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Force sensor for chameleon a candidate for dark energy

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The search for non-Newtonian forces has been pursued following many different paths. Recently it was suggested that hypothetical chameleon interactions, which might explain the mechanisms behind dark energy, could be detected in a high-precision force measurement. In such an experiment, interactions between parallel plates kept at constant separation could be measured as a function of the pressure of an ambient gas, thereby identifying chameleon interactions by their unique inverse dependence on the local mass density. During the past years we have been developing a new kind of setup complying with the stringent requirements of the proposed experiment. In this poster we present the first and most important part of this setup—the force sensor. We discuss its design, fabrication, and characterization. From the results of the latter, we derive limits on chameleon interaction parameters that could be set by the forthcoming experiment. Finally, we describe the opportunity to use the same setup to measure Casimir forces at large surface separations with unprecedented accuracy, thereby potentially giving unambiguous answers to long-standing open questions

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