Activity: Modern Particle Detectors
Ground Rules for Interpreting Events Diagrams

1. A track in the drift chamber that is curved in a counter-clockwise direction belongs to a positively charged particle.

2. A track in the drift chamber that is curved in a clockwise direction belongs to a negatively charged particle.

3. Large energy deposits in the calorimeter with corresponding tracks represent energy deposited by a charged particle.

4. Large energy deposits in the calorimeter with no corresponding track indicates the presence of a photon.

5. The bold symbols represent particles and their associated charge.

6. The greater the degree of curvature, the smaller the momentum of the particle.

7. Muons are the only particles that can be registered in the muon chamber.

8. The tiny squares indicate energy deposited in the calorimeter elements in the end caps and illustrate the three dimensionality of the detector.

9. The collision always occurs in the interaction region and the annihilation produces energy and matter that travels outward in all directions.

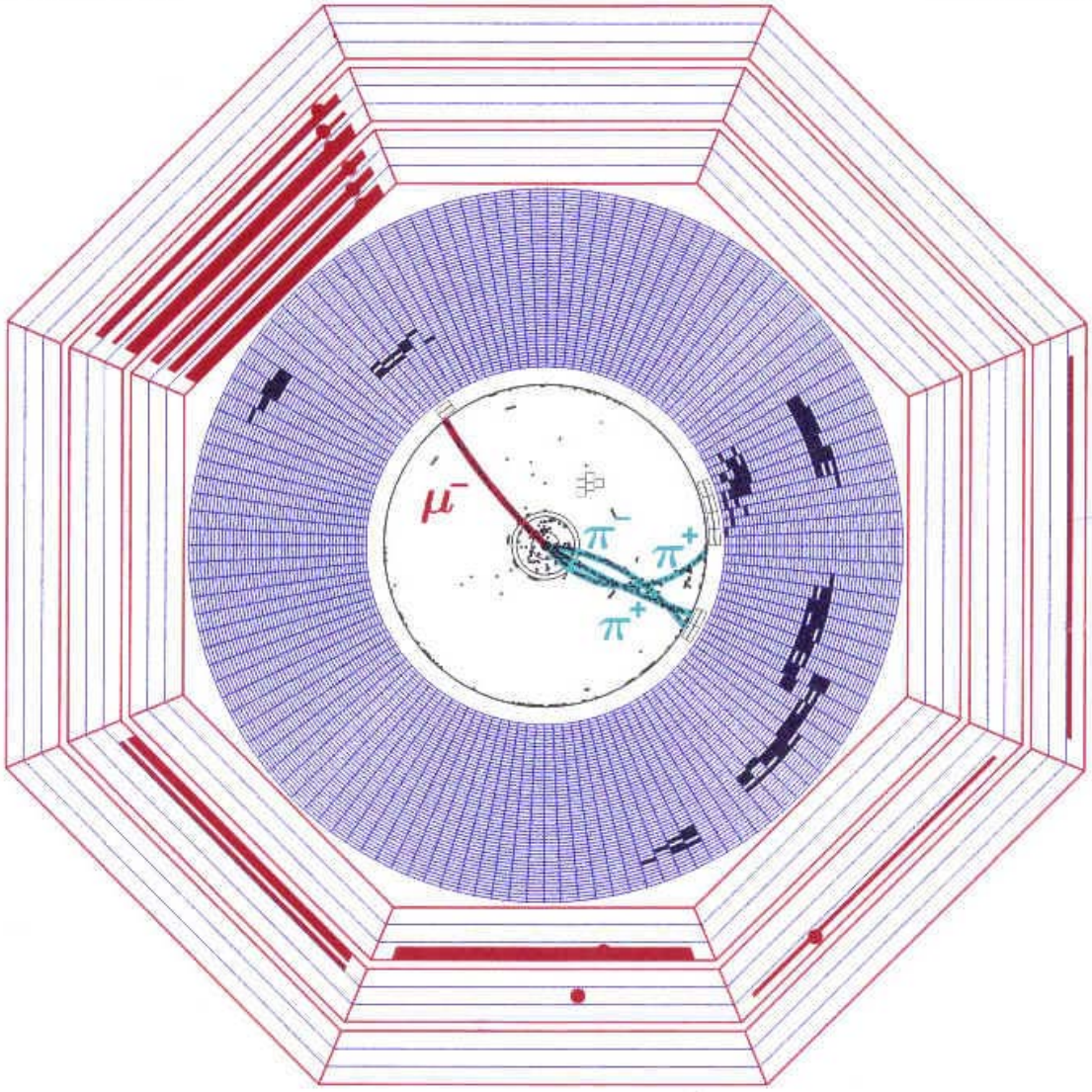
10. Sporadic dots in the calorimeter mean unwanted noise.

