PARVI
(Palomar Radial Velocity Instrument)
I&T phase

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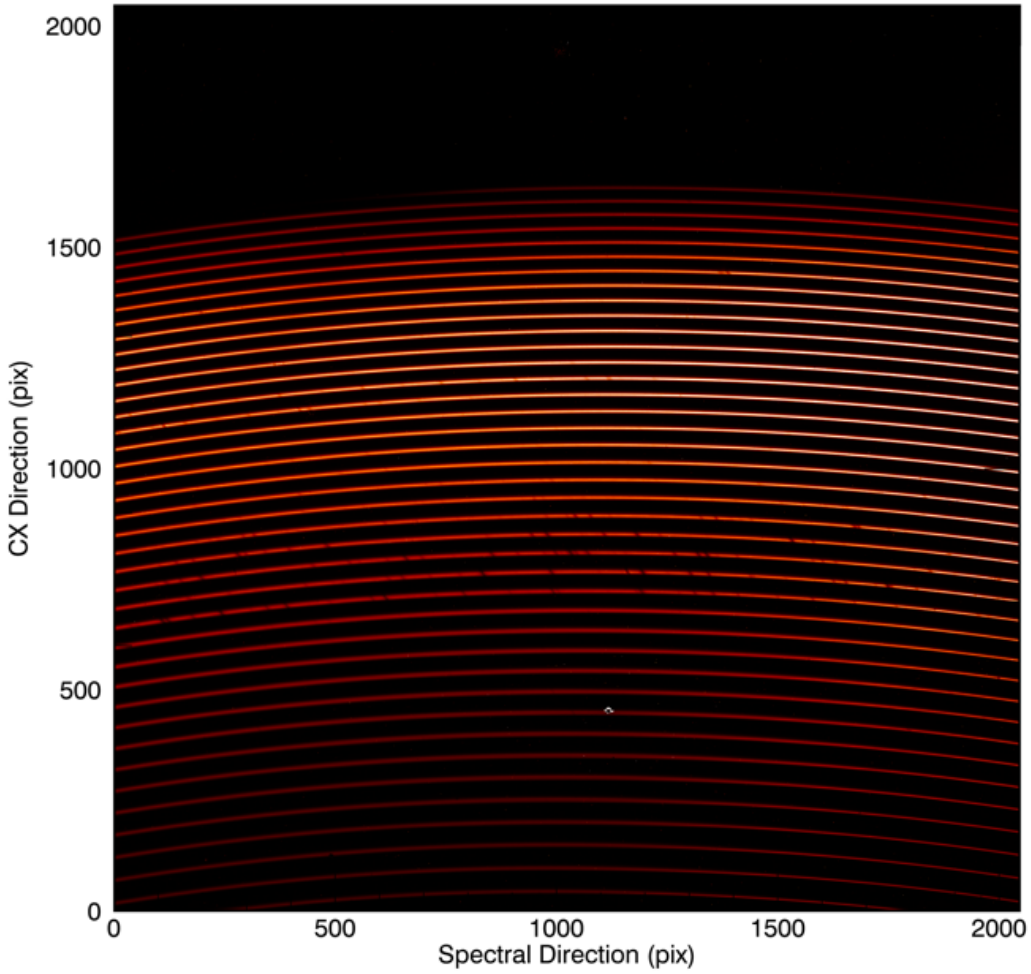
What is PARVI?

- PARVI is a single mode stabilized spectrograph fed by a P3K AO corrected beam
- It has a single 2kx2k H2RG with a zero field-of-view
- It works simultaneous across 1200-1800 nm
- PARVI is located remotely, fed by 60 m of fiber from Cass, and stabilized with a laser frequency comb
- Designed for
  - RV studies
  - High resolving power spectroscopy of objects with P3K lock range

