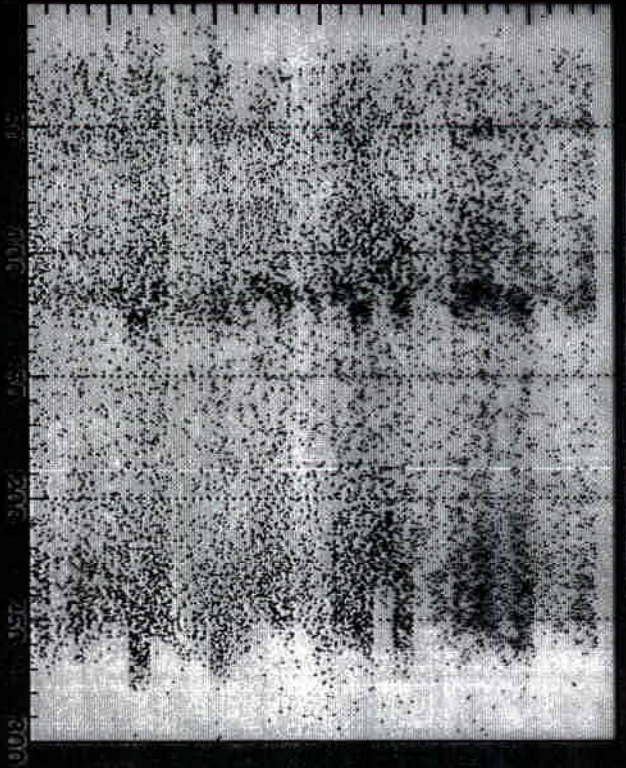
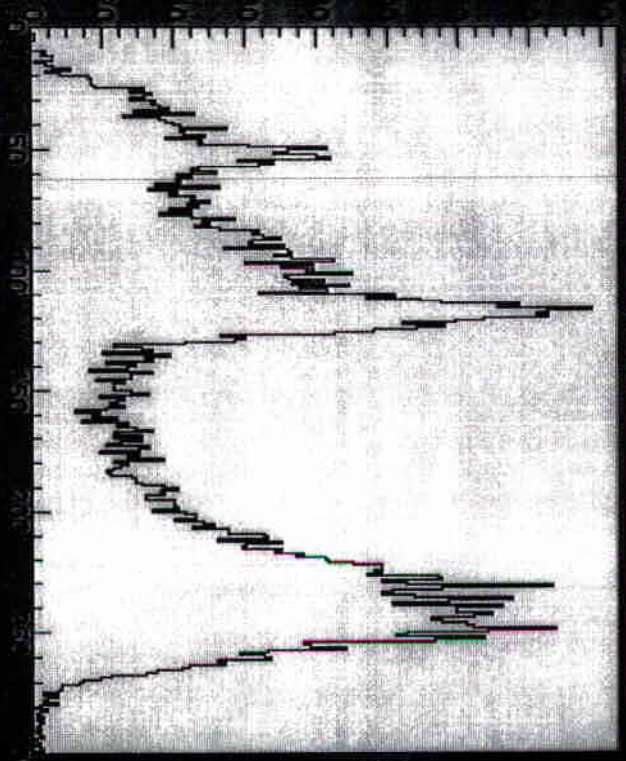


