Analysis of RDK II Data

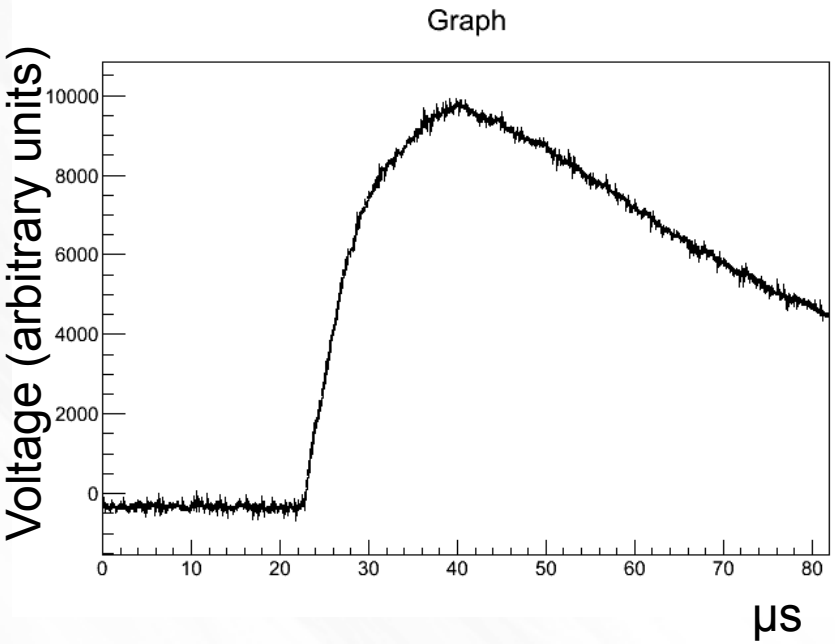
Collaboration Meeting
March 14, 2012

Outline

- Signal analysis
- Event selection
- Background subtraction
- Results

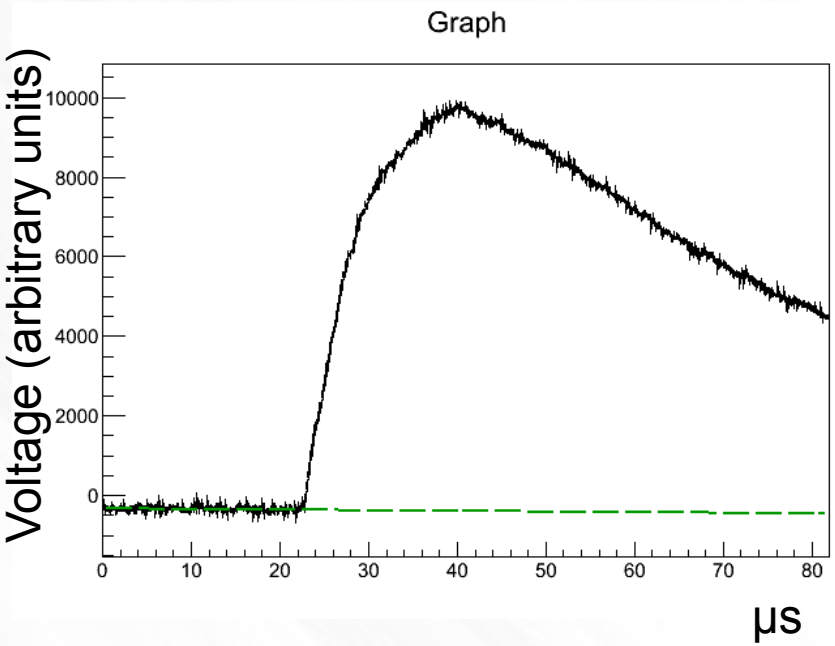
Signal Analysis – Criteria

- The peak
  - rises at least 300 units above the minimum
  - is after the minimum
  - is at least 5.12μs before end of trace
  - is at least 6.4μs (bAPD) or 7.68μs (BGO) after beginning of trace
  - is less than 300 units away from the average of neighboring points (same for minimum)
- Minimum chi^2/dof of linear regression over signal at least 4900



