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A. Foschi: Using S2 motion to constrain a scalar field cloud around SgrA*

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The motion of S2, one of the stars closest to the Galactic Center, has been well studied and used to set constraints on the compact object at the center of the Milky Way. This central object is well established to be a supermassive black hole but the nature of its environment is unknown. Here, we investigate the possibility that dark matter in the form of an ultralight scalar field clusters around Sgr A* . We used the available data for S2 to perform a Markov Chain Monte Carlo analysis and find the best-fit estimates for a scalar cloud structure. Our results show that observational data are compatible with an extended mass of order 0.1% of the central mass if the cloud is located within the orbit of S2. However, there is only a mild evidence that the model that includes the scalar cloud is preferred over the single black hole setup. Inclusion of the motion of other S-stars to confirm (or reject) this result is in preparation and will be presented in another work.

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