SWIMS
A New NIR MOS Spectrograph for TAO 6.5m Telescope

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TAO

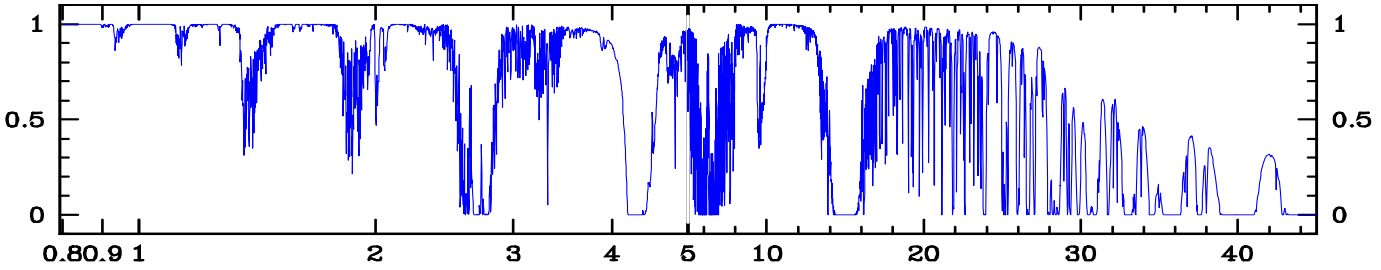
The University of Tokyo Atacama Observatory Project

* Construct an infrared-optimized 6.5m telescope at the world's highest site of 5650m(18000ft) altitude, Co. Chajnantor at Atacama desert, Chile
* Current status:
  * Installed a 1m telescope (called miniTAO), and started observations in the near- to mid infrared

Advantage of Co. Chajnantor

* Photometric nights > 60%, / usable >80% (Miyata+08)
* Median Seeing 0.7” @ V-band (KM+08)
* High Transmittance by low pressure (<0.5atm) + dry climate <= PWV 0.5mm (25%tile) (1mm@MKO)

Atmospheric Transmittance

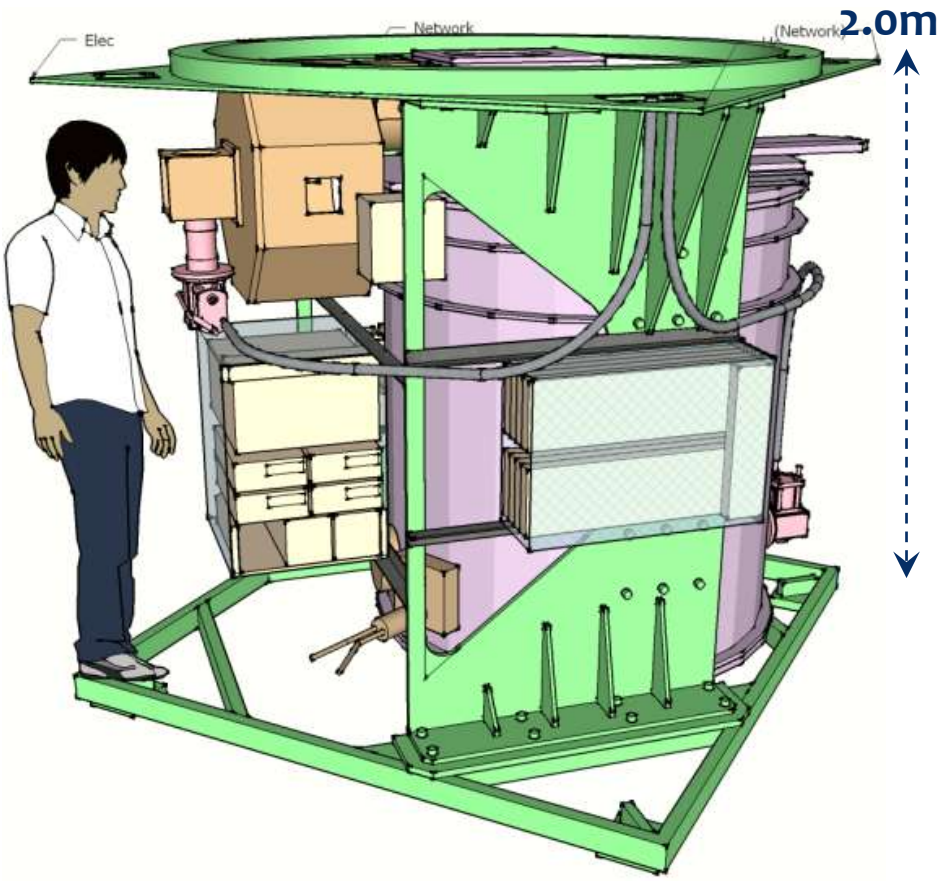


Excellent observational condition in both NIR(1-2.5mm) and MIR (5-40mm)

