Angular Distributions of the Analysing Power in the Excitation of Low Lying States of ^{56}Co

J.J. van Zyl[1], **A.A. Cowley**[1,2]

[1]Department of Physics, Stellenbosch University,
Private Bag X1, Matieland 7602, South Africa

[2]iThemba Laboratory for Accelerator Based Sciences,
P. O. Box 722, Somerset West 7129, South Africa

We present new differential cross section and analysing power measurements as a function of scattering angle for a few discrete, low lying states of ^{56}Co.

Several studies on the angular distribution of the cross section and analysing powers of reactions where composite particles are emitted from the interaction of medium energy protons have been done in the recent past. These reactions were quite successfully described by means of a statistical multi-step process, having a pickup or knockout of a few nucleons in the final step. The results of these studies indicate a strong and sensitive correlation between the proposed multi-step mechanism and the measured spin observables such as analysing power.

It was concluded that a one-step, direct process dominates the analysing power at the lowest excitation energies, and consequently give rise to large analysing power values. On the other hand, a decreasing analysing power was attributed to the combined effect of higher order steps, and was seen predominantly at the higher excitation energies.

Some observed tendencies are, however, not yet well understood. The analysing power drops as the incident energy of the projectile is increased, and this behaviour is in agreement with the multi-step mechanism. It is however not clear why this decrease appears even at the lowest excitation energies where one would rather expect the more direct, single-step reactions to dominate and therefore produce higher analysing powers. It is not certain whether this behaviour is just a coincidental result of the contributions from different discrete states or caused by a more fundamental physical process. It has also been suggested that this decrease in analysing power as a function of incident energy may be a consequence of the incident energy dependence of the direct reaction which competes with the multi-step mechanism.

To this end the reaction ^{58}Ni(p,^3He)^{56}Co has been investigated with the K600 Magnetic Spectrometer and a polarised proton beam from the

Separated Sector Cyclotron facility at iThemba LABS, South Africa in late 2010 and early 2011. Measurements were taken at incident energies of 80, 100 and 130 MeV and at angles ranging from 25 to 60 degrees on a self-supporting ^{58}Ni target.