

Preliminary Estimate of ECAL Energy Resolution

DESY Test Beam Data 05/06

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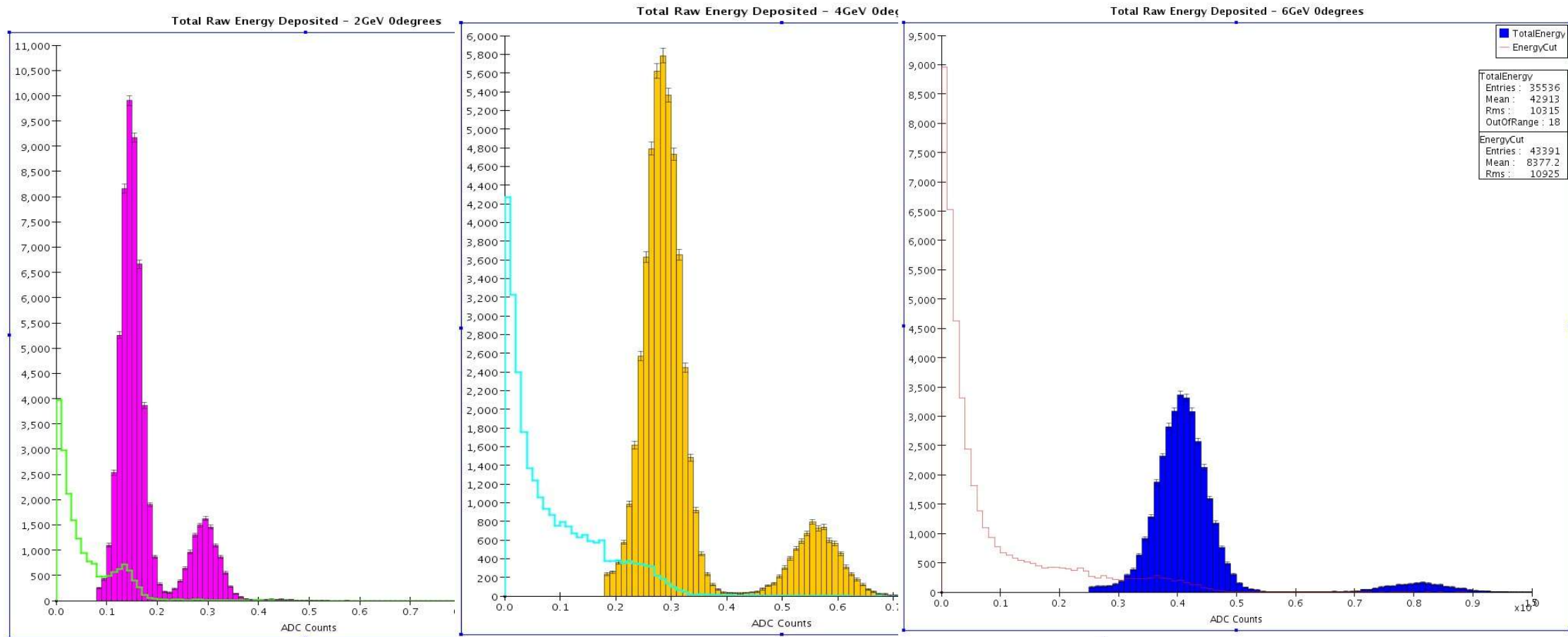
Introduction

