Corner front IN20)



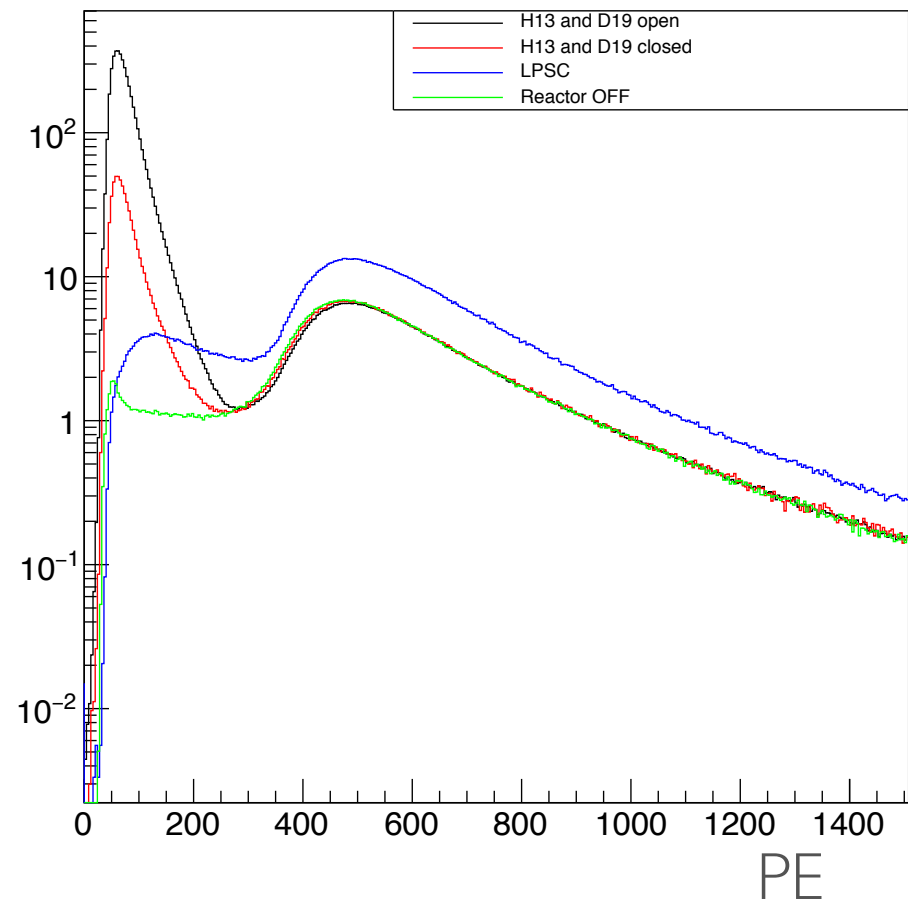
BACKGROUND COMPOSITION

- Veto trigger has been showed to be insensitive to 4.4 MeV gammas (threshold ≤ 30 PE).
- Sensitivity to neutrons not measured but should be very small
- Effect of shielding (polyethylene and lead) on the veto. (difficult to put shielding : 3 m high, tiny space)
- Fast neutrons have been identified from front wall (from H13 and possibly from H7) and D19?
- High gamma rates.
- Shielding show reduction of single rates but not a clear reduction of the trigger rates. Neutron or gamma can not explain veto event with more than 100 PEs! Pile-up?

TRIGGER RATES

- Veto Trigger rates:
- D19 and IN20 ON: 5 kHz
- D19 and H13 closed: 1.3 kHz
- LPSC : 1.4 kHz
- Reactor OFF : 700 Hz

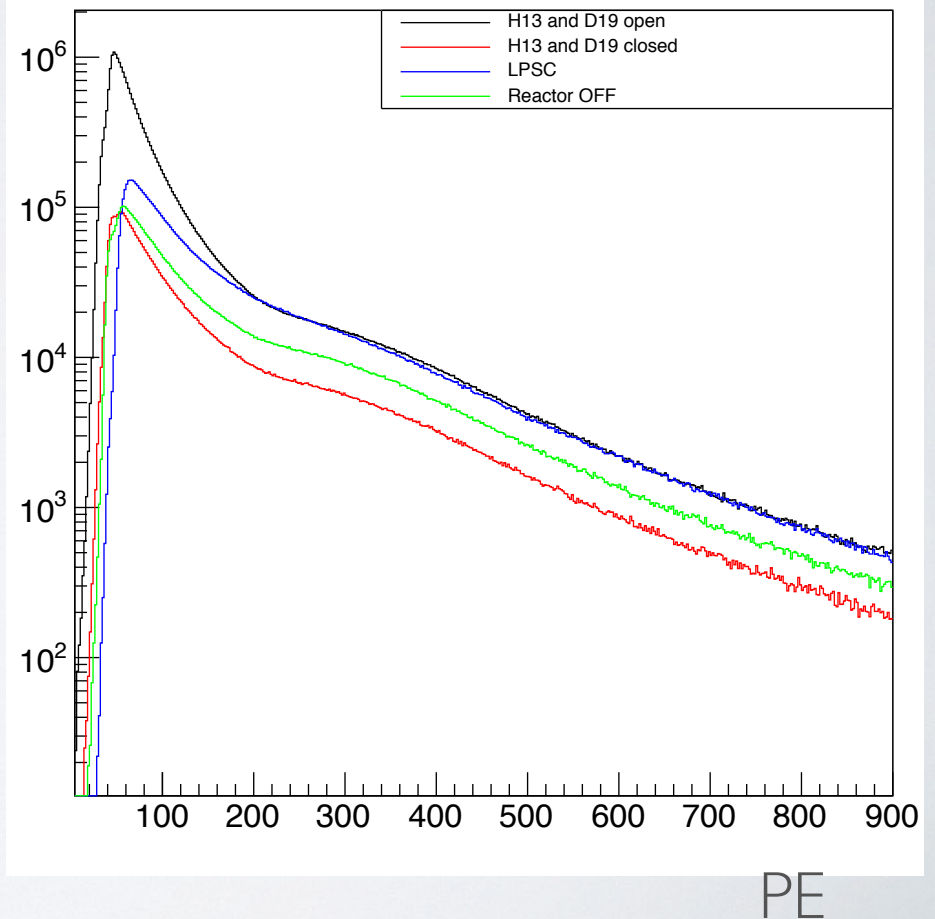
Total Photoelectrons in Veto



TRIGGER SUM 4

- Sum of 4 PM (used for the trigger) No clear separation of cosmic and background.
- Normal threshold: 40 pe
- need a threshold of 100 pe (efficiency $\sim 98\%$, more sensitive to PMT gain change).

Total Photoelectrons SUM 4



CONCLUSIONS

- High background rates in Veto :
 - Additional shielding? (does this background can affect the detector?)
 - Increase threshold and/or change trigger mapping (value and stability of the efficiency?)
 - Development of a Level 2 Trigger (efficiency?)
- Data are there (reactor ON/OFF), need analysis to conclude