

University
of Glasgow

Commissioning CKOV and KL

MICE CM41

RAL, 9 February 2014

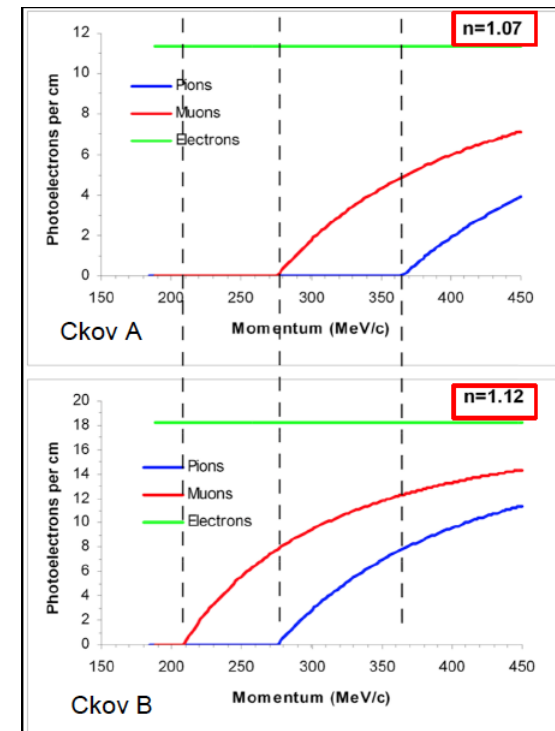
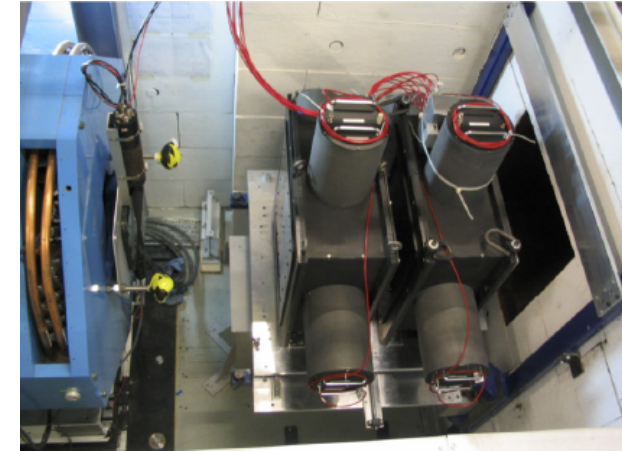
Paul Soler

(for KL and CKOV teams)

CKOV



- ❑ Remaining hardware:
 - No expected changes
- ❑ Software:
 - Digitisation required
- ❑ Calibrations: **Hanlet/Rajaram/
Cremaldi/Kaplan**
 - Pedestal runs
 - Sub-threshold pions – 1 PE
 - Electron runs: multi-PE
- ❑ Commissioning:
 - Equalise gains of PMTs
 - Cherenkov threshold scans



□ First step in commissioning:

- HV scan summer 2014 has been analysed with new pedestal and fadc charge integrators written by Miles Winter and Michael Drews, IIT.
- New HV settings will be implemented soon in the SY4527 CAEN crate, but new HV card ordered by Maurizio and waiting for delivery. (Worrying about a spare?)
- Pedestal/cosmic/data runs can be used to check new HV settings.
- CKOV thresholds and responses are very stable with present settings, so we do not anticipate problems (driving up the HV on a weak tube may be an issue? eg. PMT 5)

