Mock Data Run 2015
Electron Muon Ranger (EMR)

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Single Anode PMT replacement

Ageing **Philips XP2972** :

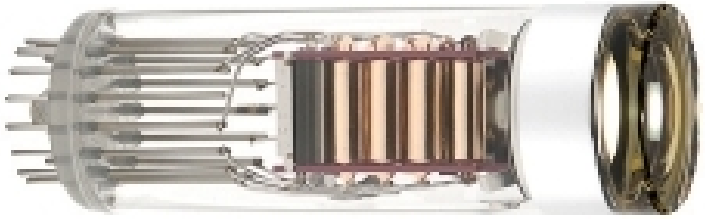
- Sensitivity: $\sim 65\ \mu$A/lm
- Gain: 3×10^6
- Time spread: ~ 800 ps
- QE: 14.5 %

$\rightarrow$ 30 years old
$\rightarrow$ Degraded photocathode
$\rightarrow$ Reduction of secondary emissions
$\rightarrow$ Gain loss
$\rightarrow$ Spurious pulses

New **Hamamatsu R6427** :

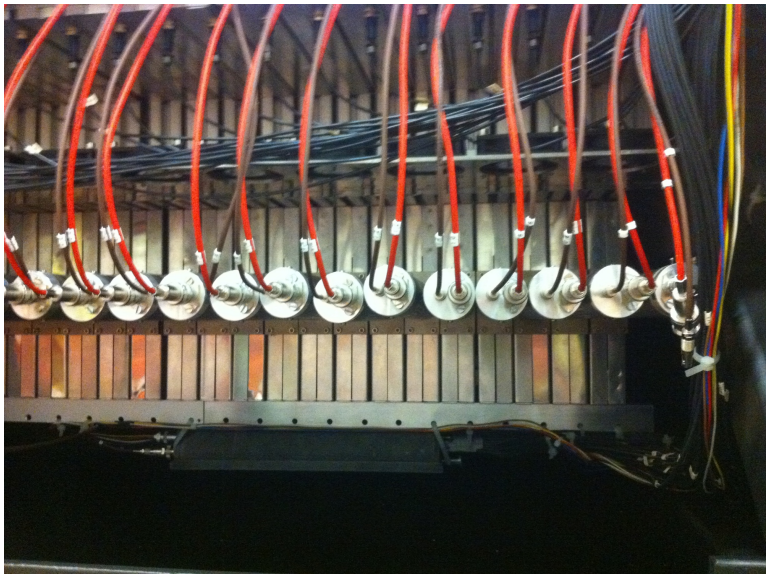
- Sensitivity: $\sim 100\ \mu$A/lm
- Gain: 5×10^6
- Time pread: ~ 500 ps
- QE: 24 %

$\rightarrow$ 56 PMTs (8 spares)
$\rightarrow$ Change done by UniGe technicians at RAL at the beginning of October 2014 (two days work)

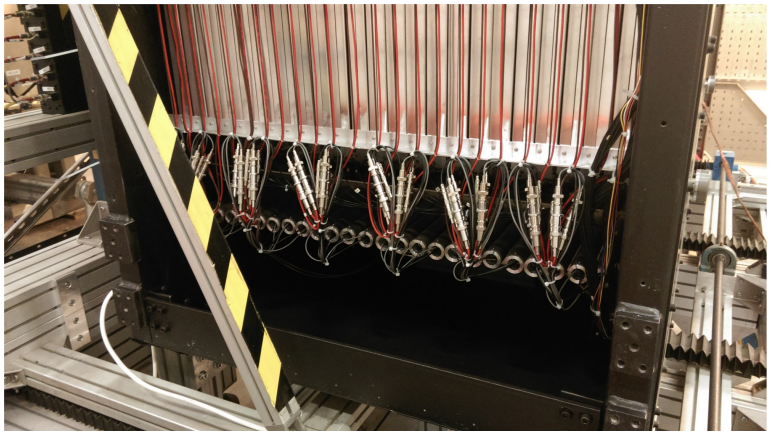


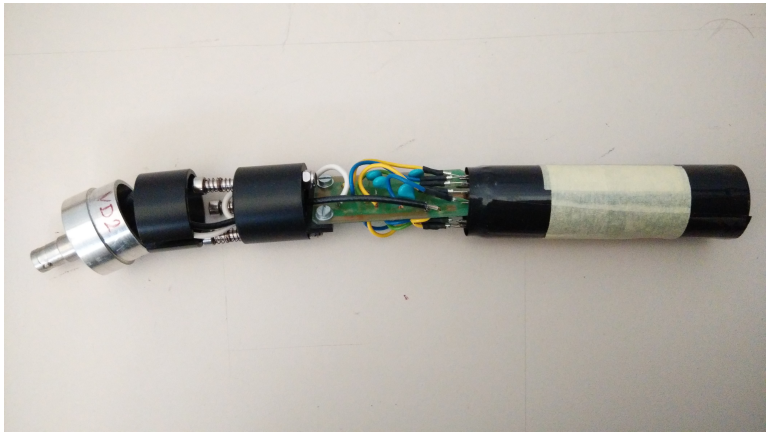
SAPMT implementation

Old set up



New set up





New EMR Elements Installation

New elements:

