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Global fit of Non-relativistic Effective Operator Dark Matter using Solar Neutrinos

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In the search for particle dark matter (DM) the most prominent model is the Weakly Interacting Massive Particle (WIMP). This work uses Non-Relativistic Effective Operators (NREOs) from corresponding effective field theory (EFT) to describe WIMP DM interactions. The advantage of the NREO formalism is its ability to describe interactions outside the typical spin dependent and spin independent couplings. Should particle DM have some weak interaction with baryonic matter, the DM would interact with the matter found in the Sun and other massive bodies. When the DM scatters to velocities below the local escape velocity of such a body, this results in gravitational capture. The NREO formalism can allow for elements like iron to dominate capture rates in the Sun despite their low abundance. This solar DM constraint can be combined with direct detection (DD) experiments to complement their constraints. This is done using the Global And Modular BSM Inference Tool (GAMBIT) to allow for a global analysis of the current state of DM detection using the NREO formalism. GAMBIT is able to simultaneously consider Solar capture of DM along with current DD experiments to perform a novel analysis of the parameter space for WIMP DM.

Collaboration name

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