SWIMS

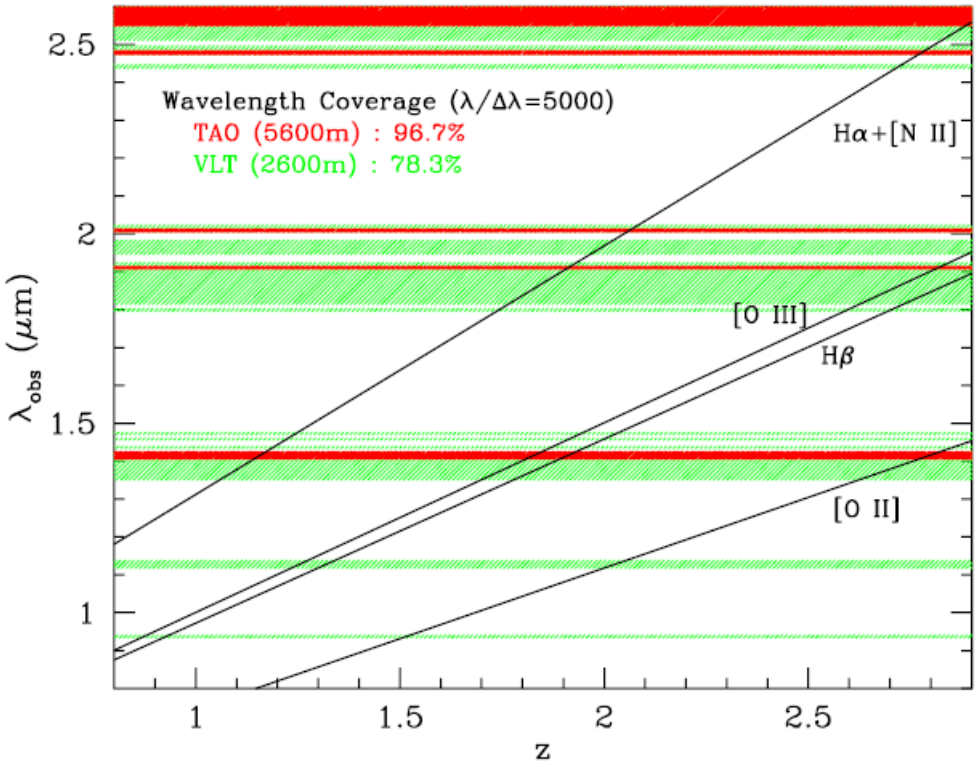
Simultaneous-color Wide-field Imager and Multi-object Spectrograph

* NIR Spectrograph for TAO 6.5m
  * Wide-Field (9.6' ϕ FoV on TAO)
  * MOS Spectrograph
  * 2-band simultaneous Imaging/Spectroscopy
    : 0.9-1.4 and 1.4-2.5μm
  * R~1000 (4pix/0.52"slit)
* Funded as a part of "Economy Stimulus Budget ", 2009-2010



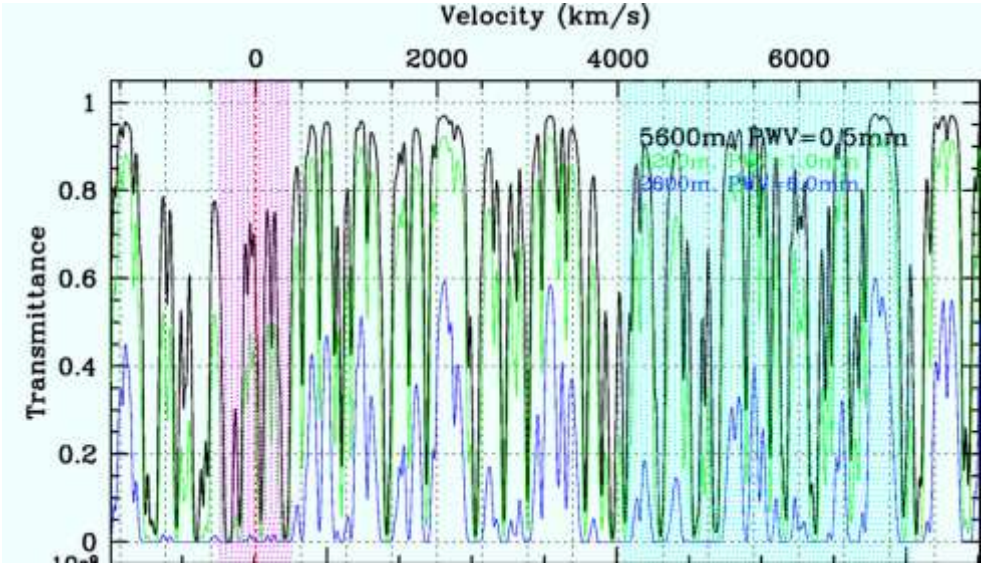
Science with SWIMS
Galaxy Redshift Surevey

