10+ Years of STEPS Astrometry

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STEPS

Why Astrometry?

- Makes dynamical mass measurements and measures inclination
- Has increased sensitivity for larger orbits—for exoplanets this favors detection of “cold Jupiters.”

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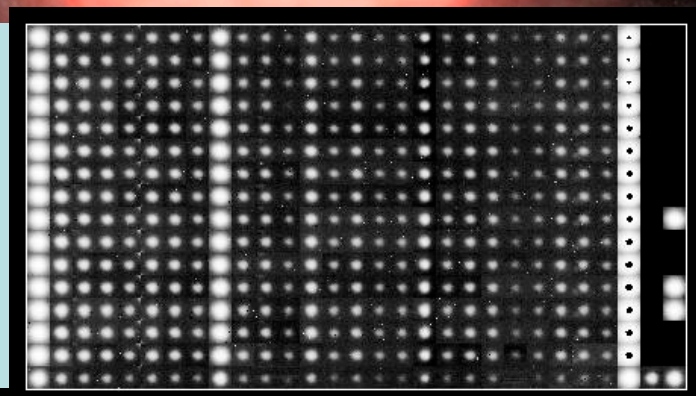
The System

- Palomar 200”
- Cass focus

- 4K x 4K CCD
- 550-750 nm window

- Extract target & reference stars from ~60-s images
- Analyze motion of target relative to reference stars



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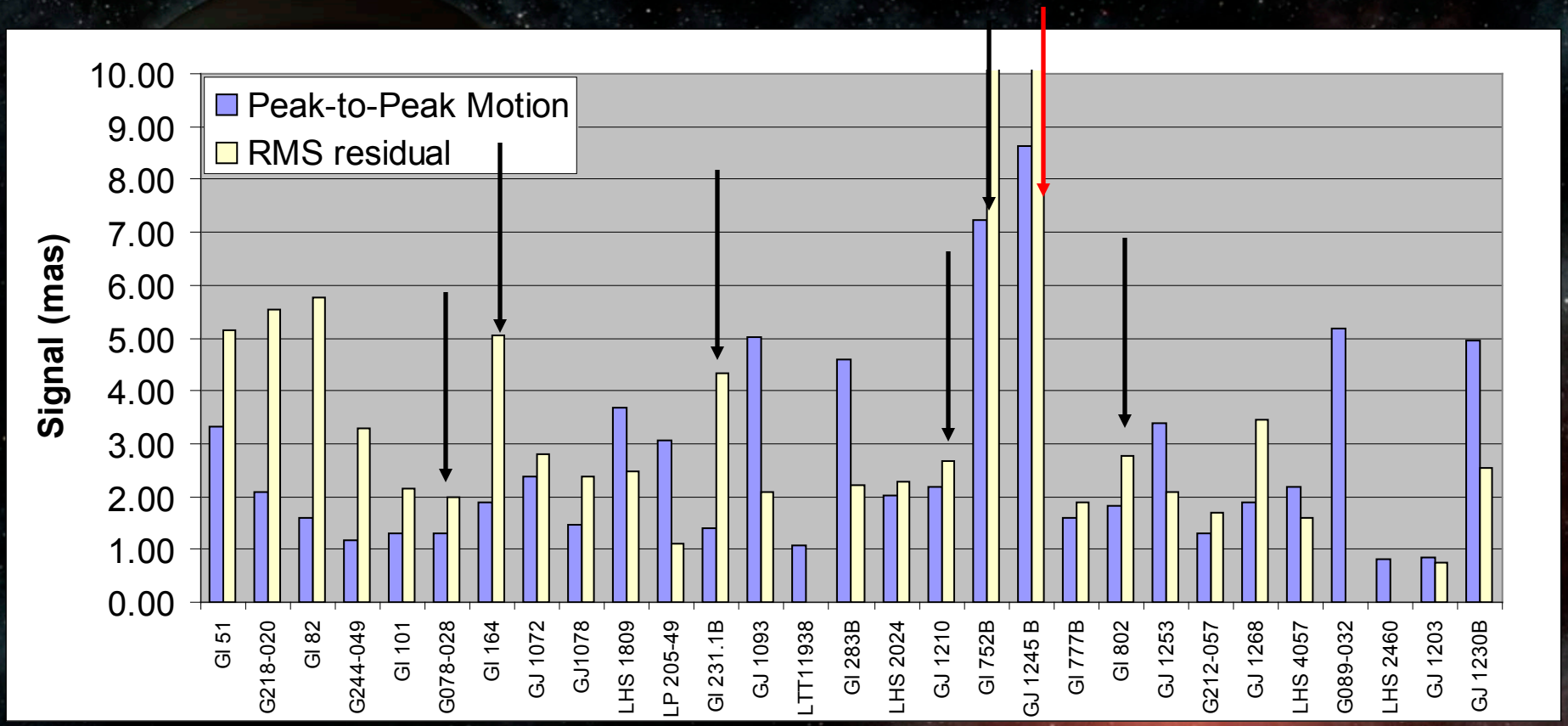
Targets & Results (from 2001 AAS)



