Gemini Overview

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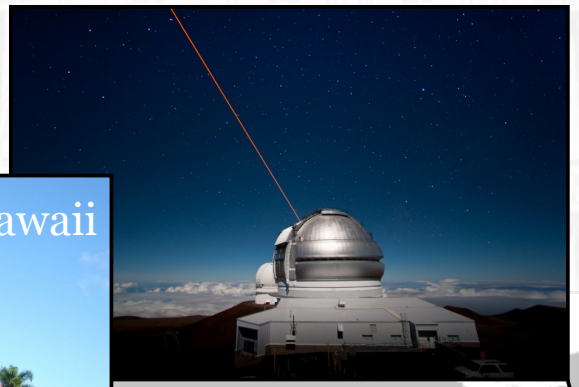
Overview

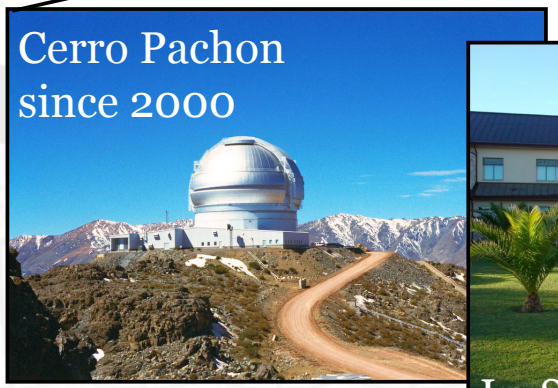
by Markus Kissler-Patig

GEMINI OBSERVATORY
Exploring the Universe, Sharing its Wonders



Gemini Observatory:
Operating two twin 8m telescopes
on Mauna Kea and Cerro Pachon:
providing access to the entire sky

We are Here
We are Here
We are Here
We are Here
We are Here
We are Here
We are Here



The International Partnership

International Agreement *2016-2021* includes as partners:
USA, Canada, Brazil, Argentina, and Chile

Shares **2016-2021:**
(Budget **~27+x $M/year**)

US 70 %
CA 20 %
BR 7 %
AR 3%
AUS+KOR +x%

KASI is a limited-term partner in *2015* and *2016*, aspiring to become a full partner in 2017

Australia did not remain a full partner beyond *2015*, but is continuing in *2016* as limited-term partner

The Future

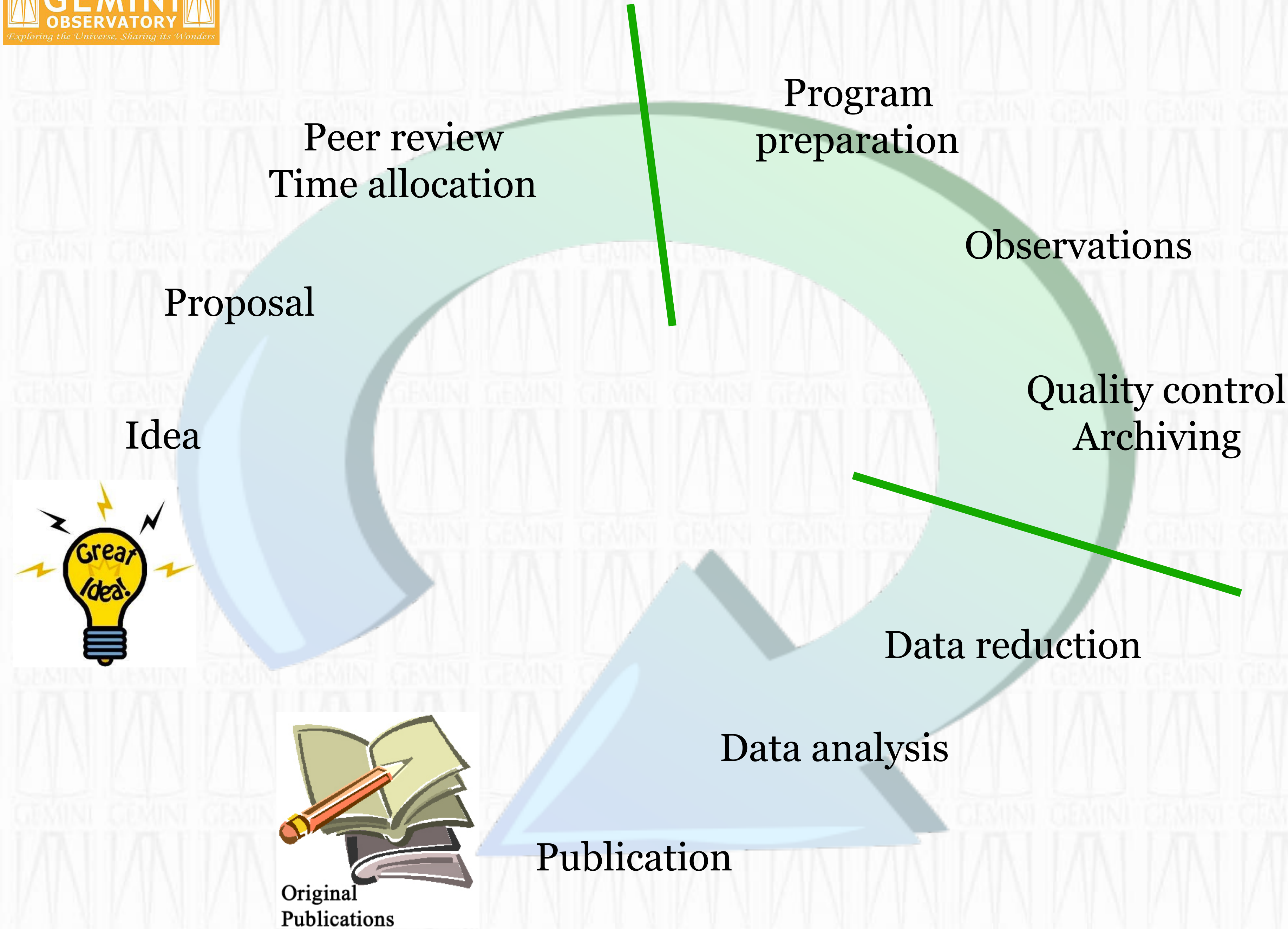
A new International Agreement will be needed for 2022+

