

Impact of Sommerfeld Effect and Bound State Formation in Simplified t-Channel Dark Matter Models

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A non-minimal dark sector could explain why WIMP dark matter has evaded detection so far. Based on the extensively studied example of a simplified t-channel dark matter model involving a colored mediator, we demonstrate that the Sommerfeld effect and bound state formation must be considered for an accurate prediction of the relic density and thus also when inferring the experimental constraints on the model. We find that parameter space thought to be excluded by LHC searches and direct detection experiments remains viable. Moreover, we point out that the search for bound state resonances at the LHC offers a unique opportunity to constrain a wide range of dark matter couplings inaccessible to prompt and long-lived particle searches.

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