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Observation of phase-fluctuating one-dimensional Bose-Einstein condensates NICOLAAS VAN DRUTEN, AALDERT VAN AMERONGEN, JAN-JORIS VAN ES, PHILIPP WICKE, Universiteit van Amsterdam — The one-dimensional Bose gas is predicted to exhibit a rich variety of different quantum regimes. We experimentally study the properties of an elongated Bose-Einstein condensate crossing over from the three-dimensional into the one- dimensional regime. We reach extreme aspect ratios up to 400 of the needle shaped condensates using micron sized patterns on a chip. To probe the atomic velocity distribution in the elongated dilute cloud we focus the atoms along the long axis using a harmonic potential pulse. In the focus the initial velocities are mapped to a spatial distribution. This is a powerful technique that allows characterization of individual small, low-density clouds. Phase fluctuations stemming from elementary excitations along the axis of the elongated condensate are observed as density fluctuations in time-of- flight. These may provide the possibility of (noise) thermometry far below the condensation temperature.

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