PHENIX-muon95-22

GENERATING BEAM GAS EVENTS BASED ON LIMITING FRAGMENTATION

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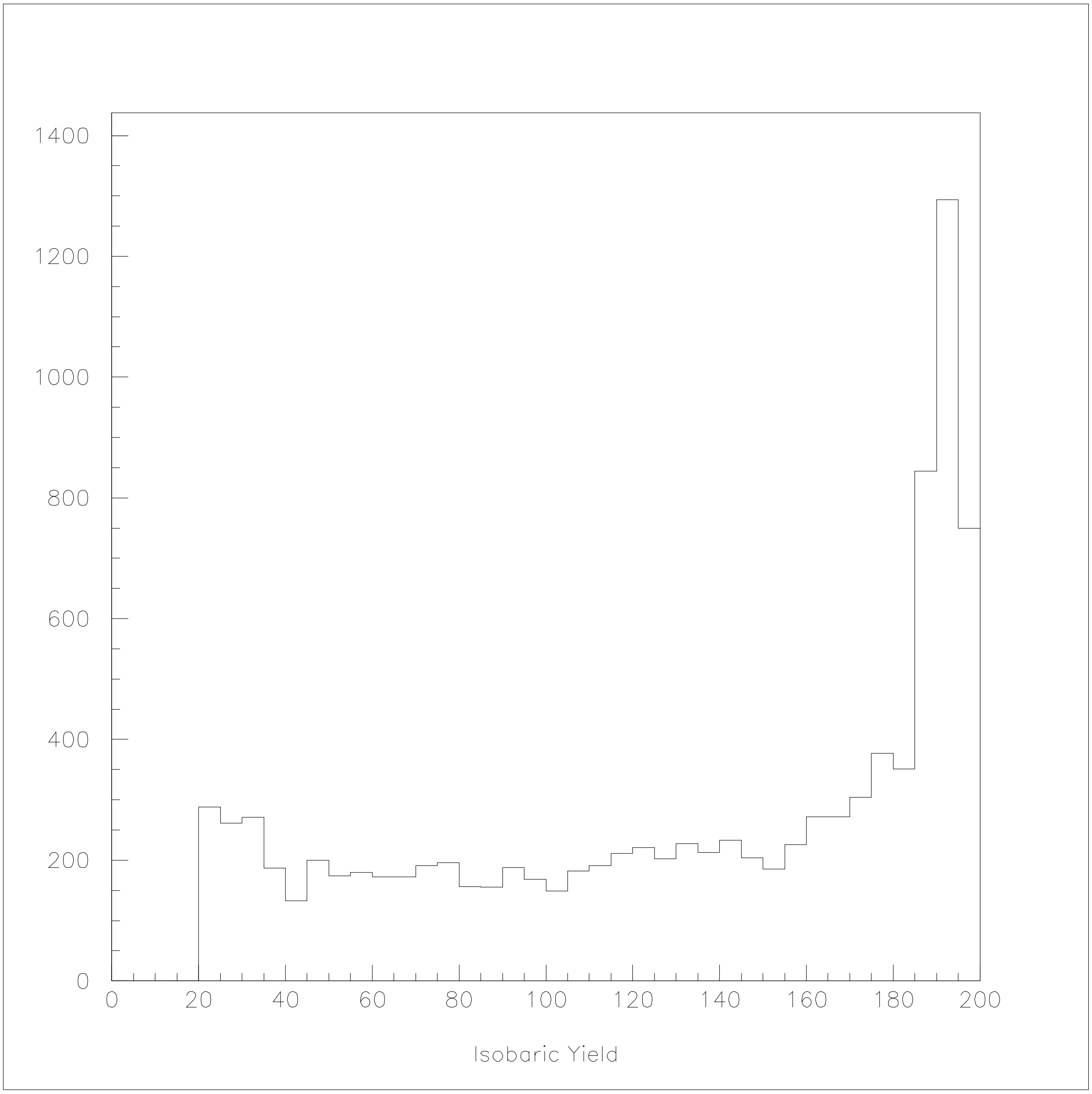
I Introduction

In an attempt to model beam gas events as they realistically occur, we have turned to a paper, entitled "Gold target fragmentation by 800 GeV protons" (L. Sihver, et. al., Nuclear Physics A543, 1992). This paper contains the data we need for spallation products of a gold target that is bombarded by protons. It includes cross sections of the spallation products, momentum information, and angular distributions. Although the data is for 800 GeV protons specifically, it is nevertheless appropriate because of "Limiting Fragmentation." At a certain energy (around 10 GeV), the spallation cross sections become independent of projectile energy. It is therefore irrelevant whether the protons have energy of 800 GeV or whether they have the energy of our beam gas as measured in the rest frame of the gold nucleus. Using the data, we can generate a spallation product together with a four-momentum. We must then do a Lorentz boost into the lab frame (the rest frame of the beam gas in which the gold nucleus is moving). The following pages show what the generated values are.

