

Charged particles for dark matter detection

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I will discuss two new ideas for using charged particles for dark matter detection. First, we find that ion traps allow sensitive searches for millicharged dark matter. Motivated by both particle physics and quantum information, significant experimental work has gone into isolating the ions from the environment. Millicharged dark matter would provide an irreducible source of heating for a trapped ion with a characteristic spectrum of events. We find that results from existing ion traps already place limits on millicharged particle parameter space far beyond previous constraints. Future ion trap experiments could significantly improve this reach with prospects for discovering millicharged dark matter over many orders of magnitude in mass and charge. Second, we will discuss the use of charged particle storage rings for detection of axion dark matter and dark energy. The relativistic speed of the particles in the ring significantly boosts the signal. This allows a sensitive search for axions and dark photons in the lightest possible dark matter mass range.

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