Electronics with 1-in PMTs (XP3102)

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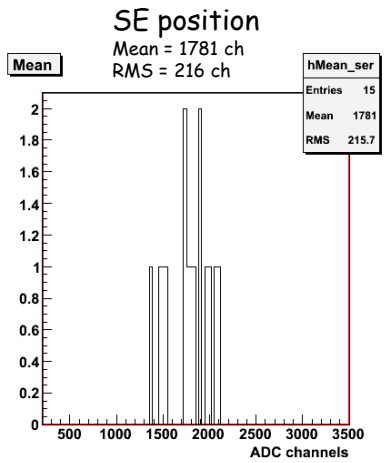
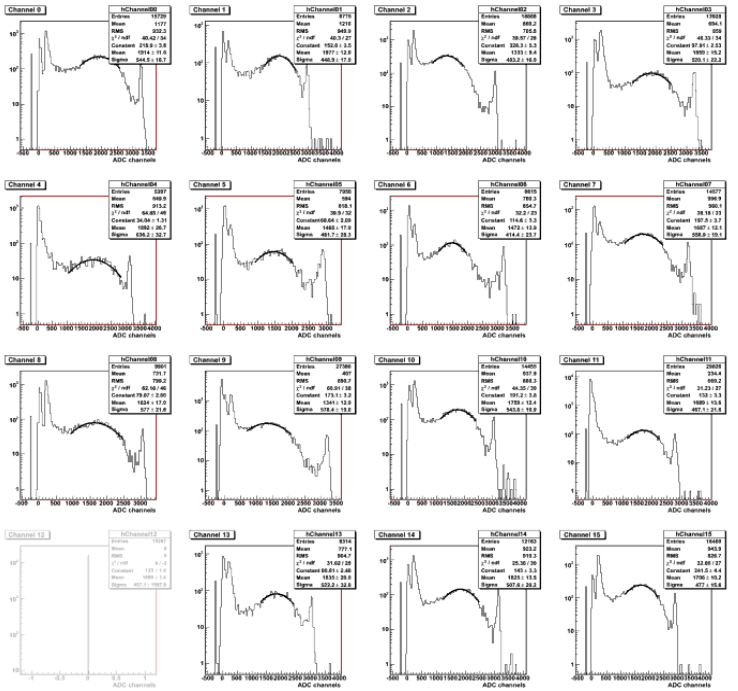
PARISROC: PMT gain alignment method

- Configuration
  - 16 small PMTs (XP3102)
  - PARISROC board
  - PMm2 box
  - Kael's DAQ software
  - High PMT gain



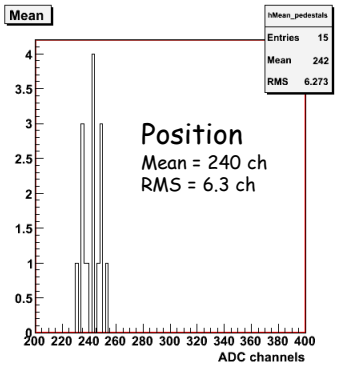


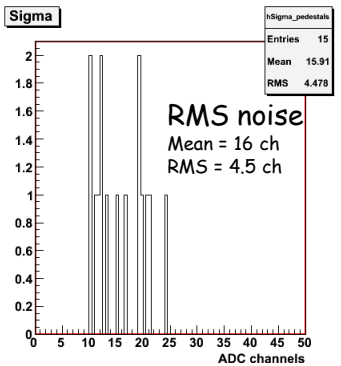
- Method
  - Rough alignment (manual)
  - Single electron acquisition on the noise
  - Single electron measurement by fit (automated) (one run for the pedestal measurement by triggering on a clock, one SER run)
  - Calculate the gain correction, assuming it is linear, for a given target for the single electron peak position
  - Apply the gain correction
  - New automated single electron measurement by fit (pedestal + SER)
  - Remark: channel #12 not working + no per channel threshold correction applied

PARISROC: gain alignment results

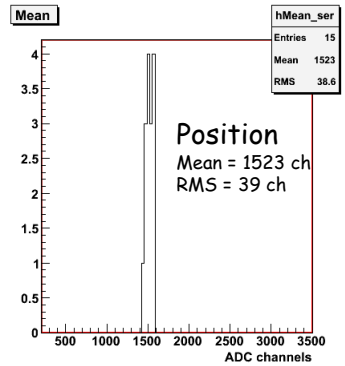
- Global performance:
  - Gain set around 10^7
  - Noise rate:
  - Remark: we confirm that the rate has to be low (weird results obtained with a high count rate due to a light leak)
- Pedestal distribution unchanged before and after gain alignment
  - Small dispersion (6.3 channels / 240 channels)
  - Noise quite important: 16 channels, which is annoying to work at smaller gains
- Alignment @ HV=1200V
  - Original distribution: peak at 1781 ch, 216 ch RMS
  - Target = 1500: 1523 ch / 39 ch RMS
  - Target = 1300: 1350 ch / 55 ch RMS
- Conclusions:
  - The gain command linearity is satisfactory at this scale
  - Tests to be done with broader gain distribution

