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MIGDAL: Towards an unambiguous observation of the Migdal effect in nuclear scattering

Despite no experimental confirmation of the Migdal effect in nuclear scattering, it is currently being exploited by several underground direct dark matter experiments to extend limits on WIMPs cross-sections to lower masses. The Migdal in Galactic Dark Matter Exploration (MIGDAL) experiment aims to make the first observation of this process induced by fast neutrons scattering from intensive DT and DD generators allowing to investigate the Migdal effect in a large range of energies of the nuclear recoils.

The characteristic topology of a Migdal event is an arrangement of two tracks sharing the same vertex, one belonging to a nuclear recoil and the other to a Migdal electron. MIGDAL will use an optical TPC filled with a low-pressure CF4 mixed with noble gases to record high-resolution track images and timing information from scintillation and ionisation readout that will be combined to reconstruct tracks in 3D. Different energy-loss rate distributions of the two tracks will be used to discriminate between signal and background events.

This talk will present the design of the experiment, the result of detailed simulations and estimates of signal and background yields. Up to a few hundred Migdal events are expected to be observed per live day of exposure to neutron beams at the Neutron Irradiation Laboratory for Electronics (NILE) at Rutherford Appleton Laboratory.

Collaboration / Activity

MIGDAL

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