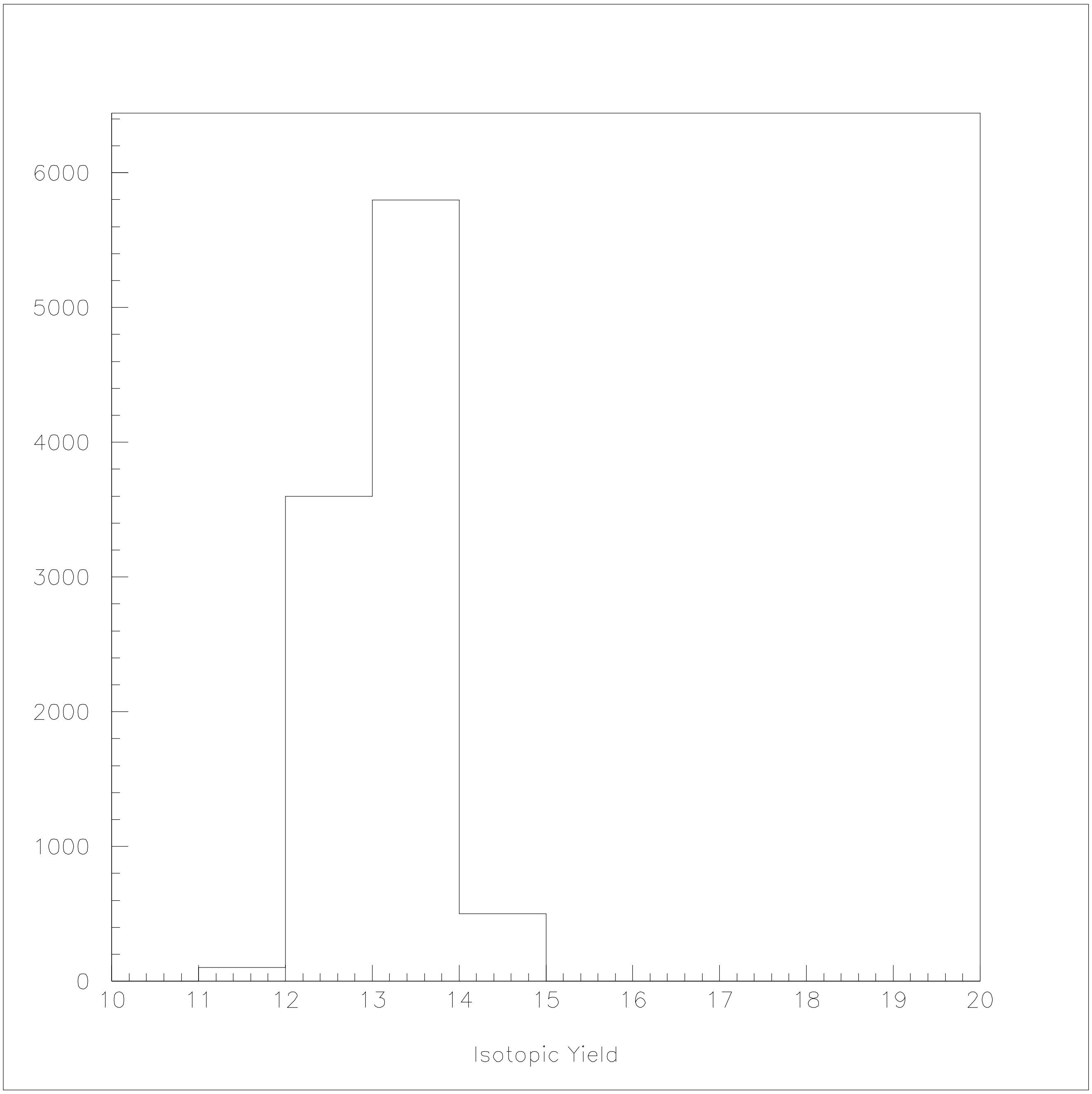
II Generated fragment mass numbers



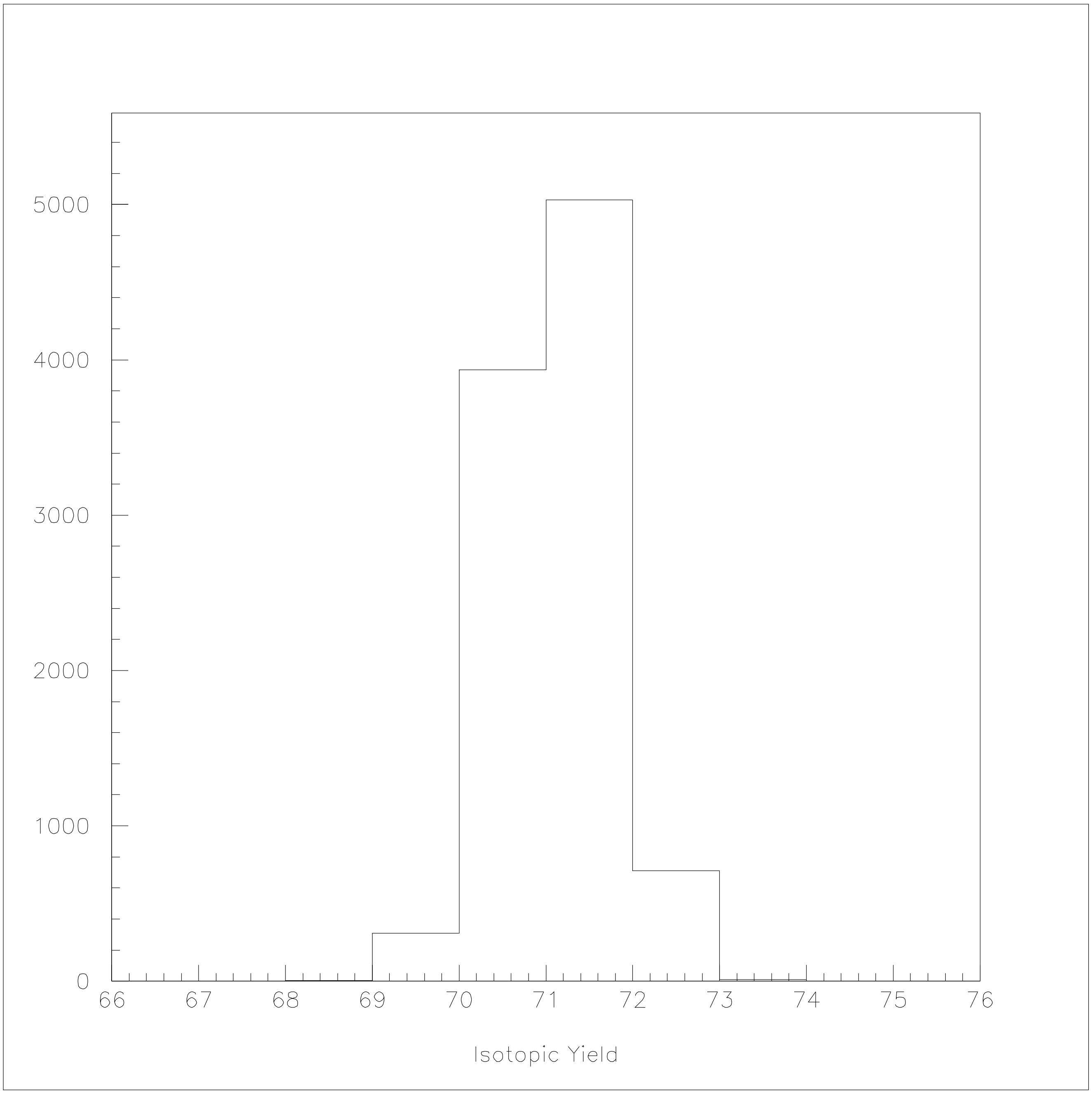
This distribution of generated isobars agrees very well with the data.

III Generated Z values for A = 28

The Z values were derived from a gaussian distribution that was fitted to the data. The following two figures are examples of the isotopes generated for a certain mass.

