Systematic Uncertainties in RDK II

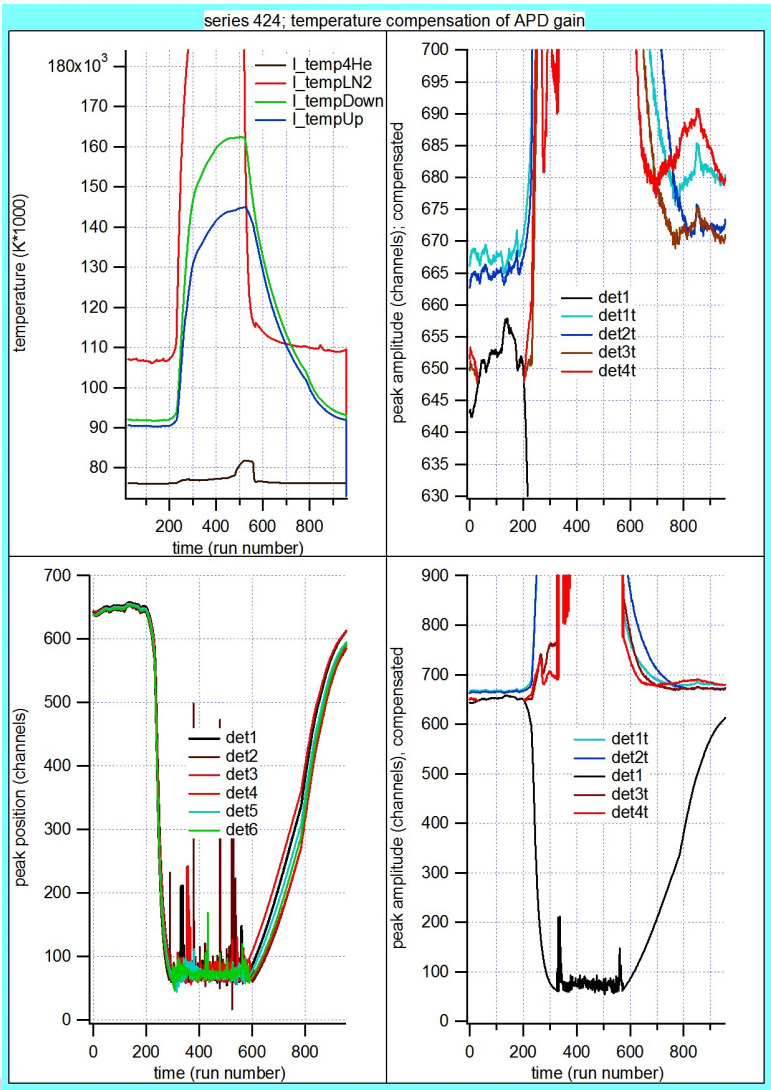
Collaboration Meeting
March 14, 2012

Outline

- Physical
  - APD
  - BGO
  - Mirror
- Electronic
  - SBD
  - APD
  - Data collection
- Software
  - Calibration Fits
  - Analysis