PARVI – Key Characteristics

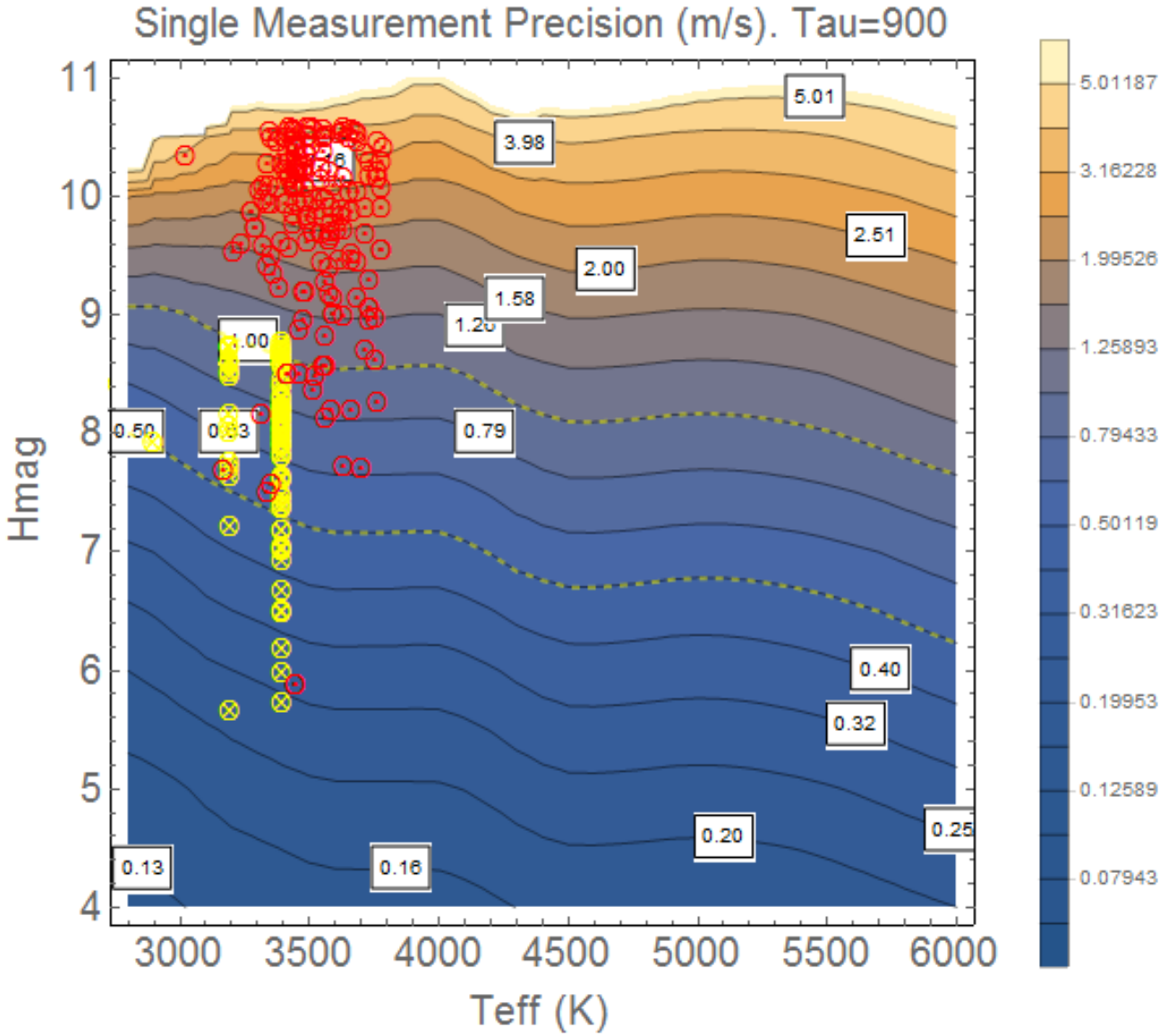
PARVI Characteristic	Value
Spectrograph Wavelength calibration	• Diffraction Limited Single Mode • Waveband 1.2-1.8 microns • R = 100,000 at 1.6 microns • H2RG • Vacuum/77 K operation/1 mK • EOM Laser frequency comb
Location/Feed	Remote/SM fiber feed
AO system	Palm 3000 with • New OCAM2k EMCCD • SH sensor • 64x64 (ExAO); also 16x16
Throughput	Loss over conventional spectrograph = mode matching loss x Strehl
Stabilization Non common path correction	Tip-tilt 50 Hz Phase diversity (MGS algorithm)
Hardware / instrument software heritage	Project 1640