The Gemini Board of Directors mandated a *Strategic Vision Committee* (gemini.edu/science or http://www.gemini.edu/science/Governance%20documents-top%20level/Strategic%20Vision_ToR.pdf)

The framework for **Gemini North** is to:

- Allow it to diverge from Gemini South
- Allow it to evolve within the surrounding system

We are looking at operating Gemini in close collaboration with TMT, Subaru, Keck and the other Maunakea telescopes


Peer review
Time allocation
Program
preparation
Observations
Quality control
Archiving
Data reduction
Data analysis
Publication
Original
Publications
Idea
Great
Idea!
Proposal

Proposing for time at Gemini

The regular proposal: *once per semester*, through the national Time Allocation Committees (TAC)
for regular proposals
(oversubscription: <2)

70%

NEW

Large & Long Programs: *once per year*, through the Large Program TAC
for large and/or long **ambitious** proposals
(oversubscription: >5)

20%

NEW

Fast turnaround programs: *once per month*, peer reviewed, no TAC
for short, rapid, immediate and/or follow-up proposals
(oversubscription: ~3)

10%

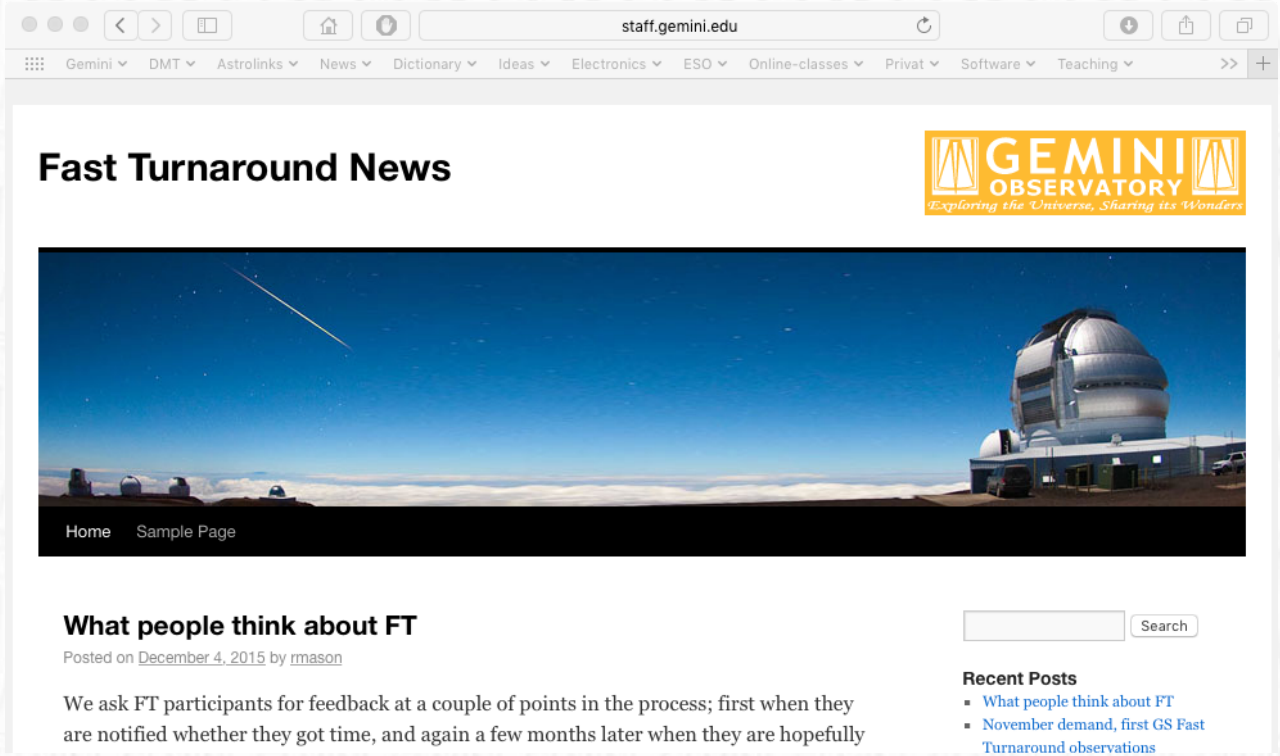
Fast Turnaround proposals

Deadline **every** month; proposers review eight proposals each

Time (20h/telescope) is allocated 2-3 weeks after the deadline

Observations are conducted **4-12 weeks after the deadline**!

Follow it on its blog: http://staff.gemini.edu/ft/



Observing at Gemini

Queue mode: (opening the time domain)

You submit your observations, we observe for you

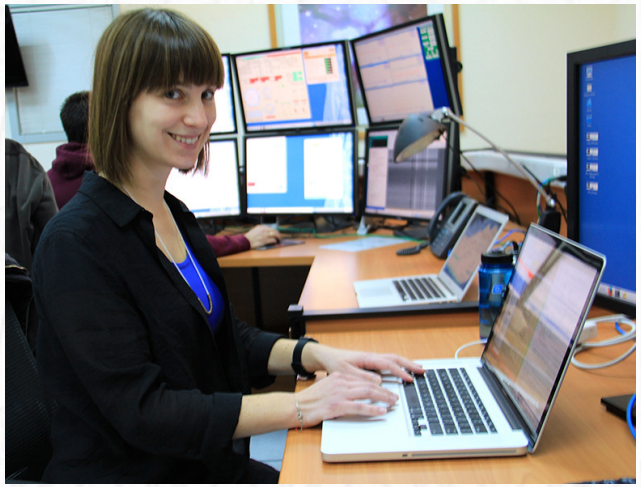
You can look over our shoulders by *Eavesdropping*!

75%

Classical mode: (allowing real-time decision)

You visit the observatory and conduct your observations

25%



First 'BOGO', Allison Noble (U.Toronto), at Gemini South

Priority Visitor Observing: you can come for as long as you want and chose & pick the best time for your observations!

