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Global study of effective Higgs portal dark matter models using GAMBIT

Monday, 2 December 2019 14:30 (20 minutes)

In this talk, I'll present results from a global analysis of effective Higgs portal dark matter (DM) models in frequentist and Bayesian statistical frameworks. We use the GAMBIT software to determine the preferred mass and coupling ranges for vector, Majorana and Dirac fermion DM models. We also assess the relative plausibility of all four (including scalar DM) models using Bayesian model comparison. Our analysis includes up-to-date likelihood functions for the DM relic density, invisible Higgs decays, and direct and indirect searches for WIMP DM, and includes the latest XENON1T data. We also account for important systematic uncertainties arising from the local DM density and velocity distribution, nuclear matrix elements relevant for direct detection, and Standard Model masses and couplings.

From our global analysis, we find the parameter regions that can explain all of the DM and give a good fit to the observed data. The case of vector DM requires the most tuning and is thus slightly disfavoured from a Bayesian point of view, whereas the fermionic DM case requires a strong preference for including a CP-violating phase due to respective suppression of direct detection limits. Finally, we present DDCalc 2.0.0, a tool for calculating direct detection observables and likelihoods for arbitrary non-relativistic effective operators. All of our results and samples are publicly available via Zenodo.

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