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Mapping dark matter in the galaxy via stellar accelerations AAKASH RAVI, NICHOLAS LANGELLIER, Department of Physics, Harvard University, DAVID PHILLIPS, Center for Astrophysics, Harvard & Smithsonian, MALTE BUSCHMANN, BENJAMIN SAFDI, Department of Physics, University of Michigan, RONALD WALSWORTH, Center for Astrophysics, Harvard & Smithsonian — Dark matter is the dominant matter in the universe, yet its particle nature and cosmological origin remain mysterious. Knowledge of the distribution of dark matter in the Milky Way Galaxy is crucial to grounding searches for the particles comprising dark matter. Measurements of the Galactic dark matter content currently rely on model assumptions to infer the forces acting upon stars from the distribution of observed velocities. Here, we propose to apply the radial velocity method honed for exoplanet astronomy, to measure the change in the velocity of stars over time. This direct measure of the acceleration of stars would provide a direct probe of the local gravitational potential. We present a realistic strategy to observe the differential accelerations of stars in our Galactic neighborhood with next-generation telescopes, and numerical simulations of the expected sensitivity of such a program.

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