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Preparing a twin-Fock state of spinor atomic condensate YIQUAN ZOU, XINYU LUO, QI LIU, LING-NA WU, State Key Laboratory of Low Dimensional Quantum Physics, Department of Physics, Tsinghua University, MENG KHOON TEY, LI YOU, State Key Laboratory of Low Dimensional Quantum Physics, Department of Physics, Tsinghua University; Collaborative Innovation Center of Quantum Matter — An even number N of bosonic particles equally partitioned into two modes represents a twin-Fock state (TFS), which is manifestly entangled and can be used to approach Heisenberg limited sensing precision $1/N$. Small N TFSs are routinely produced from parametric down conversion, for instance, the paired photons at $N = 2$. Large N TFSs, however, remain elusive although their presence have been inferred in spinor atomic condensates undergoing spin exchange collisions [1-4]. Such spin mixing process has been intensively studied in recent years, whereby a N-atom polar or non-magnetic condensate evolves into a mixture of TFSs with the number of paired atoms covering a broad range from 0 to $N/2$. The present work reports our experimental observation of $N \simeq 20000$ condensed atoms almost completely and deterministically converted into a single component TFS at ~ 10000 pairs through adiabatic means.

1. E. M. Bookjans, et al, Phys. Rev. Lett. **107**, 210406 (2011).
2. C. Gross, et al, Nature **480**, 219 (2011).
3. B. Lücke, et al., Science **334**, 773(2011).
4. B. Lücke, et al, Phys. Rev. Lett. **112**, 155304 (2014).

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