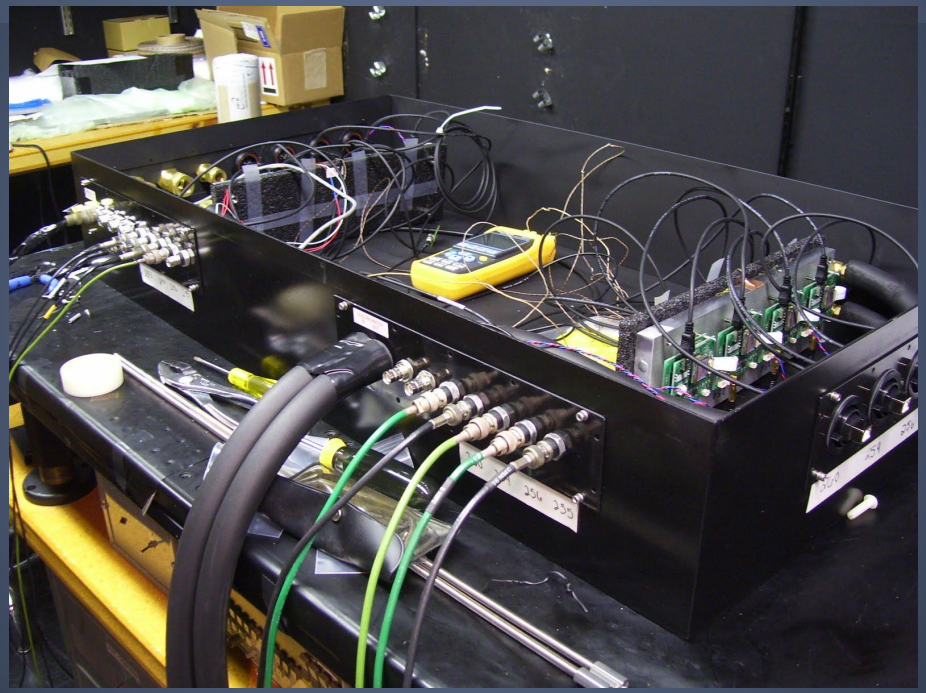
Abstract

We assisted in assembling and testing a neutron veto prototype for the SNOLAB phase of CDMS. As part of this, we analyzed various glues for the attachment of fibers to the prototype. Through analysis with a spectrophotometer, we were able to determine which glues would be effective. Additionally, we investigated several different options for the fluors and concentrations of our scintillator. By using a fluorimeter, we compared the spectra we obtained with the spectrum of the fibers. We constructed a prototype for the neutron veto for SuperCDMS and filled it with scintillator. The prototype contained eight silicon photomultipliers (SiPMs), which we characterized by using an LED setup and a cooling system. We filled the prototype and began to use radioactive sources to test the light yield of this system.

