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Measurement of Casimir forces with nonmonotonic distance dependence between silicon structures with non-conventional shapes LU TANG, JIE ZOU, HO BUN CHAN, The Hong Kong University of Science and Technology, MILOS NIKOLIC, ALEJANDRO RODRIGUEZ, Princeton University — We measure the Casimir force between silicon components of non-conventional shapes on a silicon-on-insulator wafer. The device consists of a force-sensing micromechanical beam and a comb-drive actuator for controlling the distance. The magneto-motive technique is used to measure the shift in the resonance frequency of the force sensing beam. Each of the interacting surfaces contains an array of T-shaped protusions. Since the protusions on both sides are created by lithography and reactive ion etching, both their shapes and relative positions can be accurately defined. Here, the protusions on the two surfaces are offset by half the period. As the movable electrode is pushed towards the silicon beam by the comb drives, the two sets of protusions inter-penetrate. The lateral Casimir force between the top parts of the T-shaped structures produces in an overall interaction that is either apparently attractive or repulsive depending on the displacement of the comb actuators. The measured non-monotonic dependence of the Casimir force on distance is in qualitative agreement with preliminary calculations using the boundary elements method.

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