Color centers as LDM detectors

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This experimental effort is currently in R&D phase. On the experimental side my group (3-4 people) are involved, and on the theoretical side 2-3 more, in Tel Aviv University - the Volansky group.

Primary physics goals: Detecting NRs of LDM, down to masses of $\lesssim$ 100 MeV. On top of that, sensitivity to solar νs is reached with exposures of about 100 kg$\times$year.

Summary of the experimental approach and setup

Using defects in crystals created by a NR of the order of 10 eV as the probe for LDM elastic scattering. The defects live practically forever, and in many cases are spectroscopically active. The concept is to look at a bulk of these and count extra defects as they form.

Challenges are many, to list the most important: Finding a handle of the optimal signal, rejecting backgrounds, removing existing defects (production, annealing), calculations of rates, branching ratios and response.

Summary of existing and future physics results

This project is in R&D phase, with very preliminary results on the experimental side and progress made on theoretical calculations of sensitivities and physics reach.

Plot(s) that summarize the experimental sensitivity and/or concept

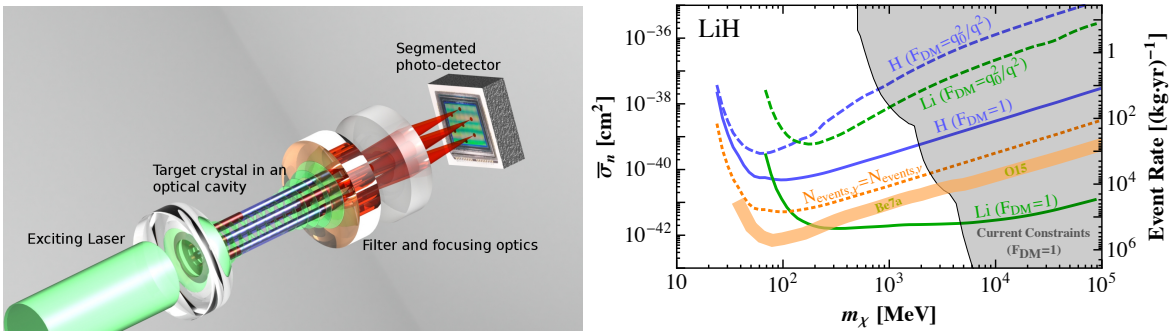

Figure 1: Left: envisioned setup of crystal rods, excited by a laser and probed by an array of photon counters. Right: preliminary sensitivity plots for LiH crystal and various assumptions on the interaction with nuclei.

Timescale of future plans

R&D will be performed in the coming 2-3 years, with later stages focused on specific targets which are the most promising. A prototype for actual DM single scatter setup is expected in $\sim$ 5 years. Budget for an actual experiment is currently estimated at order of 1 M$ for equipment, but with large uncertainties for now.