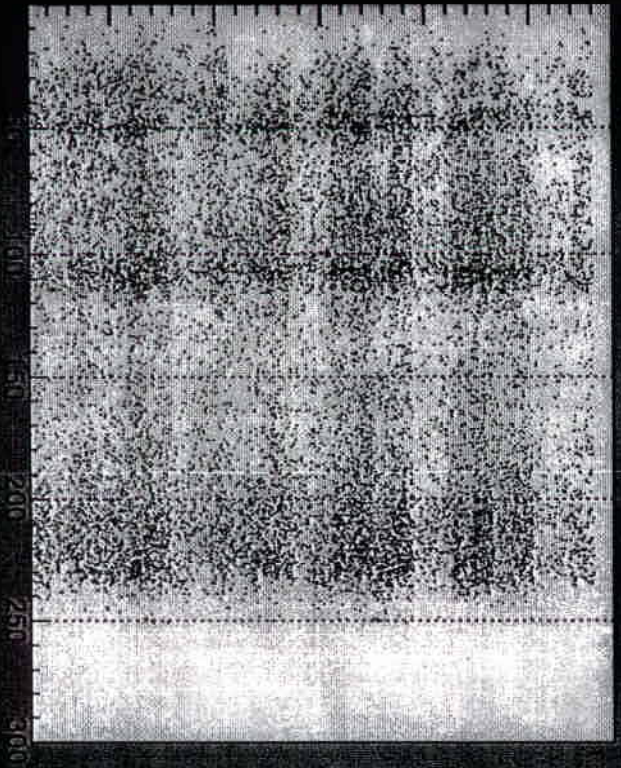
C-12 Before Gain Matching



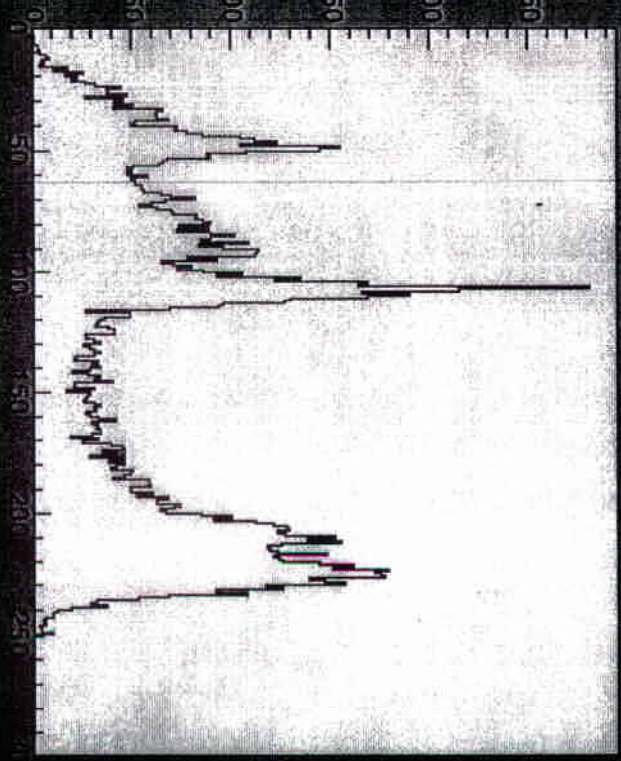
C-12 Before Gain Matching X-Projection



C-12 After Gain Matching



C-12 After Gain Matching X-Projection



Technique:

1. Due to voltage gain drifting, the BGO's did not have the same energy-to-bin correspondance. Therefore I scaled all detector data to common set of reference peaks in order to line up the peaks of interest.
2. To calculate the counts under the peaks I used a fitting technique outlined in the past of convolving a GEANT spectra with Gaussians in order to produce a fitting function. Using a scaling factor as one of the fit parameters one then can extrapolate the number of measured counts.
3. To calculate measured efficiency I needed to get average current and expected yield.

Average beam current: 145 ± 15 enA

$$\text{Yield: } Y = \frac{\lambda^2}{2} \frac{M+m}{m} \omega_\gamma \left(\frac{dE}{dx} \right)^{-1}$$

