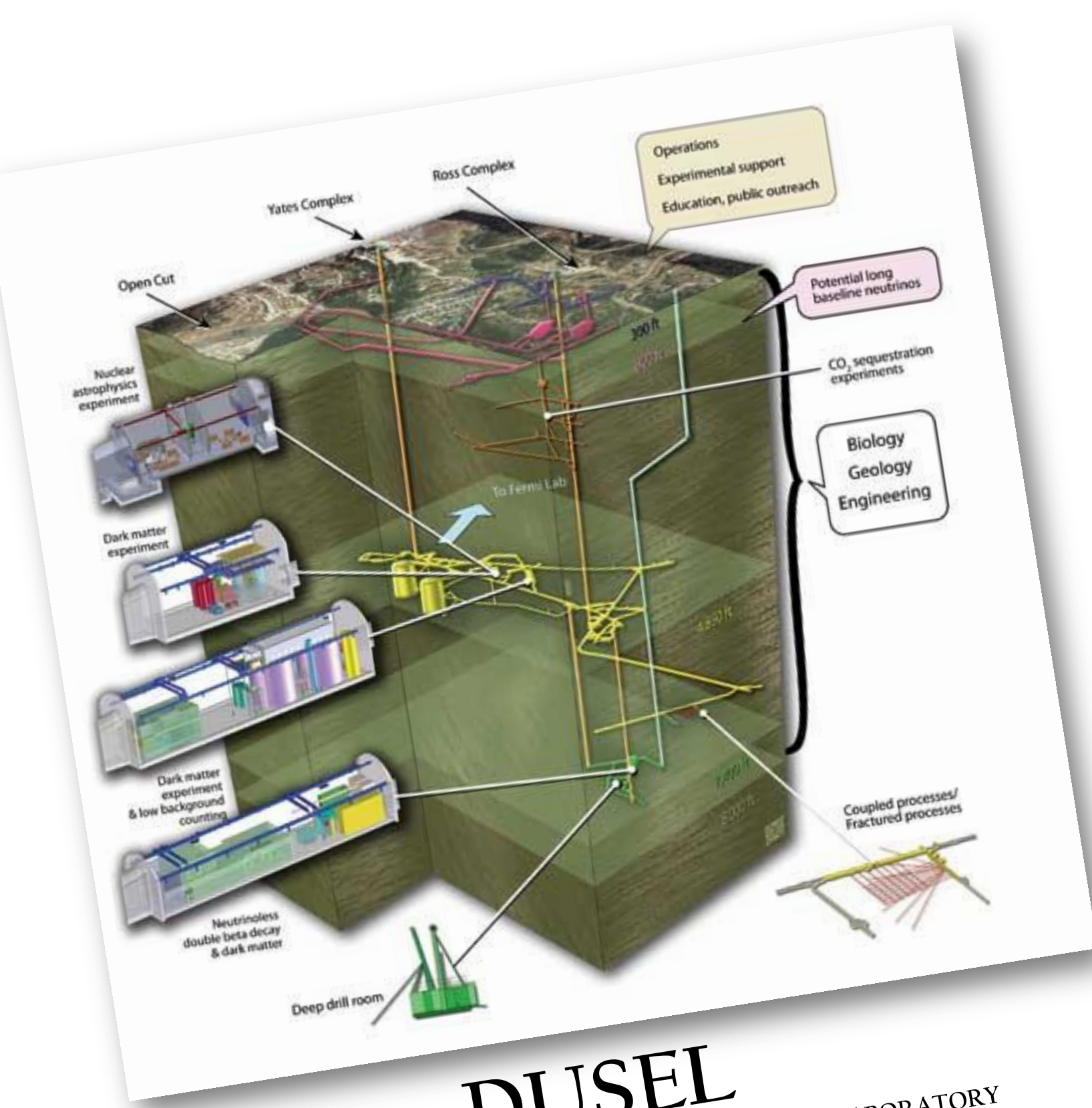


Silence of the Cosmic Rays

Matt Lewis, Laurie Blevins, Andrew Cochran and Lars Londot

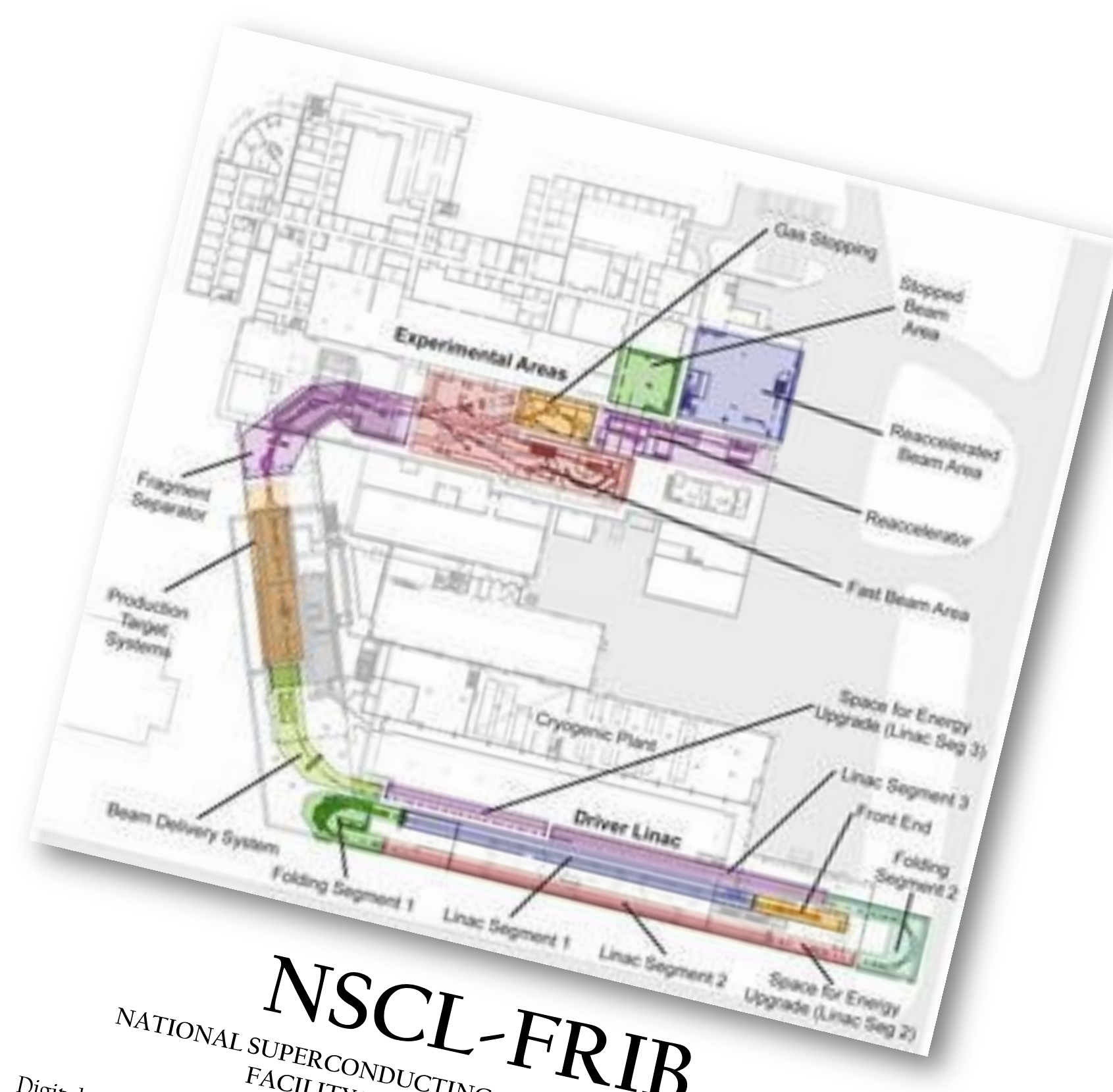
Kansas State University, Michigan Tech University, University of Alaska – Fairbanks, Wagner College

MOTIVATION



DUSEL

DEEP UNDERGROUND SCIENCE AND ENGINEERING LABORATORY
 Digital image. Deep Underground Science and Engineering Laboratory. Sanford Lab, n.d. Web. 31 July 2012.
<http://www.dusel.org/>



NSCL-FRIB

NATIONAL SUPERCONDUCTING CYCLOTRON LABORATORY
 FACILITY FOR RARE ISOTOPE BEAMS
 Digital image. About FRIB | Frb.msu.edu. Michigan State University, n.d. Web. 31 July 2012.
<http://www.frib.msu.edu/about>

Current projects require underground shielding to block out cosmic ray “noise.”
 Can we acquire the same results using above ground concrete in place of digging?

