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Dark matter velocity spectroscopy

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Dark matter decays or annihilations that produce line-like spectra may be smoking-gun signals. However, even such distinctive signatures can be mimicked by astrophysical or instrumental causes. We show that velocity spectroscopy—the measurement of energy shifts induced by relative motion of source and observer—can separate these three causes with minimal theoretical uncertainties. The principal obstacle has been energy resolution, but upcoming experiments will reach the required 0.1% level. We demonstrate this technique using existing technologies.

Author: LAHA, Ranjan (Stanford University)

Presenter: LAHA, Ranjan (Stanford University)

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