Photos



PARVI is incredibly compact for an R- 110,000 spectrograph

Project 15 min RV precision



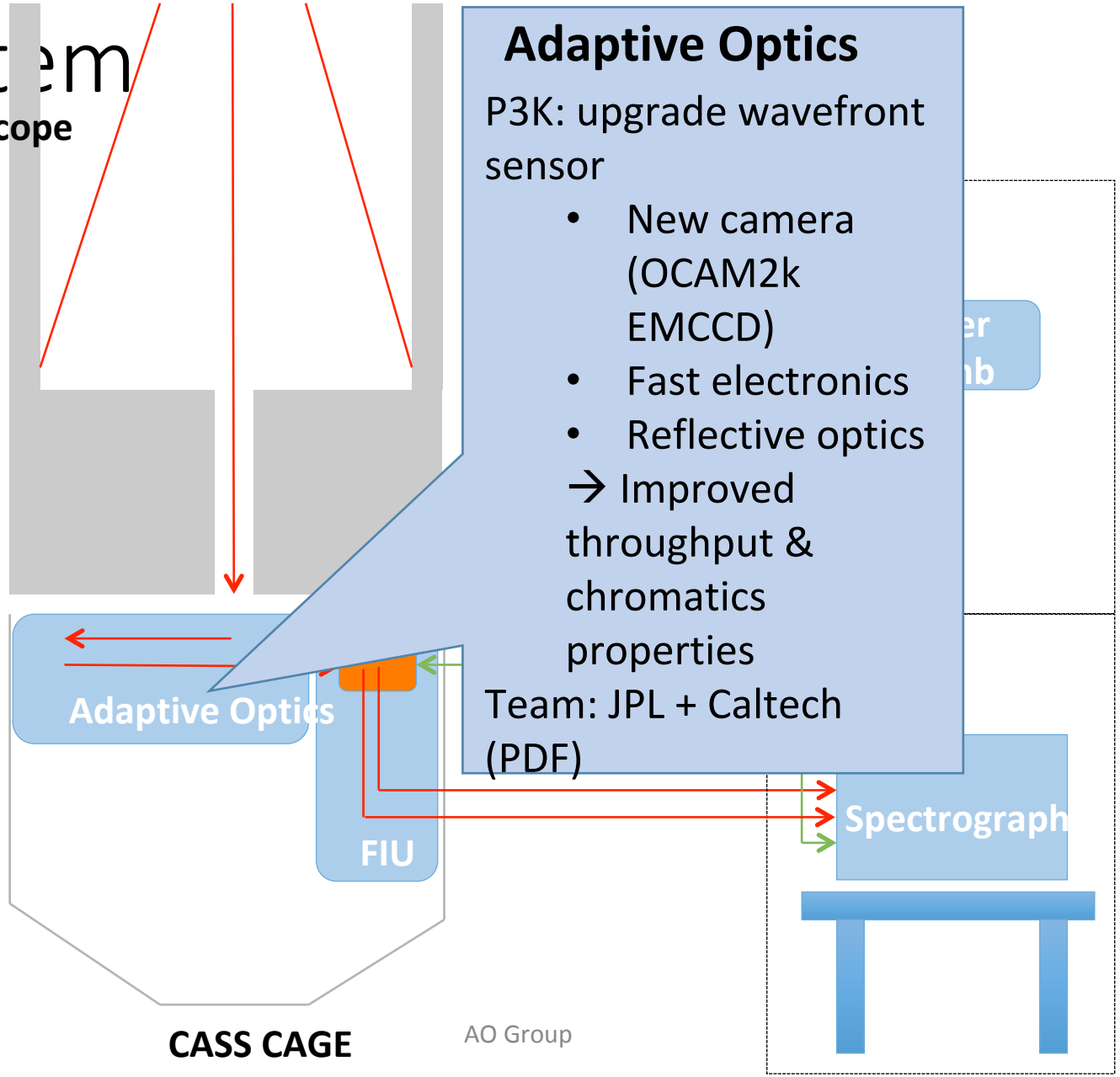
Observing and Analysis

- First light June-July this year
- Shared risk observing 2019B
- Rudimentary Echelle spectrum extraction pipeline – Oct 2019
- RV pipeline - Feb 2020
- RV pipeline II – with telluric fitting and removal – June 2020