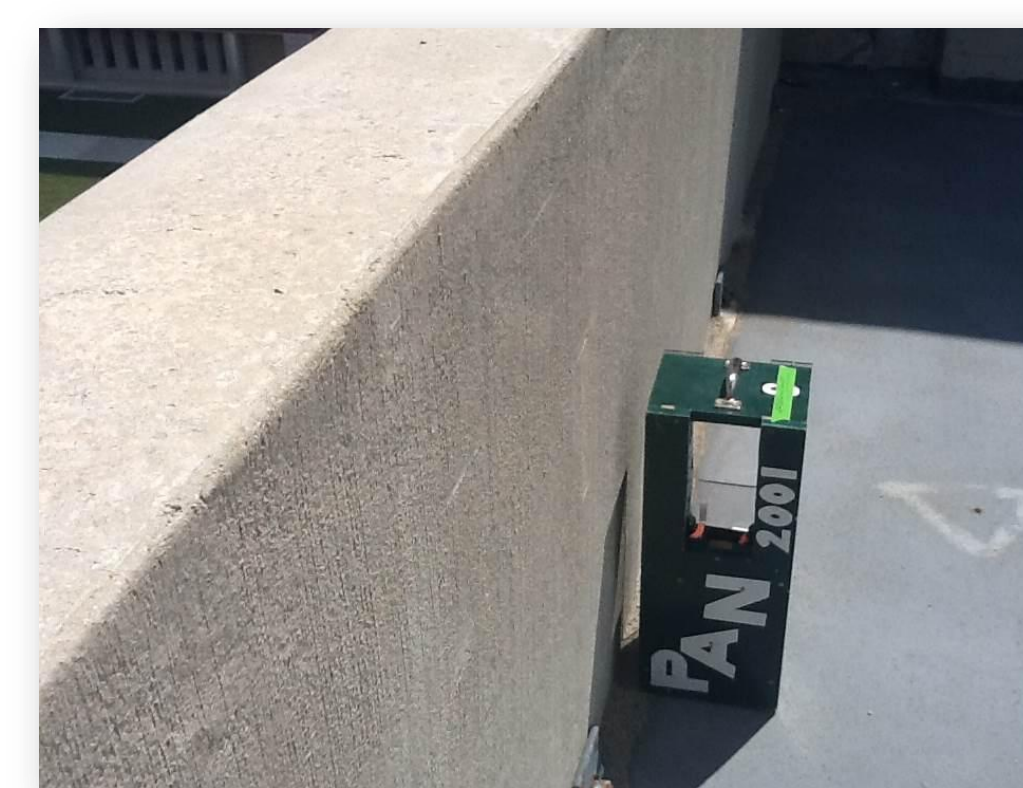
EXPERIMENTAL SETUP



Data was collected at the Shaw Road Parking Garage because of easy access to varying levels of shielding.



Outside of the parking garage (no shielding effects) data was collected with scintillators parallel and perpendicular to the ground to gather control data.



