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What can we get from nothing? Measurements of dispersion and hypothetical forces

Vacuum fluctuations are ubiquitous in nature. Their existence dictate the behavior of things we use every day (textiles and adhesives to name a few) to reasons that pinpoint extreme problems in our knowledge of the Universe (the cosmological constant problem with its 120 orders of magnitude little issue). At IUPUI we have built a name as one of the prime places to investigate these forces, with the most sensitive apparatus built to measure vacuum fluctuations and the induced dispersion forces between bodies separated by 0.1-10 microns. I will present a brief summary of the efforts undertaken to measure dispersion forces. I will also how that these forces become the background when trying to detect yet undetected force-mediating particles. Consequently, we took a new approach to try and detect them, using an engineered sample where vacuum fluctuations are cancelled at the onset. Our experimental approach and main findings will be presented and discussed.

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