- Cutting out the background.
- Calculating Energy Resolution.
- Energy Leakage

Cutting out the background

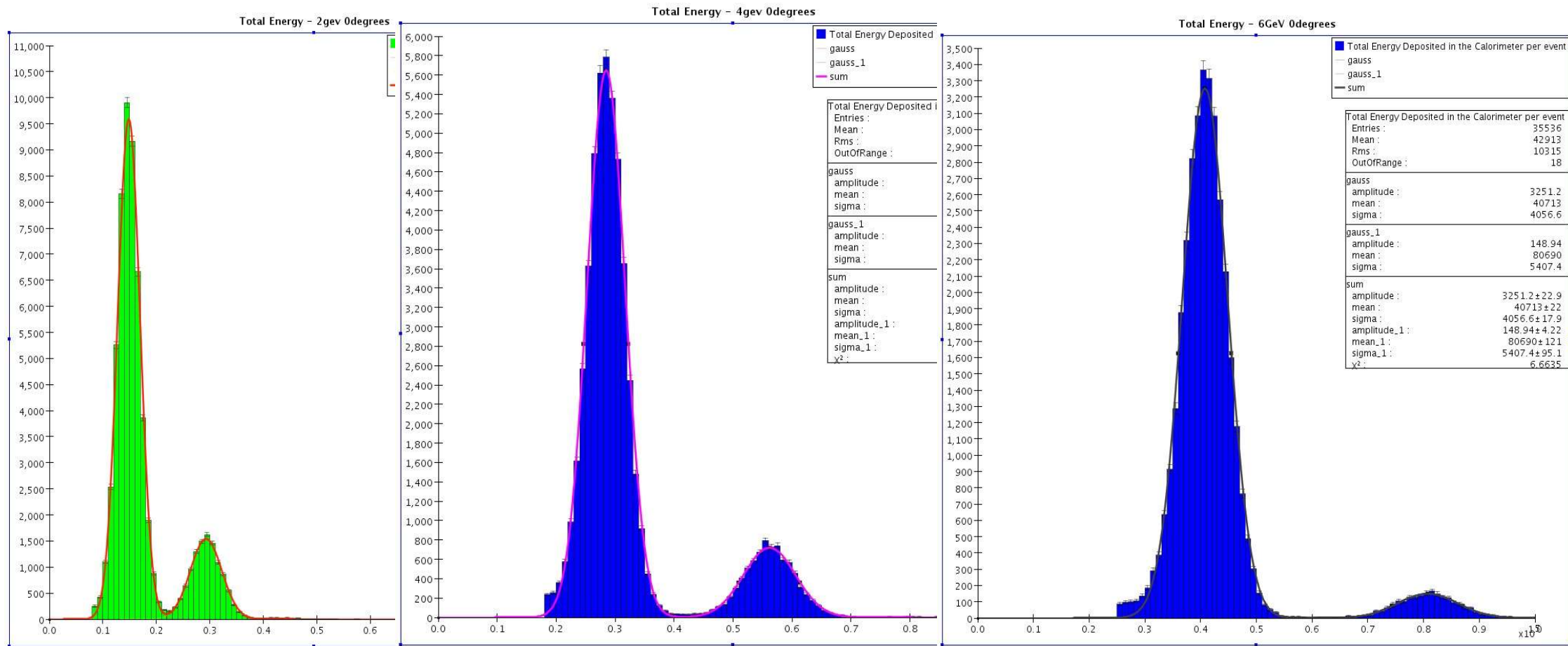
- Cut on $\langle x \rangle$, $\langle y \rangle$, $\langle \text{layer} \rangle$ and energy (similar to David Ward's cut). Could not get 'rms' to work.

Result:



Calculating Energy Resolution

- Using JAS3 I placed a Gaussian curve over single and double electron peak.
- Fitted the sum of the two functions using jminuit.
- Imperfect fit due residual background.