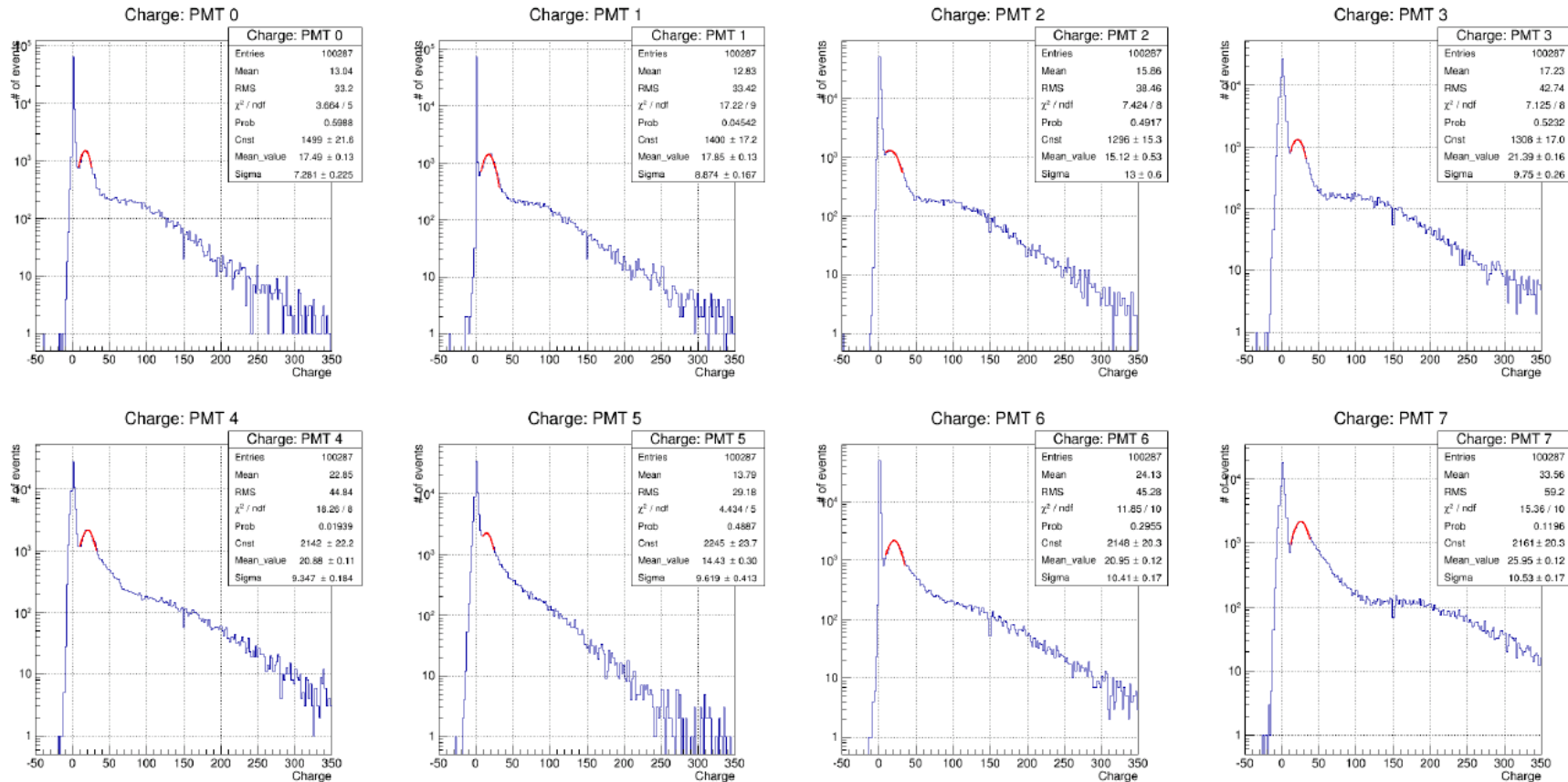
High Voltage Scans

High voltage scans were performed at several voltage offsets: -50, -25, 0, +25, +50 (V)
The following runs were used for analysis:

<u>Run #</u>	<u>Date</u>	<u>Time</u>	<u>HV offset</u>
5803	6/29/14	14:55	0
5804	6/29/14	15:20	0
5806	6/29/14	15:43	0
5807	6/29/14	15:55	0
5808	6/29/14	16:17	0
5809	6/29/14	16:38	0
5812	6/29/14	17:11	0
5816	6/29/14	17:36	0
5818	6/29/14	18:34	-50
5819	6/29/14	18:43	-50
5820	6/29/14	19:10	-50
5821	6/29/14	19:39	-50
5822	6/29/14	19:50	-50
5823	6/29/14	20:19	-50

<u>Run #</u>	<u>Date</u>	<u>Time</u>	<u>HV offset</u>
5825	6/29/14	20:58	-50
5826	6/29/14	21:08	-50
5827	6/29/14	21:31	50
5828	6/29/14	21:53	50
5829	6/29/14	22:14	50
5830	6/29/14	22:25	50
5831	6/29/14	22:53	50
5833	6/29/14	23:14	50
5835	6/30/14	00:04	25
5836	6/30/14	00:25	25
5837	6/30/14	00:43	25
5840	6/30/14	01:15	-25
5841	6/30/14	01:40	-25
5842	6/30/14	01:55	-25

