

Abstract Submitted
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Axial Symmetry Tests of Milky Way Disk Stars Probe the Galaxy's Matter Distribution¹ AUSTIN HINKEL, SUSAN GARDNER, University of Kentucky, BRIAN YANNY, Fermilab — In this talk, we show how tests of axial symmetry of the Galaxy can be realized with Gaia DR2, and consider what these tests reveal about the Galaxy's matter distribution. Namely, we apply a form of Noether's Theorem, vis-a-vis tests of axial symmetry, to probe the quality of the angular momentum about the axis normal to the Galactic plane as an integral of motion. We show how this failure of this symmetry speaks to a Milky Way that is not isolated and not in steady-state. Additionally, we show that a prolate form of the gravitational distortion of the Galaxy by the Magellanic Clouds, determined from Orphan stream fits by Erkal et al., 2019, is compatible with the axial symmetry-breaking we have discovered, and that a localized, abrupt change in the asymmetry closer to the Galactic center reveals a resonance of the Galactic bar. Finally, we outline recent findings concerning the small-scale structure of our Galaxy, with potential ramifications for dark matter candidates.

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