NEW

Bring One, Get One: If you come observing and bring your student, we will subsidize her/him with US$2,000

NEW

The Subaru – Gemini time exchange

Subaru and Gemini are exchanging time since many years

We want to offer the new Gemini observing modes to the Subaru community and expand the good collaboration

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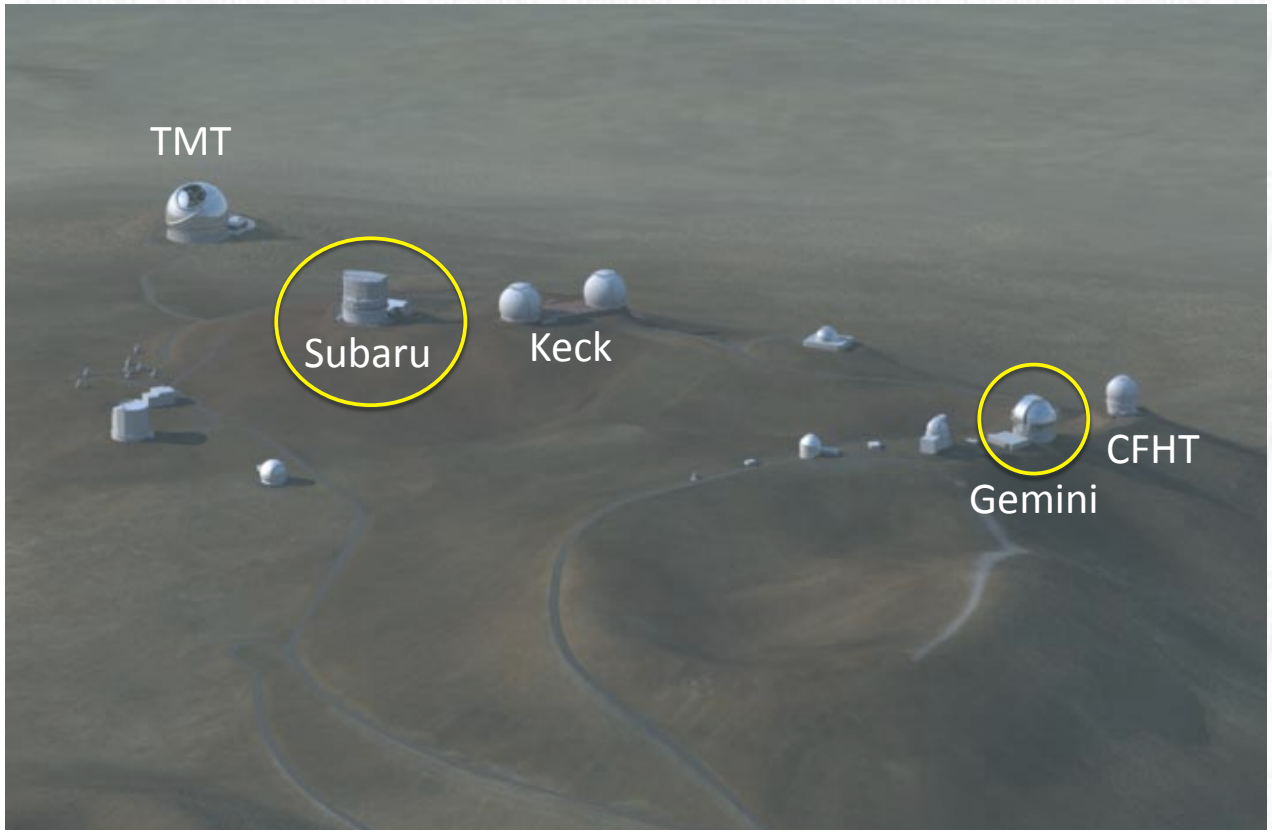
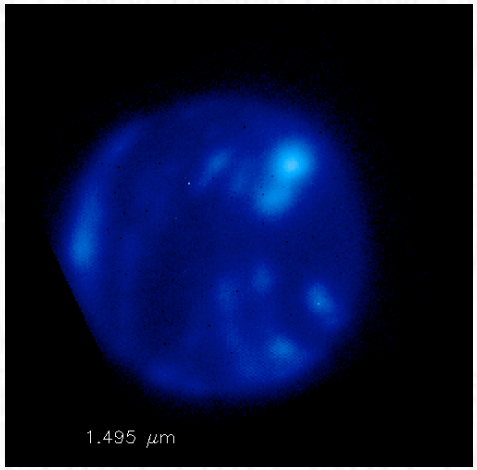
All Sky

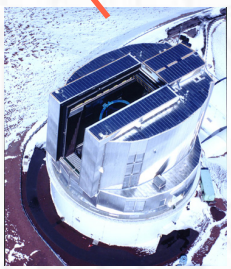
By using Gemini, Subaru users get:

- Flexibility in the time domain
- Access to unique instruments (GPI, GeMS, many visitor instruments…)





Southern Sky



Subaru latitude +19◦

ALMA latitude -23◦

Gemini-South latitude -30◦

Gemini South is better suited for:

- ALMA follow-up programs
- also ASTE, VLT, Magellan, DES, …

The Subaru – Gemini time exchange

We think that the Subaru users will enjoy all the possibilities that Gemini offers!