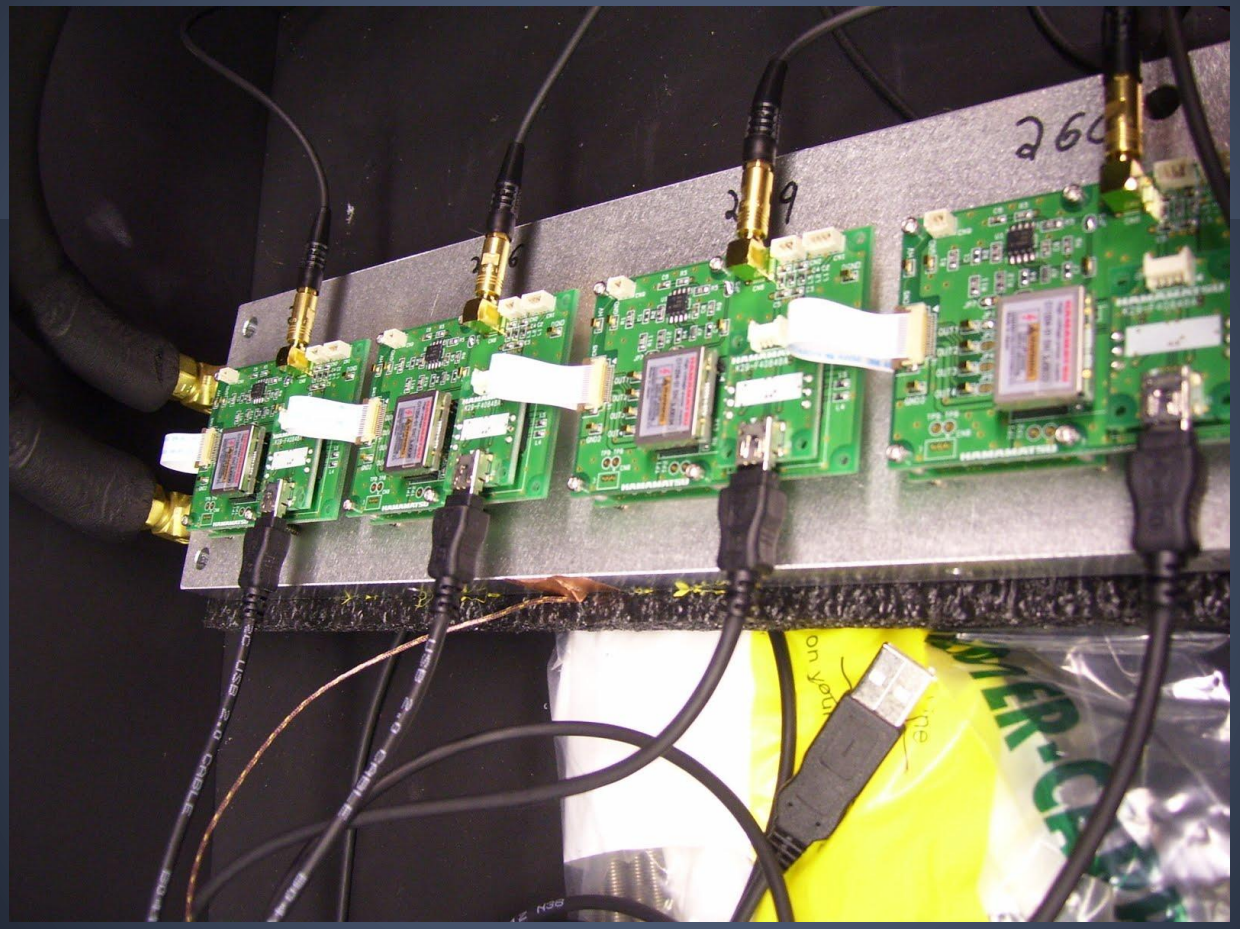
Construction and Testing of a Prototype for SuperCDMS Neutron Veto

