Construction and Testing of a Prototype for SuperCDMS Neutron Veto

Katrina Schrock (Messiah College, Grantham, PA 17027), Dan Bauer (Fermi National Accelerator Laboratory, Batavia, IL 60510).

Abstract

We helped to build and test a prototype for a device used in the SNOLAB phase of the Cryogenic Dark Matter Search (CDMS) called the neutron veto. Neutrons appear identical to dark matter when in our detectors, so a neutron veto helps us know when neutrons are present and when it may be dark matter. We analyzed the types of glue we were considering using in the prototype by testing them with different parts of our prototype. We also had to test the scintillator, or material that gives off photons when hit by radiation. In our case, the scintillator was liquid mixed with the goal of producing light when neutrons entered the veto. Once our tests of the individual parts were complete, we constructed the prototype itself, which contained eight detectors called silicon photomultipliers (SiPMs) that we tested using an LED and a cooling system, since SiPMs behave differently at different temperatures. We used radioactive sources to test the constructed prototype.