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Casimir force measurements between a gold sphere and a rectangular corrugated Silicon plate YILIANG BAO, JIE ZOU, H.B. CHAN, University of Florida — The Casimir force is the interaction that results from quantum fluctuations of electromagnetic fields in vacuum and strongly depends on the shape of the boundaries that confines the electromagnetic fields. Most previous experiments involve simple geometries such as plate-sphere, two parallel plates or two cylinders, where the pair-wise summation of two-body interactions is still valid. To demonstrate the strong shape dependence of the Casimir force, we choose one of the interacting surfaces to be an array of trenches with widths ranging from 200 nm to 500 nm. Both high-aspect-ratio trenches with depth of 1 um and shallow trenches with depth of 100 nm are fabricated. The force gradient on these structures is measured with a micromechanical torsional oscillator for the separations between 150 nm and 500 nm. We observe deviations from both the pair-wise additive approximation and the proximity force approximation. The observed deviation, however, is smaller than the calculated values for perfectly conducting surfaces, possibly due to the interplay between finite conductivity and geometry effects.

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