

Calibration and Standardization of Large Surveys and Missions in Astronomy and Astrophysics



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Photometric Calibration for the Large Synoptic Survey Telescope (LSST)

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The Large Synoptic Survey Telescope (LSST) is a next-generation optical astronomy survey facility currently under development. First light is anticipated in 2018, with survey operations officially beginning around 2021. The primary science drivers for the LSST are to understand the nature of dark energy and dark matter, to inventory the small bodies of the solar system (including Potentially Hazardous Asteroids), to explore the transient and variable optical sky, and to map the Milky Way and Local Volume. To simultaneously meet these science goals while providing a rich data set for other astronomical science, LSST will image the entire visible sky (about 18,000 square degrees) every few nights for ten years, across multiple bandpasses (ugrizy) using a 9.6 square degree camera mounted on a 8.4-m telescope.

The photometric requirements for LSST include 5 mmag photometric repeatability (relative measurements, of the same star), 10 mmag photometric uniformity across the sky (relative measurements, between any two stars) and 5 mmag band-to-band calibration. We will meet these requirements using a combination of an auxiliary telescope with spectrograph to measure the atmospheric transmission curve, a tunable laser and NIST-calibrated photodiode to measure the system hardware throughput, and leveraging the hundreds of repeat observations of bright stars in each field to compensate for variable cloud extinction. We will discuss this calibration plan and our simulation results to date.

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