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Magnons in a box: Condensation and Application FANG FANG, RYAN OLF, SHUN WU, Univ of California - Berkeley, HOLGER KADAU, 5. Physikalisches Institut, Universität Stuttgart, 70550 Stuttgart, Germany, G.EDWARD MARTI, DAN STAMPER-KURN, Univ of California - Berkeley —
Ultracold gases offer us a remarkable window into the quantum world, allowing direct access to a wide range of manybody and condensed matter phenomena at convenient macroscopic length and time scales. However, producing ultracold gases at ever lower entropy, and measuring statistical properties such as temperature in these low entropy regimes, is a persistent challenge. Magnons, gapless spin excitations of spinor Bose Einstein Condensate (BEC), are expected to behave like free particles. We show that magnons can be used to cool BEC in a deep trap and serve as a thermometer to measure temperatures at extremely low entropy-per-particle. Unlike atoms trapped in a harmonic trap, trapped magnons experience a box potential due to near exact cancellation of the trapping potential by the mean-field interaction within the condensate. We observe the quasi-condensation of magnon excitations within this nature-made box.

Fang Fang
Univ of California - Berkeley

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