Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Influence of Casimir-Lifshitz forces on actuation dynamics of MEMS WIJNAND BROER, GEORGE PALASANTZAS, JASPER KNOESTER, University of Groningen, VITALY SVETOVOY, University of Twente — Electromagnetic fluctuations generate forces between neutral bodies known as Casimir-Lifshitz forces, of which van der Waals forces are special cases, and which can become important in micromechanical systems (MEMS). For surface areas big enough but gaps small enough, the Casimir force can possibly draw and lock MEMS components together, an effect called stiction, causing device malfunction. Alternatively, stiction can also be exploited to add new functionalities to MEMS architecture. Here, using as inputs the measured frequency dependent dielectric response and surface roughness statistics from Atomic Force Microscopy (AFM) images, we perform the first realistic calculation of MEMS actuation. For our analysis the Casimir force is combined with the electrostatic force between rough surfaces to counterbalance the elastic restoring force. It is found that, even though surface roughness has an adverse effect on the availability of (stable) equilibria, it ensures that those stable equilibria can be reached more easily than in the case of flat surfaces. Hence our results can have significant implications on how to design MEM surfaces. The author would like this abstract to appear in a Casimir related session.

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Date submitted: 08 Nov 2012 Electronic form version 1.4