

In August the QuarkNet@CSU Center held a 3-day teacher workshop at Colorado State University. This workshop was organized by co-lead teachers Adam Pearlstein and Zach Armstrong, and was attended by 6 teachers in addition to a couple of invited guest presenters.

In the morning of the first day, we had an informal sharing session, where all of the teachers had an opportunity to talk about pedagogy and content as related to teaching particle physics content in their classrooms. We were joined by Dr. Gavin Polhemus, a space physicist, string theorist, and local high school teacher, who explained how he teaches a simplified version of the standard model of particle physics to his 9th grade students. Additionally, we brainstormed ideas for presenting at the Colorado Science Conference.

After lunch, we experimented with cosmic ray muon detectors (CRMDs). Our center has 3 CRMDs on loan from QuarkNet national which are shared amongst the teachers in the center. Some of the center's member teachers are quite experienced with CRMD use, while others have never seen them before. We conducted a simple cosmic ray flux study as well as an experiment with a radioactive source which showed a CRMD can be used as a (very noisy) geiger counter. In addition we had time to troubleshoot some issues with one of the CRMDs which ultimately required a replacement part from QuarkNet national.



For the second and third day, we were joined by Ken Cecire from QuarkNet national for a two day training on the LIGO eLab. Teachers had the opportunity to explore and analyze real data from LIGO's seismic sensors. Additionally, they learned about the physics of gravitational waves and how LIGO uses interferometry to measure their effects. Finally, the teachers built a small interferometer and observed the interference pattern from 3 different wavelengths of lasers (405 nm, 520 nm, and 635 nm).

