
Calibration Unit Design for High Resolution Infrared Spectrograph for Exoplanet Characterization (HISPEC)

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Abstract

The latest generation of high-resolution spectrograph instruments on 10m-class telescopes continues to push challenging science cases. Consequently, evermore precise calibration methods are necessary to enable bleeding-edge science methodology. We present the High-resolution Infrared SPectrograph for Exoplanet Characterization (HISPEC) Calibration Unit (CAL), designed to enable challenging science cases such as doppler imaging of exoplanet atmospheres, precision radial velocity, and high-contrast high-resolution spectroscopy of nearby exoplanets. CAL builds upon the heritage from the pathfinder Keck Planet Imager and Characterizer (KPIC) and utilizes four near-infrared (NIR) light sources encoded with wavelength information that are coupled into single-mode fiber. They can be used synchronously during science observations or asynchronously during daytime calibrations. A Th-Ar hollow cathode lamp and a series of gas absorption cells provide absolute calibration from 0.96 μm to 2.4 μm . A laser frequency comb (LFC) provides stable, time-independent wavelength information during observation and CAL implements a lower finesse astro-etalon as a backup for the LFC. Design lessons from instrumentation like HISPEC will serve to inform the requirements for similar instruments to go on ELTs in the future.

Keywords: calibration, instrumentation, pathfinder, precision radial velocity, exoplanets

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