Online Proceedings

Poster Session 2

Balcony, Easel 88

1:00 PM to 2:30 PM

The Search for Three-Body Final States With a Photon Following Neutron-Nucleus Scattering at Low Energy

Megan E. Kokoris, Senior, Physics: Comprehensive Physics, Astronomy
Mentor: Alvaro Chavarria, Physics

The DAMIC experiment searches for dark matter particle interactions with silicon charged-coupling devices (CCDs). The expected signal are the nuclear recoils following the interaction between the external particles and the silicon nuclei of the CCD. These appear as groupings of pixels on the CCD images where the charge collects from the ionized silicon. Recently, it was proposed that the recoiling silicon nucleus could cause a secondary ionization signal a few pixels away. This is due to a three-body final state where a third particle, a photon, is emitted at the point of interaction. We investigated a series of images from a CCD that was exposed to a neutron source, which also produces nuclear recoils in the silicon. We looked for spatial correlations between events and found that there was an excess of correlated events within the energy range of the neutron source. This excess was found in the neutron data but was absent in the background data. Currently, we are looking at the energy and separation of the events in more detail to learn about their origin. If the observation of three-body final states is confirmed, DAMIC will have found a new way to search for dark matter.

Poster Session 4

Commons East, Easel 54

4:00 PM to 6:00 PM

Characterizing Particulate Contamination on CCDs for Dark Matter Direct Detection

Alexander Lee (Alex) Vellozzi, Junior, Physics: Applied Physics
Mentor: Alvaro Chavarria, Physics
Mentor: Pitam Mitra, Physics

The DArk Matter In Charge-coupled devices (DAMIC) group at the University of Washington tests and packages charge-coupled devices (CCDs) that are used to detect dark matter. The CCD pixel array collects the free electrons that originate from collisions between silicon atoms and outside particles traveling through the CCD. The signal from these electrons is then measured and a two-dimensional image is produced, showing the interaction of the outside particles with the silicon atoms. In order to "see" a dark matter interaction, the CCDs have to be isolated from non-dark matter particles that may pass through. To do this, the experiment is operated 2 km underground and surrounded with lead blocks. However, these measures are in vain if there are radioactive particulates on the packaged CCDs. Radioactive isotopes decay and produce an array of particles, which are detected. One opportunity for particulate contamination is when the CCDs are exposed to the air in the DAMIC cleanroom. Therefore, the cleanliness of the cleanroom must be measured. This is done using a sampling procedure that has been standardized by the International Standards Organization (ISO). We used particle counters to count the number of airborne particulates and then analyzed the data using the ISO classification system. From this, we now know the cleanliness of the DAMIC cleanroom. Additionally, electron microscopy is being used to characterize the particulates that land on the CCDs during the wire-bonding process.