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Nonrelativistic Effective Field Theory for the Axion in General Relativity[1] ABHISHEK MOHAPATRA, ERIC BRAATEN, Ohio State Univ - Columbus, HONG ZHANG, Technical University Munich — A nonrelativistic effective field theory (EFT) can be obtained from a relativistic field theory by integrating out fluctuations of the field with 4-momenta of the order mass m. If the field has gravitational interactions, then fluctuations of the space-time metric with 4-momenta of order m must also be integrated out. Given the Lagrangian for the nonrelativistic EFT in the absence of gravity, we can use general coordinate invariance to deduce the effective Lagrangian for the gravitationally interacting field. The nonrelativistic EFT for a real Lorentz-scalar field is a field theory with a complex field. In this talk, I use general coordinate invariance to derive the EFT for the gravitationally interacting complex field. A physically relevant application of this EFT is axion stars, which are gravitationally bound Bose-Einstein condensates of axions.

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