Katrina Schrock

Prototype Setup



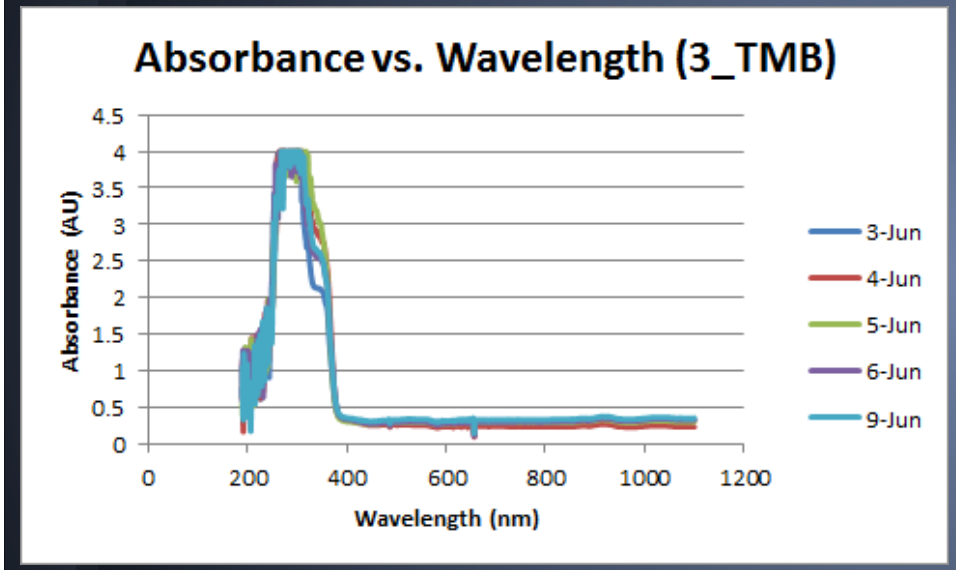
Outer box

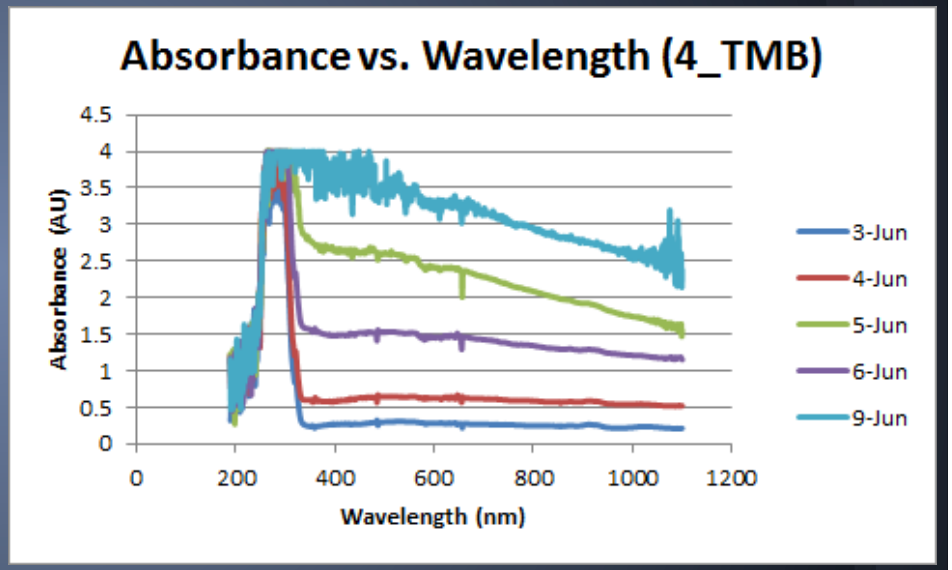


SiPM setup - cooling plate

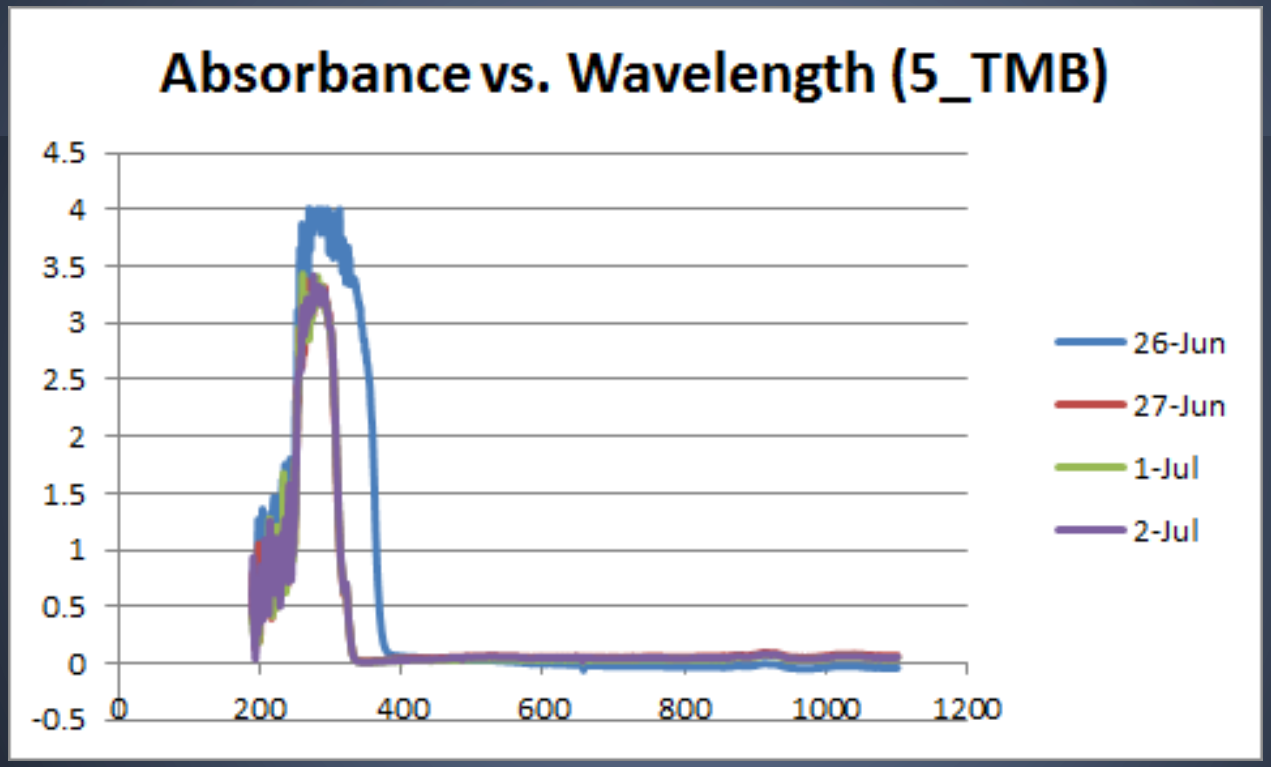
Initial setup for data acquisition

Glue Testing



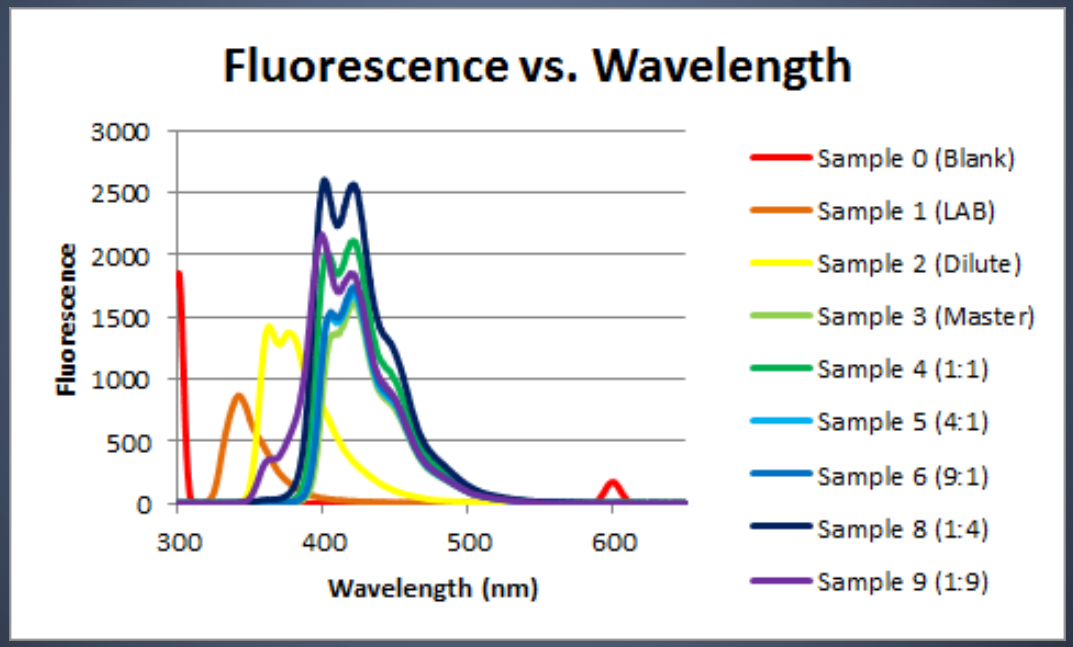


Five-Minute Epoxy (left) and RTV (right) spectra in scintillator containing TMB