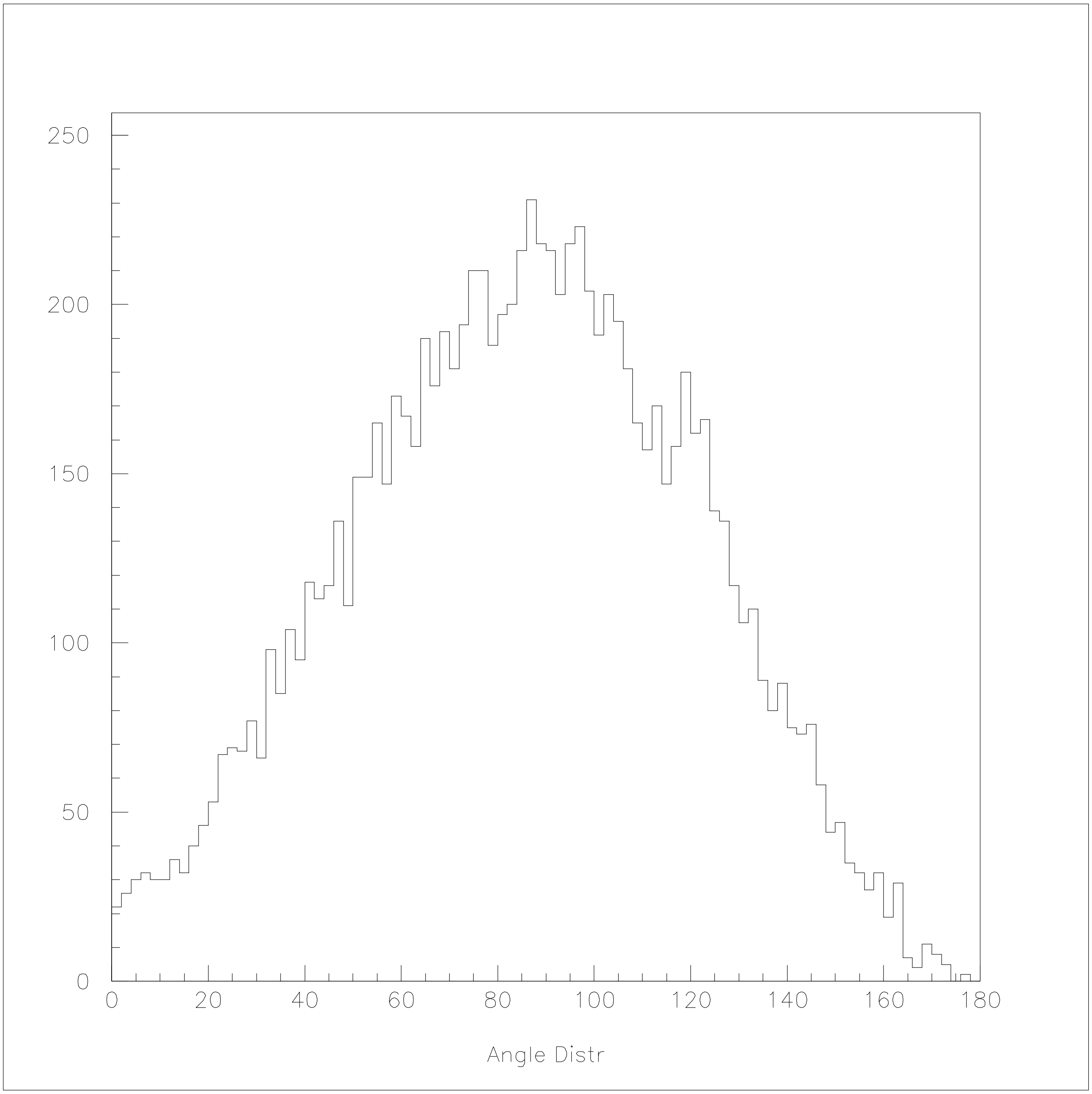


IV Generated Z values for A = 168

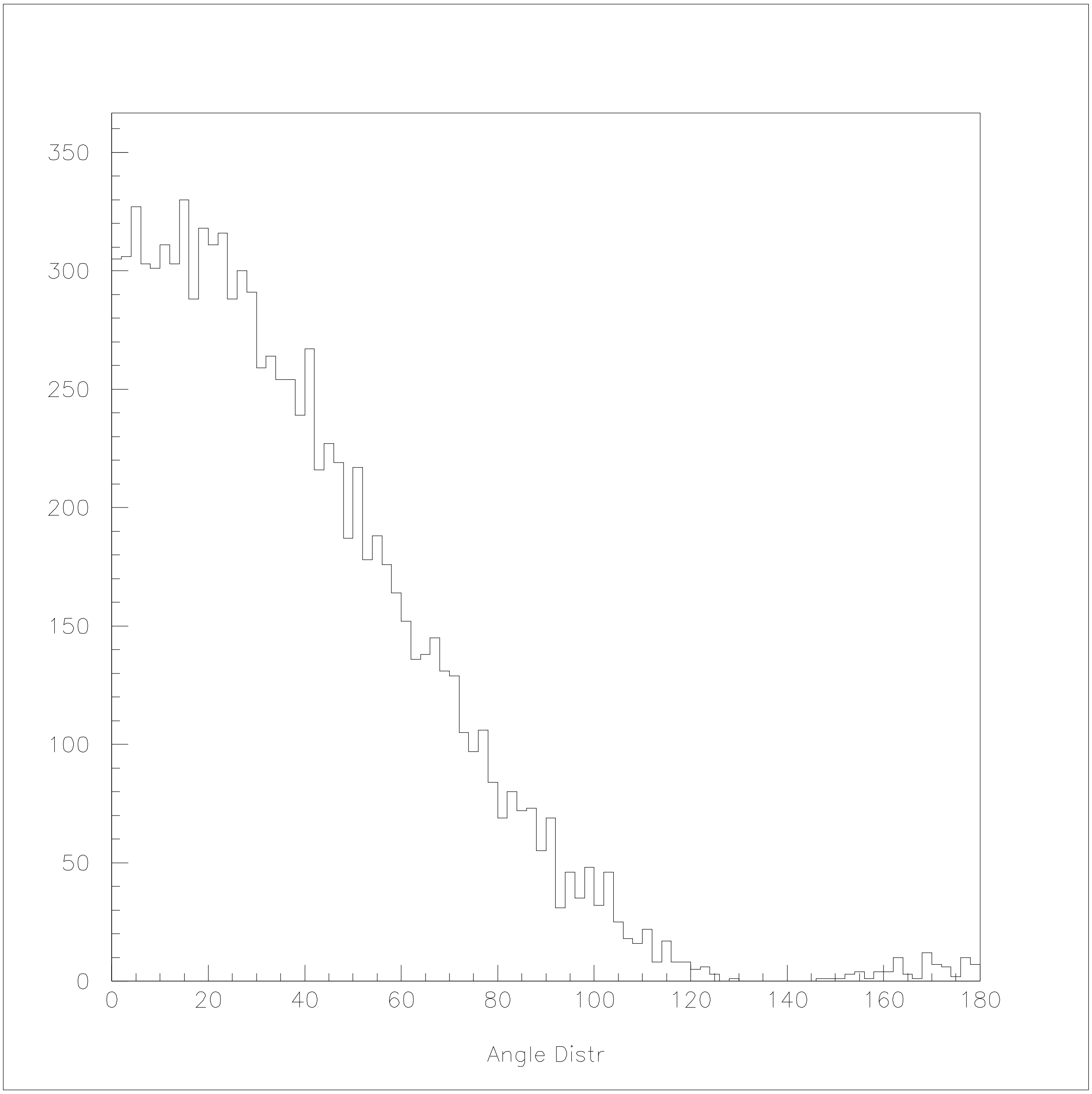


V Generated θ for A = 47

The data for the angular distributions was fitted to the following parameterization: $F(\theta) = 1 + A_1\cos(\theta) + A_2 cos^2(\theta)$



VI Generated θ for A = 167



VII Continuing the Generator

Our goal in creating this generator is to bracket the beam gas problem. We do not hope to be able to model a beam gas event completely accurately (taking into account both the spallation and the strong interactions). What we hope to accomplish is to find a lower upper bound for the trigger rate of beam gas events. Presently, our upper bound for the trigger rate of beam gas events is from a model that completely separates the gold nucleus into 197 nucleons. Our lower bound comes from the same model, but neglecting spectators. If this new generator creates even only one spallation product and lets the remainder of the nucleus separate, we hope to see a lower trigger rate, having thus given a lower upper bound to the problem.