Name(s): _____ Section: _____
_____ Date: _____

In Search of Cosmic Rays
Activity 3: Angle of Particle Arrival

Investigation Questions:

1. At what angles are Cosmic Rays usually moving through the atmosphere?
2. What can you hypothesize about the amount of energy that most Cosmic Rays have?
3. Do they mostly have high energies, or low energies?

Lab Procedure

1. There are two rows of twelve tubes, one on top of the other. It would be helpful for you to remember these rows as "A" for the top row and "B" for the bottom row. Each tube can be numbered from one to twelve going from left to right. In this numbering system, the bottom left tube will be called "Tube B1" and the top right tube will be called "Tube A12".

2. The histogram to the right of the array will record the "horizontal displacement" of the events that occur during the experiment. To clear this histogram, click on the "clear" button in the top right corner of the histogram. *This will empty the histogram of all the data you've collected so far.*

3. At the bottom of the array, there are four buttons. The one labeled "Show Ray" will allow you to see the line tracing the path of the particle. The one labeled "Next Event" will allow you to scroll through the events one at a time. If you click on the one labeled "Scroll Events", the particles will go as fast as they can. After you click on "Scroll Events", the button changes to say "Single Event". If you click on this, it will return to the single event mode. The last button named "Exit" will end the experiment and take you to the analysis questions at the end of the lab.

Analysis Questions

1. Do you see any patterns in your histogram? Explain.

2. What is the most likely displacement for cosmic ray hits? What direction does it correspond to?

3. Which is more likely, an A2, B10 combination, or an A4, B6 combination?

4. Are particles more likely to come through the atmosphere at steep or shallow angles?

5. Suppose A5 lit up, which B light would you predict to be the most likely to light up?

6. What conclusion can you make about angles at which cosmic rays enter the Earth's atmosphere? Which angle is the most likely to occur?

7. Record one or more reasons why you think a cosmic ray research scientist at the University of Utah would want to know this information?

8. Using only the observations you made in the lab, what can you hypothesize about the energy that cosmic rays have? (High or low?)