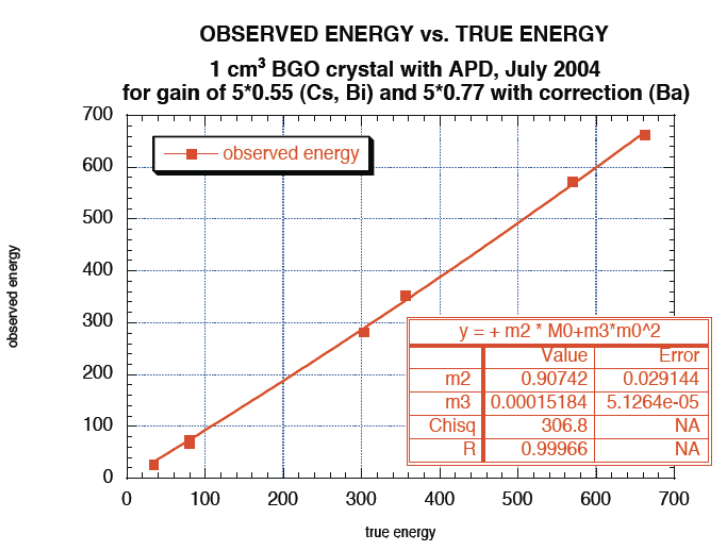
APD

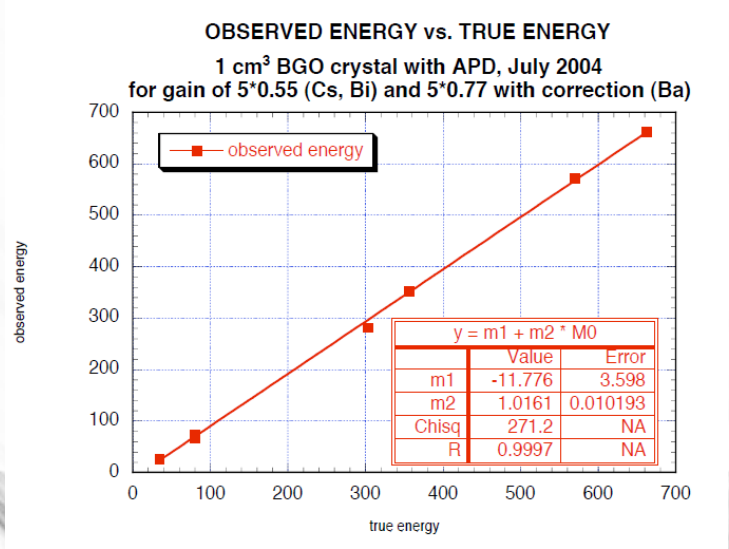
- Temperature dependent gain
- Lag in temperature sensors
- Approx. 6% per K
- Solved by Herbert Breuer



BGO

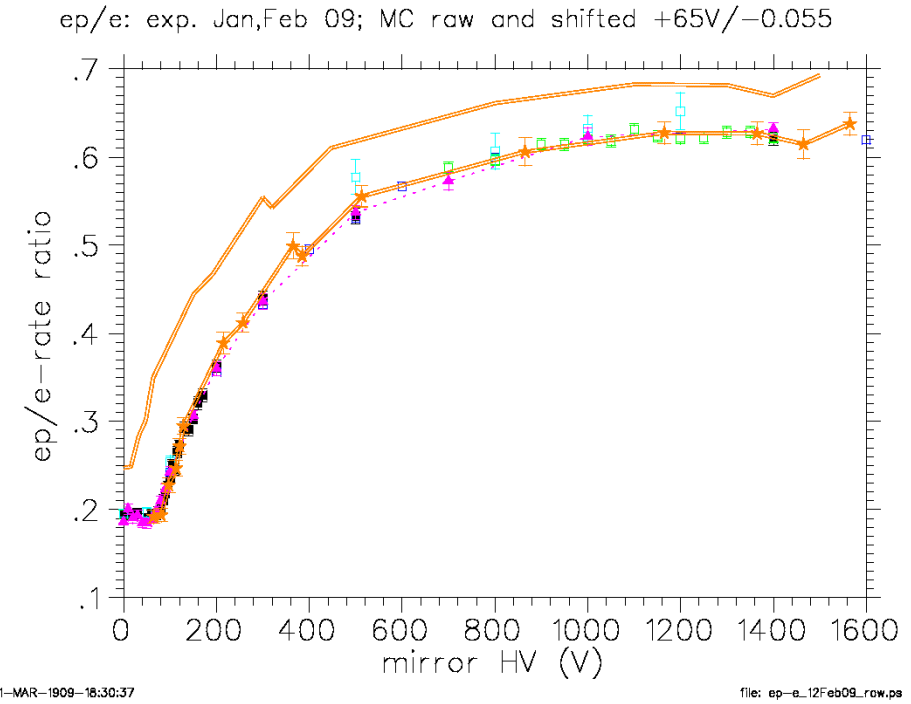
- Two models of non-linearity
- Linear with offset
- Quadratic w/o offset
- Average 1.4% diff above 100keV