Instrumentation

by Scot Kleinman

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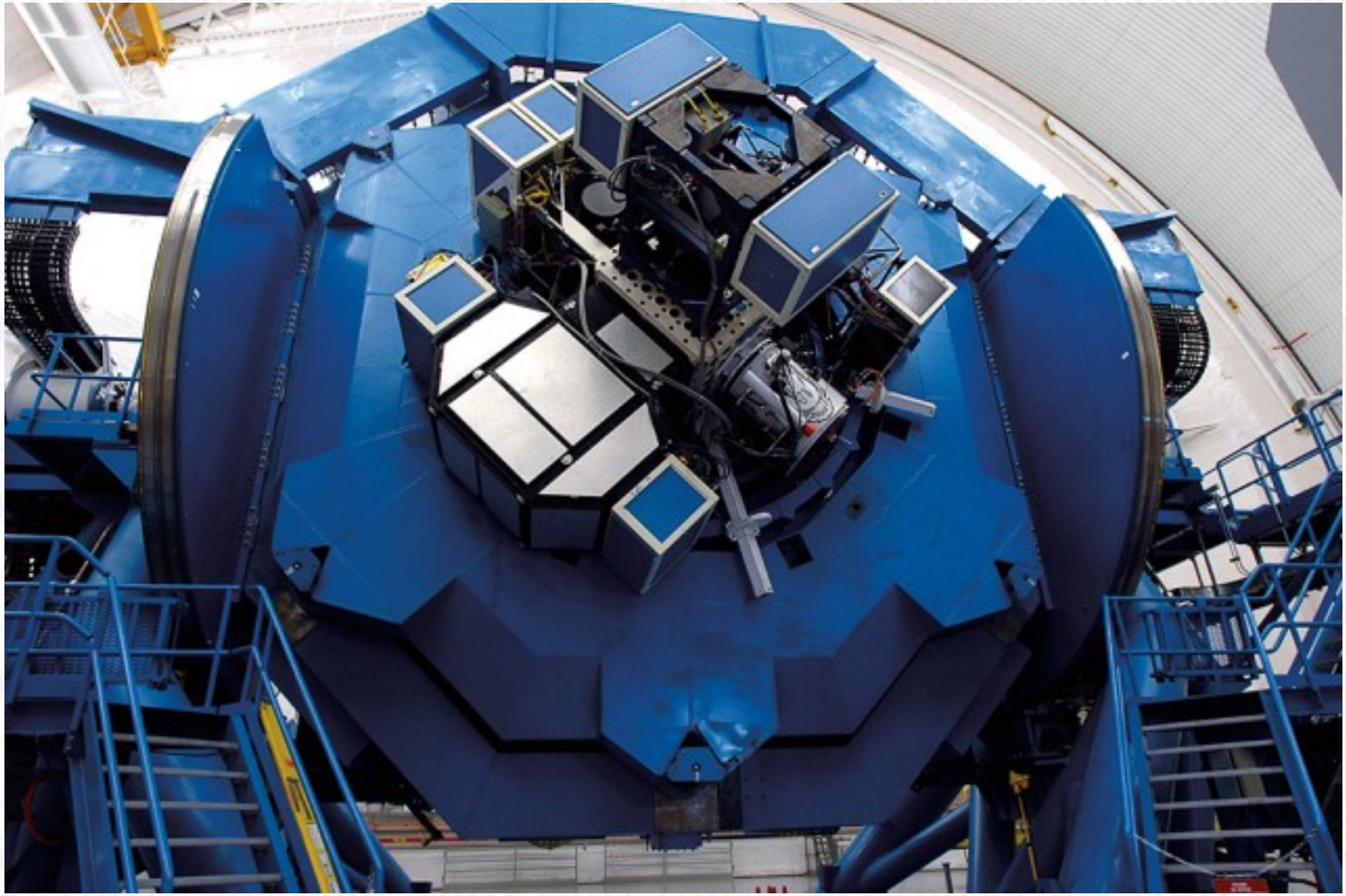
Gemini Instruments



