

(Not Only) Forward End Cap News

Thomas Held

Ruhr-Universität Bochum
Institut für Experimentalphysik I

XLIV. PANDA Collaboration Meeting, Goa, India,
March 11th, 2013

RUHR
UNIVERSITÄT
BOCHUM

RUB



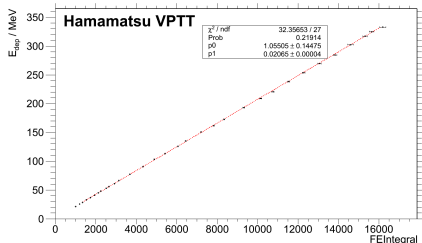
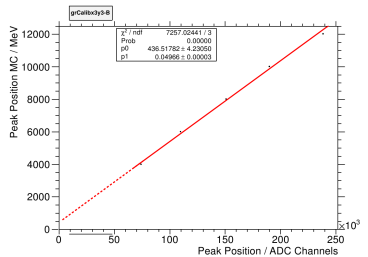
Outline

- 1 Read-Out Non-Linearities
- 2 More CERN Beamtime Results
- 3 APDs
- 4 Slow Control
- 5 Summary/Outlook

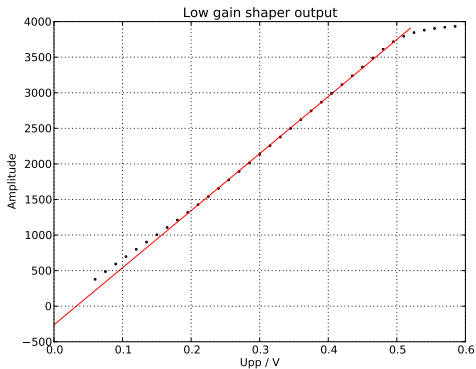
Read-Out Non-Linearities

There are non linearities in the EMC (forward endcap) readout:

- Calibration curve of CERN 2012 (low gain) data
(in contrast to corresponding MAMI high gain data)



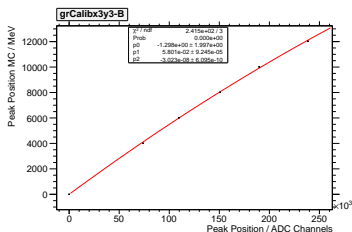
- Pulser tests in the lab in Bochum
(sampled and AF generated preamp output
fed to shaper, ADC)



- Low level non linearity expected to be shaper effect
- High level non linearity (just before clipping) due to ADC
(already known)

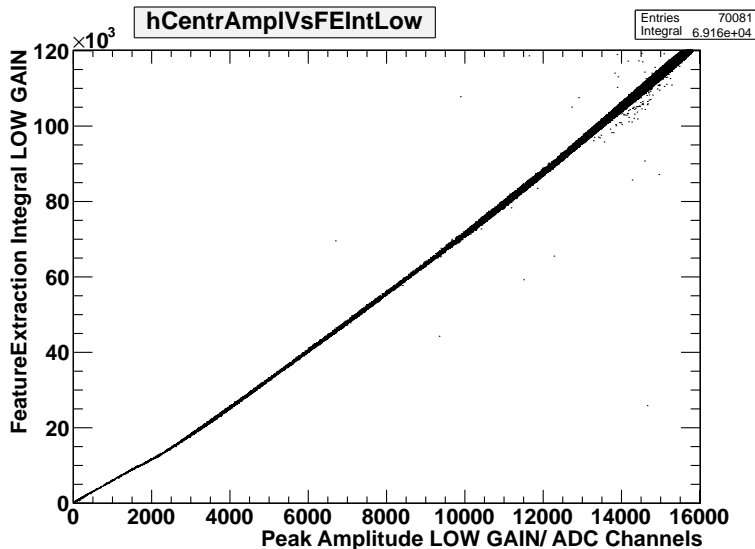
More CERN Beamtime Results

- Obvious non-linearities in calibration curve
- Preliminary results (December meeting) obtained by forcing straight line through origin
- Workaround: Parabola fit (without forcing origin)

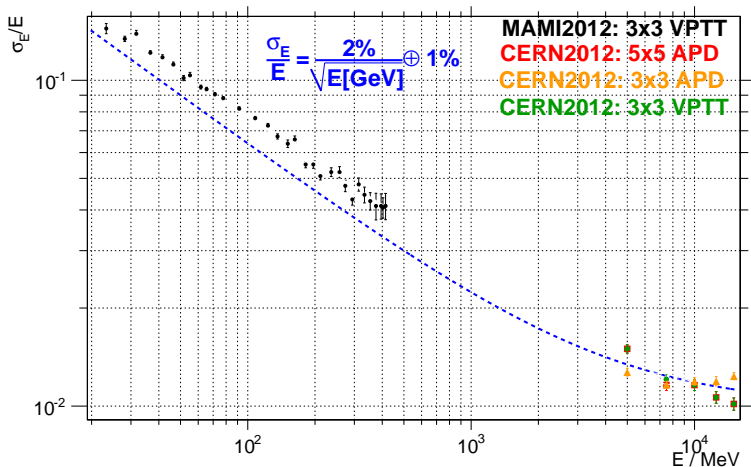


- Improved energy resolution: APD (5x5): 1.14% → 1.09%, VPTT (3x3): 1.35% → 1.05%

- Additional non-linearity due to feature extraction
FE integral vs. amplitude:

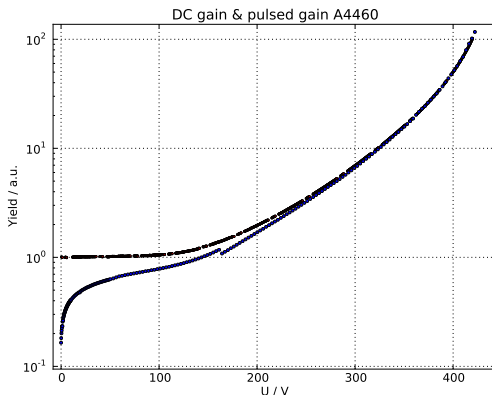


- Latest (high energy) CERN data and (low energy) Mainz data visually combined in one plot compared to TDR curve (no common analysis/fit - different APD gain settings)



APDs

- We finally managed to reproduce Hamamatsu's gain determination (gain 50 at 25 °C compared to gain 1 at $U_{bias}=0$) with untreated type X3 APD (from Bonn/Crystal Barrel - no irradiation/annealing)



- There is a clear difference between determination using (PWO-like) pulses or DC light
- Cause?
 - Either frequency walk of amplification
 - And/or capacitive voltage divider effect (C_{APD} , $C_{coupling}$)
- No implication on operating bias voltage/gain as our optimum gain (200) is calculated based on Hamamatsu (DC) gain

Slow Control

- There has been a first DCS SeeVogh Meeting organized by Mario in February
- Tobias (Bochum, EMC) and Florian (Mainz, LD; Bochum, EMC) contributed
- Overview of Proto192 (EMC, Panda) slow control: EPICS
- New CAN bus/RS232 interfaces for Raspberry Pi (cheap, high performance replacement of HADCONs)
- Alarm handler integrated now

Summary/Outlook

- Non-linearities in read out/feature extraction
 - Suspicious:
 - low gain shaper range
 - FE algorithm
 - Needs closer inspection
- High-E CERN data analysis affected by non-linearities
 - Workaround: Polynomial calibration curve improves results
 - In contrast: Low energy/high gain Mainz data perfectly linear
- We urgently need type X4 APDs (GSI/Frankfurt?) to go on with (irradiation) tests!