Contribution ID: **116** Type: **Oral**

Dark matter velocity spectroscopy

Friday, 11 August 2017 16:45 (15 minutes)

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.

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Session Classification: Dark matter

Track Classification: Dark matter (direct detection, indirect detection, theory, etc.)