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Using Atom Interferometry to Detect Chameleon Dark Energy

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I will discuss the prospect that the first evidence for dark energy may be found through meter scale, laboratory based, atom interferometry experiments. I will discuss how, in order to be compatible with fifth force constraints, dark energy scalar fields must have a screening mechanism which hides their effects from us within the solar system. Focusing in particular on one such screening mechanism, known as the chameleon, where the field's mass becomes dependent on the environment I will show how the field behaves in the presence of a spherical source. In the presence of the kind of high vacuum associated with atom interferometry experiments, and when the test particle is an atom, it is possible to use the associated interference pattern to place constraints on the acceleration due to the fifth force of the chameleon field - this has already been used to rule out large regions of the chameleon parameter space and may one day be able to detect the force due to the dark energy field in the laboratory.

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