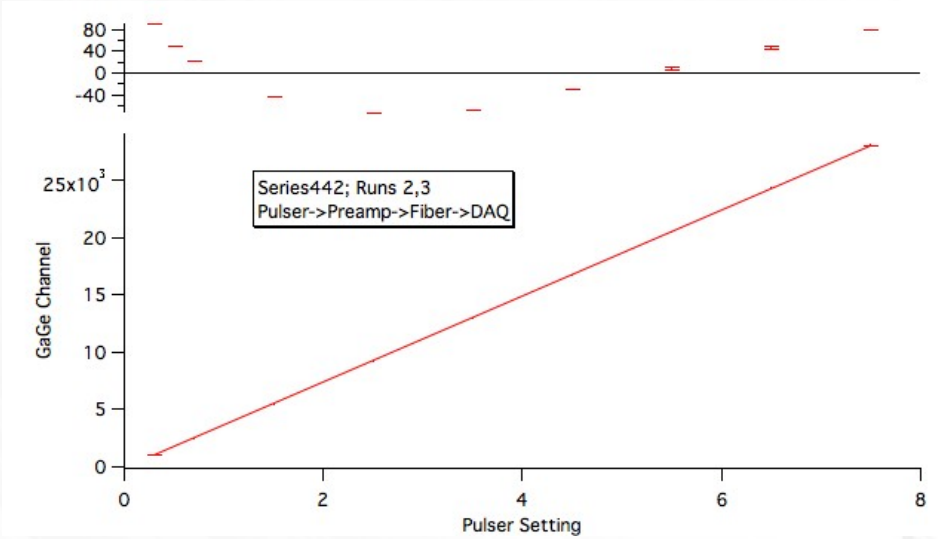
Electrostatic Mirror

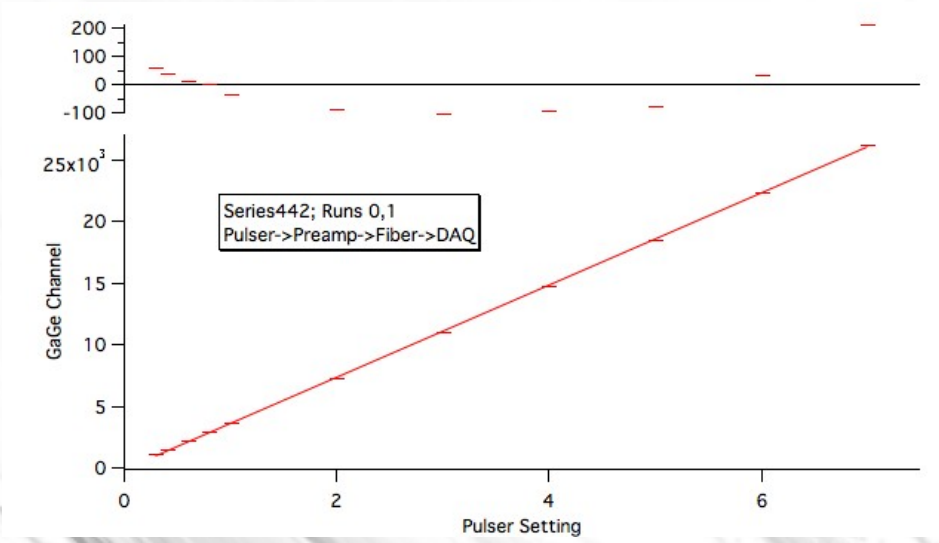
- Low voltage anomaly
- Charged insulator near mirror
- No effect at full mirror
- Disregard low mirror voltage runs



SBD Electronics

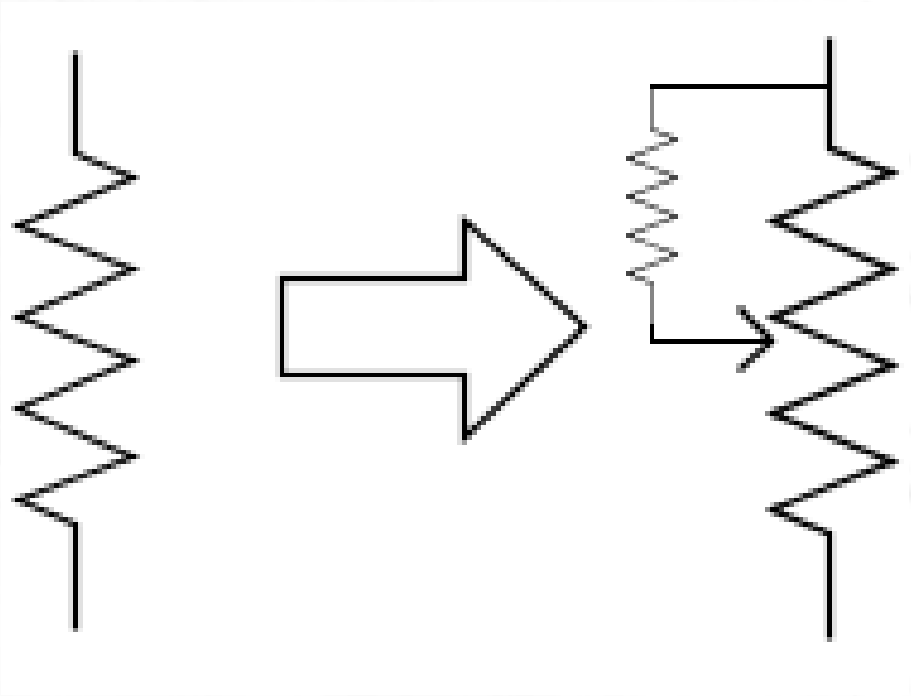
- Non-linearity
- Pulser test by Jeff and Herbert
- Approx 0.5% residuals
- Effect on little b
- No effect on BR?





