The Casimir interaction
in a one-dimensional Bose gas

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When two impurities are immersed in a one-dimensional Bose gas, they impose constrains to density and phase fluctuations of the Bose gas. This modifies the ground state energy of the system, leading to a Casimir interaction between the two impurities. In prior publications, a short-range attraction that exponentially decays beyond the healing length ξ of the system was found, while at large distances ℓ between impurities, the effective interaction scales as $1/\ell^3$. The descriptions of the system used to find these behaviors were either not taking into account quantum corrections for the former, or described excitations using a linear dispersion relation, valid only at low energy, for the latter. In our work [1], we develop a consistent microscopic theory which overcomes these shortcomings. We are able to treat simultaneously the nonlinear spectrum of excitations and the quantum fluctuations. We obtain an analytical expression for the Casimir interaction, valid at all distances, resolving the discrepancies in the literature.

[1] B. Reichert, A. Petković, Z. Ristivojevic, *manuscript under preparation*