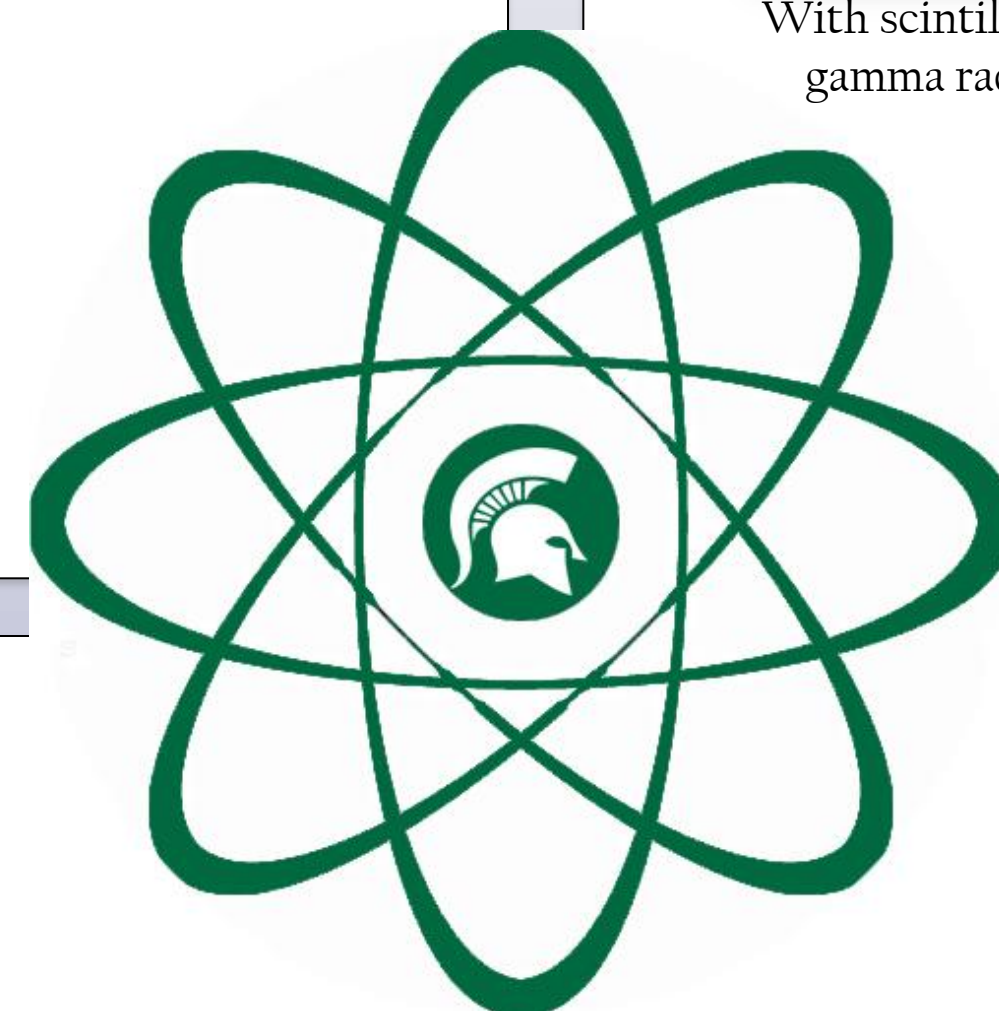
With scintillators oriented parallel to the wall, no gamma radiation of significance was detected from the concrete.



Data was collected in the same relative location on each level of the parking garage.

