Tower Testing and Development for CDMS SNOBAB

Maxwell Lee

Office of Science, Science Undergraduate Laboratory
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Overview

- Introduction to Dark Matter
- Introduction to SuperCDMS and SNOLAB
- SQUIDs and HV detectors
- Co-ax Wire Tension Measurements*
- Fuzz Buttons*
- Tower Engineering*

- * Won't be in this presentation

Dark Matter

- Why do we know it exists?
 - Movement of galaxies and stars
 - Gravitational lensing

- What is it?
 - WIMP? (weakly interacting massive particles)
 - Cold
 - Does not interact with light
 - Weakly interacting

SuperCDMS SNOLAB

- Direct dark matter search
- TES and SQUIDs read phonons, HEMTs read charge
- Dark matter nuclear interactions produce phonons

Detector Tower

SQUIDs

- Superconducting quantum interference device

- 2 Josephson junctions with critical currents (DC)
- Bias current is applied
- Magnetic flux triggers voltages in the junctions
- Must add negligible noise to TES

SQUID Noise Modulation

SQUID Noise Measurements

SQUID Noise Measurements

High Voltage Detectors

- Ability to measure low mass dark matter (<1GeV)
- Increasing the voltage across the detector increases the phonon signal
 - Luke Neganov Effect

$$n \propto V$$

n: # of phonons V: Voltage

Optically Isolated Amplifier

- Optically isolated circuits allow us to float high voltages safely
- Uses a LED light to transmit signal so circuits are not physically connected

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