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Motion of S2 and bounds on scalar clouds around SgrA*

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The motion of S2, one of the stars closest to the Galactic Centre, has been measured accurately and used to study the compact object at the centre of the Milky Way. It is commonly accepted that this object is a supermassive black hole but the nature of its environment is open to discussion. Here, we investigate the possibility that dark matter in the form of an ultralight scalar field "cloud" clusters around SgrA*. We use 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 no substantial evidence for such structures. When the cloud size is of the order of the size of the orbit of S2, we are able to constrain its mass to be smaller than 0.1% of the central mass, setting a strong bound on the presence of new fields in the galactic centre.

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