- Backup material

PARVI System

200” Telescope



Adaptive Optics

P3K: upgrade wavefront sensor

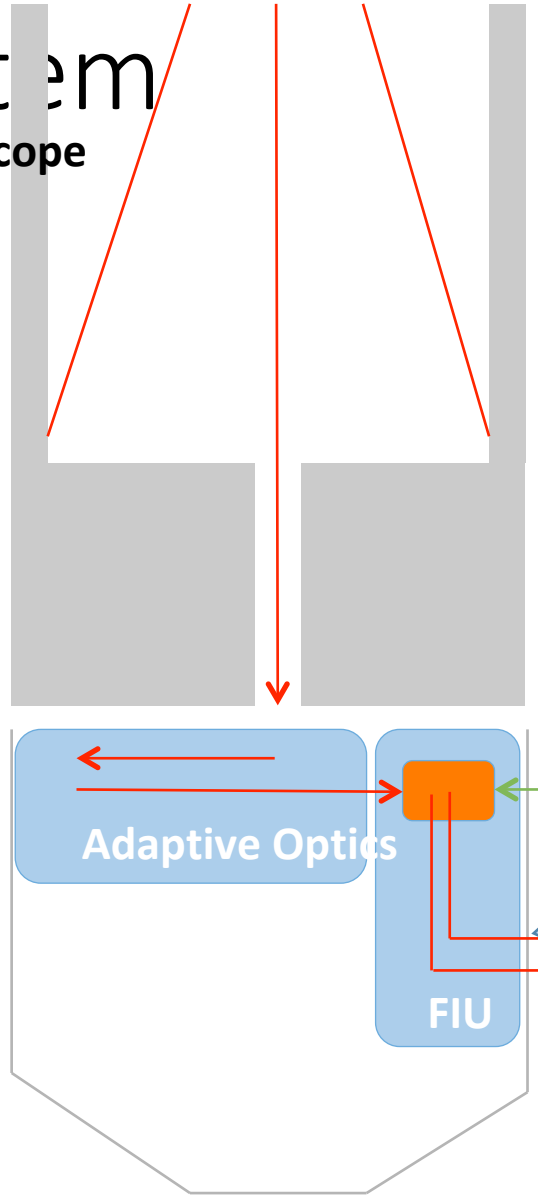
- New camera (OCAM2k EMCCD)
- Fast electronics
- Reflective optics

→ Improved throughput & chromatics properties

Team: JPL + Caltech (PDF)