* High transmittance at TAO site : Ideal for the redshift survey in the infrared
* Full 0.9-2.5μm spectra can be obtained simultaneously : precise continuum / line ratio measurement possible
* Simultaneous Hi-z Narrow-band Imaging (e.g. Hα/OIII, Hβ/OII)

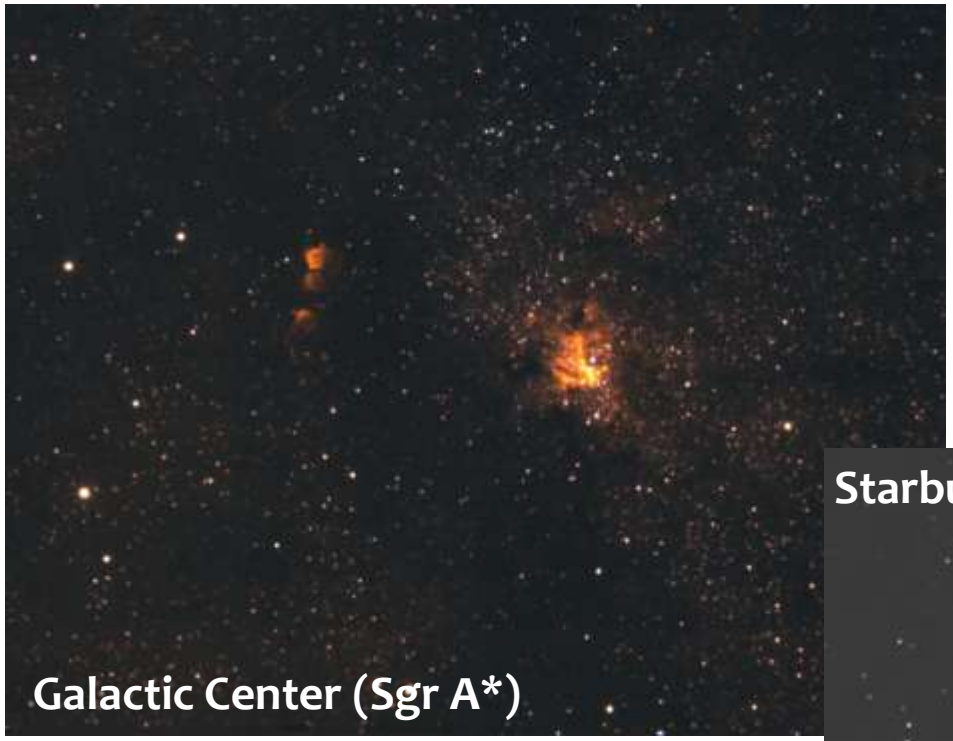