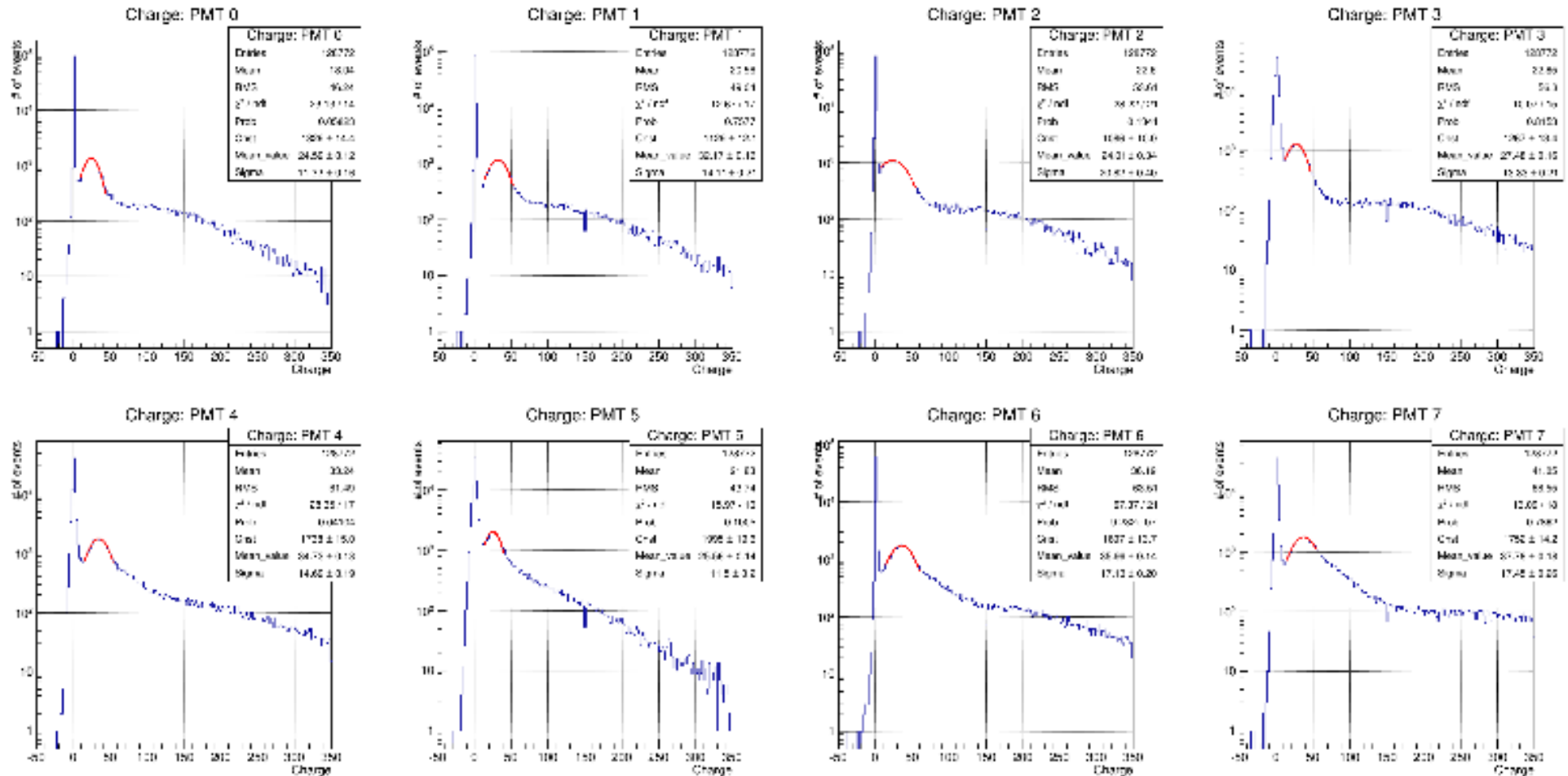
SPE Peak Fit: -25 V offset



Run Used: 05840, 05841
