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Gamma rays from light dark matter in vector-scalar portals

Detecting gamma-ray signals that could be due to dark matter (DM) particles would give us invaluable information about the nature of DM. In particular, gamma-ray lines could provide a way to measure the DM mass. The excellent energy resolution of the upcoming MeV gamma-ray telescope COSI will allow us to probe underexplored regions of the DM parameter space while being sensitive to distinctive spectral features of potential DM signals. In this talk, I will discuss the case of a fermionic sub-GeV DM in the context of standard model extensions featuring a new U(1) gauge symmetry spontaneously broken by a singlet scalar. The masses of the new particles in this class of vector-scalar portal models are closely related and can be at the MeV scale, leading to detectable gamma-ray lines in the bandpasses of COSI and proposed missions such as AMEGO-X. We estimate the sensitivity of COSI and AMEGO-X to sub-GeV DM in this context, considering a B-L and a purely axially coupled Z' as benchmark examples. We find regions of the parameter space where COSI will provide leading constraints, beyond the strong CMB limits. On the other hand, AMEGO-X would probe most of the viable parameter space leading to continuum gamma rays.