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Resolving Momentum and Position in a trapped gas using Laguerre-Gaussian beams RABIN PAUDEL, TARA DRAKE, JOHN GAEBLER, JAYSON STEWART, DEBORAH JIN, JILA, National Institute of Standards and Technology and Department of Physics, University of Colorado, Boulder, Colorado — We demonstrate a general method to probe the momentum distribution of ultracold atoms near the center of a trap, thereby removing the effect of atoms at low density near the trap edge. Our basic technique is to use two intersecting Laguerre-Gaussian beams to selectively remove atoms from the edge of the cloud before releasing the trapped gas for time-of-flight expansion. This allows us to observe a sharp Fermi surface of a degenerate ^{40}K atom cloud. We then apply the technique to atom photoemission spectroscopy to probe the effect of density inhomogeneity on this measurement technique in the BCS-BEC crossover.

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