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Using PySiUltraLight to Model Scalar Dark Matter with Self-Interactions NOAH GLENNON, CHANDA PRESCOD-WEINSTEIN, University of New Hampshire — We introduce PySiUltraLight, a modification of the PyUltraLight code that includes self-interaction terms to model the evolution of axion fields. PyUltraLight simulates ultralight dark matter dynamics. We use a boson mass of $10^{-22}\mathrm{eV/c^2}$ in this talk. We use PySiUltraLight to produce collapsing solitons, spatially oscillating solitons, and exploding solitons which prior analytic work shows will occur with attractive self-interactions. We test the maximum mass criteria described in arXiv:1604.05904 for a soliton to collapse when attractive self-interactions are included. We find the oscillation frequency as a function of soliton mass and equilibrium radius with attractive self-interactions. We verify that when the soliton mass is below the critical mass described in arXiv:1604.05904 and the initial radius is within a specific range, solitons explode. We also analyze binary soliton collisions and a soliton rotating around a central mass with attractive and repulsive self-interactions. We also find that a soliton is less susceptible to tidal stripping when attractive self-interactions are included. We find that the opposite is true for repulsive self-interactions in that solitons would be more easily tidally stripped.

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