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Creation of monopole spin textures and synthetic fields in a Bose-Einstein condensate AZURE HANSEN, JUSTIN T. SCHULTZ, NICHOLAS P. BIGELOW, University of Rochester — We create two types of two-dimensional monopole spin textures in a spinor Bose-Einstein condensate using a stimulated optical Raman interaction. The first is a topological monopole spin texture, characterized by a radial local spin. The second has a cross-disgyration local spin that corresponds to a radial synthetic field in the vorticity of the condensate. Both of these structures are generated by engineering vortices of opposite handedness in opposite magnetic Zeeman spin states with an additional precisely-tuned relative phase between the spin states. We control and measure this relative phase using atom optics polarimetry [1] and verify the vortex handedness using atom interferometry. This optical wavefunction engineering technique will allow us to generate multiple point defects within the condensate and study their interaction.

[1] J. T. Schultz, A. Hansen, and N. P. Bigelow. "A Raman Waveplate for Spinor Bose-Einstein condensates." Optics Letters **39**, 4271 (2014).

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