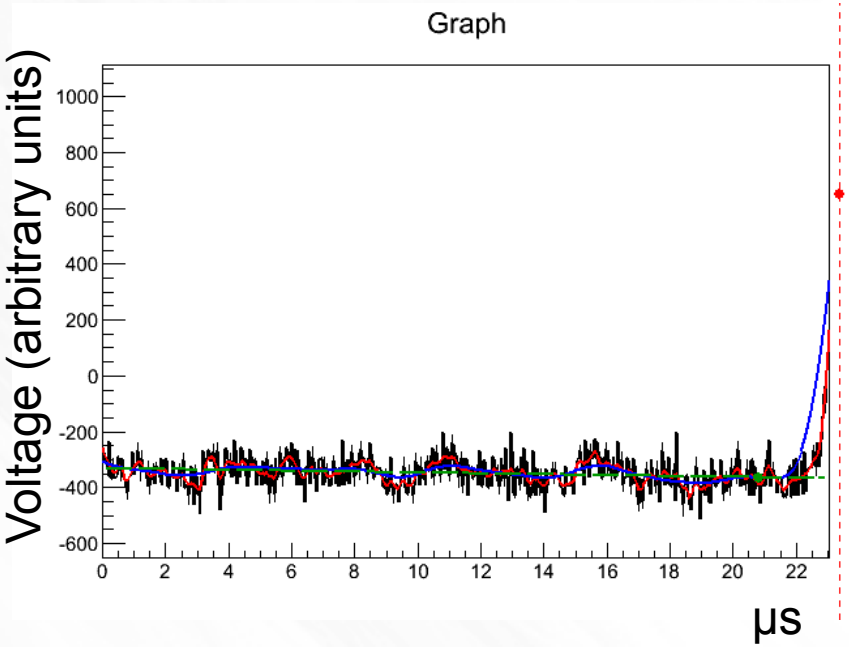
Signal Analysis – Baseline

- Linear regression on the range $0 \leq t \leq i$ for all i
- Calculate Ax+B and chi^2 for each fit
- Save the results for later



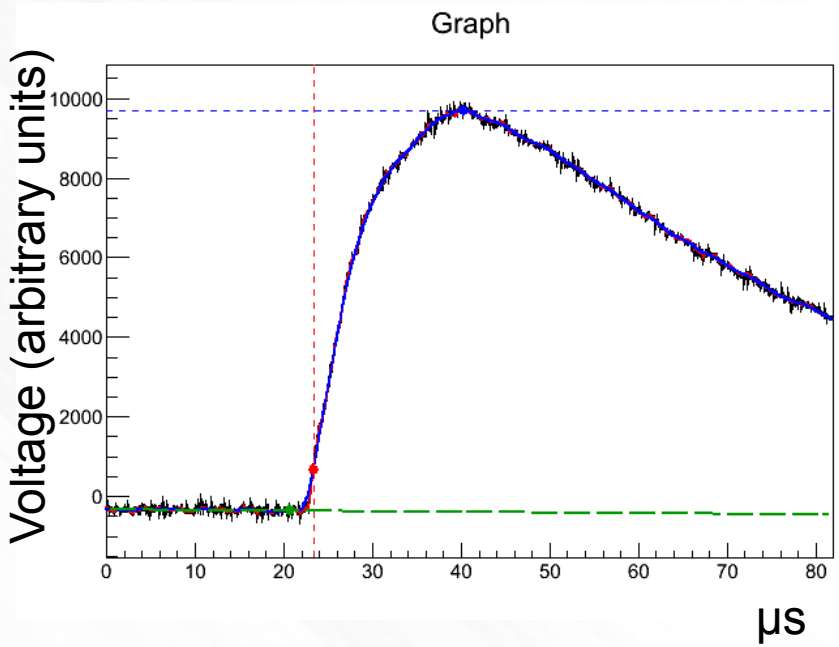
Signal Analysis - Smoothing

- Weighted sum derived from local polynomial regression method
  - Narrow width for timing
  - Wide width for “energy”



