

# Critical Velocity and Current-Phase Relation of Dilute Ultracold Bosonic Atoms

Francesco Piazza

Technische Universität München Physik Department T34

James-Franck-Strasse 85747 Garching Germany

email: francesco.piazza@ph.tum.de

## Abstract:

Dilute Ultracold Bosonic Gases are optimal systems where to study the fundamental aspects of superfluidity. They are indeed well described by the Gross-Pitaevskii equation which contains all the essential ingredients characterising a superfluid, like the existence of persistent currents below a finite critical velocity, Josephson effects, or quantized vortices. In this talk, we focus on critical velocities and propose a possible general criterion determining the maximal speed with which the system can flow past an obstacle. This criterion is closely related to the Josephson critical current characterising the current-phase relation of the weak-link formed through the obstacle.

## References:

1. F. Piazza, L.A. Collins, A. Smerzi, arXiv:1208.0734.
2. A. Ramanathan, et al., Phys. Rev. Lett 106, 130401 (2011)