

Commissioning of the MIGDAL detector with fast neutrons at NILE/ISIS

Friday, 31 May 2024 12:00 (20 minutes)

Many dark matter experiments are exploiting the Migdal effect, a rare atomic process, to improve sensitivity to low-mass WIMP-like dark matter candidates. However, this process is yet to be directly observed in nuclear scattering. The MIGDAL experiment aims to make the first unambiguous measurement of the Migdal effect in nuclear scattering. A low-pressure optical Time Projection Chamber is used to image in 3-dimensions the characteristic of a Migdal event: an electron and a nuclear recoil track sharing a common vertex. Nuclear recoils are induced using fast neutrons from a DD source, which scatter in the gaseous volume of the detector. The experiment is operated with 50 Torr of CF₄ using two glass GEMs for charge amplification. Both light and charge are read-out, and these measurements are combined for full-track reconstruction.

Commissioning data has been taken with fast neutrons at the Neutron Irradiation Laboratory for Electronics (NILE) at Rutherford Appleton Laboratory in the UK. In this talk, I will present the results of the experiment's commissioning and the performance of the detector with a high rate of highly ionising nuclear recoils. I will also present the detector's performance for low energy electrons, highlighting the capability to operate at the wide dynamic range needed to image the characteristic Migdal topology.

Collaboration

MIGDAL

Role of Submitter

I am the presenter

Primary author: MILLINS, Lex (University of Birmingham / STFC RAL)

Presenter: MILLINS, Lex (University of Birmingham / STFC RAL)

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