05842

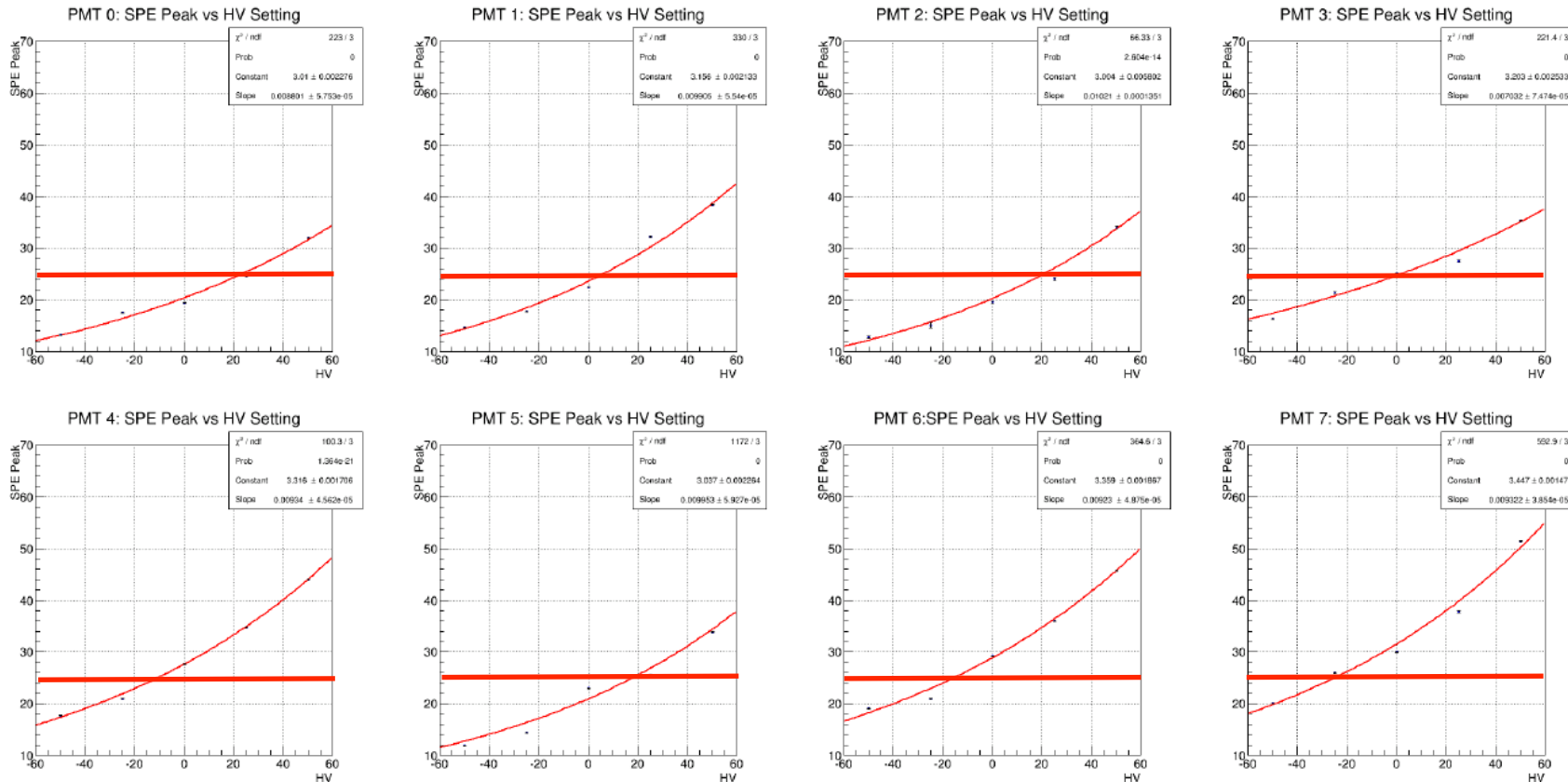
1 PE distributions for nominal HV - 25 V

