

## Detection and Dynamics of Exoplanets (DDE): Interplay between theory and observations



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### Searching for exo-satellites around directly imaged companions and brown dwarf binaries using KPIC

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The Keck Planet Imager and Characterizer (KPIC) is a high contrast imaging suite that feeds a high resolution spectrograph (1.9-2.5 microns,  $R \sim 35,000$ ) at the W.M. Keck Observatory. One target accessible with KPIC is GQ Lup B, a substellar companion with a detected circumplanetary disk, or CPD. Observations of the CPD suggest the presence of a cavity, possibly formed by an exo-satellite. Using high resolution, K-band spectra from KPIC, I present the first dedicated exomoon radial velocity searches around the directly imaged substellar companion GQ Lup B. Over 10 epochs, we find a median RV error of 1 km/s, most likely limited by systematic fringing, or oscillations in the spectrum's continuum as a function of wavelength due to transmissive optics in KPIC. With this RV precision, KPIC is sensitive to exomoons 2.8% the mass of GQ Lup B at a separation of 65 Jupiter radii, or the extent of the cavity measured in the CPD detected around GQ Lup B. Additionally, I introduce a three-year KPIC survey focused on identifying spectroscopic brown dwarf binaries within 1 AU of their host stars to search for higher mass ratio companions beginning in 2023. By measuring companion RVs of 11 targets, this survey aims to better understand the occurrence rate and separation of these binaries as a function of mass ratio and distance to the host star.

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