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Probing BSM physics with Solar and Atmospheric Neutrinos in Dark Matter Experiments

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We demonstrate the ability of future dark matter experiments to probe beyond the standard model (BSM) effects in neutrino scattering of solar and atmospheric origin in models with heavy scalar and vector mediated interactions. Mapping the effective four-Fermi vertex of a scalar NSI to the well studied model of leptoquarks, we find that near future detectors can probe parameter space beyond the reach of current and planned collider facilities. Using this formalism, we place constraints on the S1 leptoquark using preliminary data from LUX-ZEPLIN (LZ). We comment on the effects of the diffuse supernova neutrino background and discuss the ability of leptoquarks to explain neutrino masses and $(g - 2)_\mu$ motivating experimental probes of such models.

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