Figures for the Final Report for the project PERG06-GA-2009-256291 QuantumDynamics

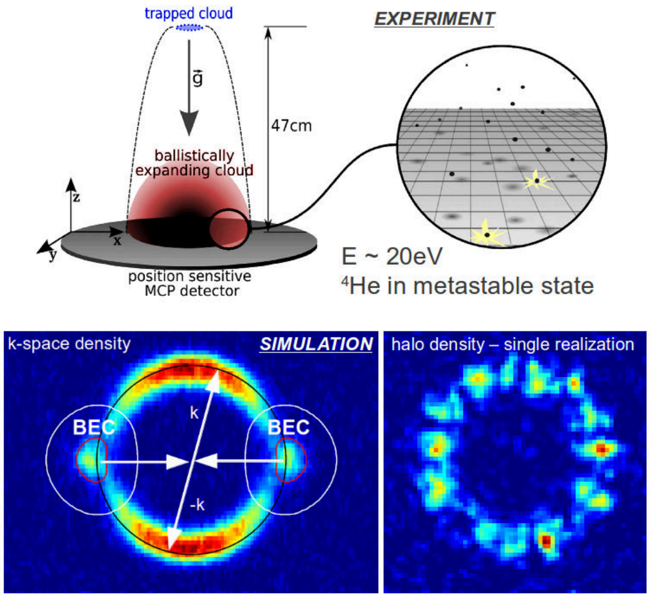

FIG. 1. BEC collisions. *Top:* Experimental setup for the Palaiseau He* experiment *[adapted from Schellekens et al, Science* **310** *648 (2005)]*. As the atoms free-fall towards the MCP detector, they become distributed according to their momentum. They are detected with an efficiency of about 12%. *Bottom:* Momentum distribution of atoms at the detector simulated with the STAB method, left: density average in the detector plane over many realizations, *[from Deuar et al, Eur. Phys. J. D Phys. Rev. Lett.* **108**, *260401 (2012)]*, right: cut through the halo $\perp$ to the collision direction for a single realization. *[from Deuar et al, arXiv:1301.3726]*

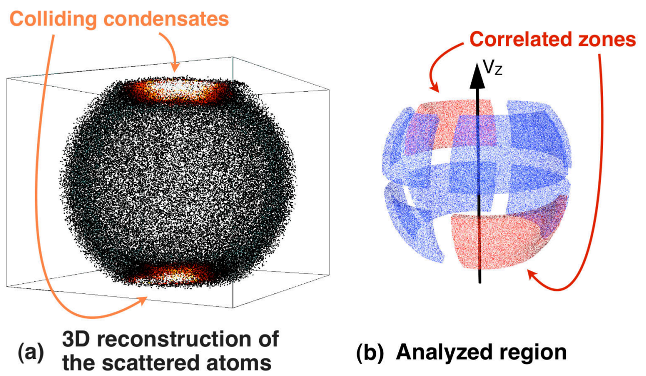

FIG. 2. A binning scheme for the study of correlations across the scattered halo. (a) The experimental data plotted in momentum space, with each dot corresponding to a detected atom. Atoms on the collision halo are black, while the colliding, pancake shaped BECs (condensates) at the top and the bottom of the halo are orange/yellow. (b) Schematic of the analyzed part of the detected halo of scattered atoms. In this example there are 8 zones, with an example of two correlated zones in red. The statistics of the atom numbers counted in such two zones can show quantum correlation effects. *[From Jaskula et al, Phys. Rev. Lett.* **105**, *190402 (2010)]*

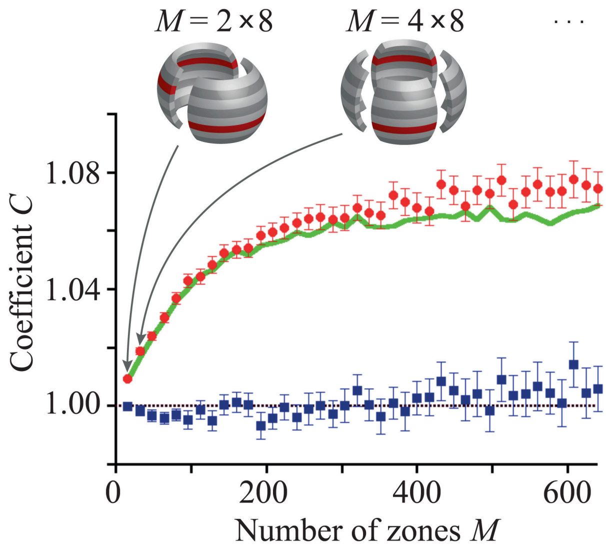

FIG. 3. Violation of the Cauchy-Schwartz inequality between counterpropagating zones in the scattered halo. Correlation coefficient C between opposite zones as a function of the number of zones into which we cut the scattering sphere (illustrated by the red-gray diagrams in the upper part). $C > 1$ corresponds to violation of the Cauchy-Schwarz inequality. The data points for diametrically opposite zones are shown as red circles, for uncorrelated (neighbouring) zones—as blue squares. The (green) solid line is the theoretical prediction calculated using the STAB method. *[From Kheruntsyan et al, Phys. Rev. Lett.* **108**, *260401 (2012)]*

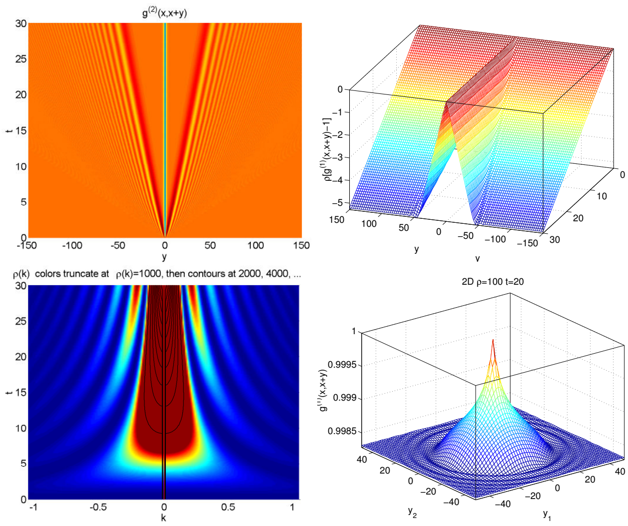

FIG. 4. Several examples of the universal correlation functions after a quantum quench in uniform dilute BECs. Top row: the evolution of density $g^{(2)}(y,t)$ (a) and phase $g^{(1)}(y,t)$ (b) normalised correlation functions in the 1D system. Bottom row: the evolution of the momentum distribution $\rho(k)$ in the 1D system (c), and a snapshot of the phase correlation $g^{(1)}(\vec{y})$ at time $t = 20$ in 2D. The scale is in dimensionless units $\hbar = m = \xi = 1$, where ξ is the healing length.