



INVITATION

as part of the Particle Physics Seminar

to the talk by

Stefan NELLEN

(University of Vienna)

on

***“When can a Collision Shake an Electron off an Atom?
The Migdal Effect and Adiabatic Response”***

Abstract:

The Migdal effect, the prompt ionization induced by a nuclear recoil, has become an important channel in direct dark matter searches, enabling sensitivity to recoils that would otherwise fall below nuclear-recoil thresholds. Recently, the first detection of the Migdal effect from neutron-nucleus scattering was announced in a gaseous target. Over the past decade, the theory of the Migdal effect has also been developed and extended beyond atoms. A significant issue in standard calculations of the Migdal ionization rate is that they rely on the so-called impulse approximation: the assumption that the projectile scatters off the nucleus instantaneously. However, for a sufficiently slow interaction, one would expect the electrons to respond adiabatically and ionization to be suppressed; the electron cloud remains in its ground state and moves together with the slowly recoiling nucleus. In this work, we present a first-principles derivation of the Migdal effect beyond the impulse approximation. We find that dark matter searches lie in the sudden regime, so prior limits set using the impulse approximation are robust. On the other hand, neutron-nucleus scattering may be subject to adiabatic corrections.

Time: Tuesday 23 June 2026, 4:15 p.m.

Location: Erwin-Schrödinger Lecture Hall, 1090 Vienna, Boltzmannngasse 5, 5th floor

Join Zoom Meeting - Meeting ID: 933 4269 3866 Passcode: 185096
<https://univiennea.zoom.us/j/93342693866?pwd=aUpTR0VJNUhJY2Q0ajdaKzI1YWVBQT09>

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