

Migdal event rates for D-D and D-T neutron generators

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The ‘Migdal effect’ is an atomic physics effect that leads to the emission of a bound-state electron from atomic or molecular systems when the atomic nucleus is suddenly perturbed. This effect has been used by several experimental collaborations to extend the sensitivity of dark matter direct experiments to sub-GeV mass dark matter candidates. The MIGDAL (Migdal In Galactic Dark mAtter expLoration) collaboration has been formed to detect the tell-tale signature of an electron that has been ejected from an atom or molecule upon the scattering of fast neutrons, providing a unique and unambiguous measurement of the Migdal effect. The experiment will run with intense D-D and D-T neutron generators at the Rutherford Appleton Laboratory (RAL) in the UK.

In this talk, I will present the atomic-physics theory underlying the Migdal effect and discuss the differences and similarities of the effect between dark matter direct detection experiments and at the D-D and D-T neutron energies employed at RAL. I will then present estimates for the number of events that can be observed at the experimental set-up at RAL for several different gas species.

Reference to paper (DOI or arXiv)

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