

Abstract Submitted
for the APR16 Meeting of
The American Physical Society

Optically Levitated Microspheres as a Probe for New Interactions

ALEXANDER RIDER, DAVID MOORE, CHARLES BLAKEMORE, MARIE LU, GIORGIO GRATTA, Stanford Univ — We are developing novel techniques to probe new interactions at micron distances using optically levitated dielectric microspheres. Levitated microspheres are an ideal probe for short-range interactions because they are suspended using the radiation pressure at the focus of a laser beam, which means that the microspheres can be precisely manipulated and isolated from the surrounding environment at high vacuum. We have performed a search for unknown charged particles bound within the bulk of the microspheres. Currently, we are searching for the presence of a Chameleon field postulated to explain the presence of dark energy in the universe. In the future we plan to use optically levitated microspheres to search for micron length-scale gravity like interactions that could couple between a microsphere and another mass. We will present recent results from these experiments and plans for future searches for new interactions.

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Date submitted: 07 Jan 2016

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