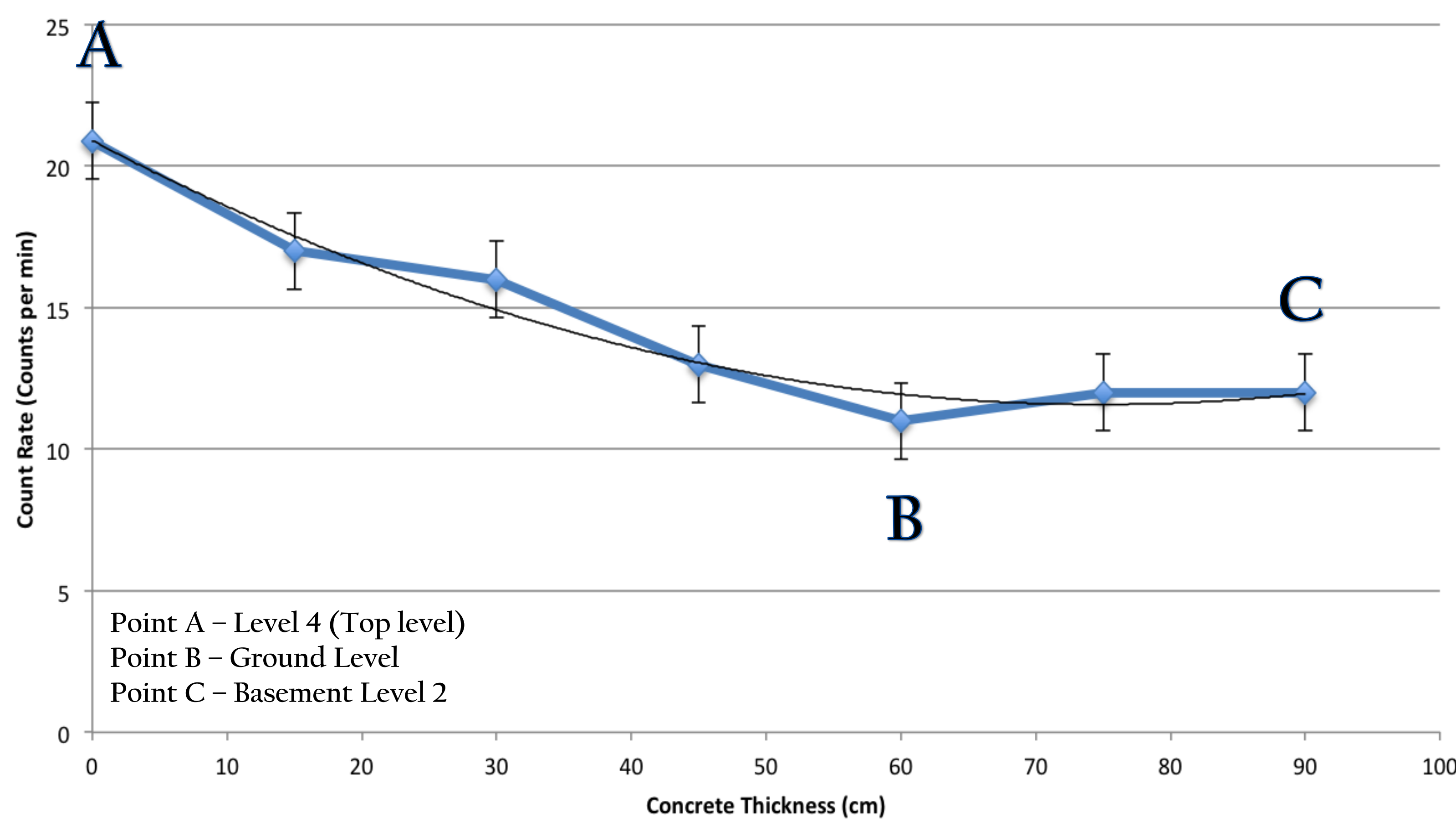


Cosmic ray detector was set for a coincidence setting. Three, three-minute trials were conducted at each location.



ANALYSIS

Count Rate vs. Concrete Thickness, including Basement Levels



Point A – Level 4 (Top level)
 Point B – Ground Level
 Point C – Basement Level 2

CONCLUSION

RESULTS

- ◆ Our background data showed that there was no significant impact of gamma radiation from concrete.
- ◆ Since the counts at the top of the garage (open air) and the counts on the grass (open air) were the same, we focused only on the shielding effects of the concrete roadway.
- ◆ From points A to B on the graph to the left, we lost 3 to 4 counts per 15 cm of concrete.
 - ◆ Points B to C represented the two basement levels.
 - ◆ The slight rise in counts may have been due to a light fixture, possible thicker walls, more enclosed space and other unknown underground factors.
- ◆ The consistent drop in counts from points A to B suggest that concrete does have a shielding effect on cosmic rays.
- ◆ The graph at the lower right, shows that to effectively eliminate cosmic rays with above ground concrete, we would have needed approximately 130 cm of concrete.
- ◆ The parking garage would need to be 9 levels with a concrete thickness of 15 cm.

NEXT STEPS...

- ◆ Conduct the experiment in an above ground parking garage large enough or a slab of concrete thick enough to verify the results.
- ◆ Perform the experiment using other materials to compare the shielding effect of above ground structures.
- ◆ Further investigate the effect of lights in the basement levels..
- ◆ Calculate the energy lost per cm of travel for the muons as they pass through concrete and any other materials that will be tested.

