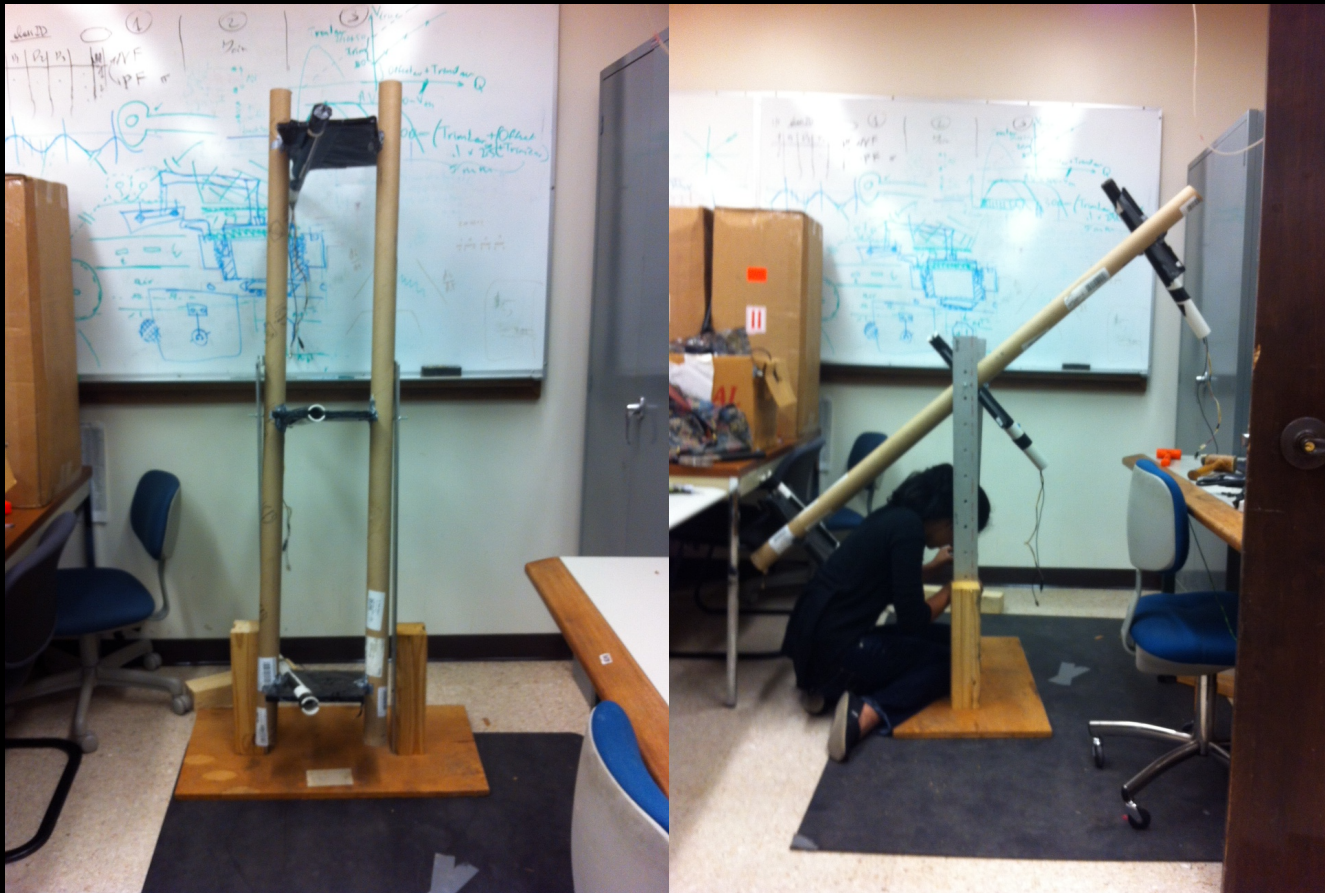


Muon Telescope



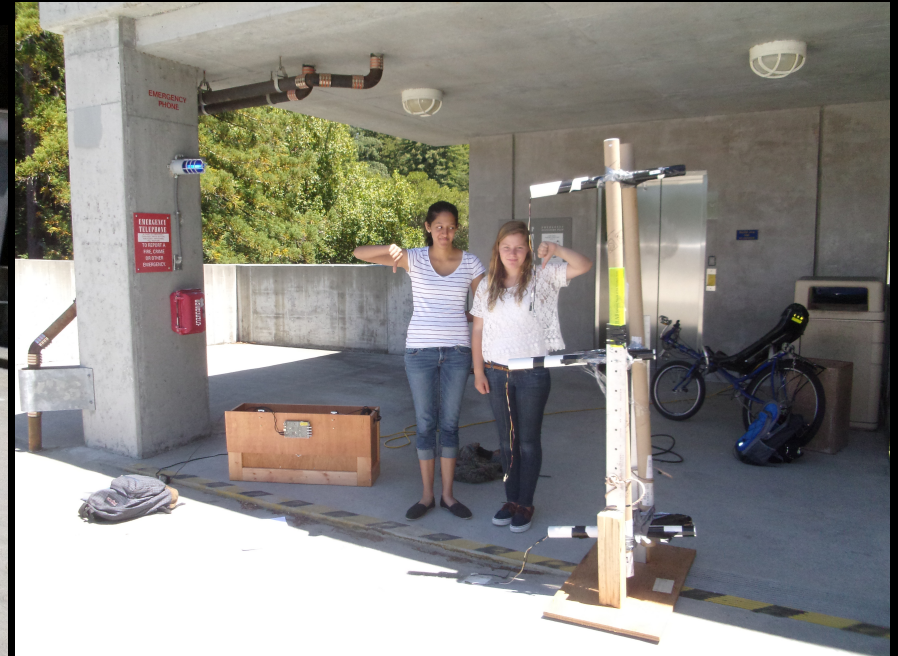
By Nandita Sampath and Izzy Harrison

Abstract

We wanted to determine whether the count rate of muons per hour would be affected if we changed the angle that our muon telescope pointed at. We used three detectors offset about a meter apart and shifted horizontally to minimize the acceptance angle. First we started at 90 degrees (pointing straight up) and then measured every 15 degrees until the telescope was parallel to the ground (at 0 degrees). We repeated with each of the cardinal directions. Our results were that the count rate became higher when the angle was at or close to 90 degrees, and the count rate did not differ significantly when the cardinal direction was changed.

