# One-dimensional Bose gases in and out of equilibrium

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## Abstract

Dimensionality strongly affect the physics of a Bose gas. Freezing its transverse degrees of freedom allows to enter the one-dimensional regime, characterized by large phase fluctuations for degenerate weakly interacting gases. In expansion, these fluctuations lead to strong density density correlations that we have been able to measure experimentally [1]. Our results show good agreement with a recent theoretical description [2]. Interestingly, our measurements take place in a near field regime where anomalous correlations play an important role.

Even though all the atoms forming a one-dimensional Bose gas lie in their transverse ground state, these degrees of freedom have to be taken into account to accurately describe the dynamics of such systems [3]. Populating their transverse excited states by parametric heating, we have been able to study their relaxation's properties. Due to parity rules the decay by binary collisions of the transverse excitations leads to the creation of pairs of longitudinal high energy free particles with opposite momenta. Using a novel fluorescence detector [4], we have been able to show that the number difference of these modes is squeezed. We now aim to study the longitudinal relaxation of these correlated pairs.

**Keywords:** LOW DIMENSIONS, CORRELATIONS, SQUEEZING, BOSE GAS

## References

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