SPE Peak Fit: +25 V offset



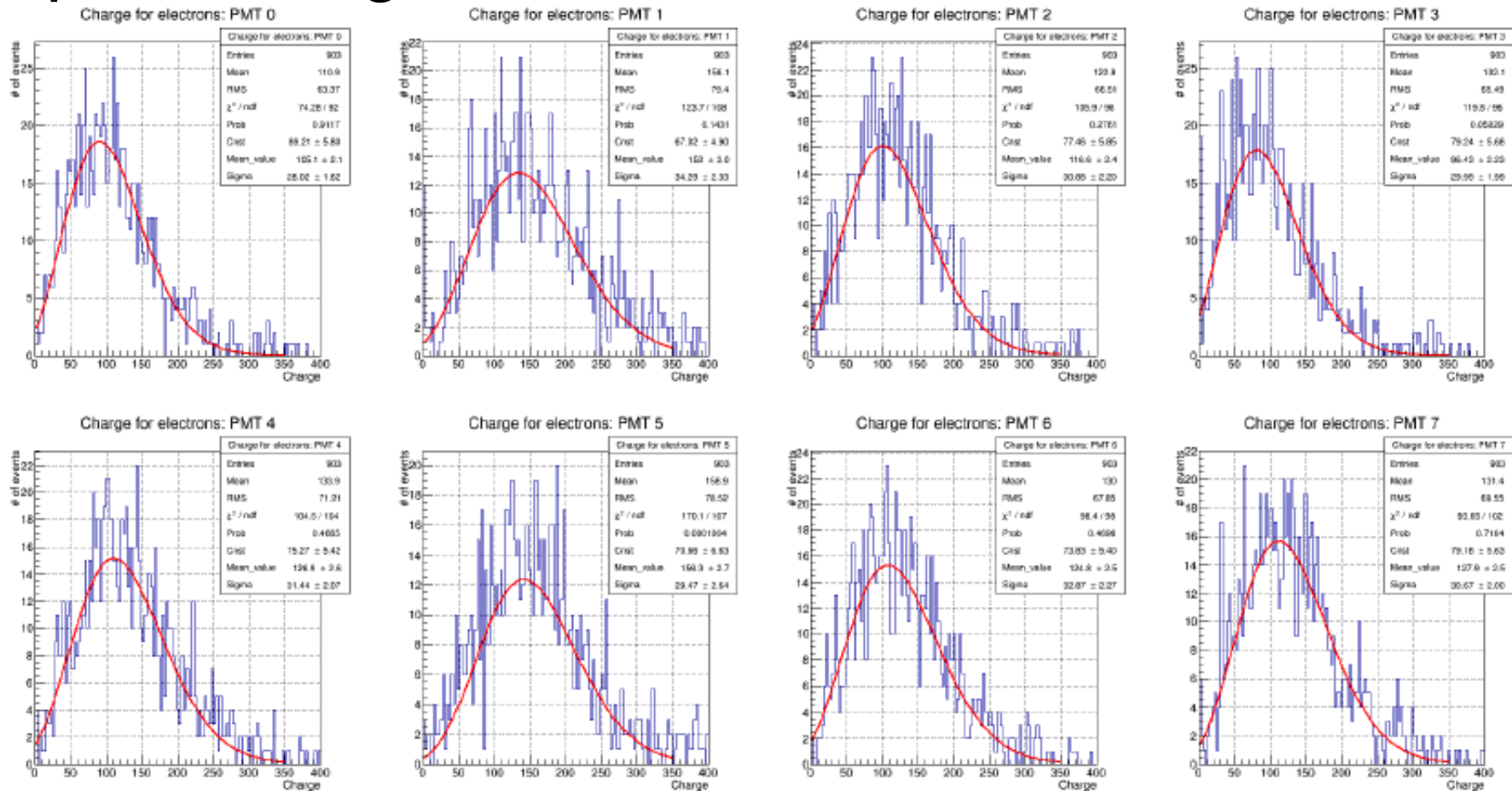
1 PE distributions for nominal HV + 25 V