Materials

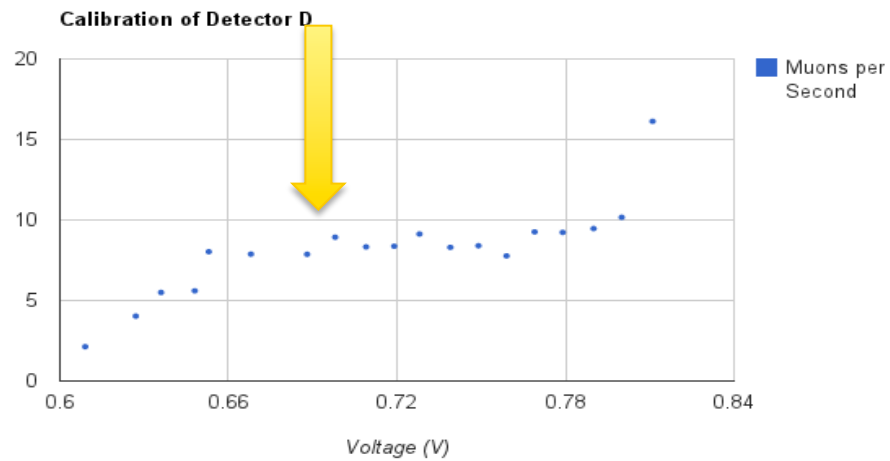
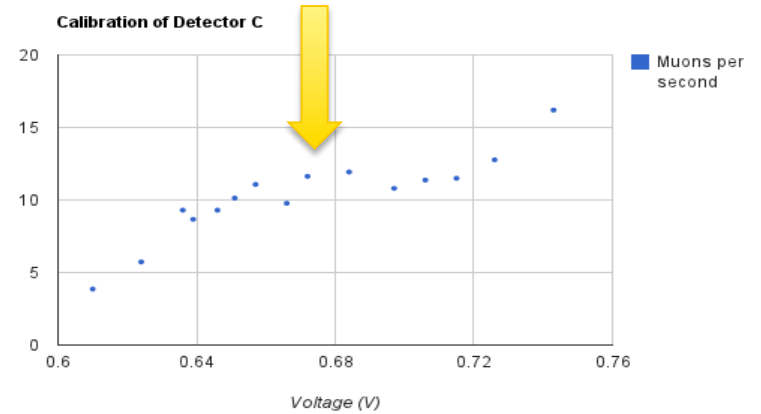
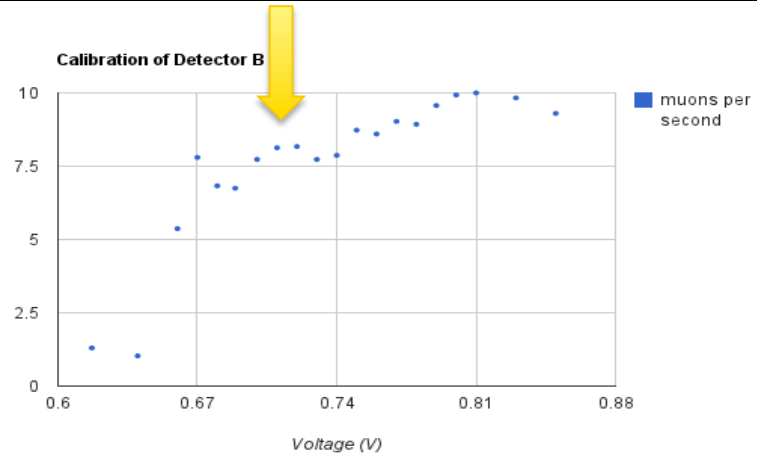
- 3 detectors
- DAQ/PDU
- Cardboard poster tubes
- Cardboard from boxes
- 2 metal bars with holes
- Wood for base
- Rope to secure the angle of the telescope
- tape



Procedure and Set Up

- We used 3 scintillators and put them on parallel planes but slightly shifted them to reduce the largest angle of acceptance to $.2007$ radians (11.5 degrees).
- We took the telescope up to the roof of the parking garage so the muons could not be affected by surrounding materials
- We started with the telescope pointed straight up and timed it for an hour. Then we changed the angle by 15 degrees and went all the way to 0 degrees in each cardinal direction.

