

Abstract Submitted  
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**Annihilation rates of wino dark matter from an effective field theory approach**<sup>1</sup> EVAN JOHNSON, ERIC BRAATEN, The Ohio State University, HONG ZHANG, Technische Universit at Mnchen — Near a critical value of the wino mass where there is a zero-energy S-wave resonance at the neutral-wino-pair threshold, low-energy winos can be described by a zero-range effective field theory (ZREFT) in which the winos interact nonperturbatively through a contact interaction and through Coulomb interactions. The effects of wino-pair annihilation into electroweak gauge bosons are taken into account through the analytic continuation of the real parameters for the contact interaction to complex values. The parameters of ZREFT can be determined by matching wino-wino scattering amplitudes calculated by solving the Schroedinger equation for winos interacting through a real potential due to the exchange of electroweak gauge bosons and an imaginary potential due to wino-pair annihilation into electroweak gauge bosons. ZREFT at leading order gives an accurate analytic description of low-energy wino-wino scattering, inclusive wino-pair annihilation, and a wino-pair bound state. ZREFT can also be applied to partial annihilation rates, such as the Sommerfeld enhancement of the annihilation rate of wino pairs into monochromatic photons.

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