Summary of Companions Discovered

- From ~30 targets all but 1 presumed to be single M dwarfs
  - 3 or 4 M dwarf companions
    - GJ 1210B
    - G 78-28B
    - GJ 231.1C
    - GJ 164B (late M or BD)
  - 1 or 2 Brown Dwarfs
    - GJ 802B
  - 1 Extrasolar Giant Planet (EGP)
    - VB 10b

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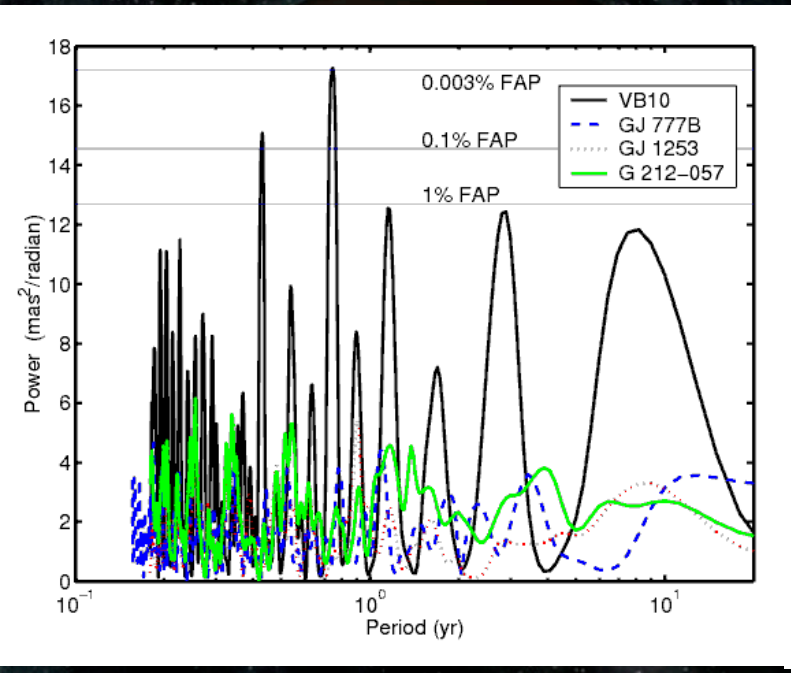
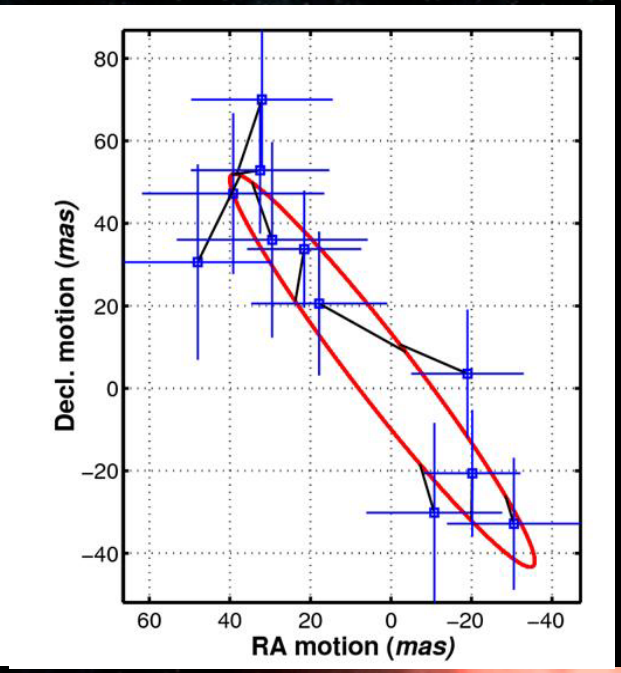
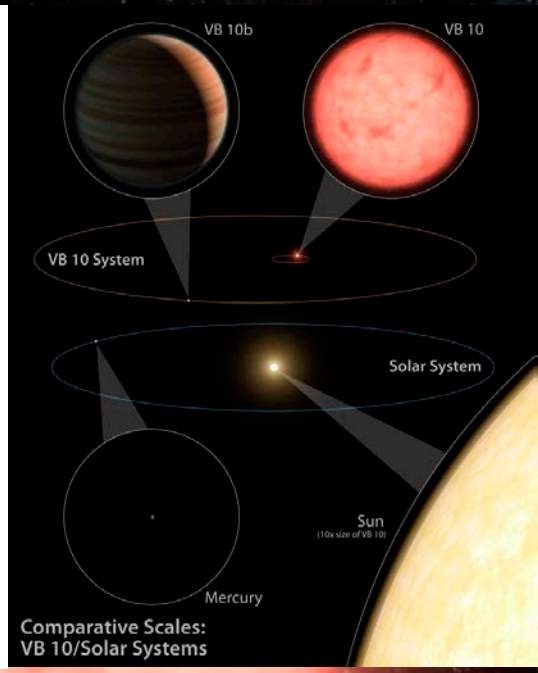
VB 10b-First Astrometric Planet







