



LRIS: Polarimetry with the ADC, Part 2

The use of the ADC (Atmospheric Dispersion Compensator) with LRIS may have some effect on polarization measurements with the LRISp polarimetry module. See KITN 0004 for details of measurements taken with the ADC installed in the telescope.

The same polarized standard stars, HD 142863 and HD 155528, observed in 2007 May 23 with the ADC installed, were observed on the night of 2007 Aug. 21 (UT) without the ADC installed. A similar observing setup and observing procedures were used, to make direct comparison easiest.

Polarimetry Precision with and without the ADC

The dispersions in polarization measurements seen in KITN 0004 was significantly larger than the uncertainties calculated from shot noise, and we will ignore the shot noise in the analysis. A straight mean was taken over the region $\lambda\lambda 500\text{--}6000$, and the multiple measurements of a given standard generated a dispersion of measured polarization. The question asked is whether the dispersions in measurements of the polarization percentage and angle with the ADC are larger than the dispersions without. Results are summarized below:

	HD 142863		HD 155528	
	w/ADC	w/o ADC	w/ADC	w/o ADC
$\langle P \rangle$	1.951%	2.005%	5.012%	5.045%
$\sigma(P)$	0.057%	0.087%	0.076%	0.082%
$\sigma(\theta)$	1.047°	1.211°	0.461°	0.622°

The results are that there is no substantial difference between the dispersion of measured parameters, $\sigma(P)$ and $\sigma(\theta)$, with and without the ADC installed. Indeed, the dispersions are slightly larger w/o the ADC installed. The dispersion must come from some other, unknown source.

The absolute values of P are given to show that they agree with each (with and without the ADC) to within the empirical uncertainties. The dispersion in θ , $\sigma(\theta)$, is fairly consistent with the dispersion in P , $\sigma(P)$, and the measured P , related by the usual formula $\sigma(\theta) = 26.5^\circ \sigma(P)/P$.

This analysis indicates that the ADC does not limit the precision of polarization measurements taken with LRISp, at least using the normal observing mode of two observations per linear Stokes parameter, with the wave plate rotated by 45° .



Author	Date	Comment
R. W. Goodrich	2007 December 18	Original