- 47 U rack to replace current one
- AC fan system (back of the rack, top of the rack, EMR box)
- Remote controlled AC power supply
- HVPSU (photomultipliers)
- LVPSU (trigger distribution boards, LED driver, fans)
- New VME (and NIM) crate(s)

Implementation:

- New design and layout approval (RAL) (✓)
- Installation of remote control switch, connection to grid (RAL) (✓)
- Rack repackaging (UniGe) (✓)
- Cables rewiring (UniGe) (✓)
- Test and commissioning (UniGe) (✓)
  → Finalized after the upgrade of the SAPMT

Issues encountered after restarting

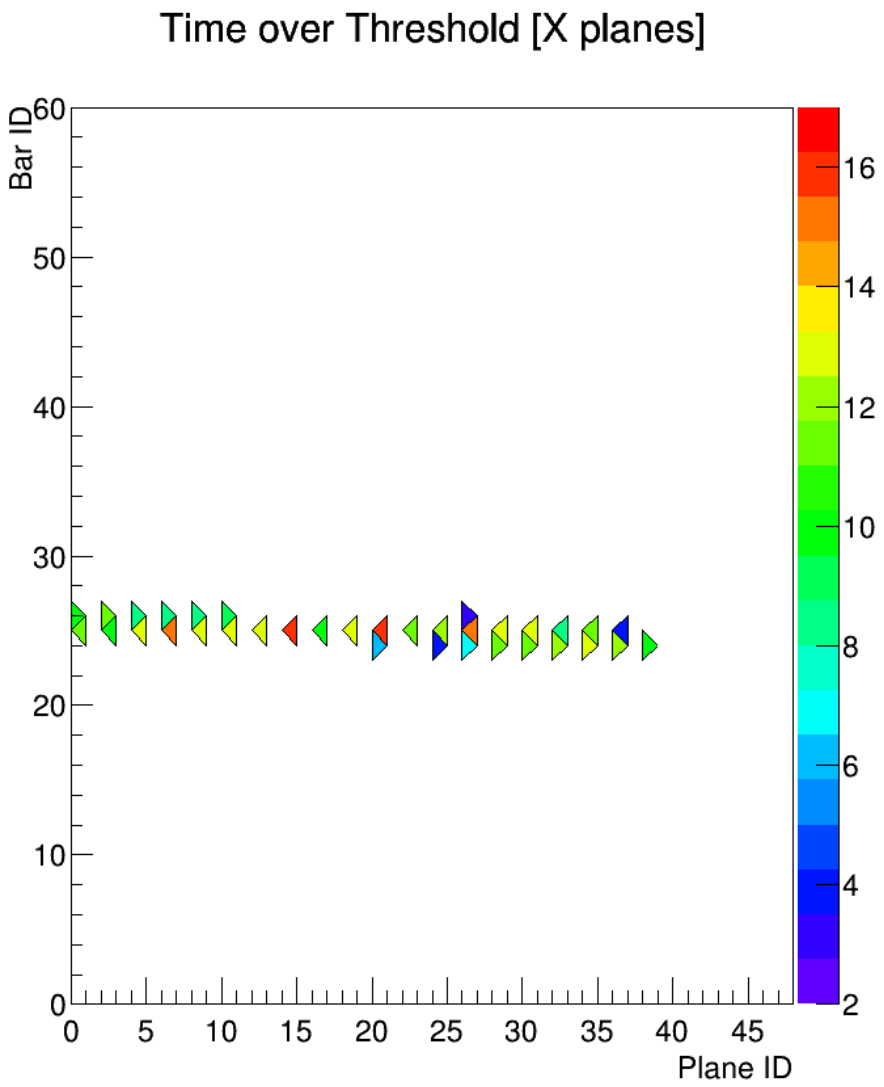
PROBLEM	SOLUTION
1 VHDC fails to configure its FEBs	Spare cable used (✓)
New HVPSU won't start	Controller fixed by CAEN (✓)
LED LV channel malfunctioning	New LVPSU ordered (✗)
Cosmic DAQ code bugging	Fixed on site (✓)
2 very noisy FEBs (plane 9, 10)	HV tuned down (✓/✗)
1 of the new SAPMT down	Need to be replaced (✗)