- Periodogram shows 3 x 10^{-5} FAP for 0.7-y period
- 6 M_J planetary mass, 0.36 AU semi-major axis
- RV constrained by past observations to < 1.5 km s^{-1}

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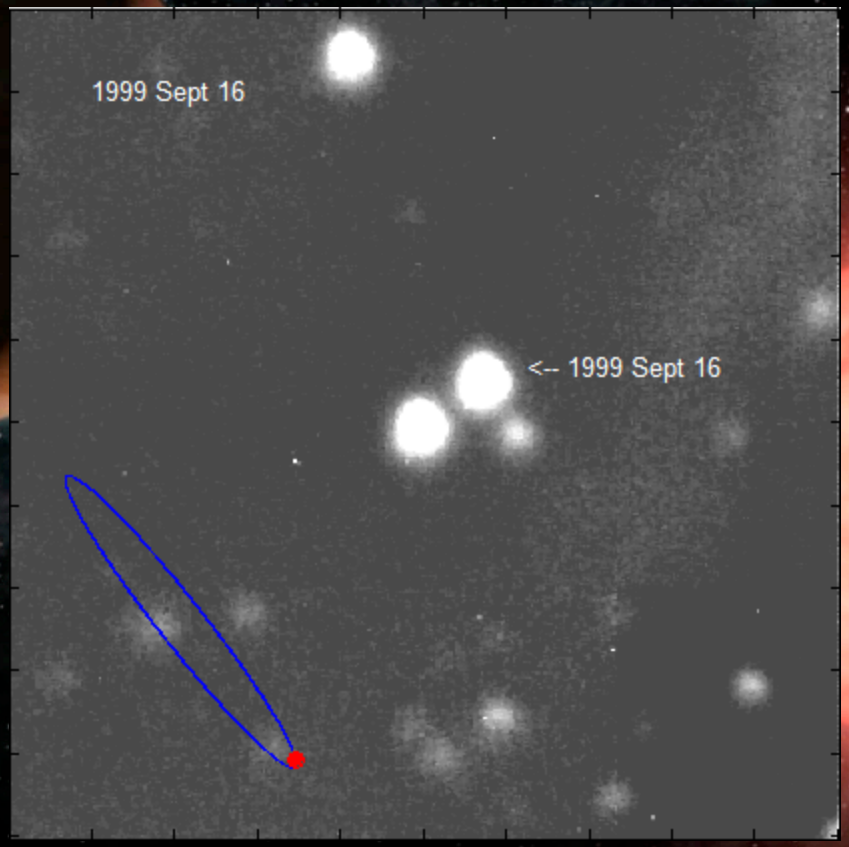
VB 10 in Space