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Search for dark photons with CMS and fixed-target experiments

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Searches for dark matter in the past two decades have largely focused on Weakly Interacting Massive Particles (WIMPs). But what if instead of just one type of dark matter particle, there exists a richer dark sector hidden from ordinary view? This opens up a whole new paradigm for dark matter searches, allowing us to focus not only on the coupling between dark matter and the Standard Model, but also on the interactions between dark sector constituents themselves. In this talk, I describe two complementary approaches to this new kind of dark matter program: (1) PADME, a fixed-target, missing-mass experiment seeking evidence for the dark photon, a hypothetical mediator of a new U(1) gauge symmetry in the dark sector; and (2) a search for inelastic dark matter (iDM) with a unique signature in the CMS detector, using dark photons as DM-SM mediators. The complementarity of these two methods is explored, both in terms of accessible parameter space and experimental challenges.

Summary

I describe two ongoing searches for rich dark sector physics relying on complementary experimental approaches: a search for inelastic dark matter (iDM) with the CMS detector and the LHC collider; and PADME, a fixed-target, missing-mass experiment to search for direct evidence of dark photons.

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