SPE Peak as a Function of HV



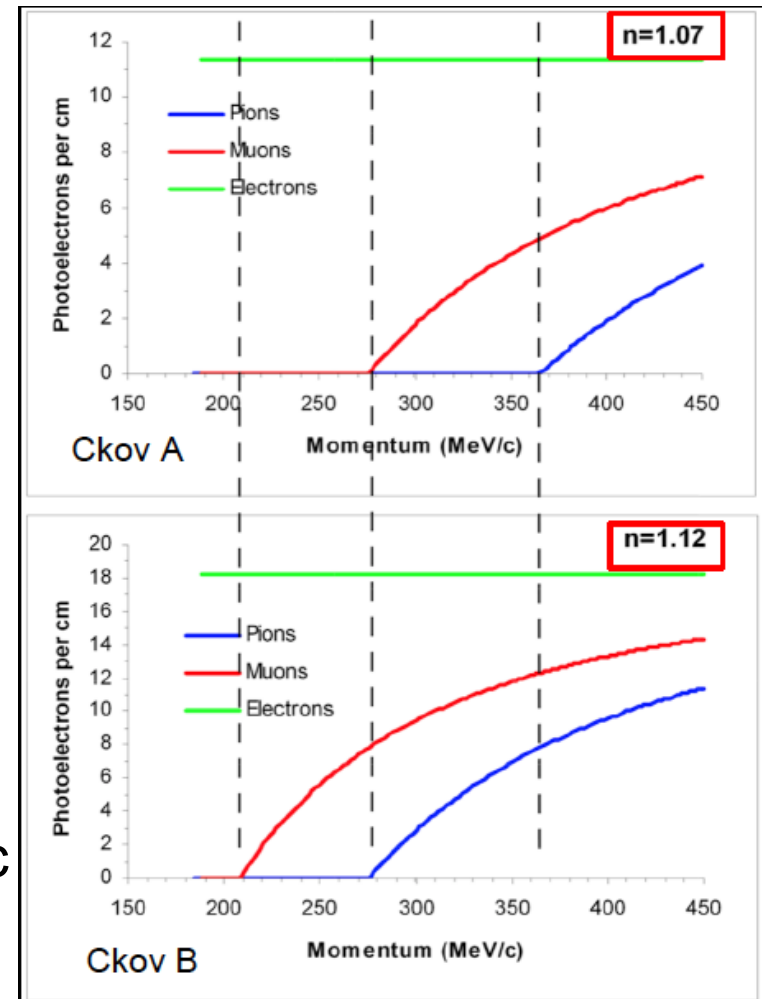
Select HV setting for each PMT to have equal ADC counts, eg. 1PE = 25 ADC counts

- Check that the number of PE for selected positrons gives stable number of PEs

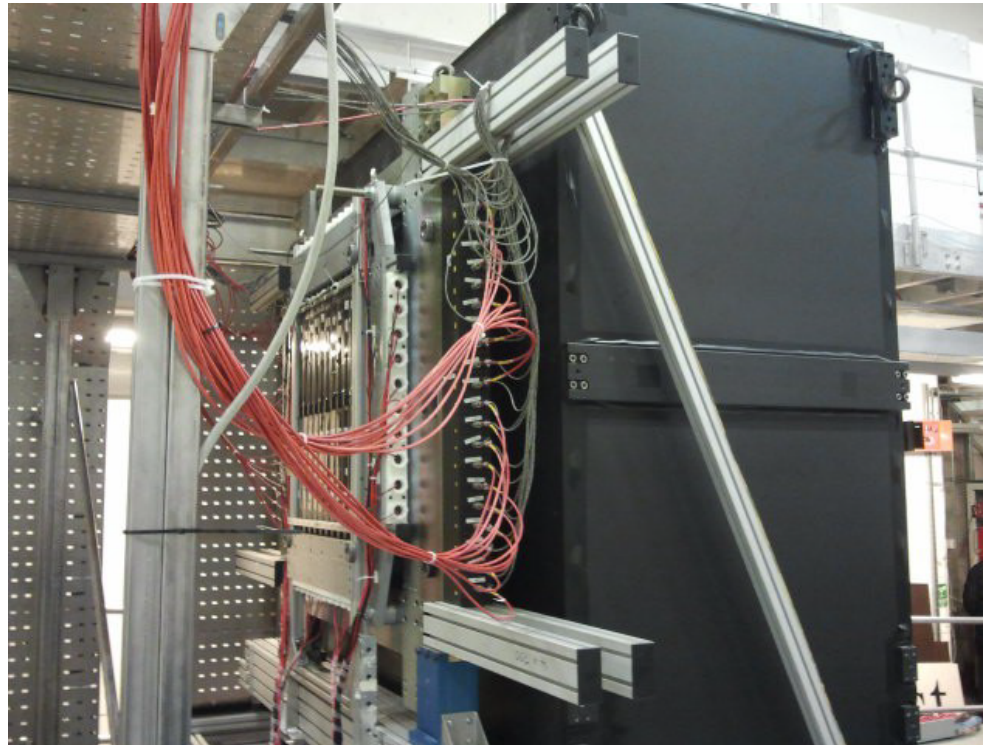


Final steps in CKOV commissioning:

