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Casimir interaction between mobile impurities in one-dimensional quantum liquids MICHAEL SCHECTER, University of Minnesota, ALEX KAMENEV, University of Minnesota and Fine Theoretical Physics Institute — At zero temperature virtual phonons of a quantum liquid scatter off impurities and mediate a long-range interaction, analogous to the Casimir effect. At finite temperature, moving impurities also experience a correlated friction due to coherent exchange of real phonons. In one dimension the effect is universal and the induced interaction decays as $1/r^3$, much slower than the van der Waals interaction $\sim 1/r^6$ where r is the impurity separation. The magnitude of the effect is characterized by the product of impurity-phonon scattering amplitudes, which are seen to vanish for the class of integrable impurity models. By tuning the parameters near integrability one can thus observe an attractive interaction turned into a repulsive one.

Michael Schecter
University of Minnesota

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