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Spinor dynamics-driven formation of a twin-beam atom laser NATHAN LUNDBLAD, Caltech/Jet Propulsion Laboratory, DAVID AVELINE, ROBERT J. THOMPSON, LUTE MALEKI, Jet Propulsion Laboratory — We demonstrate a novel twin-beam atom laser formed by outcoupling oppositely polarized components of an $F = 1$ spinor Bose-Einstein condensate whose Zeeman sublevel populations have been coherently evolved through spin dynamics. The condensate is formed initially through all-optical means using a single-beam running-wave dipole trap. We initially form a condensate in the field-insensitive $m_F = 0$ state, and drive coherent spin-mixing evolution through adiabatic compression of the initially weak trap. Such twin beams, nominally number-correlated through the angular momentum-conserving reaction $2m_0 \leftrightarrow m_{+1} + m_{-1}$ have been proposed as tools to explore entanglement and squeezing in Bose-Einstein condensates. The twin beams are outcoupled from the opposite ends of a cigar-shaped trap; we compare observed images with the behavior of a single-species version outcoupled in the direction of gravity.

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