- Set all PMT HVs to nominal settings, according to the HV scan performed in summer 2014
- Check that new HV settings really do give ~ 25 ADC/counts for 1 PE for each channel (verifies that HV scan worked)
- Next stage is to perform pion threshold curves, by running pion beams of increasing momentum, see run plan: <http://micewww.pp.rl.ac.uk/projects/operations/wiki/RunPlan20140629>
- Scans with pion momenta: 300, 325, 350, 375, 400, 425 MeV/c



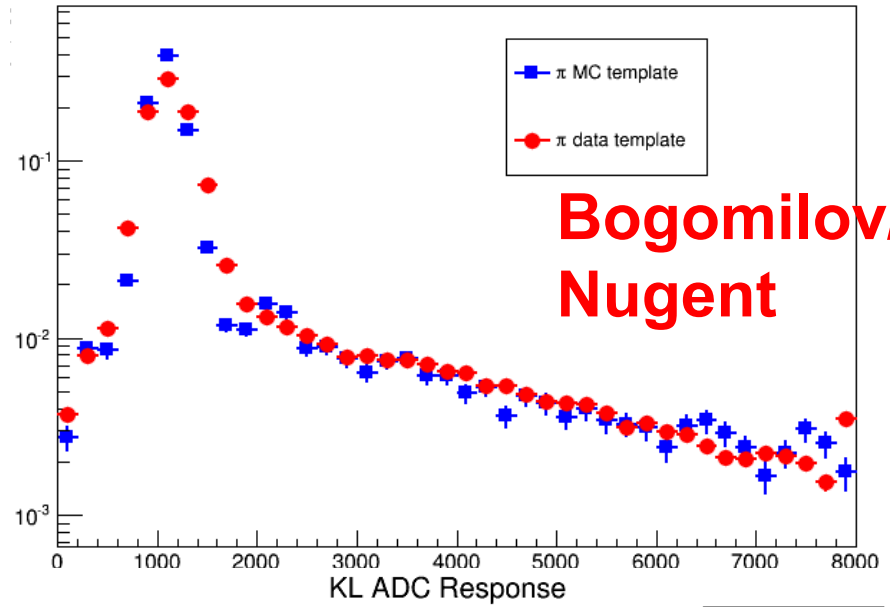
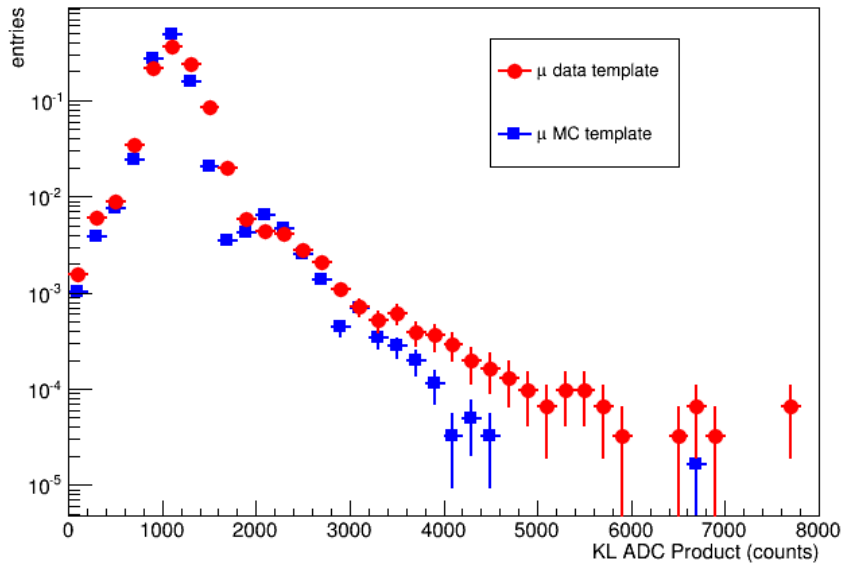
- ❑ Remaining hardware:
 - No expected changes
 - Detector has been working well for 4 years without any interventions



