

Particle Physics Identification

Go to <http://www.physics.smu.edu/~sdalley/particlelab/home.html>

You should have read the sections Introduction and Detector already to complete the pre-lab.

1. Do the tutorial Parts 1–3 with your partner. You will probably need to spend about 1 hour on it to master the material. When you feel you are ready, the instructor will test whether you can proceed by picking at random one of the tutorial events and asking you to identify it (you cannot use the tutorial guide).
2. If you pass that test, next do the selected exercises with your partner in Part 4 listed below, writing your identification and brief relevant reasons for your identification in your lab notebook. 25% of credit is for identification, 75% of credit is for correct reasons. When giving reasons, use scientific language - like “charged-particle track of high momentum” and not “black line near the center”.

(You do not need to write a conclusion for this lab!)

Example

Event 30 Identification: $W^+ W^- \rightarrow \tau \nu q \bar{q}$

Reasons for identification:

- No signal in μ chambers.
- 2 jets of hadrons (from $q \bar{q}$).
- One charged particle track (black line) has momentum greater than energy deposited in electromagnetic calorimeter and energy deposited in hadronic calorimeter, so single hadron (from τ decay) rather than e .
- ν unseen but balances momentum.

Exercises

Identify and then list *reasons* for the identification of the following events: 36, 34, 33, 31, 32.