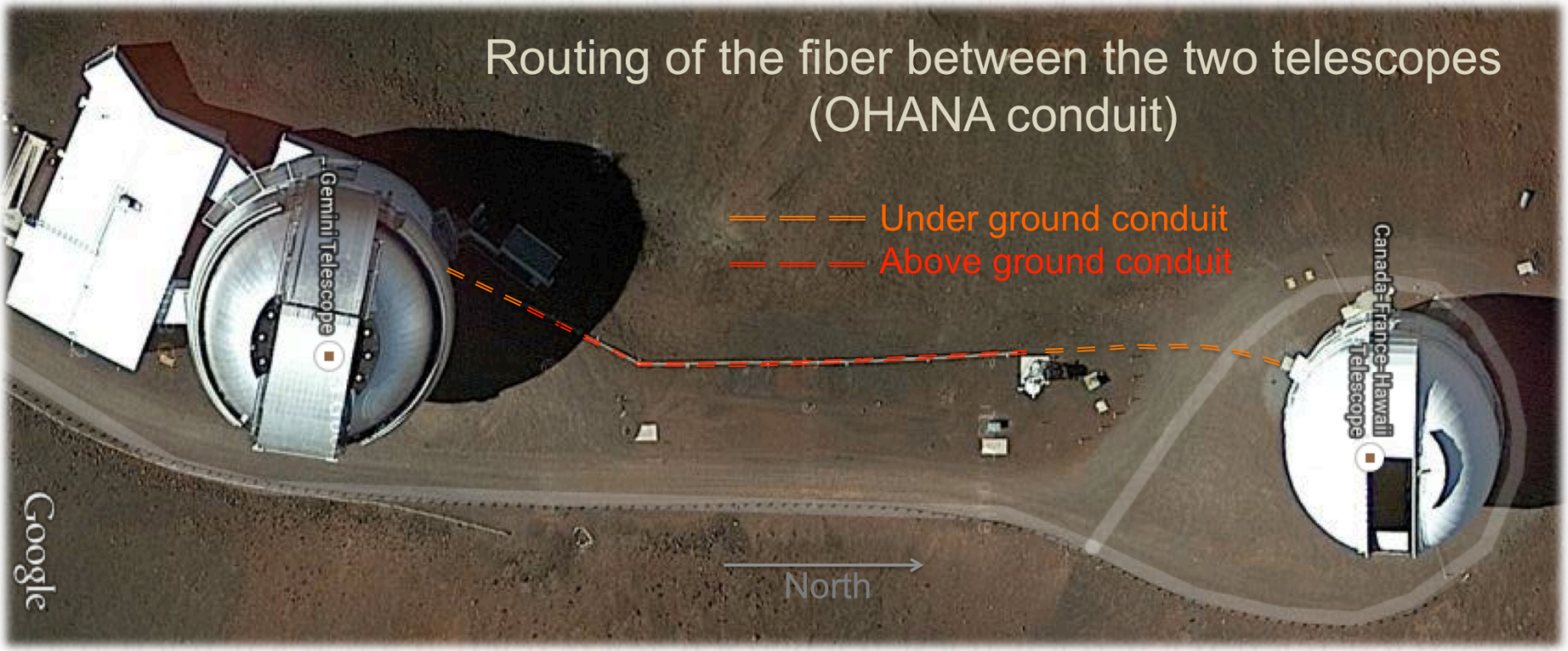
Current Instrumentation

4 instruments + 1 AO system at each site

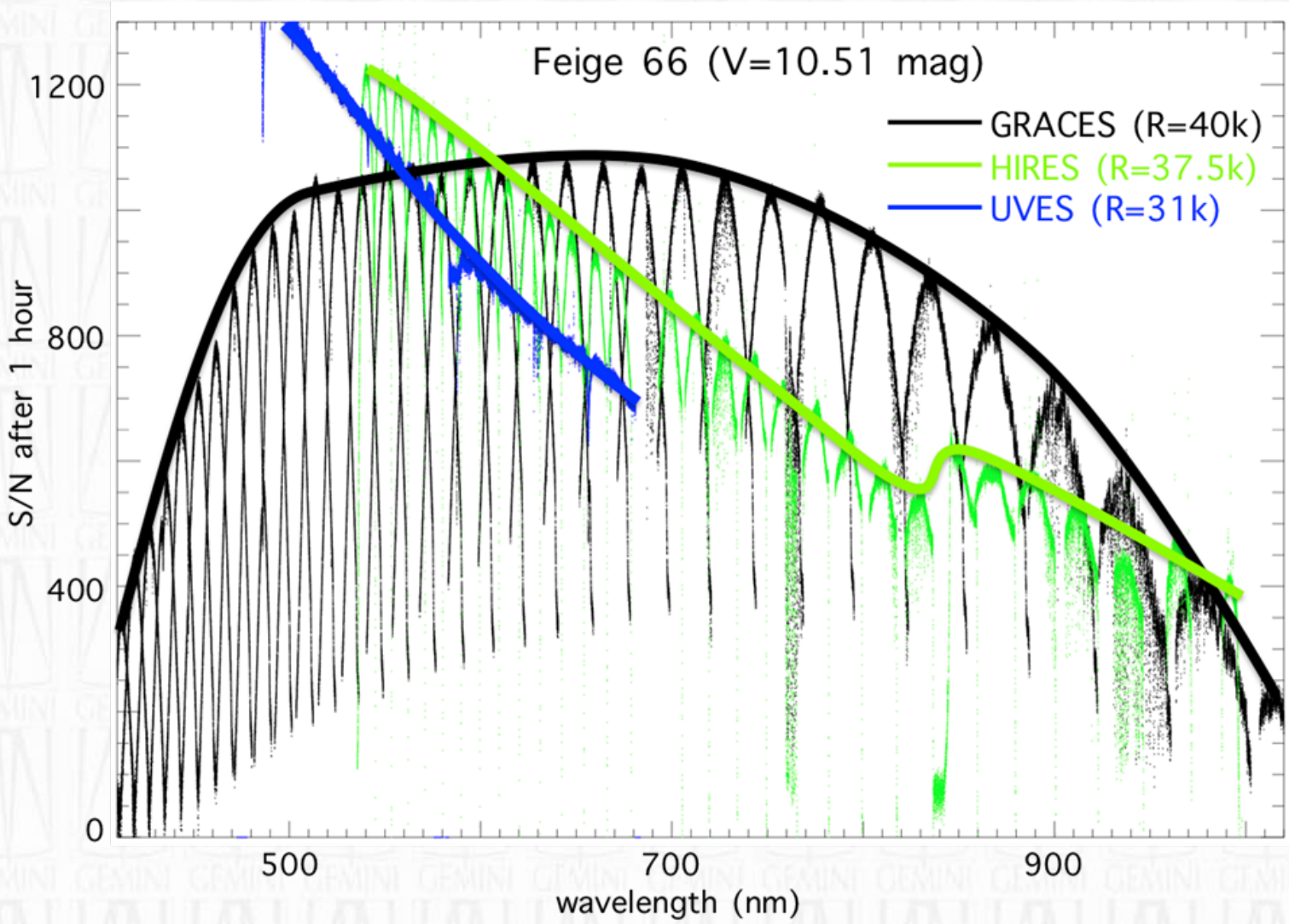
3 instruments and the AO system simultaneously mounted

Site	Instrument		FoV, Mode, Resolution	AO Support
Gemini-N up to 2017	GMOS-N NIRI NIFS GNIRS	360-940 nm 1-5 µm 950-2400 nm 1-5 µm	img 5.5'x5.5' LS, MOS, IFS (5"x7") R:600-4,000 img 20"x20" - 120"x120" IFS (3"x3") R:5000 LS R:1,800-18,000 (+img)	(ALTAIR) ALTAIR ALTAIR ALTAIR
Gemini-S GN in 2018	GMOS-S GSAOI FLAMINGOS-2 GPI	360-940 nm 950-2400 nm 950-2400 nm 900-2400 nm	img 5.5'x5.5' LS, MOS, IFS (5"x7") R:600-4,000 img 85"x85" with MCAO img 6.1' ∅ LS, (MOS) (2'x6') R: 1,200-3,000 IFU 2.8"x2.8" contrast: 10^7 at 0.4"	(GeMS) GeMS (GeMS) XAO
~2018 (TBC) ~2022 (TBC)	*(GHOST)* *(Gen4#3)*	360-1000 nm Visible + NIR	2 IFUs in 7' ∅ R: 50,000 + 75,000 aimed to be an **LSST** follow-up instrument	(None)
Visiting 2017	TEXES (GN) DSSI (GN) GRACES (GN) Phoenix IGRINS	5-25 µm 400-1000 nm ~600-1000 nm 1-5 µm H+K	LS R: 4,000 - 85,000 Dual EMCCD imaging, 20 mas resolution@650nm see CFHT/ESPaDOnS - high-res. spectrograph LS R: 50,000 - 80,000 LS R: 40,000	none speckle none

GRACES


Routing of the fiber between the two telescopes
(OHANA conduit)
Under ground conduit
Above ground conduit
Gemini Telescope
Canada-France-Hawaii Telescope
North
Google

GRACES



Performance essentially the same as HIRES/UVES (above ~550nm) and available now!

