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Rapid production of spinor quantum fluids LAUREN AYCOCK, SRIVATSAN CHAKRAM, MUKUND VENGALATTORE, Cornell University — Quantum degenerate spinor gases, with their interplay between superfluidity and magnetism, offer rich prospects for the study of quantum magnetism [1], non-equilibrium physics [2], and quantum metrology [3]. As has been shown [4], these studies are aided by the creation of large, spatially extended ensembles of condensed gases. Furthermore, metrological applications of these fluids require an apparatus capable of a rapid duty cycle. Using a combination of novel cooling techniques such as degenerate Raman sideband cooling [5] and all-optical evaporation, we are implementing a multi-species spinor gas apparatus capable of generating large quantum degenerate ensembles within 1 second. We present our design and characterization of this apparatus, and outline experimental studies that will be undertaken in the immediate future. In addition, we comment on adaptation of these techniques to atomic species that have proved less amenable to traditional methods of cooling.

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