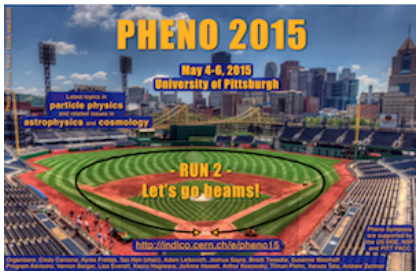


Contribution ID: **63** Type: **parallel talk**

# Modulation Effects in Dark Matter-Electron Scattering Experiments

*Monday 4 May 2015 15:00 (15 minutes)*

One of the next frontiers in dark-matter direct-detection experiments is to explore the MeV to GeV mass regime. Such light dark matter does not carry enough kinetic energy to produce an observable nuclear recoil, but it can scatter off atomic electrons, ionizing the target atom and leading to a measurable signal. We introduce a semi-analytic approach to characterize the resulting electron-scattering events in atomic and semiconductor targets, improving on previous analytic proposals that underestimate the signal at high recoil energies. We then use this procedure to study the time-dependent properties of the electron-scattering signal, including the modulation fraction, higher-harmonic modes and modulation phase. The time-dependence is distinct in a non-trivial way from the nuclear scattering case and also affected by gravitational focusing due to the Sun. Additionally, we show that dark matter interactions inside the Earth can significantly distort the lab-frame phase-space distribution of sub-GeV dark matter, leading to a daily modulation.

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**Session Classification:** Dark Matter I