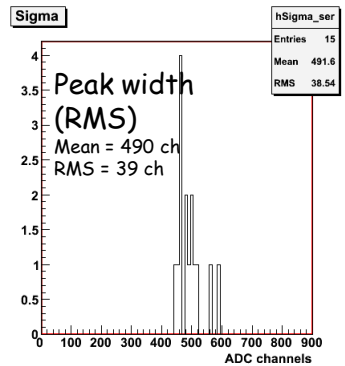
Pedestals





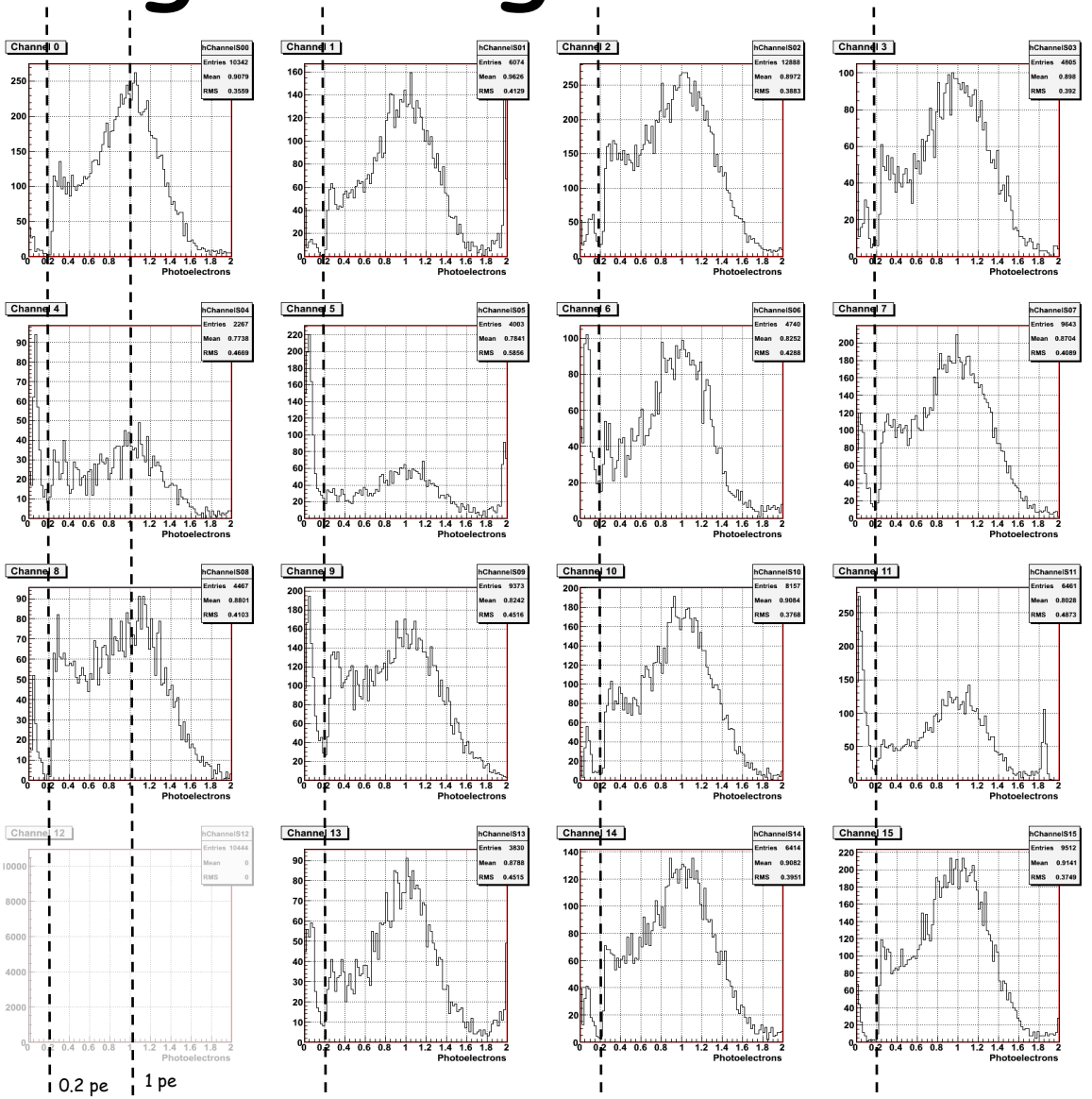
Peak position after gain alignment



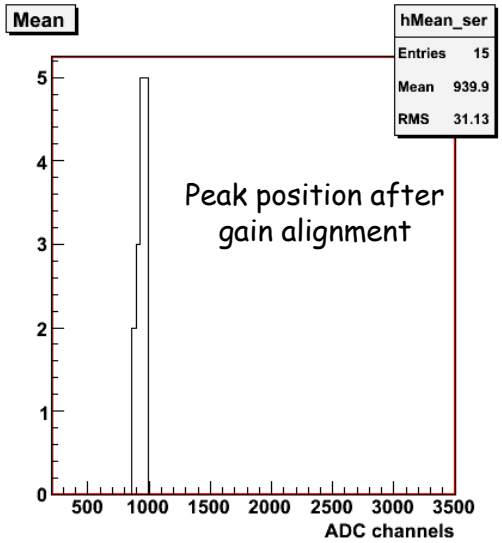


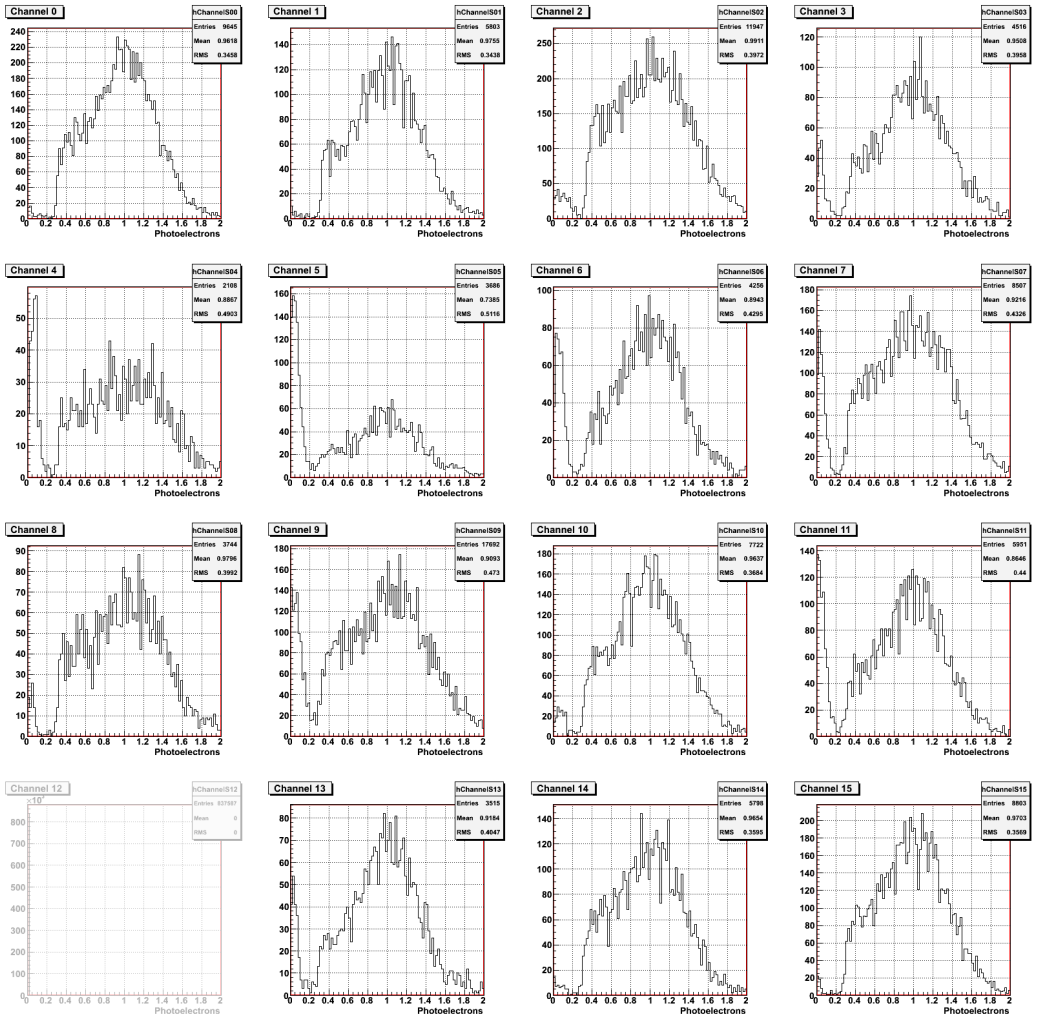
PARISROC: single electron spectra after gain alignment

- Spectra after pedestal subtraction and horizontal rescaling
- Threshold around 0.2 pe
- Still some events below the threshold



PARISROC: alignment at 1050 V





- Lowest bias voltage tested: 1050 V
- Target = 1000 ch (highest gain, to get rid of noise + ability to detect signals from noise)
- More events below threshold
- Difficult to work below 0.3 pe
- SER dispersion:
  - Before alignment: 640 ch / 80 ch RMS
  - After alignment: 940 ch / 30 ch RMS

Summary and future work

- Encouraging results for the PMT gain alignment with PARISROC + DAQ, but still has to be verified at lower PMT gains
- the dynamic range will be much smaller as expected
- More tests to be done with the 16 tubes in the vessel