

Hunting axion dark matter with anti-ferromagnets: a case study with nickel oxide

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We show that nickel oxide, which is already a very promising target to look for sub-MeV dark matter scattering, can be employed to hunt axion dark matter, with masses in the meV range and couplings to electrons allowing them to potentially be QCD axions. We describe the interactions between axions and the collective excitations of nickel oxide in terms of a universal effective field theory, built solely out of symmetry arguments. The processes of conversion into one or two excitations provide, respectively, a narrowband and a broadband channel for the axion search, and the possibility of varying an external magnetic field up to a phase transition point allows to cover a large portion of a yet unexplored parameter space, reaching axion masses down to few fractions of an meV. Our results underline nickel oxide as an ideal candidate for a multi-purpose target for light dark matter searches.

Primary authors: CATINARI, Pier Giuseppe (Istituto Nazionale di Fisica Nucleare); ESPOSITO, Angelo (Istituto Nazionale di Fisica Nucleare); PAVASKAR, Shashin (University of Illinois at Urbana-Champaign)

Presenter: CATINARI, Pier Giuseppe (Istituto Nazionale di Fisica Nucleare)

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