Instrument Fact Sheet, v. 2016B

GPI

Description

GPI is an extreme adaptive-optics (AO) integral-field spectrometer and polarimeter, which provides diffraction-limited data within the spectral range 0.9–2.4 μm (YJHK). The system provides contrast ratios of 10^6 on companions at separations of 0.2–1" in a 1-hour observation.

Core operating modes: (6)
- Three focal plane options: Coronography (APLC), Direct (no mask), and Non Redundant Mask (NRM) observations.
- For each focal plane option, spectroscopy or polarimetry can be performed.
  - R ≈ 40 spectrograph uses lenslet integral field unit. 2.4"x2.4" field of view, sampled at 0.014" per lenslet. YJHK spectral ranges (K band is split).
  - Dual channel polarimeter (full field) in any of the five bands (Y, J, H, K1 or K2).
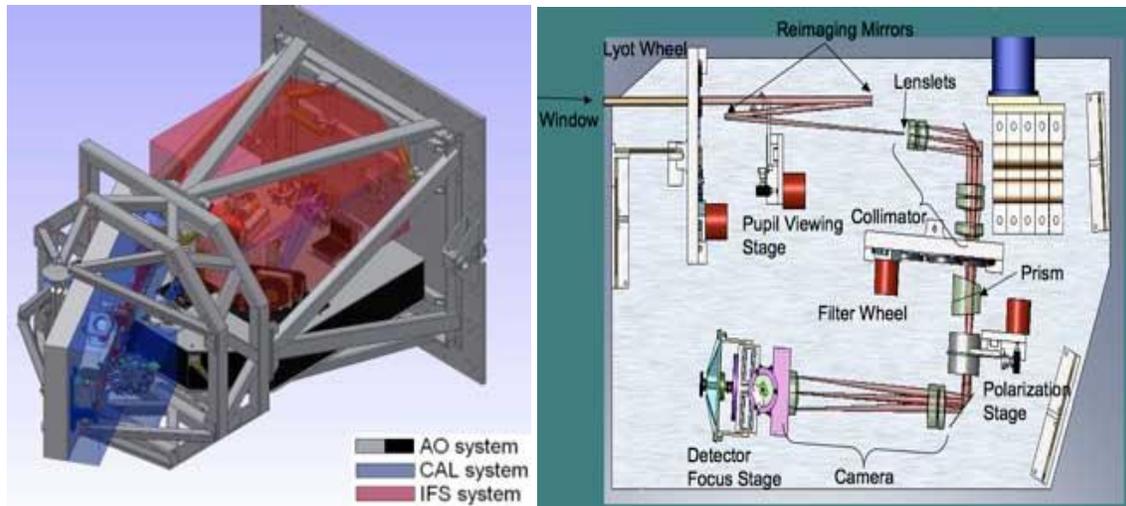
Components

AO System:
- AOWFS at 1 kHz, limiting magnitude I ~ 9.
- High-order 4096 actuators deformable mirror ("Tweeter").
- Low-order 81 actuators deformable mirror ("Woofer").

Calibration system (CAL):
- Low Order WFS (LOWFS) for slow speckle correction, tip/tilt and focus corrections.
- High Order WFS (HOWFS) for static speckle correction.

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Coronographic system: Apodized-Pupil Lyot Coronagraph with optimized masks for each band.

Integral field spectrograph:
- 2.4" x 2.4" field of view, Nyquist image sampling 0.014" per lenslet. Operation in YJHK (K split into K1 and K2), yielding R ≈ 40 spectroscopy at H band.
- Dual channel polarimeter (full field) in any of the five bands (Y, J, H, K1 or K2)

Camera, using a Hawaii-2RG HgCdTe detector, 2048 x 2048 pixels, working in the spectral range 0.9–2.5 μm.

Science operations

GPI started campaign observations in 2014A and queue operations on 2014B.

Semester	Demand (% *)	Inst. allocation (% of total assigned)	Observed hours**	Hours lost to fault
2014B	11	7	95	8.6
2015A	16	13	136	15.1
2015B	9	12	149	7.6
2016A	11	8	180	11.8

* Fraction of total hours requested in all proposals received for the semester, per telescope.
** Approximate effective on-sky use (corrected for fault loss and weather losses)

Modes pending commissioning or non-operating

Full use of the low order wavefront sensor, to correct non-common path aberrations on the minute time scales, as full corrections would allow up to Zernike 15 corrections.
High Order WFS limited in use due to telescope vibrations and in progress remediation work. The active CCR's decreased the vibrations by a factor of 10 but pending is identifying the external vibrations coupling to the instrument.

Upgrades

Upgrades to the AOWFS controller algorithm for improving contrast.
Upgrade to the Speckle nulling code for improved speed to allow on-sky speckle nulling.
Replacing the Shack-Hartmann AOWFS by a pyramid WFS (under consideration).