Primakoff Effect: ***Here is a diagram that shows the process which will be used to measure the π^{o} lifetime. The wavy lines represent photons (also indicated by the g symbols), while the dashed line represents the π^{o}. The large blob at the bottom is a nucleus made up of protons and neutrons. The formula is the QCD prediction of how likely it is that this process occurs.***

Layout of the Experiment: ***This picture shows the planned layout of the equipment that will be used in the PrimEx experiment. In this picture, the Jefferson lab electron beam is coming in from the lower–lefthand corner. The electron beam is used to make a photon beam in the Photon Tagger. The photon beam then strikes the experimental target where a few of the photons create π^{o} s. If a π^{o} is created, it will immediately decay back into two photons. These will strike the HYCAL detector which will precisely measure their energy and position. This information will be used to reconstruct information about the π^{o}.***

Computer Simulation: ***This picture was created from a computer simulation of the PrimEx experiment. Each of the squares represents a detector in the HYCAL calorimeter. The HYCAL calorimeter is made up of 1088 crystal detectors. The two purple blobs show where two photons from a π^{o} hit the HYCAL. When an energetic photon hits HYCAL, it spreads its energy to many individual detectors. Computer simulations help us refine the design of the experiment and indentify problems before using valuable beam time.***

HYCAL detector: ***This is a conceptual drawing of the HYCAL calorimeter. It will be made up of 1088 individual crystal detectors. We will be able to move the entire calorimeter by remote control so that each detector may be placed in the beam. This allows us to calibrate each detector very accurately using the well−known beam energy. The crystals work best when kept cold so they will also be enclosed and refrigerated.***

Dipole Magnet: ***Here is a picture taken while installing the PrimEx dipole magnet. The magnet plays two roles: 1.) It sweeps away the charged particles before they hit the HYCAL detector and 2.) It bends electron/positron pairs into a Pair Spectrometer detector. The large number of electron/positron pairs produced make it a useful tool for measuring how many photons were shot at the target.***

$PbWO_4$ crystals: ***This picture is of a prototype calorimeter built for testing in the Jefferson Lab beam. Though just six crystals are shown, the prototype was eventually filled with 36. The HYCAL calorimeter will contain 480 $PbW0_4$ crystals (and 608 lead−glass blocks). Cold water was run through tubes embedded in the walls of the frame to keep the crystals cold and at constant temperature.***

<u>π^o production cross–section:</u> ***This plot shows the "cross–section" for π^o production. The important thing to notice here is how sharp the peak is (only about 0.02 degrees wide!). We must measure at this accuracy to do the experiment.***

<u>Previous measurements:</u> ***Here is a plot showing previous meaurements of the π^o decay width (1/lifetime). The lines on each point indicate how accurately each experiment was done (longer lines mean less accurate). No previous experiment has measured the π^o lifetime accurately enough to test the theory.***