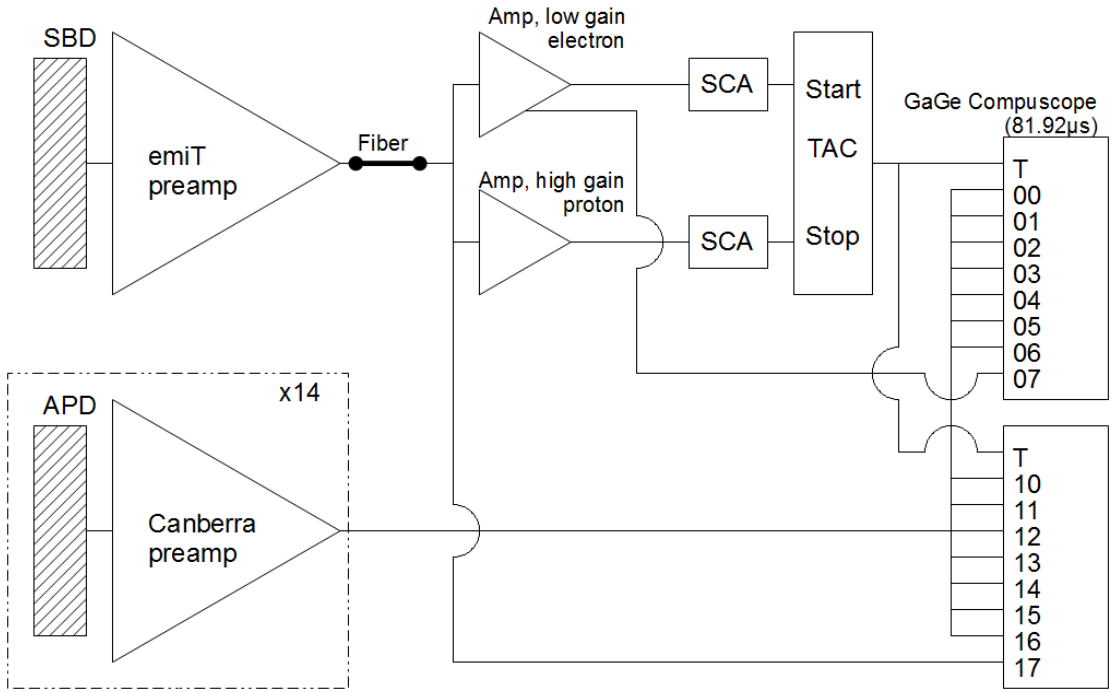
APD Electronics

- Voltage offset
  - Calibration trigger
  - Peak height
- Modified to minimize voltage offset
- How stable?



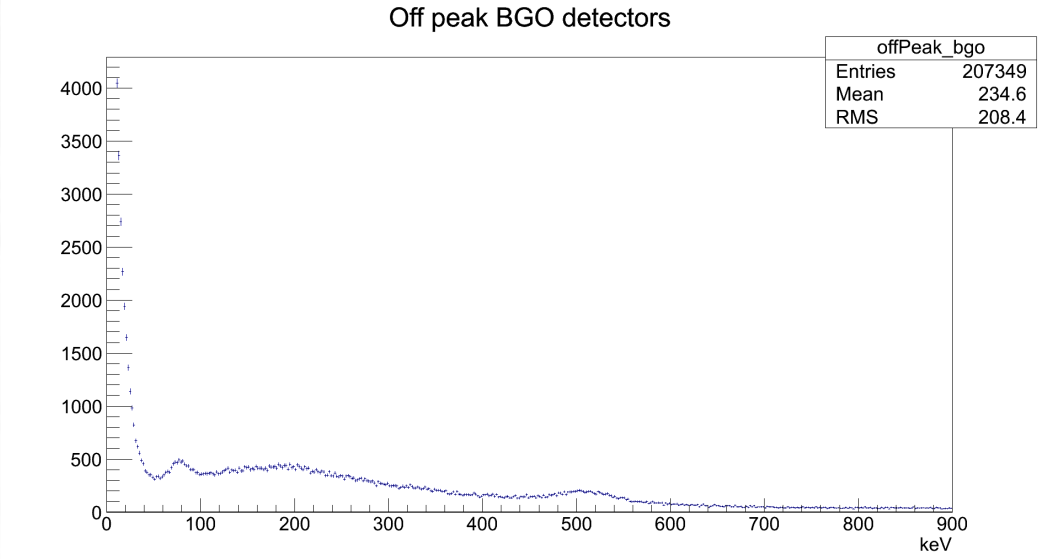
Data Collection

- Synchronization issues
- Dead time



Calibration Fits

- Singles mode
- Scale energies to 511 keV peak
- Stat. uncertainty
  - 0.39% (BGO)
  - 0.60% (bAPD)
- BGO temperature corrected



Analysis

- Two independent algorithms
- Estimate of uncertainty from noise
- Differences
  - bAPD
    - Time: (64.8±32.0)ns
    - Energy: (0.85±2.19)%
  - BGO
    - No comparison yet