PARVI System

200” Telescope



CASS CAGE

Fiber Injection Unit

- Efficient broadband coupling into a single mode fiber core
- Corrects atmospheric dispersion ~ fraction of PSF width
- Fast steering mirror + IR guide camera servos out residual guide
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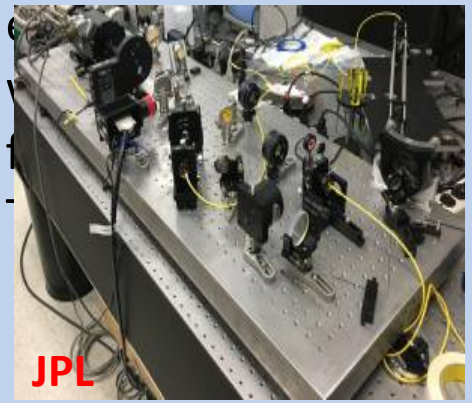
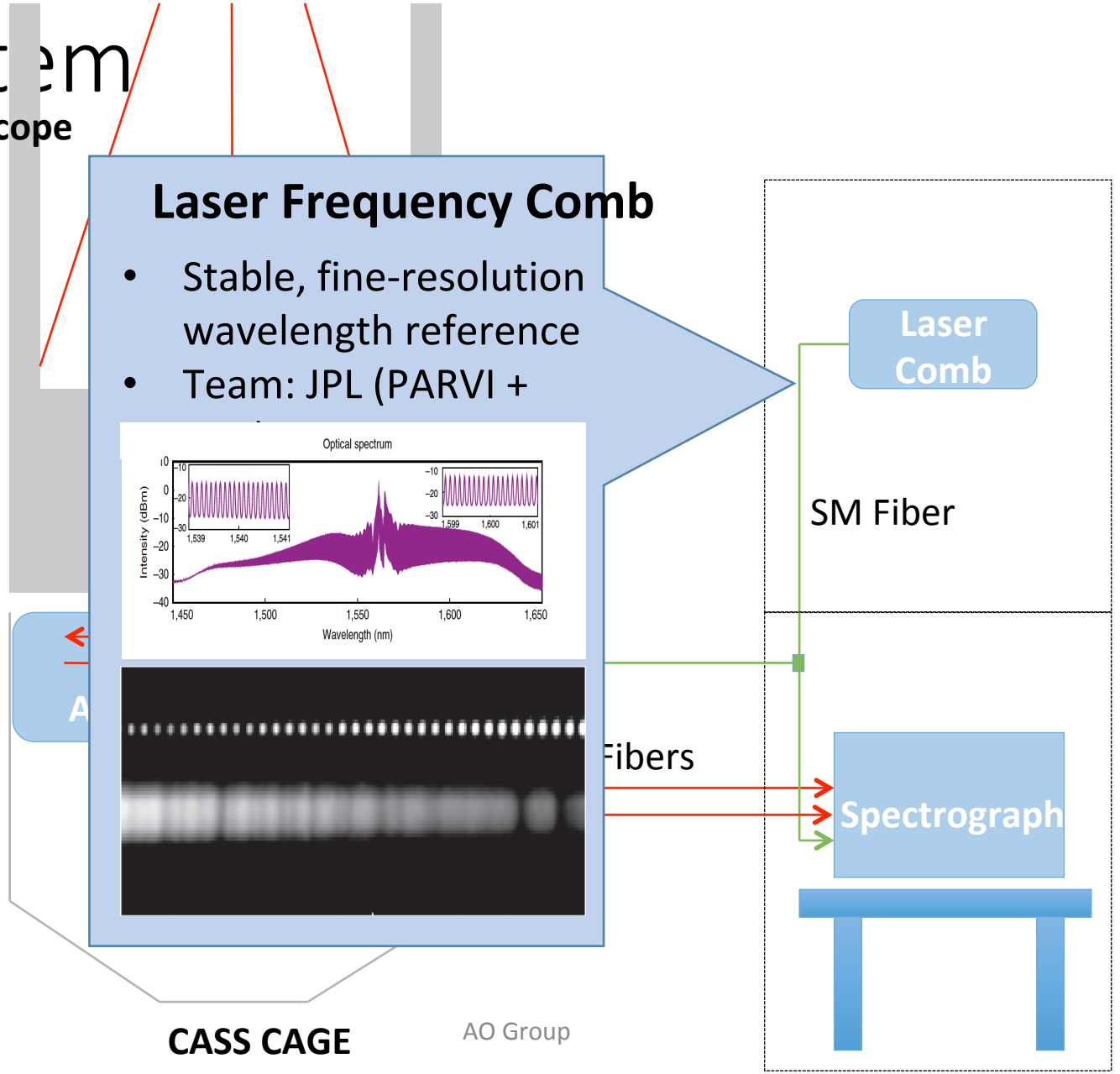