GRACES

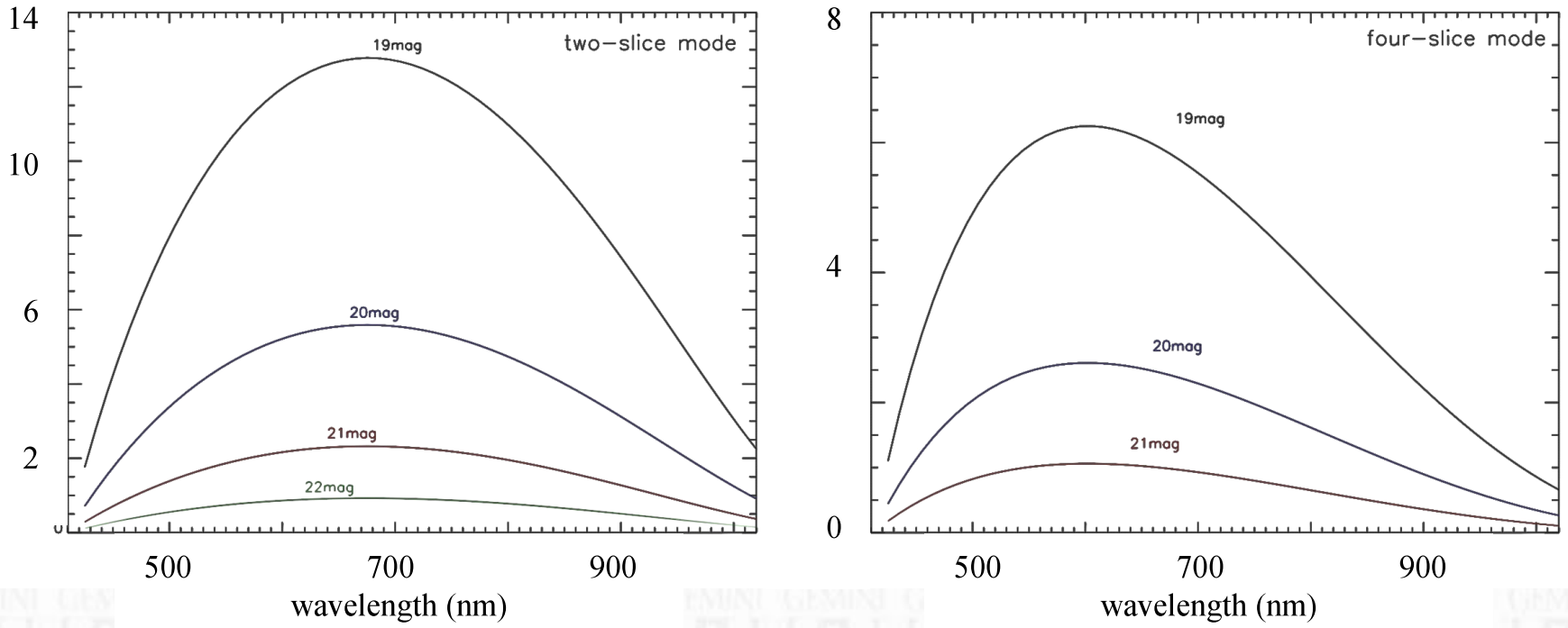
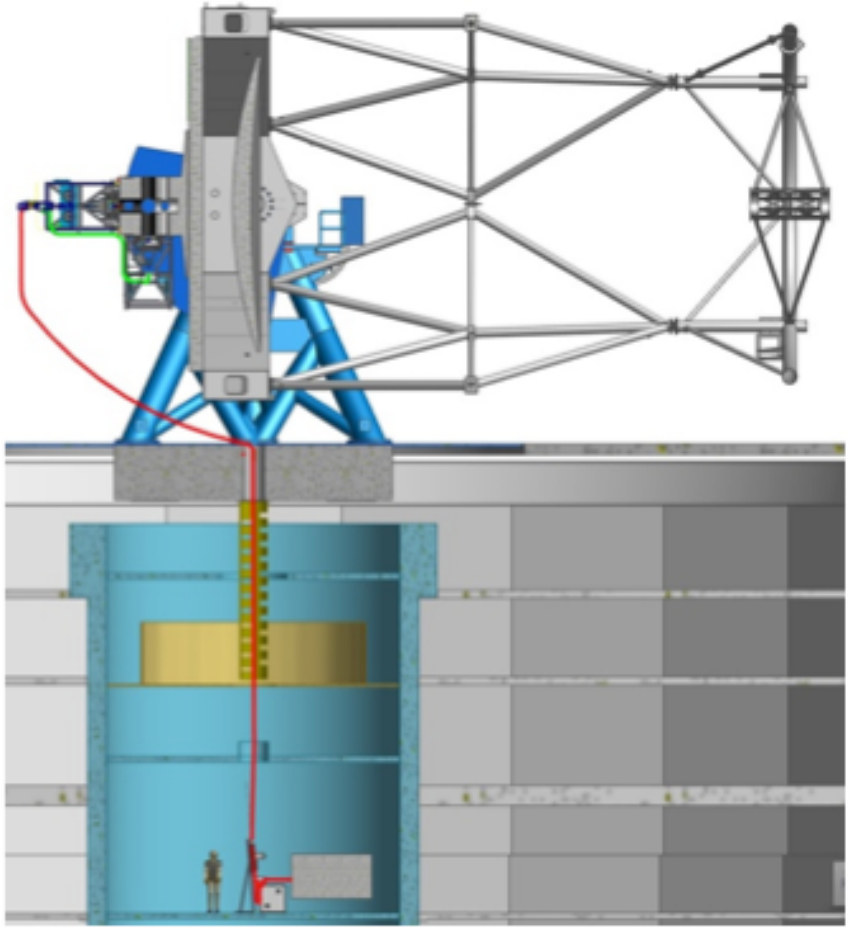


Figure 4. *S/N* reached for a flat spectrum of different magnitudes after a 1h exposure in the two-slice (left) and the four-slice (right) modes.

Performance essentially the same as HIRES/UVES (above ~550nm) and available now!