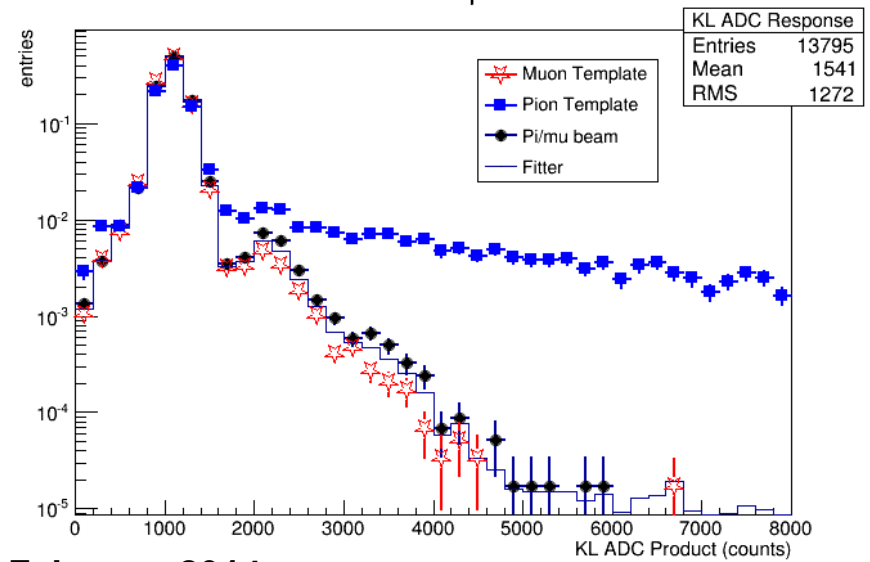
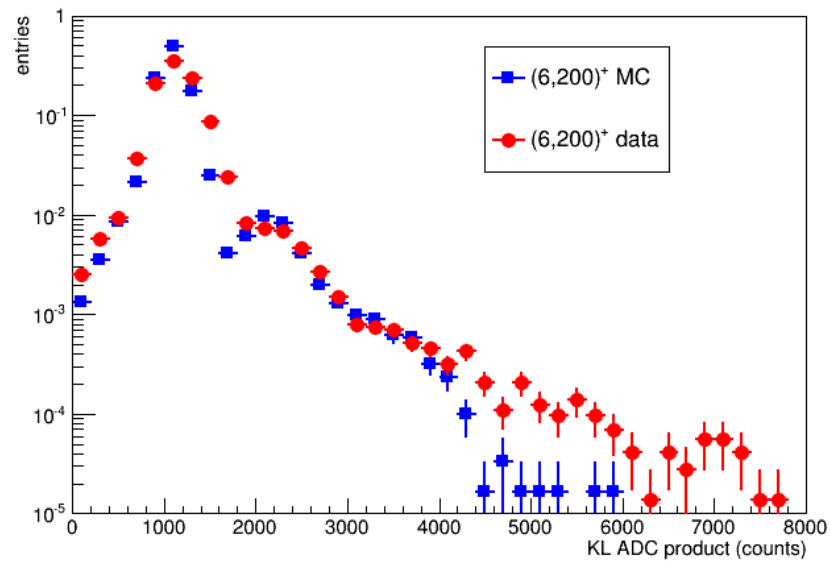
**Orestano/
Tortora**

- Software: digitisation and data have been tuned for pion contamination paper: **Bogomilov/Nugent**
 - Poisson smearing of photons in scintillation fibres photoelectrons at PMT
 - PMT gain, Gaussian with mean $\sim 2 \times 10^6$ standard deviation $\sim 1/2$ of gain
 - Conversion factors from PE to ADC:
 - 250,000 PE/ADC, 0.000125 MeV/PE,
 - Attenuation lengths (2400 mm and 200 mm)
 - Scintillating fibre collection efficiency (3.6%)
 - Light-guide collection efficiency (85%)
 - PMT quantum efficiency (26%)
 - Final gain: 1060 ADC counts/MIP

KL



**Bogomilov/
Nugent**



Calibrations:

Orestano/Tortora

- KL pedestal stability with cosmics (trigger TOF2)
- Validate response of electrons, pions, muons

Commissioning:

- No special commissioning
- Monitor pedestals and monitor gains through particle response