2230395-001

Run: 46779

CLEO XD

Event: 192

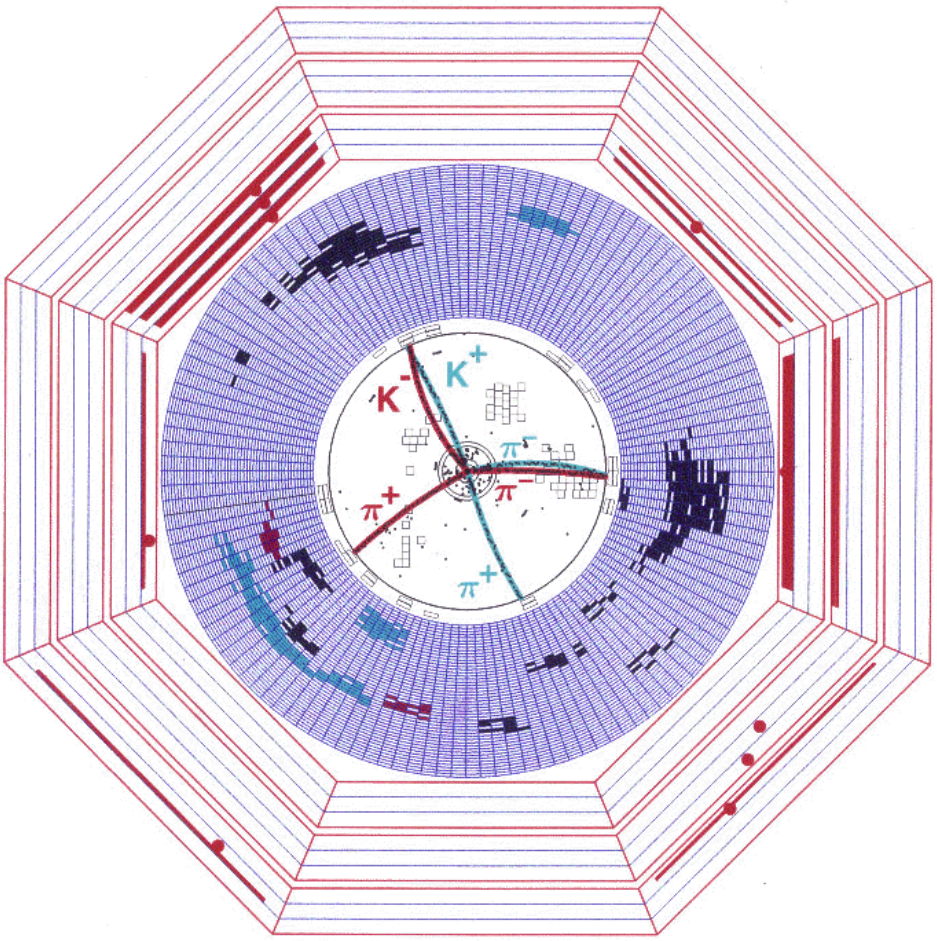


2230595-006

Run: 39694

CLEO XD

Event: 1749

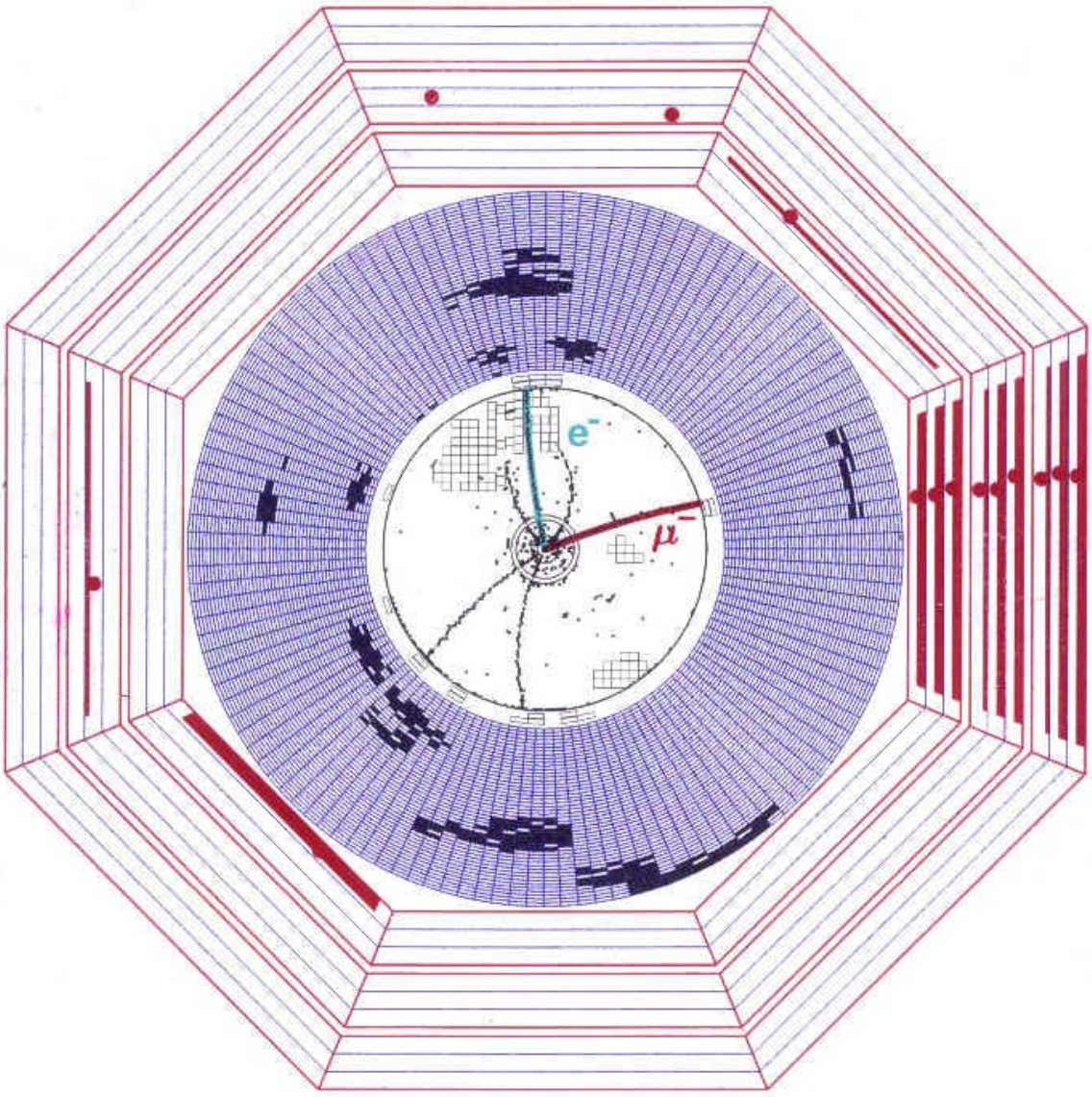


2230595-007

Run: 43134

CLEO XD

Event: 137



Events Diagram Quiz

Events Quiz Number One (Event 1749)

1. Were any photons created in this collision? How many? How do you know?

2. Which particle has the least momentum?

3. There are two K mesons and four π mesons labeled in this event. How do you think we know which tracks are K's and which are π's? Can you tell just from the picture presented?

Events Quiz Number Two (Event 137)

1. How many negatively charged particles in total were produced in this collision?

2. Was there any unwanted noise hits in the drift chamber?

3. a) Is there any indication of energy deposited in the end cap calorimeter?

   b) Is any of this end cap energy deposited by a photon?

4. Was there a muon in the event?

Events Quiz Number Three (Event 192)

1. How many tracks are there in the event?

2. Is the conservation of charge illustrated in this collision? How?

3. Which particle has the least momentum? Explain your answer.

4. Was there a muon in the event? Explain you answer.

5. How many photons are there in this event?

Answer Key to Events Diagram Quiz

Events Quiz Number One (Event 1749)

1. Yes, there are large energy deposits (particularly in the second and third quadrants of the calorimeter) that have no corresponding tracks
2. K^- and π^- are similar
3. Cannot tell from the picture. Additional information needed.

Events Quiz Number Two (Event 137)

1. Three: electron, muon and an unidentified particle in the end caps
2. Yes, signified by small energy deposits with no tracks in the calorimeter
3. a) Yes, the third and fourth quadrant of the drift chamber contain noticeable background noise.
   b) Second quadrant energy deposition was caused by a photon.
4. Yes

Events Quiz Number Three (Event 192)

1. Four
2. Yes, two negatively charged particles (-2) and two positively charged particles (+2) were produced for a net charge of zero.
3. π^+ has the least amount of momentum because it has the greatest track curvature
4. Yes. The single track in the third quadrant since there are six hits on a line in the muon chamber.
5. 2 or 3