

Abstract Submitted  
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**Improvements In Laser Circular Polarization for Optical Pumping**<sup>1</sup> ANASTASIA AFANASSIEVA, TRIUMF / McMaster University, JOHN BEHR, TRIUMF, TRINAT COLLABORATION — TRINAT (TRIUMFS Neutral Atom Trap) uses spin-polarized  $^{37}\text{K}$  nuclei to make precision measurements of nuclear beta-decay asymmetry with respect to spin [Fenker et. al Phys. Rev. Lett. 120, 062502 (2018)]. This poster outlines techniques in improving the circular polarization of the optical pumping light used to polarize the spin of trapped nuclei. Commercially available Twisted Nematic Liquid Crystals (TNLC) are able to quickly flip light polarization between two states. The TNLC yielded a circular light polarization  $S_3 = 0.99996 \pm 0.00003$  as defined by Stokes Parameters. This is a significant improvement from the previous liquid crystal device used which gave a circular polarization between  $S_3 = 0.9931$  and  $0.9997$ . The poster will also look at the use of Quarter Wave Plates for light circular polarization. There is also a discussion on how the quality of polarization can be improved by an additional mechanically rotating linear polarizer. When combined with a demonstrated 3 times increase in laser power, the improved circular polarization of the light resulted in a predicted improvement in the nuclear spin polarization from  $0.9913 \pm 0.0009$  to  $0.9970$ . The circular light polarisation is no longer a limiting effect in the nuclear spin polarization.

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