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Modeling the Effect of Refractive Optics on CMB Polarization SARAH MARIE BRUNO, PATRICIO GALLARDO, BRIAN KOOPMAN, MICHAEL NIEMACK, Cornell University, ACTPOL COLLABORATION — Precise CMB polarization measurements are crucial in investigating dark energy. The Atacama Cosmology Telescope Polarimeter (ACTPol) in Chile is built to simultaneously measure temperature and polarization. Polarization angle measurements require an error margin $< 0.1^\circ$, or these will limit our results. This requires greater understanding of how refractive optics alter the polarization of the microwave radiation. Lens coatings are necessary to avoid the reflection of the majority of the incoming light. Early experiments found that there were systematic angular distortions in the data, in which the optical elements in the ACTPol telescope rotated the polarization of the incoming microwave radiation slightly. We modeled a single lens using two commercial optics modeling software packages, CodeV and Zemax, with single and double-layer coatings. Unexpectedly, significant disparities between these models were observed. We subsequently developed our own Python model of the single lens system in order to predict the polarization rotation values. I will present the results of this work. Our next aim is to reproduce the modeled phenomena using physical lenses.

Sarah Marie Bruno
Cornell University

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