

Towards the first observation of the Migdal effect in nuclear scattering I. Design and construction of the MIGDAL experiment (in-person)

Wednesday, September 15, 2021 11:50 AM (15 minutes)

The Migdal in Galactic Dark Matter Exploration (MIGDAL) experiment aims at making the first observation of the Migdal effect from fast neutron scattering. A Migdal event can be identified by two ionization tracks sharing the same vertex, one belonging to a nuclear recoil and the other to a Migdal electron. To detect this track topology in a low-pressure gas we are building an Optical Time Projection Chamber equipped with glass-GEMs operating in 50-Torr CF₄, with light and charge readout provided by a CMOS camera, a photomultiplier tube, and 120 anode-strip channels. This will allow precise three-dimensional reconstruction of the ionization tracks from electron and nuclear recoils down to 5 keV in electron equivalent energy. The detector will be exposed to intense neutron beams (10⁹-10¹⁰ n/s) from DT and DD neutron generators, enabling us to investigate the Migdal effect in a wide energy range of nuclear recoils. We will report on the status of the design and construction of the experiment at the Neutron Irradiation Laboratory for Electronics (NILE) of the Rutherford Appleton Laboratory, UK.

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Session Classification: Applications in Astro-particle Physics; Applications in Astronomy, Planetary and Space Science 2

Track Classification: Applications in Astro-particle Physics