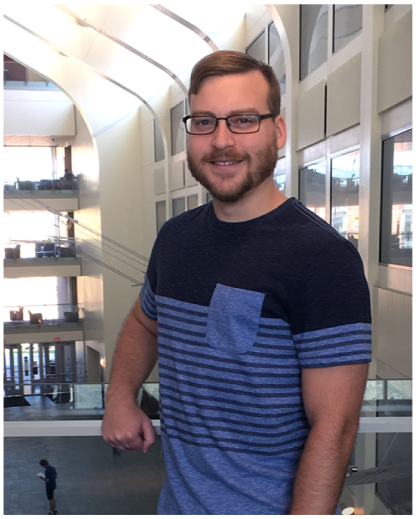
DEPARTMENT OF PHYSICS

High Energy Physics Seminar

Friday, April 13, 2018 @ 11:30 AM
Room M2035
Physics Research Building



Evan Johnson

The Ohio State University

Hosted by Prof. Eric Braaten

Zero-Range Effective Field Theory for Resonant Wino Dark Matter

Dark matter in the form of weakly interacting massive particles (WIMPs) with masses at the TeV scale receive nonperturbative "Sommerfeld enhancements" to their pair annihilation rates due to unsuppressed exchanges of weak gauge bosons before the annihilation. These enhancements are conventionally computed numerically through the solution of coupled-channel Schrödinger equations. The most dramatic enhancements occur when there is an S-wave resonance near the WIMP-pair threshold. My collaborators and I have developed an effective field theory for wino dark matter near such a resonance. Winos interact nonperturbatively through zero-range contact interactions as well as through the long-range Coulomb interaction. Our analytic results for wino scattering and wino-pair annihilation accurately reproduce the results calculated numerically using the Schrödinger equation. I will show how this effective field theory is systematically improvable, how the Coulomb resummation is carried out, and how to build in the annihilation processes. Finally, I will demonstrate the power of this effective field theory by showing how a complicated process, the formation of a WIMP-pair bound state, can be calculated analytically.

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