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Studying quench dynamics in an ultracold quantum gas by near-field interferometry BODHADITYA SANTRA, CHRISTIAN BAALS, RALF LABOUVIE, HERWIG OTT, Research Center OPTIMAS and Fachbereich Physik, University of Kaiserslautern, 67663 Kaiserslautern, Germany — The effect of interferometric self-imaging in the near-field, also known as Talbot effect, has been exploited in many areas of research since its discovery in the 19th century. In our experiment the temporal Talbot effect is used to measure the coherence length of a matter-wave field. A Bose-Einstein condensate of Rb-87 is loaded adiabatically into a 1D or a 3D optical lattice. Subsequently, the lattice potential is switched off for a short time and then on again. After a holdtime the momentum distribution is obtained by time-of-flight absorption imaging where the width of the central peak serves as a measure of coherence. For a superfluid this width shows oscillations where the period corresponds to the Talbot time. In the Mott-insulating regime these oscillations disappear but can be restored by quenching the system to the superfluid regime before the pulse is applied. With increasing waiting time between the quench and the pulse the coherence length increases which can directly be seen by the appearance of oscillations in the measured signal.

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