PARVI System

200” Telescope



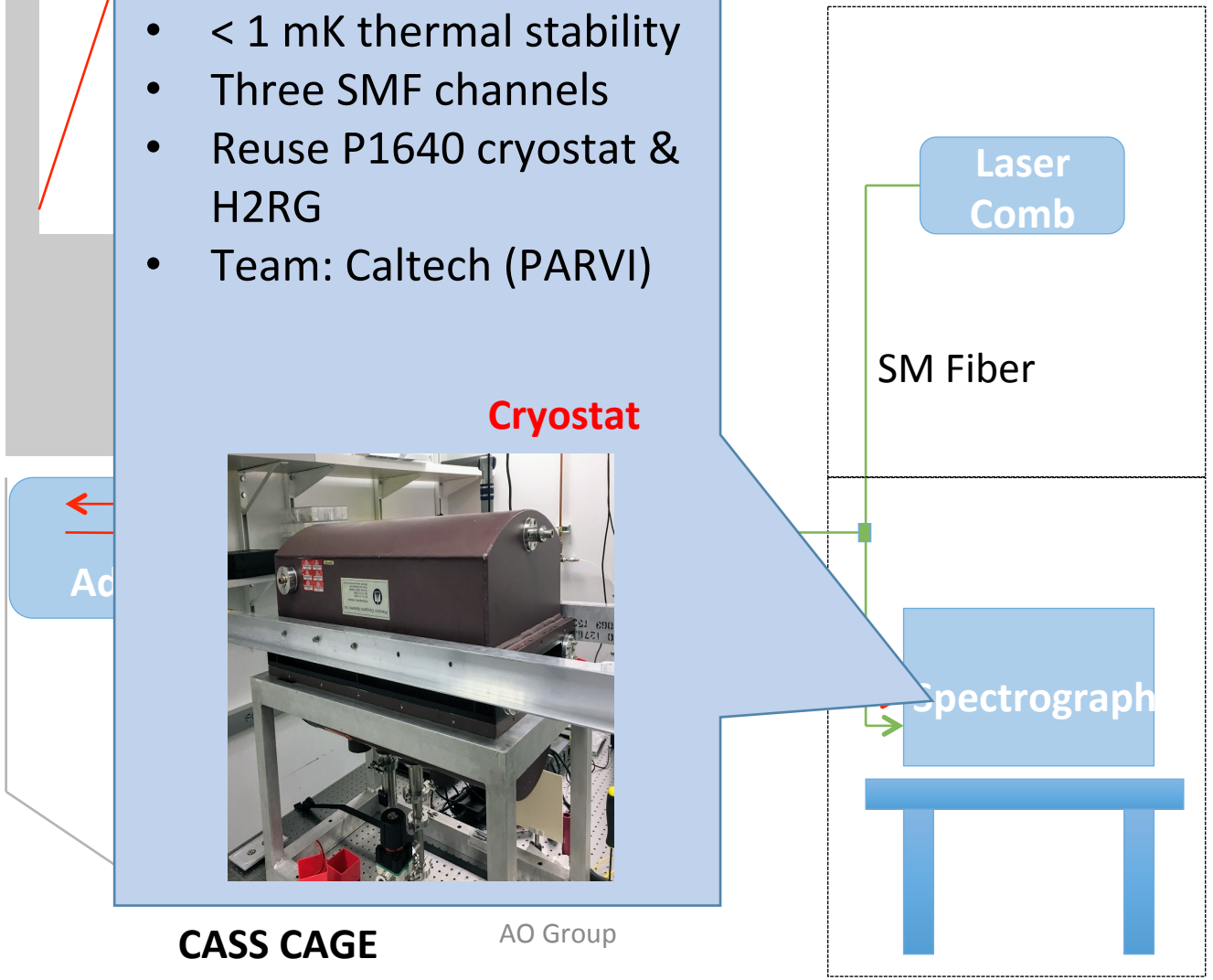
PARVI System

200” Telescope

Spectrograph

- High resolution (100,000)
- Super-compact (2’ x 1’)
- < 1 mK thermal stability
- Three SMF channels
- Reuse P1640 cryostat & H2RG
- Team: Caltech (PARVI)

Cryostat



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