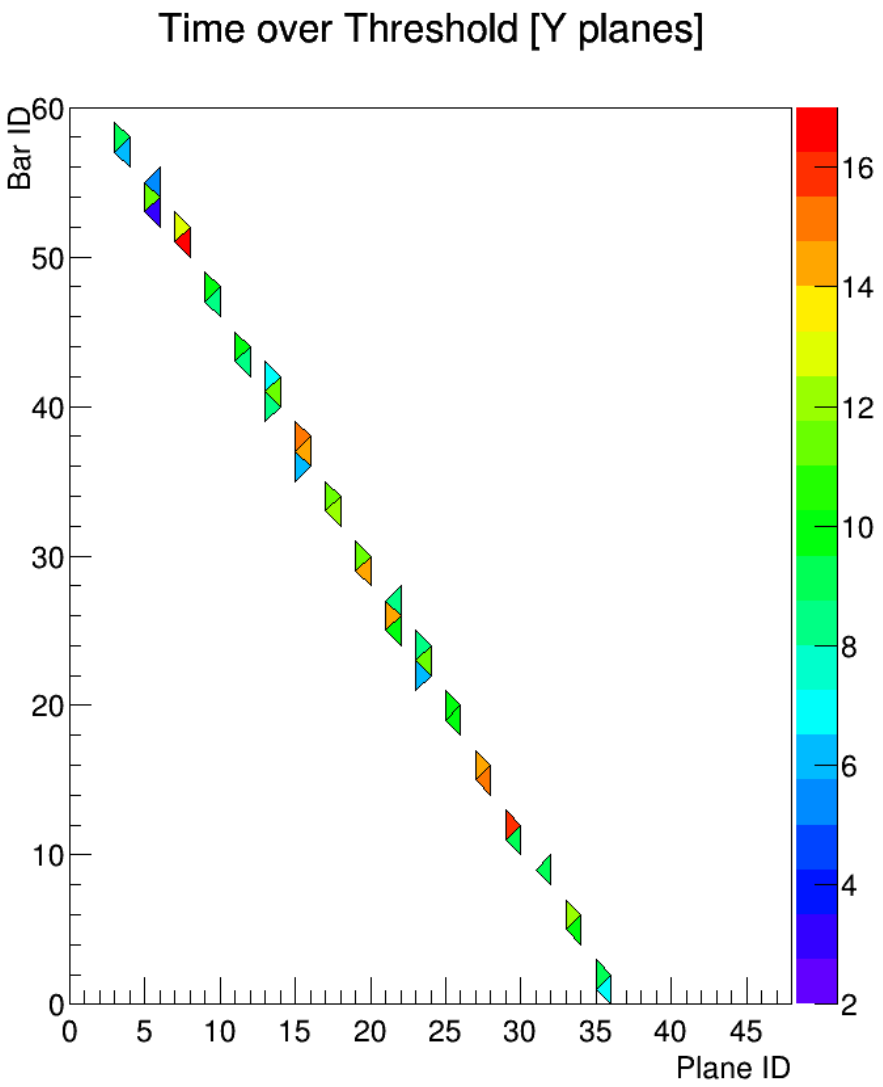
Cosmic data taking

After fixing the issues encountered after restarting, a first round a cosmic data was taken in January. The following configuration was used:

- All the boards, fans and crates were on at nominal voltage
- All the SAPMT set to 1500V
- All the MAPMT set to 700V, except 2 at 680V
  $\rightarrow$ 2 noisy FEBs
- Spill generated by the software, every 2.5ms, for 2ms
  $\rightarrow \sim$ 1 in 10 spill has a trigger
- Particle trigger generated by a pair of coincidences between two adjacent planes (14&&15) || (30&&31)
  $\rightarrow$ 4 trigger planes record no charge information
- 100k events recorded to check stability

