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Dark matter in minimal universal extra dimensions with a stable vacuum and a 126 GeV Higgs boson

The recent discovery of a Higgs boson with mass of about 126 GeV, along with its striking similarity to the prediction from the standard model, informs and constrains many models of new physics. The Higgs mass exhausts one out of three input parameters of the minimal, five-dimensional version of universal extra dimension models, the other two parameters being the Kaluza-Klein (KK) scale and the cutoff scale of the theory. The presence of KK fermions with large coupling to the Higgs implies a short-lived electroweak vacuum, unless the cutoff scale is at most a few times higher than the KK mass scale, providing an additional tight constraint to the theory parameter space. In this presentation, I will present results where we focus on the lightest KK particle as a dark matter candidate and investigate the regions of parameter space where such particle has a thermal relic density in accord with the cosmological dark matter density. We find the paradoxical result that, for low enough cutoff scales consistent with vacuum stability, larger than previously thought KK mass scales become preferred to explain the dark matter abundance in the Universe. The explanation for this phenomena is previously unconsidered coannihilation partners for the dark matter which become important at such low cutoff scales. I will show current constraints on the theory from both collider and direct dark matter searches as well as predicted sensitivity ranges for future experiments that might soon close in on all viable theory parameter space.

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