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Towards generating synthetic gauge potentials for a Bose-Einstein condensate in a toroidal trap PAN-PAN HUANG, CHENG-AN CHEN, HUNG-JI WEI, CHIN-YEH YU, JUNG-BIN WANG, YU-JU LIN, Institute of Atomic and Molecular Sciences, Academia Sinica — We have designed a setup to experimentally study ultracold atoms dressed by Raman laser beams in a ring-shaped trapping potential. To make BECs of Rb87 atoms, we first capture zeeman-slowed atoms in a Magneto-Optical-Trap, perform polarization gradient cooling, and then load the atoms in a quadrupole magnetic trap with a number of ∼1e9. After 3.5s of rf-evaporation, these pre-cooled atoms are transferred into a hybrid potential, a crossed optical dipole trap with a magnetic gradient. Evaporative cooling of 4.3 s in the dipole trap is performed by first ramping down the power of dipole beams, followed by ramping off the magnetic gradient during which the trap frequency largely remains the same. We achieved a BEC with 2e5 atoms with an experimental cycle time of 15 s. Our next step is to load the atoms into a toroidal dipole trap and use two Raman beams with orbital angular momentum to dress the atoms, thus generating synthetic vector gauge potentials. Both the dipole beam for the toroidal trap and the Raman beam(s) are Laguerre-Gaussian beams produced by spiral phase plates.

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