Calibration

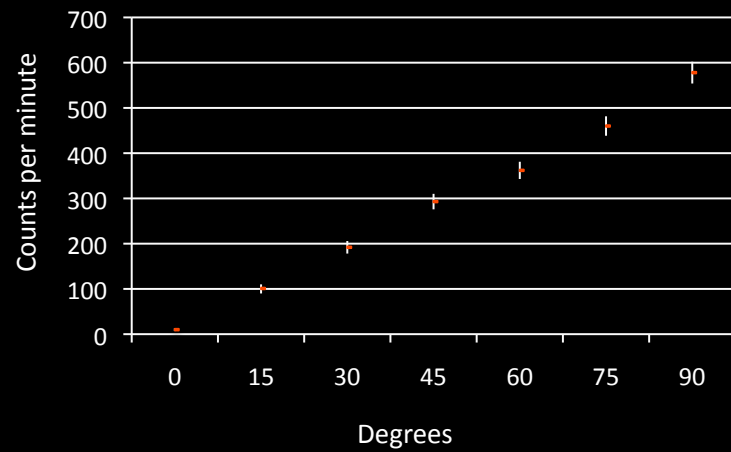


Results

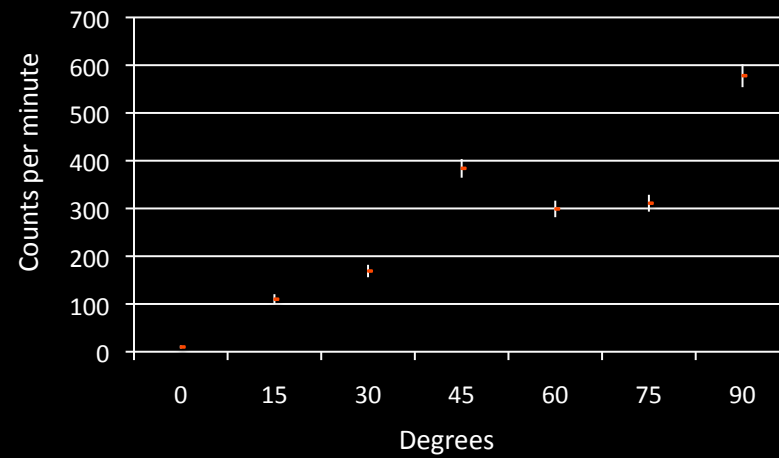
As the angle changed and became closer to 0 degrees, the amount of muons going through all three detectors significantly decreased. At 90 degrees the count in one hour was 578 muons while the average count for 0 degrees was close to 14 muons. The cardinal direction the telescope pointed did not significantly affect the muon count.

Results Cont.

