

Abstract Submitted
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Direct Detection of Sub-GeV dark matter through molecular excitations JESUS PEREZ-RIOS, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Germany, ROUVEN ESSIG, C. N. Yang Institute for Theoretical Physics, Stony Brook University, USA, HARIKRISHNAN RAMANI, Berkeley Center for Theoretical Physics, Department of Physics, University of California, Berkeley CA 94720, OREN SLONE, Princeton Center for Theoretical Science, Princeton University, Princeton, NJ 08544, USA — We propose a novel direct detection concept to search for dark matter with 100 keV to 100 MeV masses. Here, dark matter scatters off molecules in the gas phase transferring part of its kinetic energy to the internal degrees of freedom of the molecule. The excited molecule decays emitting a multiple infrared photons, which are detected externally with ultrasensitive photodetectors. We discuss in detail carbon monoxide at a temperature of 50K and with a high vapor pressure, leading to efficient photon emission. Using different isotopes of the molecule, the target is also sensitive to spin-dependent dark matter interactions with the neutron. Moreover, we also consider a target made of hydrogen halides, which probe spin-dependent dark matter interactions with the proton. The present detection concept can be realized with near-term technology and allows for the exploration of orders of magnitude of new dark matter parameter space.

Jesus Perez Rios
Fritz-Haber-Institut der Max-Planck-Gesellschaft, Germany

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