Abstract Submitted
for the CUWIP21 Meeting of
The American Physical Society

Cosmological evolution of ultralight axionlike scalar fields CAMERON NORTON, Vanderbilt University, ROBERT SCHERRER, Vandebilt University — We examine the cosmological evolution of ultralight axionlike (ULA) scalar fields with potentials of the form $V(\phi) = m^2 f^2 [1 - \cos(\phi/f)]^n$, with particular emphasis on the deviation in their behavior from the corresponding small$-\phi$ power-law approximations to these potentials: $V(\phi) \propto \phi^{2n}$. We show that in the slow-roll regime, when $\dot{\phi}^2/2 \ll V(\phi)$, the full ULA potentials yield a more interesting range of possibilities for quintessence than do the corresponding power law approximations. For rapidly oscillating scalar fields, we derive the equation of state parameter and oscillation frequency for the ULA potentials and show how they deviate from the corresponding power-law values. We derive an analytic expression for the equation of state parameter that better approximates the ULA value than does the pure power-law approximation.

Cameron Norton
Vanderbilt University

Date submitted: 04 Jan 2021 Electronic form version 1.4