The Effect of Trap Geometry on Phase Separation in a Polarized Fermi Gas

YEAN-AN LIAO, Rice University, W. Li, G.B. PARTRIDGE, T. PAPROTTA, R.G. HULET — We have observed phase separation in a polarized $^6\text{Li}$ atomic Fermi gas in an elongated (aspect ratio of 30) single-beam optical trap. The phase-separated phase consists of a paired superfluid core surrounded on each end of the trap by a completely polarized normal gas. The observed density distributions represent a violation of the local density approximation, and have been explained by surface tension. In addition, we find that the superfluid core survives until the system is nearly completely polarized, with $P \geq 0.95$. These results contrast with a similar experiment, done at MIT, that observes the superfluid core to survive up to $P \sim 0.74$, in agreement with the Clogston limit. In this case, no surface tension is observed. Though the explanation of these discrepancies is not yet clear, one major difference is trap geometry, since the MIT trap has an aspect ratio 6 times smaller than ours. We have implemented a crossed beam trap with an aspect ratio $\sim 3$ in order to study the effects of trap geometry. Our latest experimental results will be presented.

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