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Direct detection of classically undetectable dark matter through quantum decoherence[1] C. JESS RIEDEL, IBM Research — Although various pieces of indirect evidence about the nature of dark matter have been collected, its direct detection has eluded experimental searches despite extensive effort. If the mass of dark matter is below 1 MeV, it is essentially imperceptible to conventional detection methods because negligible energy is transferred to nuclei during collisions. Here I propose directly detecting dark matter through the quantum decoherence it causes rather than its classical effects such as recoil or ionization. I show that quantum spatial superpositions are sensitive to low-mass dark matter which is inaccessible to classical techniques. This provides new independent motivation for matter interferometry with large masses, especially on spaceborne platforms. The apparent dark matter wind we experience as the Sun travels through the Milky Way ensures interferometers and related devices are directional detectors, and so are able to provide unmistakable evidence that decoherence has galactic origins.

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