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Critical behavior of a trapped interacting Bose gas STEPHAN RITTER, TOBIAS DONNER, THOMAS BOURDEL, FERDINAND BRENNECKE, ANTON ÖTTL, MICHAEL KÖHL, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich, Switzerland — In the vicinity of a phase transition minute variations in the controlling parameters can dramatically change the properties of a system. Using a trapped Bose gas we have entered the critical regime of Bose-Einstein condensation and gained access to its beyond mean-field physics. This regime is characterized by fluctuations extending far beyond the thermal de Broglie wavelength: The length scale over which the system behaves coherently diverges, which is directly reflected in the shape of the spatial first order correlation function. Using matter-wave interference we measure the correlation length of these fluctuations as a function of temperature. We study the divergence of the correlation length of the order parameter as the temperature approaches the critical point and determine its critical exponent for a trapped, weakly interacting Bose gas to be $\nu = 0.67 \pm 0.13$.

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