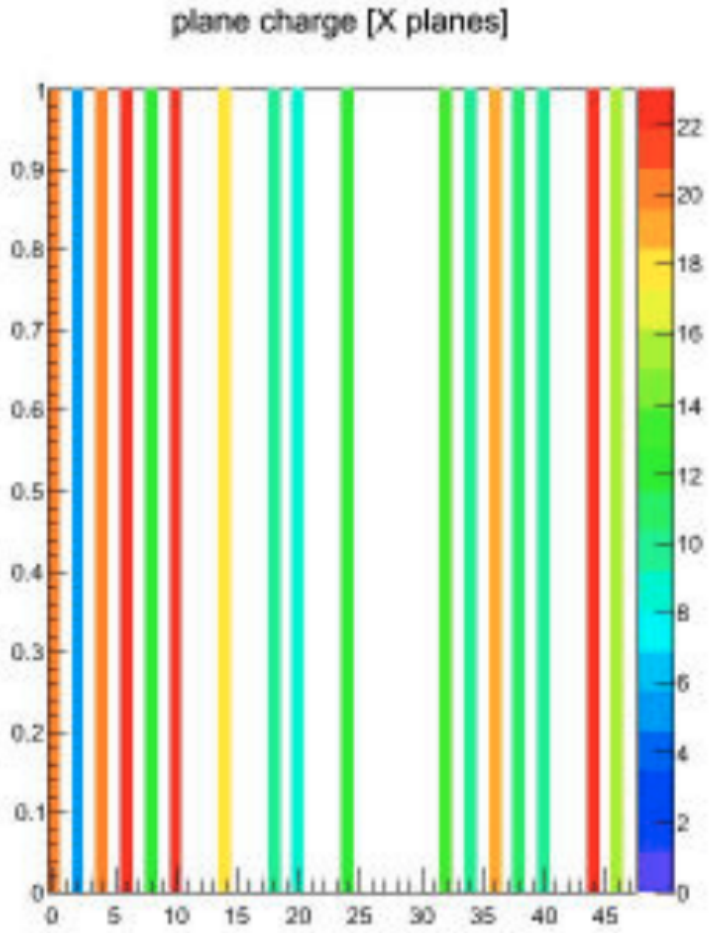
Cosmic muon event



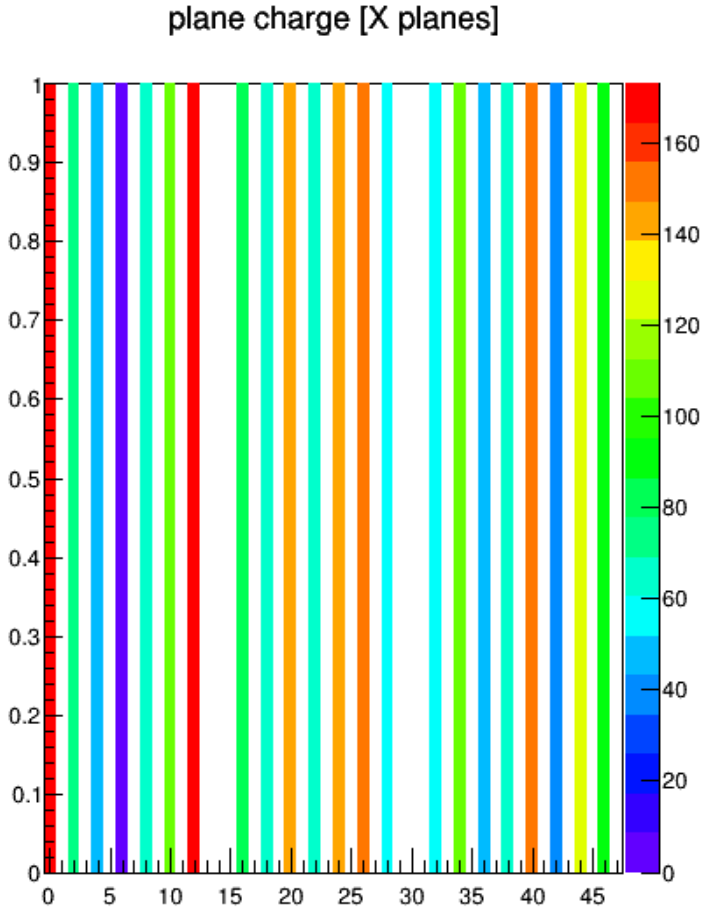


New SAPMT performance

Old SAPMT



New SAPMT



→ Much higher signals recorded in the new SAPMTs

→ No more charge losses as we had before (no signal in some planes)

EMR status summary

EMR hardware upgrade **completed**

- SAPMT updated in commissioned, upcoming MICE-DET-NOTE (✓)
- New 47U rack, network operated power switch → functional (✓)
- New HVPSU → controller fixed by CAEN (✓)
- New LVPSU → functional with the exception of the LED driver (✓)
- New CAEN VME crate → functional (✓)
- VHDC replacement → operational configuration (✓)
- New patch panel and environmental sensors → functional (✓)

Outstanding issues

- Investigate the noisy FEBs, make some spares (✗)
- Replace the faulty SAPMT (✗)
- Implement and test the new LED LVPSU (✗)

Mock Data Run? No problem in sight.