THE INSTITUTE
FOR UNDERGROUND SCIENCE
AT SURF

Contribution ID: **130** Type: **not specified**

TALK: Updates on the Migdal effect and hydrogen doping for dark matter detection

Thursday, June 27, 2024 2:00 PM (45 minutes)

Author: Jayden Newstead

An ongoing challenge in dark matter direct detection is to improve the sensitivity to light dark matter in the MeV–GeV mass range. One proposal is to dope a liquid noble-element direct-detection experiment with a lighter element such as hydrogen. This has the advantage of enabling larger recoil energies compared to scattering on a heavy target, while leveraging existing detector technologies. Direct-detection experiments can also extend their reach to lower masses by exploiting the Migdal effect, where a nuclear recoil leads to electronic ionization or excitation. In this work, we combine these ideas to study the sensitivity of a hydrogen-doped LZ experiment (HydroX) and a future large-scale experiment such as XLZD. We find that HydroX could have sensitivity to dark matter masses below 10 MeV for both spin-independent and spin-dependent scattering, with XLZD extending that reach to lower cross sections. Notably, this technique substantially enhances the sensitivity of direct detection to spin-dependent proton scattering, well beyond the reach of any current experiments.

Presenter: NEWSTEAD, Jayden (University of Melbourne)