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Optimal antiferromagnets for dark matter detection

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We propose anti-ferromagnets as optimal targets to hunt for sub-MeV dark matter with spin-dependent interactions. These materials allow for multi-magnon emission even for very small momentum transfers, and are therefore sensitive to dark matter particles as light as the keV. We use an effective theory to compute the event rates in a simple way. Among the materials studied here, we identify nickel oxide (a well-assessed anti-ferromagnet) as an ideal candidate target. Indeed, the propagation speed of its gapless magnons is very close to the typical dark matter velocity, allowing the absorption of all its kinetic energy, even through the emission of just a single magnon.

Mini Symposia (Invited Talks Only)

Author: PAVASKAR, Shashin

Co-author: ESPOSITO, Angelo

Presenter: PAVASKAR, Shashin

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