

# Particle Physics at CLEO

PHYS 1301 F98  
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Last edit: 6 Aug '98

## Introduction

Today's lab session will give you some taste for how elementary particles are actually studied in the laboratory. We will use event displays from the experiment CLEO., the elementary particle physics experiment located at Cornell University and supported by the National Science Foundation and the US Department of Energy that I (along with 200 or so other physicists from 22 other institutions) perform research with. These event displays are generated from the actual computer simulation used by the CLEO collaboration of physicists to analyze the behavior of elementary particles and represent the creation of particles after an electron anti-electron collision and the response of the CLEO detector to the passage of these particles through the detector. Although the technique we will use is too crude for actually analysis the data, the technique is still useful because it mimics exactly what a computer does with the same data represented visually here.

## Procedure

1. Start with event 4. **Question 1.** Count the number of charged tracks that you see in the central portion of the event display. What is the **net** charge of all these particles? How do you know? **Question 2.** Do you see some areas of the calorimeter where there seems to be activity but for which there seems to be no associated track in the central tracking detector? What kind of particle do you think is responsible for this pattern of detector behavior? **Question 3.** Do you think there are any muons in this event?
2. Estimate the so-called momenta of tracks 1-3. For this you will need to measure the sagitta of the track. This will be explained in the lab lecture. **Question 4.** What are the momenta of these tracks? **Question 5.** Which momentum measurement do you think has the largest error associated with it? Why do you think that is so?
3. Now analyze event 9. **Question 6.** How many tracks do you see? What is the **net** charge of all the tracks in this event? **Question 7.** Do you see any photons in this event? How many? **Question 8.** Do you see any muons in this event? Provide evidence one way or the other for your opinion.
4. Estimate the momenta of tracks 1 and 2 by measuring the sagitta. **Question 9.** What are the sagitta and momenta of tracks 1 and 2? **Question 10.** Just by looking at the tracks, can you make a statement about their relative momenta? Justify your answer.

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Name \_\_\_\_\_ Section \_\_\_\_\_

**Abstract:**

## Questions

**Question 1:**

**Question 2:**

**Question 3:**

**Question 4:**

**Question 5:**

**Question 6:**

**Question 7:**

**Question 8:**

**Question 9:**

**Question 10:**

**Conclusions:**