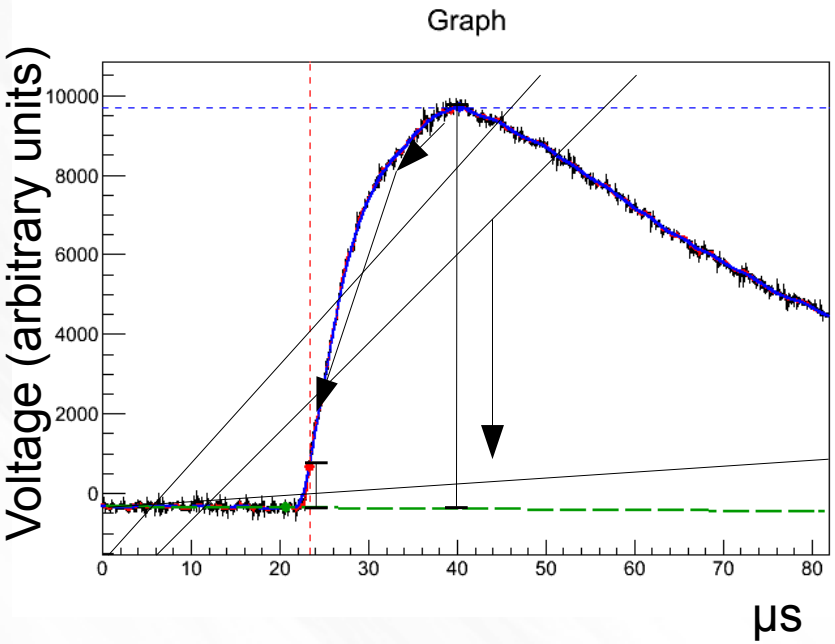
Signal Analysis – Parameters

- Determine t_γ and E_γ
  - Floating baseline
  - Max above baseline
  - Rise 10% of peak above baseline



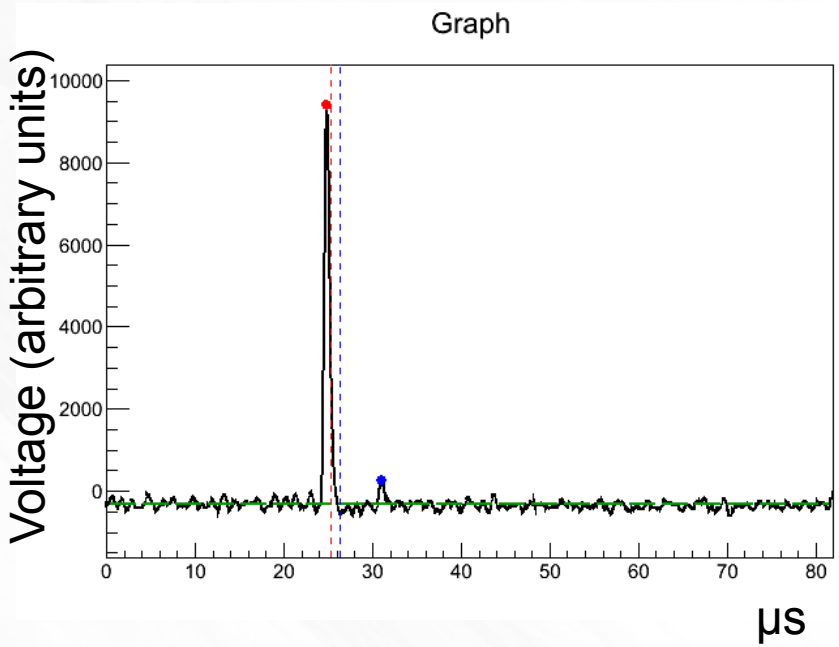
Signal Analysis – Parameters

- Start at peak
- Use stored fits
- Trace back until chi^2/dof<7000
- Trace back until smoothed < 10% of peak



Signal Analysis - SBD

- Electron time and "energy" from peak channel
- Proton time and "energy" from next highest peak after electron peak reaches a dip
- Subtract average baseline from energies



