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ALTAIR: Precision Calibration via Artificial Light Sources Above the Atmosphere

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Understanding the properties of dark energy via supernova surveys (and to a large extent other methods as well) requires unprecedented photometric precision. Laboratory and solar photometry and radiometry regularly achieve precisions on the order of parts in ten thousand, but photometric calibration for non-solar astronomical imaging presently remains stuck at the percent or greater level. We present our CSA and NSERC (+ U.S.) sponsored project, ALTAIR, to erase this discrepancy, and current steps toward achieving laboratory-level photometric precision for major sky surveys late this decade. In particular, we show far- and near-field imaging of the balloon-borne light source we presently launch to altitudes of approximately 20 km, and our initial calibration results (in addition to prior work with a present calibrated source in low-Earth orbit). Our technique is additionally applicable to microwave astronomy. Observation of gravitational waves in the polarized CMB will similarly require unprecedented polarimetric and radiometric precision, and we briefly present our plans for a calibrated microwave source above the atmosphere as well.

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