$$\omega_\gamma = 552 \text{ meV (with 12\% error)}$$

$$\frac{dE}{dx} = 57.36 \text{ eV}/(10^{15} \text{ atoms/cm}^2)$$

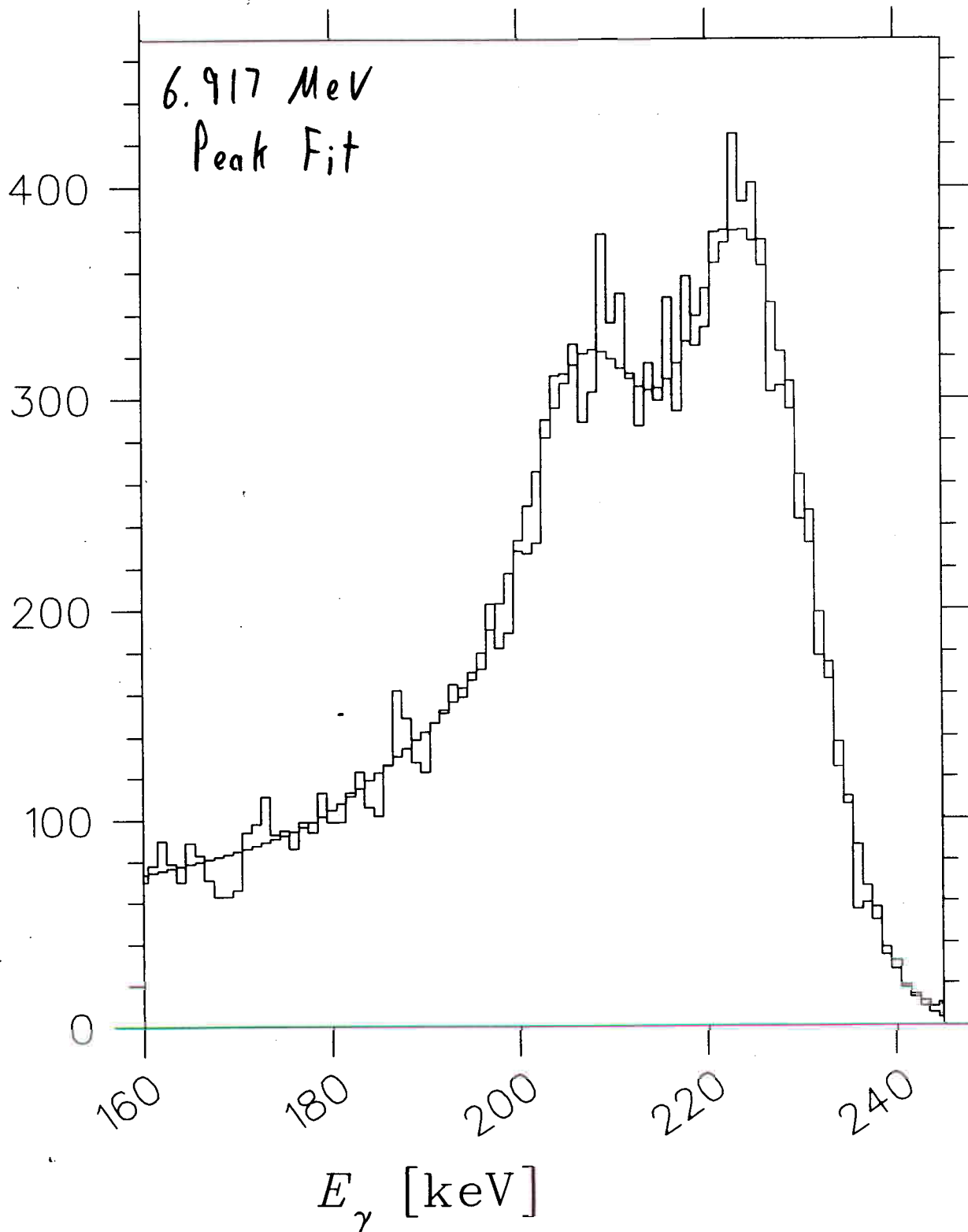
$$Y = (5.185 \pm 0.062) \times 10^{-12}$$

$$N_0 = -11.64 \pm 3.49$$

$$yNorm = 0.033 \pm 0.00$$

$$\sigma = 1.06 \pm 0.80 \text{ keV} \quad Gain = 1039.26 \pm **** \text{ ch/MeV}$$

