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Detecting spin nematicity via optical birefringence effects in spinor Bose-Einstein condensates MICKIE EIKENBERRY, TAO TANG, ZIHE CHEN, LICHAO ZHAO, YINGMEI LIU, Oklahoma State University — We present an experimental study on detecting the spin nematicity of an antiferromagnetic spinor Bose-Einstein condensate via its optical birefringence effects. The diagonal elements of a spin nematic tensor are only related to fractional populations of all spin components, while its off-diagonal elements reflect interesting optical birefringence effects. We determine values of these off-diagonal elements by applying a well-selected light beam onto the spinor gases and detecting changes in the beams polarization after the beam passes the gases. One important application of this detection method is to identify various important spin states. In this presentation, we demonstrate how to utilize this detection technique to distinguish two ground states of the antiferromagnetic spinor gases, i.e., a polar (spin-singlet) state with a non-zero (zero) spin nematicity.

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