

Physics 499
Homework Assignment 4
Simulating Scattering Data
Due Friday May 24th

Problem : π^+ – *proton* elastic scattering
Reference: Phys. Rev. C, 33, 1407 (1986).

For this assignment you will generate (simulate) data for pions scattering elastically off of protons ($\pi^+ + p \rightarrow \pi^+ + p$). In the lab frame, the protons are at rest, and the pions are to have a lab kinetic energy of 80 *MeV*. For this pion lab kinetic energy, the phase shifts (in the center of mass frame) are $\delta_0 = -8^\circ$ and $\delta_1 = 10^\circ$.

- a) Write a computer code that will output simulated cross section data for the pion proton elastic scattering (in the center of mass frame) described above. Your code should print out the differential cross section from $5^\circ \rightarrow 170^\circ$ every 5 degrees. Each cross section data should have a 10% error that has a Gaussian probability distribution.

- b) If you write the program in ROOT, you can plot the simulated data. Plotting the data (if done correctly) can compensate for mistakes in your code.

You should turn in (e-mail) two files: your computer code that will run in either gcc or ROOT, and a file discussing your results. For the discussion file, you can use straight text (*.txt) or latex. No *.doc files. Be sure your name is somewhere in each file you e-mail to me.