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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. As an example, we show that experiments with the required energy resolution can cleanly separate the signal from background. We emphasize that this new smokingguninmotion signature of dark matter is general, and is applicable to any dark matter candidate which produces a sharp photon feature in annihilation or decay.

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