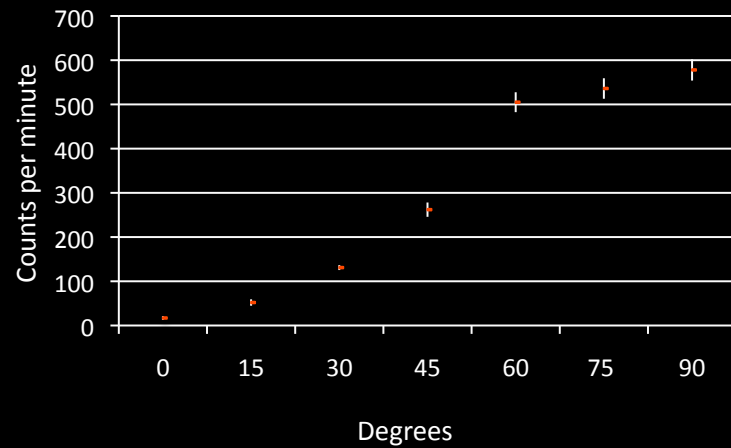
North



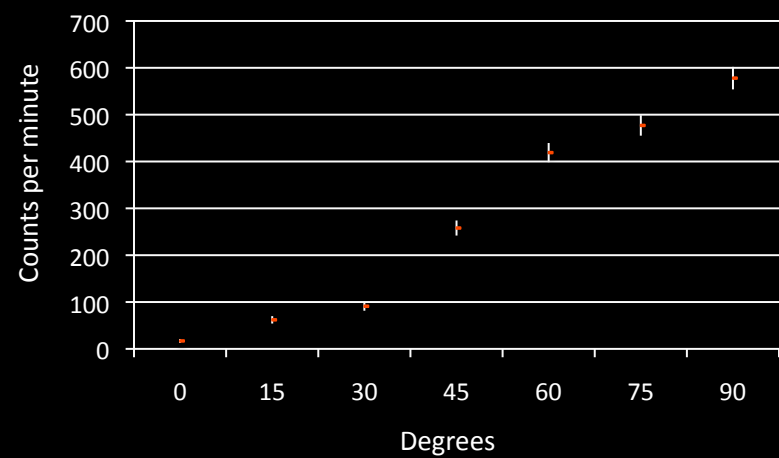
South



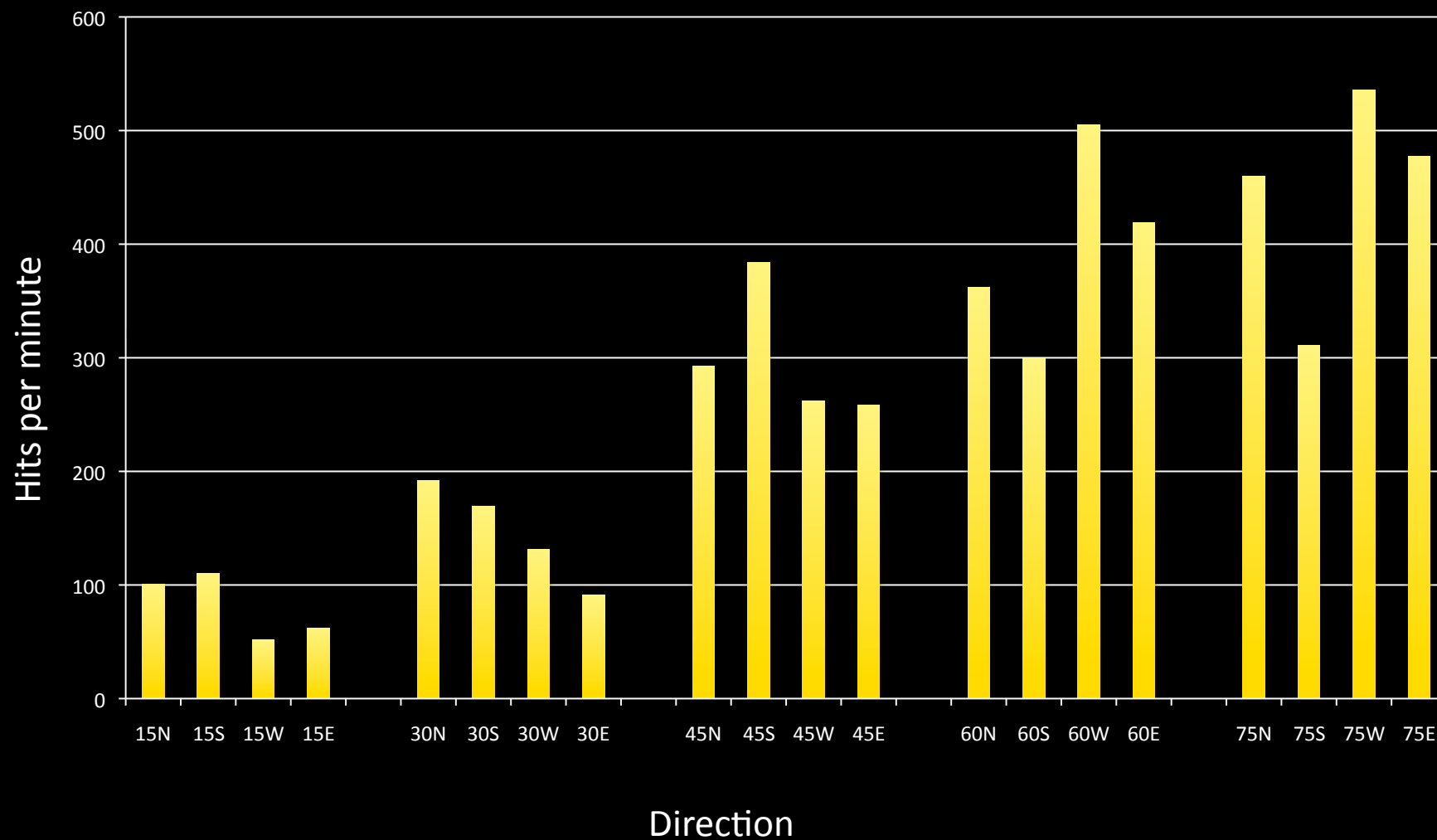
West



East



Difference in Cardinal Direction



Sources of Error

- The changes in weather might have an affect on the amount of showers or an affect on muon decay in the atmosphere
- The slight changes in voltage each day might have changed the count rate
- Due to manual construction/human error as well as the slant on the roof, the angles we pointed the telescope could have been slightly innacurate

Conclusion

Because the count rate decreased as the angle of the telescope became close to 0 degrees, we can assume that most of the muons that are created during cosmic ray collisions fall straight to the ground, or that the muons that come at angles must fall through more atmosphere and decay in the process.