

# Spin squeezing in Bose-Einstein Condensates: from the two-mode model to a multi-mode description

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## Abstract

Spin squeezing in an ensemble of atoms is about creating quantum correlations that can be useful for metrology. In a bimodal condensate, thanks to atomic interactions squeezing is created dynamically starting from a factorized state. After introducing the subject, I will concentrate on this squeezing scheme to explore its ultimate limits.

An important point is the scaling of the entanglement and of the metrology gain as the system size and the atom number become large, and how the decoherence and the finite temperature affect this scaling. I will start from a simple two-mode hamiltonian picture, with a stochastic ingredient, and show that in some conditions it can effectively describe the decoherence and also the more complicated multi-mode case at finite temperature.