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SIMPs with Vector Mediators

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A general mechanism for thermal production of dark matter (DM) via 3-to-2 scatterings, or other higher-order interactions, allows for sub-GeV dark matter and strong self-interactions that meet existing constraints but have the potential to explain mysteries with cold DM and structure formation. In such models, so-called Strongly Interacting Massive Particles (SIMPs), a correct thermal average is important. These SIMP mechanism can exist in models with multiple scalars or in a strongly coupled gauge theory where the Weiss-Zumino-Witten term generates the 3-to-2 interaction. Particularly, a two-scalar model with a residual Z_5 discrete symmetry and a model with a dark QCD sector can produce parameter spaces where the SIMP paradigm is realized. In both models, the importance of vector mediators in the SIMP mechanism, and how these vector mediators affect the thermal average, is discussed.

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