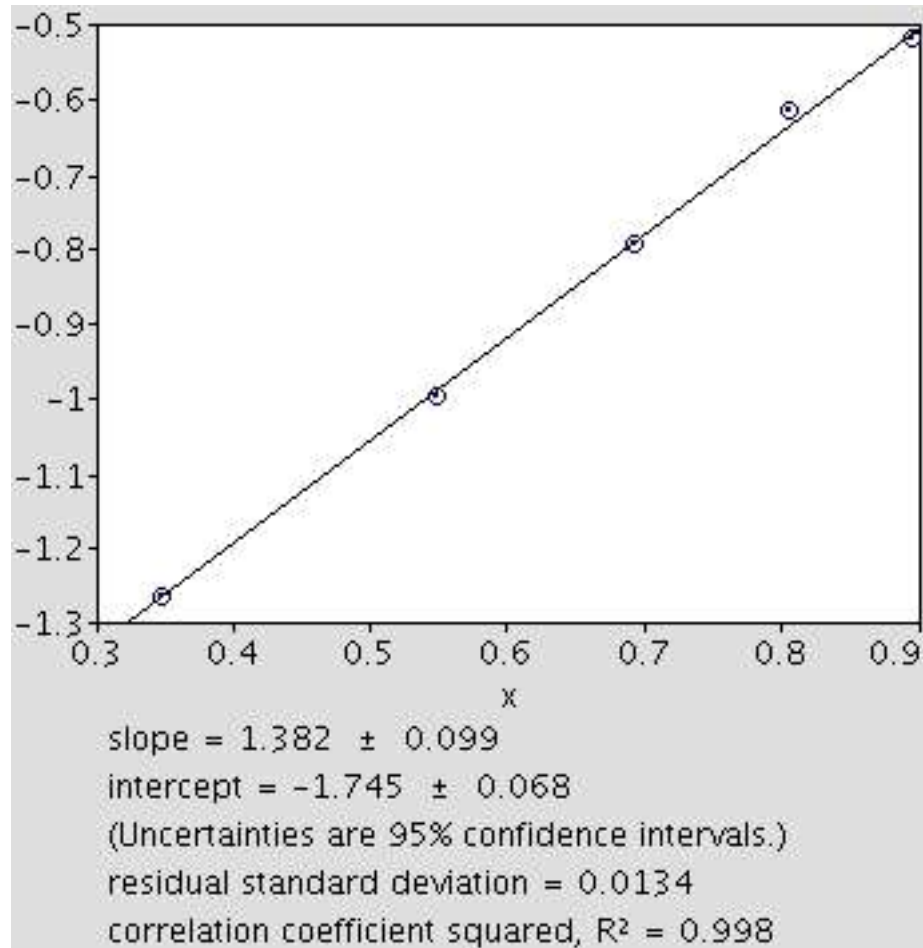
Calculating Energy Resolution

- Assumed 0 ADC Counts to be true zero energy and assumed used known beam energy to convert ADC to GeV (assuming a linear scale).
- Ignored Energy Leakage and beam spread.
- No calibration for change in layer thickness.
- Assumed energy resolution of the form:

$$\frac{\sigma(E)}{E} = \frac{\text{constant}}{\sqrt{E}}$$

Calculating Energy Resolution

- Linear least squares fit of $\ln(\sigma)$ against $0.5\ln(E)$:



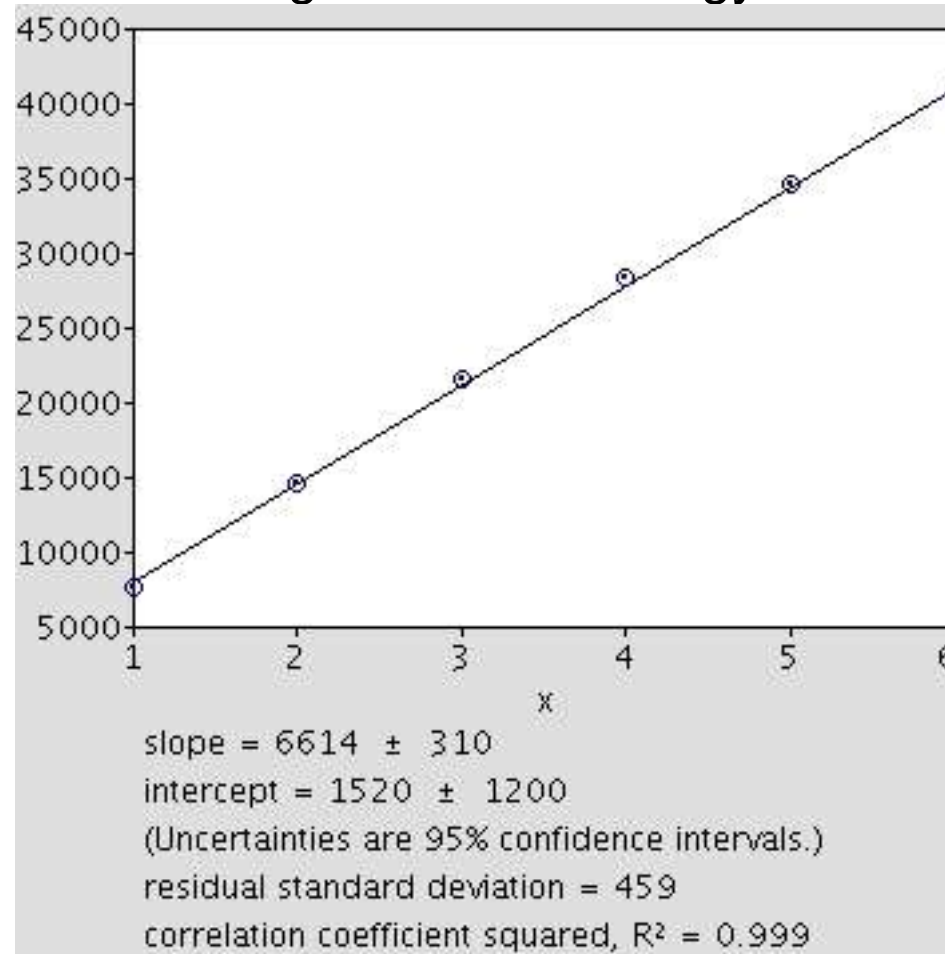
- Gives an energy resolution of $(17 \pm 1)\%/\sqrt{E}$.