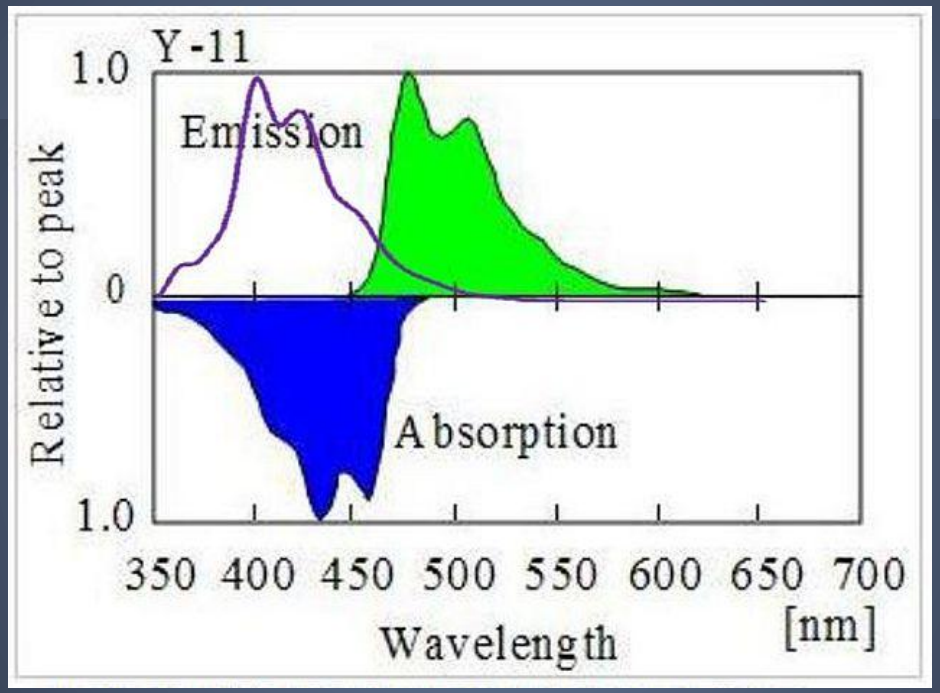


Absorption spectra for DP-100

Scintillator Testing

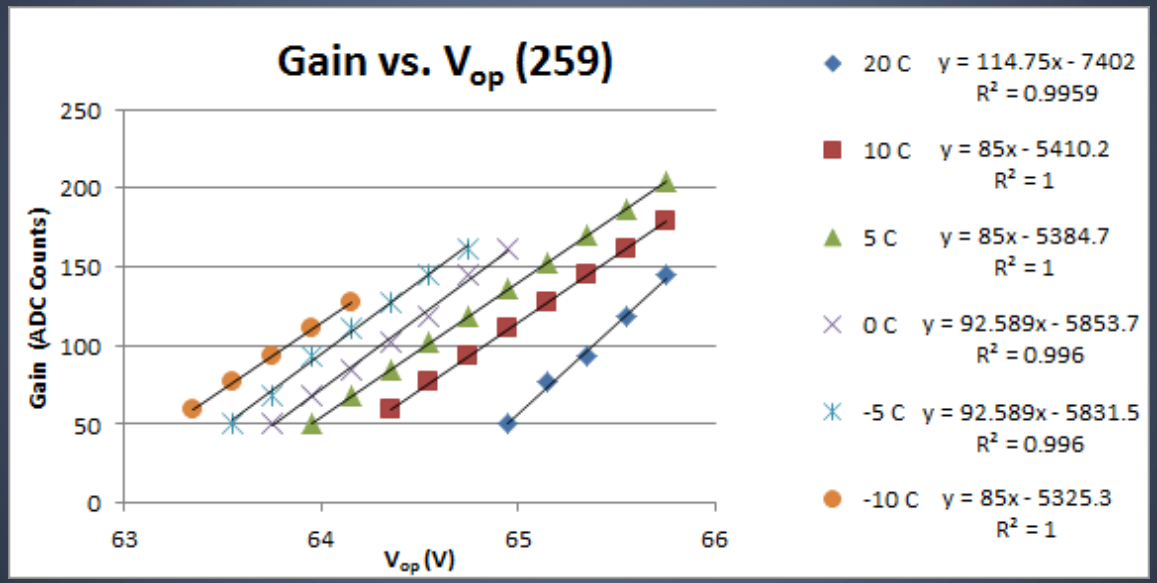


Fluorescence spectra for scintillator samples with varied bis-MSB concentrations

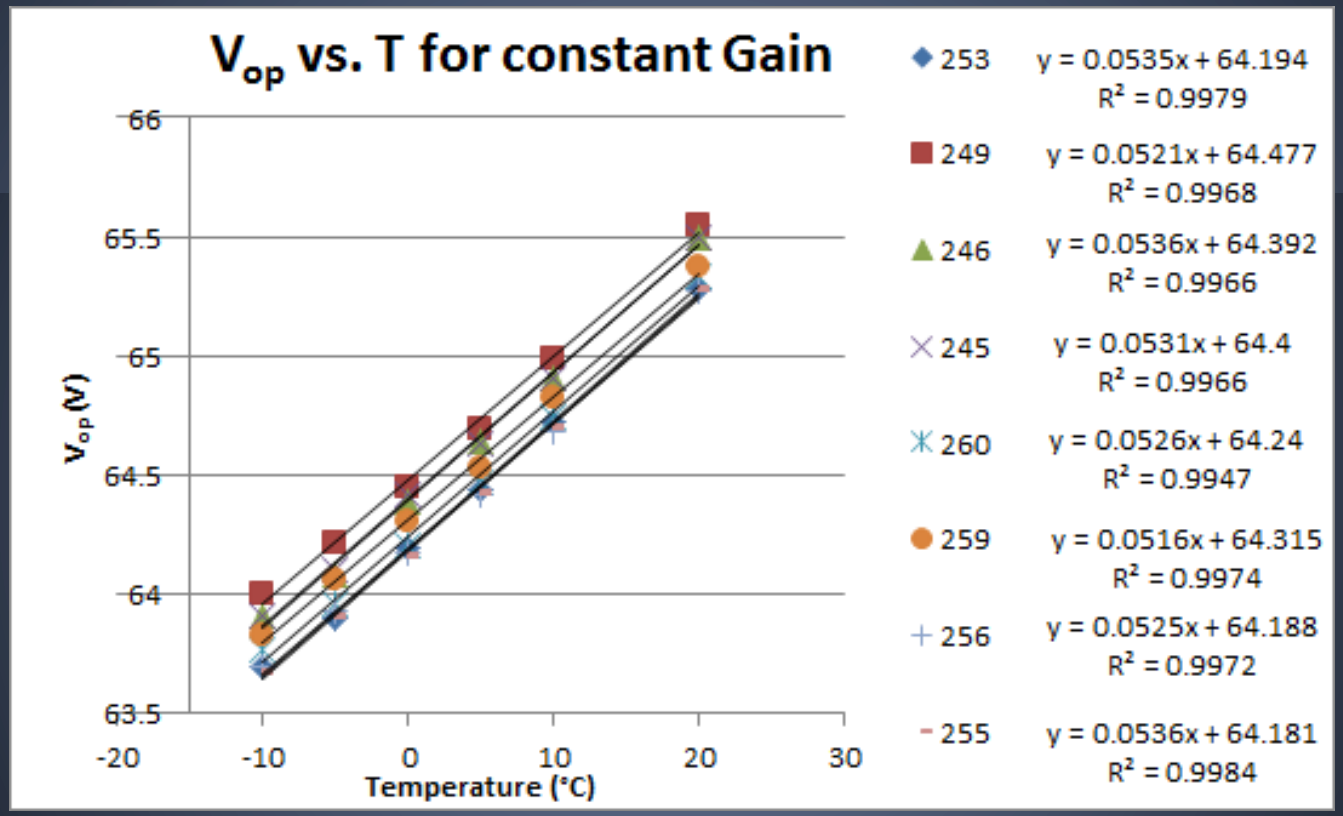


Emission spectrum of 1:9 master to dilute ratio overlaid on Kuraray Y11 fiber emission and absorption spectra

SiPM Characterization



Gain versus operating voltage at multiple temperatures for SiPM 259



Operating voltage versus temperature with constant gain for all eight SiPMs

Conclusions

Glue test - DP100 was our choice.

Scintillator Testing - Chose the 1:9 ratio, meaning 2 g/L PPO and 6.5 mg/L bis-MSB.

SiPM Characterization - Observed relationships between temperature and gain, and operating voltage and temperature at constant gain.

Future Work

Take additional data with radioactive sources and analyze current source data.

Add TMB to scintillator in prototype.

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