

A Tidal Probe to Dark Axionic Solitons

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A population of wide-separation binary star systems can be susceptible to small-scale gravitational perturbations, including those from dark matter. Bosonic stars are spatially extended objects that can not be treated as point particles. We give a fully analytic calculation for the tidal perturbation from randomly distributed diffuse objects, and derive a form factor that fully take account of the size effect of solitons. We then discuss their evaporation effects on isolated, a.k.a. halo-like' wide binary systems in our Galaxy, and identify high-probability halo-like' candidates from GAIA with separations larger than 0.1 pc. Survival of the farthest-separated candidates will provide a novel gravitational probe to dark matter in the form of solitons. In the case of axion-like solitons, the observational sensitivity is shown to extend into the axion mass range of $m_a \sim 10^{-15} - 10^{-17}$ eV.

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