Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Casimir forces between two impurities in a lattice ANDREI PAVLOV, DMITRI EFREMOV, JEROEN VAN DEN BRINK, Institute for Theoretical Solid State Physics, IFW Dresden, 01069 Dresden, Germany — One of the fundamental properties of matter is the Casimir force, i.e. interaction of classical objects via quantum fluctuations. It appears in various field, including optics, Bose-condensates, micro-structure geometry compounds, etc. The usual wisdom is that the Casimir force between two atoms decays as $r^{-(2D+1)}$, which is originated from the two boson exchange in the lowest order of the perturbation theory. Stimulated by the recent experiments on the high temperature superconductor H_3S under high pressure, we reconsider the Casimir forces between two impurities in solid state physics via virtual phonons at long and short distances. We found strong deviation from the standard law at short distances which depends on the masses of impurities atoms. At long distances it comes to the standard r-dependence, but the value of the prefactor is much larger than it's expected from the lowest orders of the perturbation theory. These differences become important when the impurity masses differ from the lattice atoms more than twice. Finally we apply our results to impurity atoms of deuterium and tritium in H_3S.

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Date submitted: 20 Nov 2016 Electronic form version 1.4