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Effects of non-vanishing dark matter pressure in the Milky Way galaxy

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We consider the possibility that the Milky Way's dark matter halo possesses a non-vanishing equation of state. Consequently, we evaluate the contribution due to the speed of sound, assuming that the dark matter content of the galaxy behaves like a fluid with pressure. In particular, in the galactic core we compare two scenarios: a supermassive black hole in vacuum and a dark matter distribution without black hole. We model the dark matter distribution via an exponential sphere profile in the galactic core, and inner parts of the galaxy whereas we assume three widely-used profiles for the halo, i.e. the Einasto, Burkert, and Isothermal profiles. We show a posteriori that Newtonian gravity works well in the proposed scenarios far from the galactic center and investigate the expected experimental signature provided by gravitational lensing in the presence of dark matter.

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