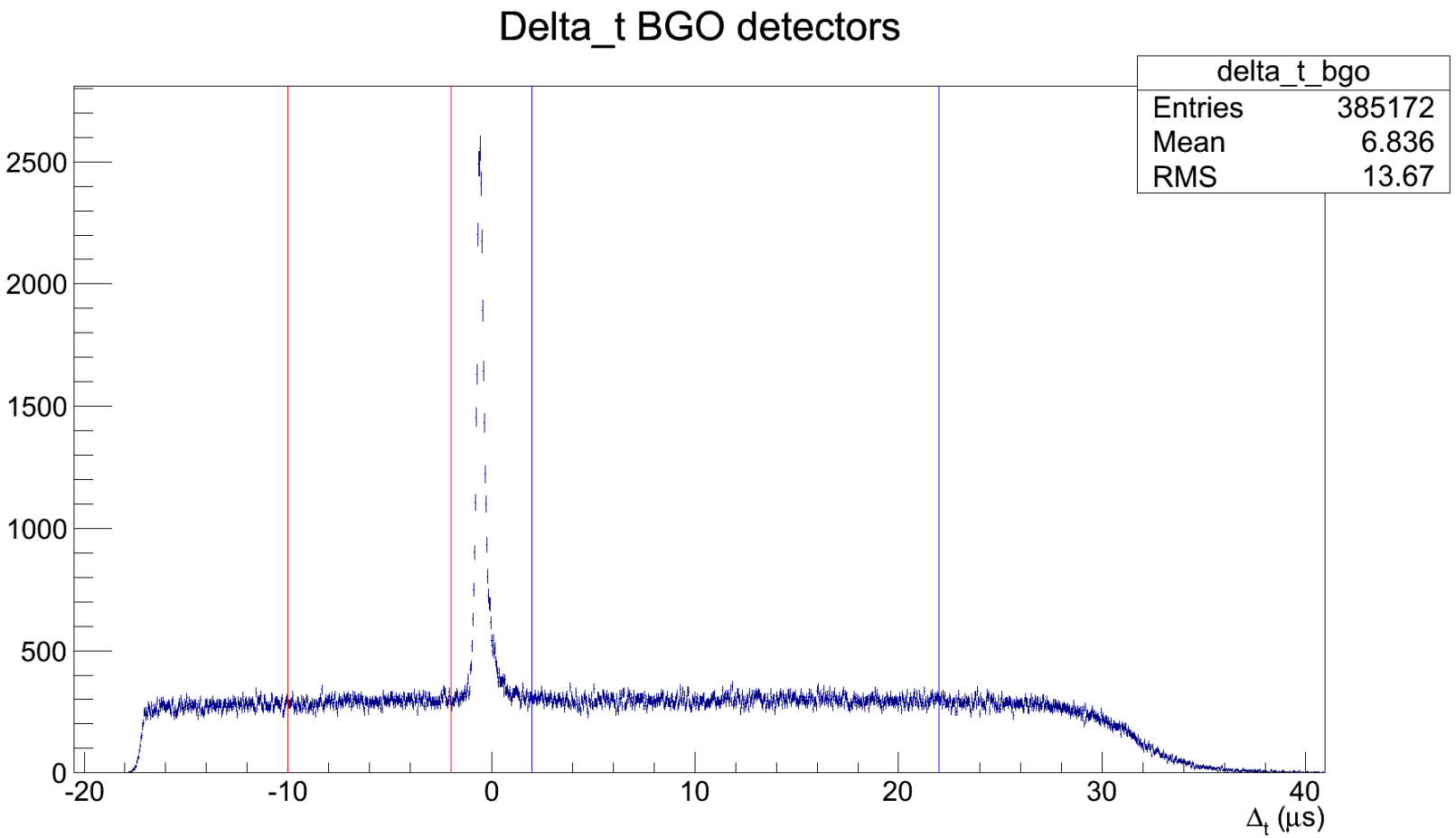
Event Selection

- Only one explicit criteria for ep events

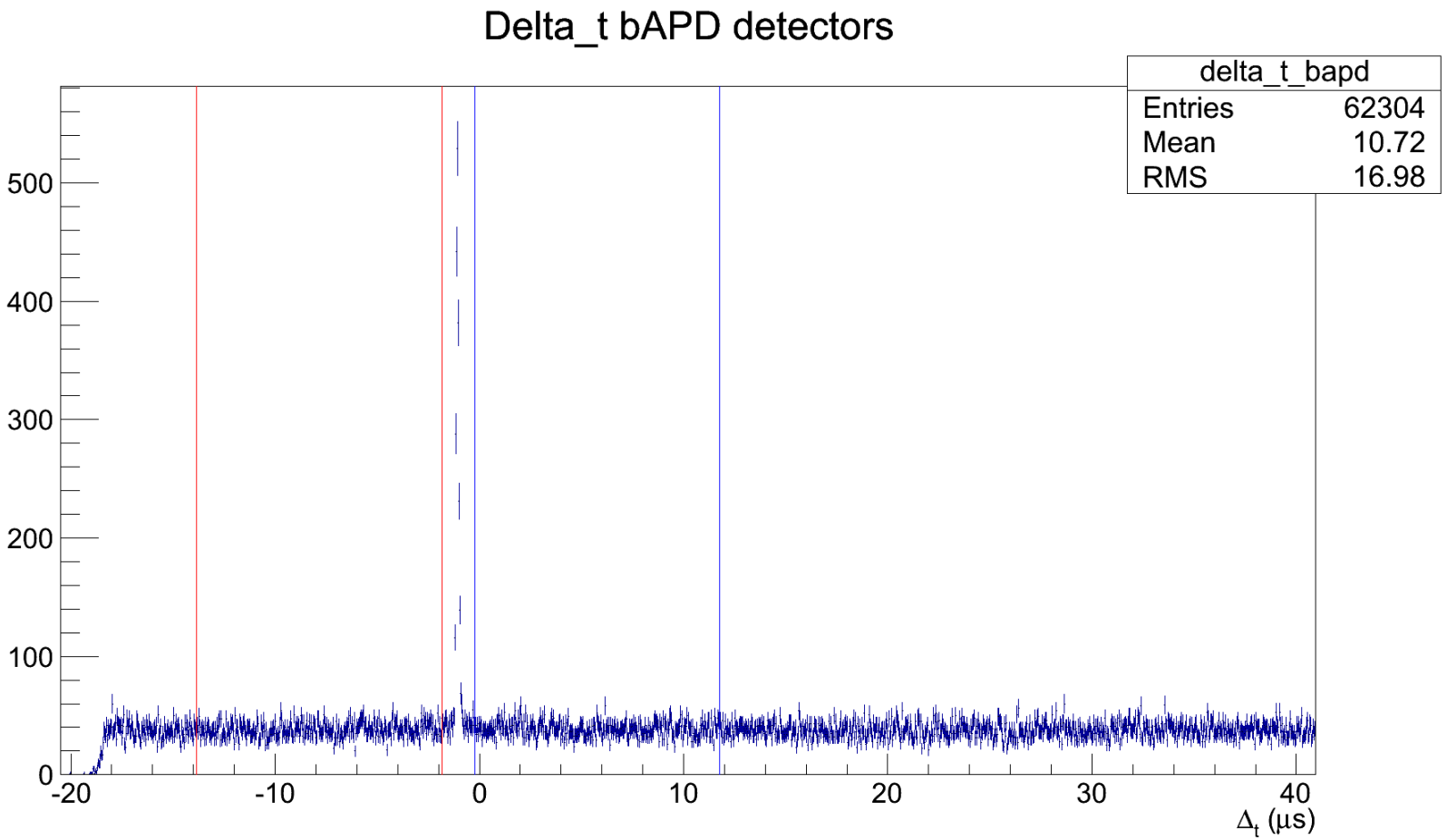
  $t_p - t_e < 26\mu s$

- Criteria to look into
  - End of electron signal, t_{dip}
  - 50% fall time, t_{half}