Calculating Energy Resolution

- Large energy resolution is probably due to:
 - Energy Leakage.
 - 5% Beam Energy Spread.
 - Not calibrated for changes in layer thickness.
 - Residual Background.

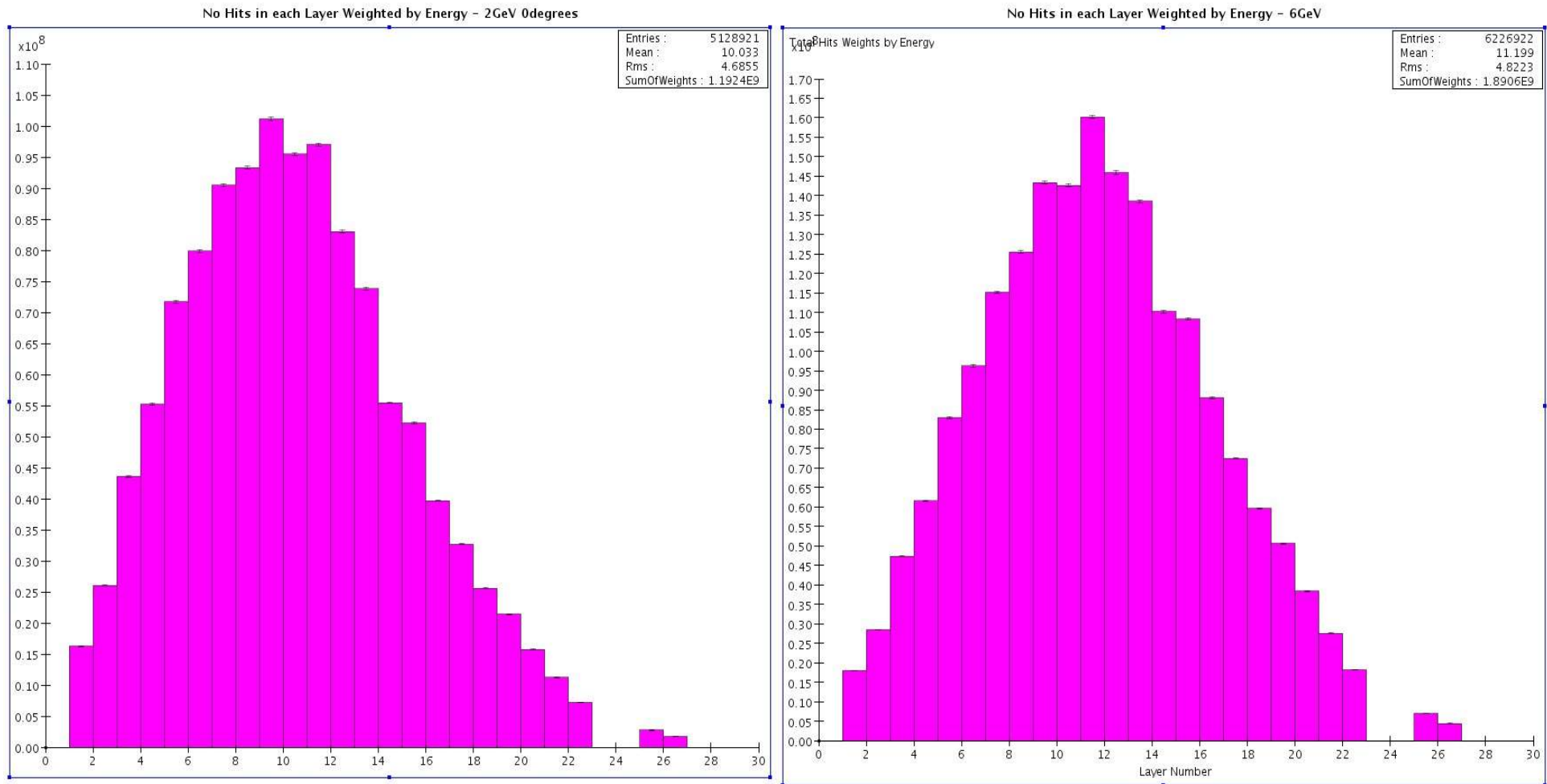
Converting ADC to GeV

- Plotted centre of Gaussian fit against beam energy and fitted a straight line:



- $1\text{GeV} = (6614 \pm 310)$ ADC Counts.

Energy Leakage



- Very little energy leakage, even at 6GeV.

Summary

- Cut out some of the background.
- Preliminary estimate of energy resolution $(17 \pm 1)\%/\sqrt{E}$
- Need a calibration for change in layer thickness and to include beam spread.
- Need a quantitative estimate of energy leakage.

Any Questions?