$$\chi^2/82 = 1.78 \quad m = 0.00 \text{ ch/MeV} \quad b = 0.00$$



$$N_0 = -11.03 \pm 0.25$$

$$yNorm = 0.028 \pm 0.00$$

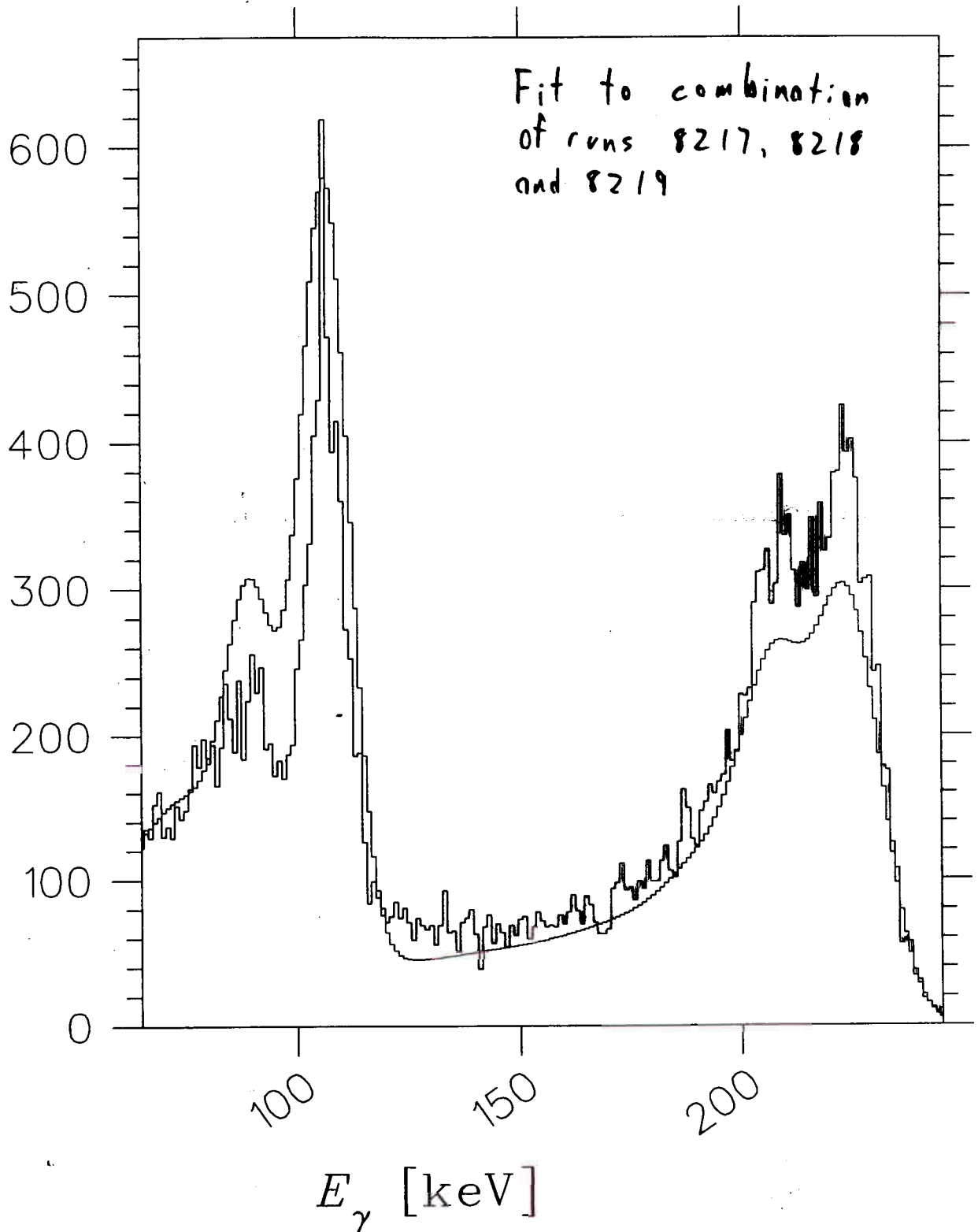
$$\sigma \equiv 2.00 \text{ keV}$$

$$Gain = 1035.75 \pm 1.38 \text{ ch/MeV}$$

$$\chi^2/178 = 11.62$$

$$m = 0.00 \text{ ch/MeV}$$

$$b = 0.00$$



Assuming branching ratio for the 5+ state of $(48.9 \pm 5.0)\%$

Adding Errors in quadrature final Measured BGO efficiencies at 6.917 MeV and 3.439 MeV are:

Efficiency at 3.439 MeV: $(25.1 \pm 4.7)\%$

Efficiency at 6.917 MeV: $(26.9 \pm 5.0)\%$

GEANT simulated Efficiencies

3.439 MeV: 48.7 %

6.917 MeV: 38.2 %