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POS-J82 – Constraining ultralight dark photons with galactic center gas clouds

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We demonstrate that dark matter heating of gas clouds, hundreds of parsecs from the Milky Way Galactic Center, provides a powerful new test of dark sector interactions. As an example, we constrain ultralight dark photon dark matter, which requires a simple extension of the Standard Model (SM) by a U(1) gauge group. We place new bounds on ultralight dark photon dark matter for $m \leq 10^{-10}$ eV. An ultralight dark photon, through its mixing with the SM photon, produces an oscillating electric field that generates a current and dissipation in

the gas cloud medium, which is not a perfect conductor. This altogether transforms dark photon potential energy into the kinetic energy of charged particles in cold gas clouds. This enables us to place leading constraints on ultralight dark photon interactions.

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