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One-dimensional Bose gas with an atom chip

One-dimensional (1D) interacting Bose gases offer a richness of physical regimes with striking specificities compared to three dimensions. For instance, in the strongly interacting regime, appearing at low temperature and large interactions, the hamiltonian of the system can be mapped into the one of non-interacting spinless fermions.

In order to access such physics, we have built a cold atoms experiment at Laboratoire de Physique des Lasers, relying on an atom chip, which allows for very anisotropic magnetic confinements. We are now able to reach a degenerate regime where the atoms occupy the transverse ground state of the trap and the physics is effectively 1D, in the weakly interacting regime.

In order to be able to reach the strongly interacting regime, a control over the atomic interactions is required. To this end, we plan to rely on a microwave-induced Feshbach resonance. The atom chip encompasses a microwave waveguide allowing to reach large microwave amplitudes in the near field, needed to enlarge the width of the resonance. We are currently trying to locate the resonance and characterize it.

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