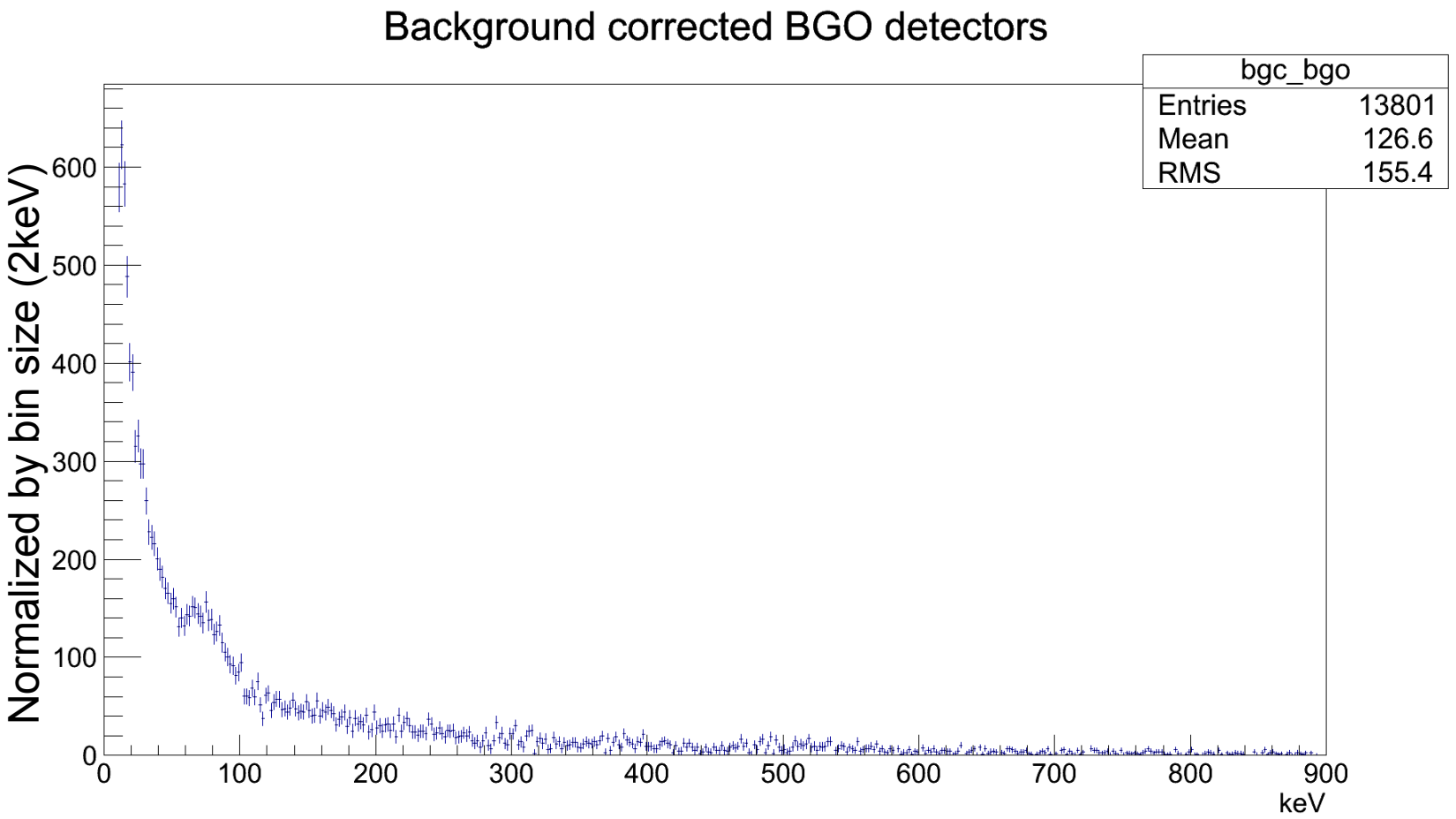
Background Subtraction - BGO



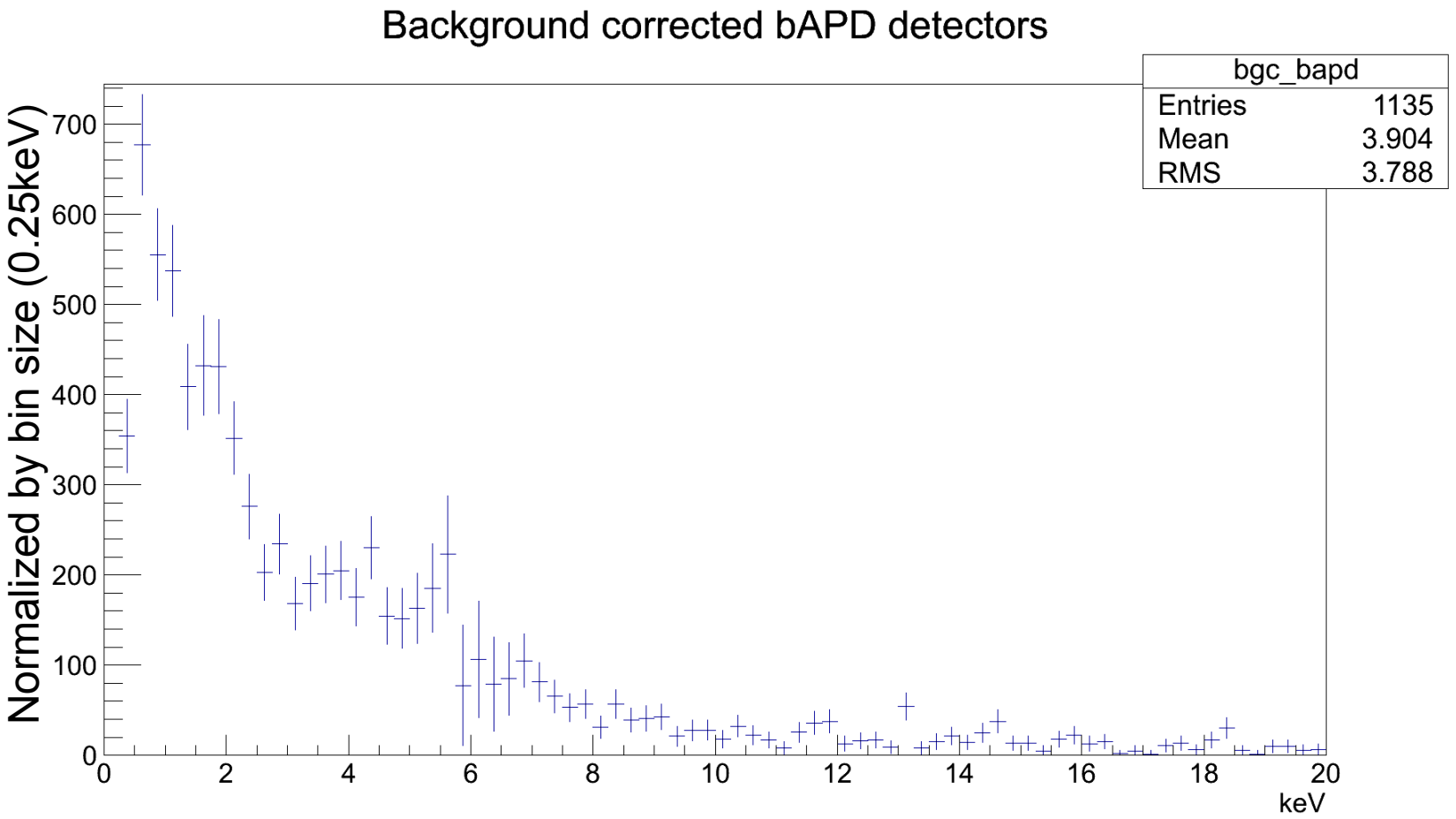
Background Subtraction - bAPD



Results - BGO


Background corrected BGO detectors
bgc_bgo
Entries 13801
Mean 126.6
RMS 155.4
Normalized by bin size (2keV)
0
100
200
300
400
500
600
0
100
200
300
400
500
600
700
800
900
keV

Results - bAPD



Results

- Ratio epg/ep
  - BGO

$$(1.129 \pm 0.010) \cdot 10^{-4}$$

  - bAPD

$$(8.811 \pm 0.257) \cdot 10^{-5}$$