GHOST

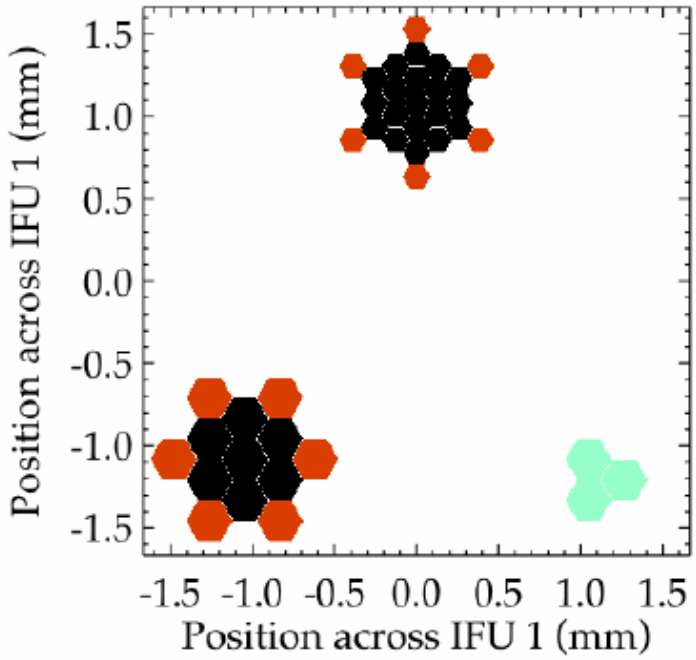


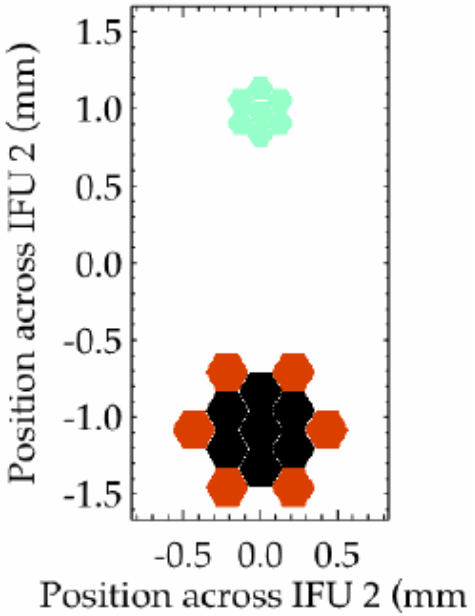
AAO GEMINI OBSERVATORY Canada NRC·CNRC Australian National University

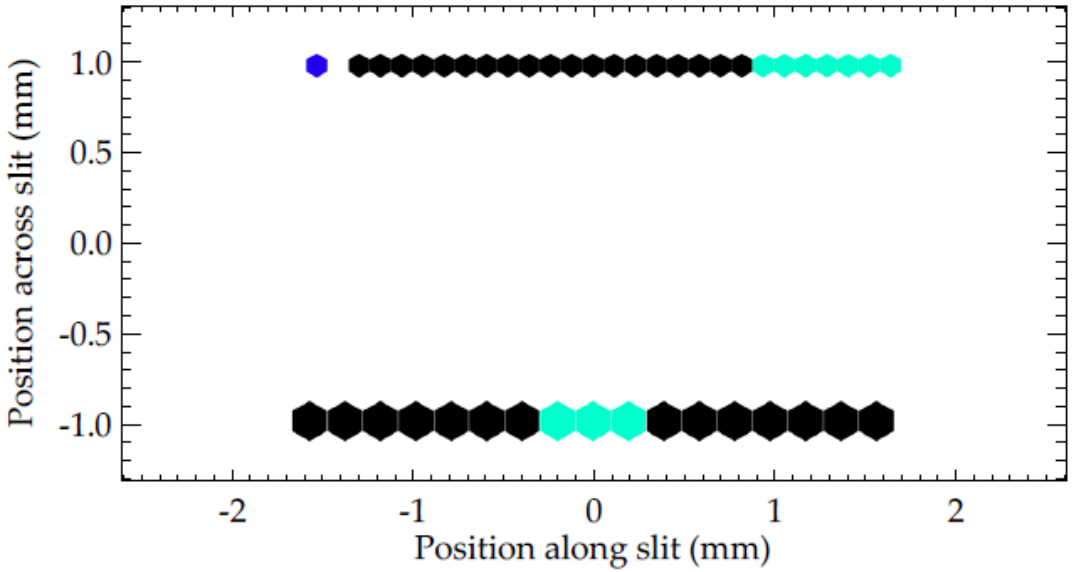
GHOST

CDR Part 2:
March, 2016.

On sky: 2018!







Gemini's Next Instrument: Gen4#3

A moderate resolution, broad bandwidth spectrograph

Baseline parameters

R ~4000
λ ~400-1600nm
Highly efficient
Throughput
Acquisition and observing overhead
On-sky by start of LSST main survey (2023)

GIFS Studies Enhancements

Extension to 2.5μm and 369nm
IFU
Multi-object
Simultaneous imaging
Higher resolution
Very long slit mode for planetary transit observations
Spectropolarimetry
EMCCD

Look for Gen4#3 RfP later this year!

Other Work

GMOS CCDs (Hamamatsu fully depleted)
- GMOS-S CCDs are in and performing to specifications!
- GMOS-N CCDs will be installed later this year

GeMS (Gemini South AO system)
- New laser contracting in progress now (2017-2018 install)
- Improved natural guide stars coming
- →Improved reliability and sky coverage

ALTAIR (Gemini North AO)
- Developing plan for new RTC for improved performance (Probably 2017 installation)

