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Testing of the LSST's photometric calibration strategy at the CTIO 0.9 meter telescope

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Abstract. The calibration hardware system of the Large Synoptic Survey Telescope (LSST) is designed to measure two quantities: a telescope's instrumental response and atmospheric transmission, both as a function of wavelength. First of all, a "collimated beam projector" is designed to measure the instrumental response function by projecting monochromatic light through a mask and a collimating optic onto the telescope. During the measurement, the light level is monitored with a NIST-traceable photodiode. This method does not suffer from stray light effects or the reflections (known as ghosting) present when using a flat-field screen illumination, which has a systematic source of uncertainty from uncontrolled reflections. It allows for an independent measurement of the throughput of the telescope's optical train as well as each filter's transmission as a function of position on the primary mirror. Second, CALSPEC stars can be used as calibrated light sources to illuminate the atmosphere and measure its transmission. To measure the atmosphere's transfer function, we use the telescope's imager with a Ronchi grating in place of a filter to configure it as a low resolution slitless spectrograph. In this paper, we describe this calibration strategy, focusing on results from a prototype system at the Cerro Tololo Inter-American Observatory (CTIO) 0.9 meter telescope. We compare the instrumental throughput measurements to nominal values measured using a laboratory spectrophotometer, and we describe measurements of the atmosphere made via CALSPEC standard stars during the same run.

Keywords. techniques: photometric, instrumentation: miscellaneous