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Magneto-Roton Instability in a Rotating Bose-Einstein Condensate BISWAROOP MUKHERJEE, AIRLIA SHAFFER, CEDRIC WILSON, PARTH B. PATEL, ZHENJIE YAN, BOLA MALEK, VALENTIN CRÉPEL, RICHARD FLETCHER, MARTIN W. ZWIERLEIN, Massachusetts Institute of Technology MIT — Magneto-rotons are elementary excitations at finite momentum that appear in gases of interacting charged particles placed under a strong magnetic field. With rotation as an analog to a magnetic field, the excitation spectrum of a rotating weakly-interacting Bose-Einstein condensate (BEC) in an anisotropic confinement potential is also predicted to exhibit a roton feature. We observe the dynamical instability of a BEC under rotation, and witness a spontaneous translational symmetry breaking in the density profile of the BEC. We identify this instability with the population of an interaction-driven magneto-roton mode, and measure the variation of the lengthscales and growth rates of the resulting roton crystal with interactions. These results indicate the emergence of a roton with a rotational sense, and shed light on the development of a magneto-roton in a superfluid.

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