Flamingos-2
- MOS commissioning this year

Other Instrument Upgrade Opportunities
- Coming ~September, 2016

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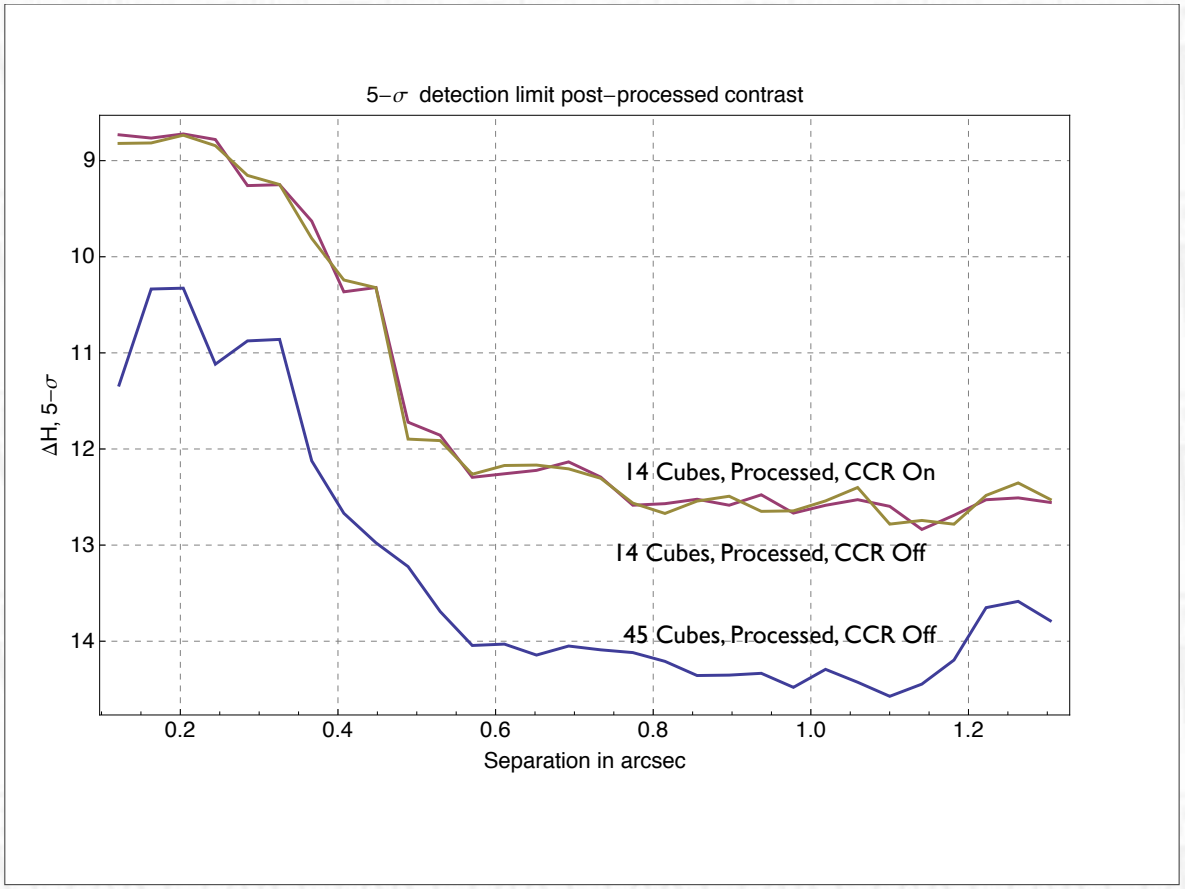
Hope to see you on the Gemini Bus!

どうもありがとうございました。

Backup Slides

GPI Performance



Tuesday, June 17, 14

GMOS-S CCDs

	Hamamatsu	EEV
Readout/Gain	slow/low	slow/low
Gain (e-/ADU)	1.65	2.19
Read noise (e-)	3.96	3.68
Full well (e-)	106,000	125,000
Dark current (e-/pixel/hr)	~3	~3
Readout time (s) 1x1	83	127
Readout time (s) 2x2	25	55
Fringing (peak to valley / mean)	<1% in i	~70% in i

What is GeMS?

Gemini Multi-Object Adaptive Optics System (GeMS)

- ★ Delivers (almost) difraction limited images in the Near Infrared
- ★ 5 x 10W LGS
- ★ 3 NGS (R~ 8-15.5)
- ★ 3 DMs conjugated at 0, 4.5, and 9km
- ★ Over a larger field of view (~ 85" x 85")
- ★ With an extremely good uniformity (PSF)

Instrument suite

- ★ Gemini South Adaptive Optics Imager (GSAOI): NIR HR imager
- ★ Flamingos 2: NIR MOS spectrograph (coming)
- ★ GMOS-S: Gemini South MOS optical Spectrograph (coming)

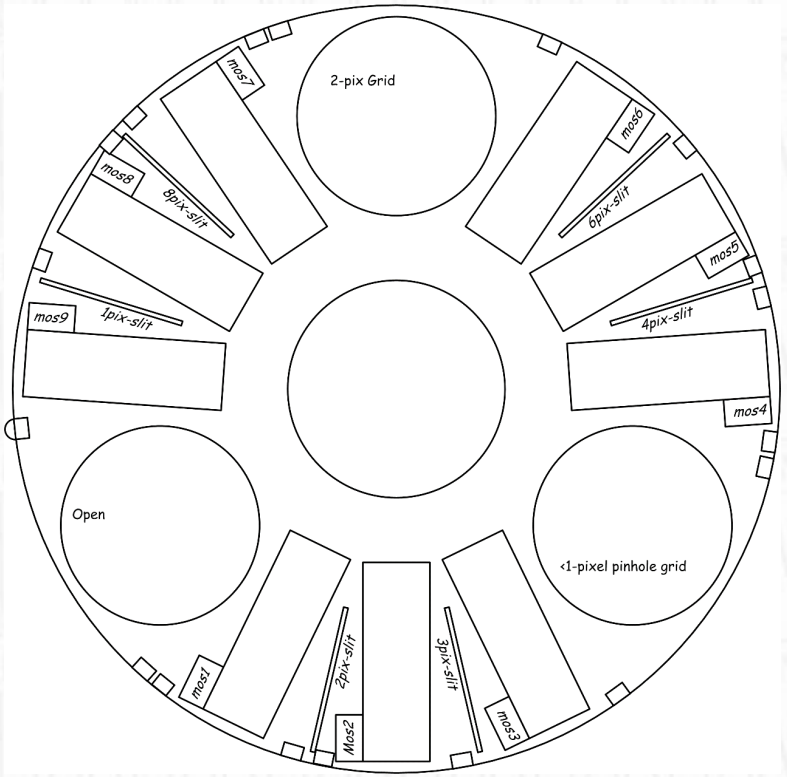
GeMS Performance

	J	H	K	Natural seeing
Strehl avg. FWHM avg.	15% 50-60mas	25% 55-70mas	35% 60-65mas	<0.8 arcsec
FWHM avg.	150mas	100mas	90mas	0.8-1.0 arcsec
FWHM avg.	300mas	250mas	200mas	1.0-1.2arcsec

Flamingos 2

Imaging
- 6.1’ diameter FOV
- 0.95 – 2.4 microns

Long slit
- widths: 1-pix, 2-pix, 3-pix, 4-pix, 6-pix, 8-pix (1-pix =0.18”)
- length: ~4.4' (263", 1460 pixels)
- (non-AO mode)



MOS mode (not yet offered)
- ~80 slitlets in 2’ x 6.1’ FOV
- 9 masks are housed at once

3 Grisms:
- JH, HK (R~1200), or R~3000 single bandpass (y,J,H,K)