

Abstract Submitted
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Measurement of electron beam polarization produced by photoemission from bulk GaAs using twisted light NATHAN CLAYBURN, JOAN DREILING, University of Nebraska-Lincoln, JAMES MCCARTER, Thomas Jefferson National Accelerator Facility, DOMINIC RYAN, University of Nebraska-Lincoln, MATT POELKER, Thomas Jefferson National Accelerator Facility, TIMOTHY GAY, University of Nebraska-Lincoln — GaAs photocathodes produce spin polarized electron beams when illuminated with circularly polarized light with photon energy approximately equal to the bandgap energy [1, 2]. A typical polarization value obtained with bulk GaAs and conventional circularly polarized light is 35%. This study investigated the spin polarization of electron beams emitted from GaAs illuminated with “twisted light,” an expression that describes a beam of light having orbital angular momentum (OAM). In the experiment, 790nm laser light was focused to a near diffraction-limited spot size on the surface of the GaAs photocathode to determine if OAM might couple to valence band electron spin mediated by the GaAs lattice. Our polarization measurements using a compact retarding-field micro-Mott polarimeter [3] have established an upper bound on the polarization of the emitted electron beam of 2.5%.

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[2] C.K. Sinclair, et al., PRSTAB 10 023501 (2007).

[3] J.L. McCarter, M.L. Stutzman, K.W. Trantham, T.G. Anderson, A.M. Cook, and T.J. Gay Nucl. Instrum. and Meth. A (2010).

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