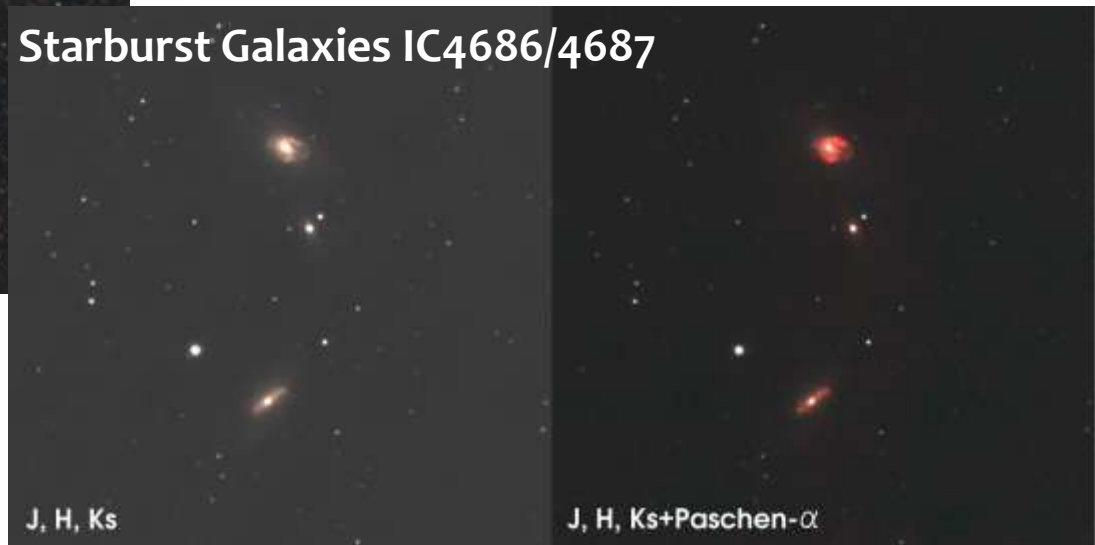
Science with SWIMS
New Window for Paα

* Hydrogen Paα line (1.8751mm) available
  * Strongest Hydrogen Line in NIR
  * Good probe in dusty environment

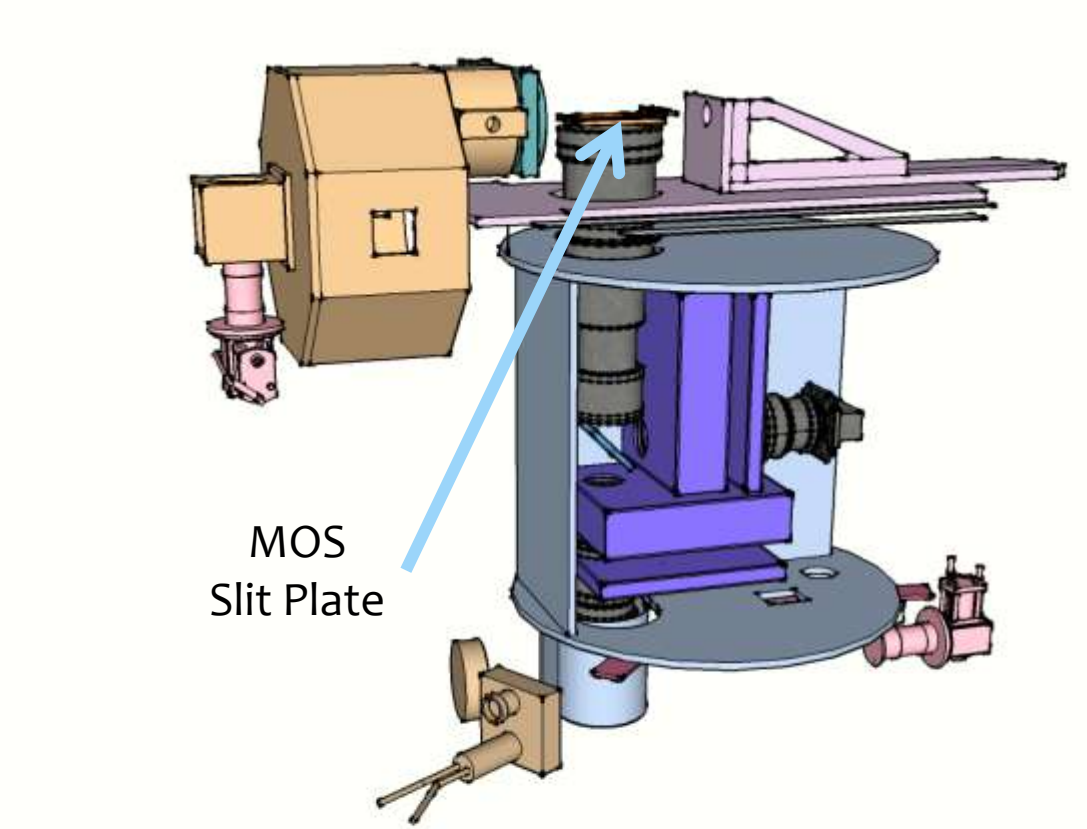


Paα Imaging with ANIR at Co. Chajnantor





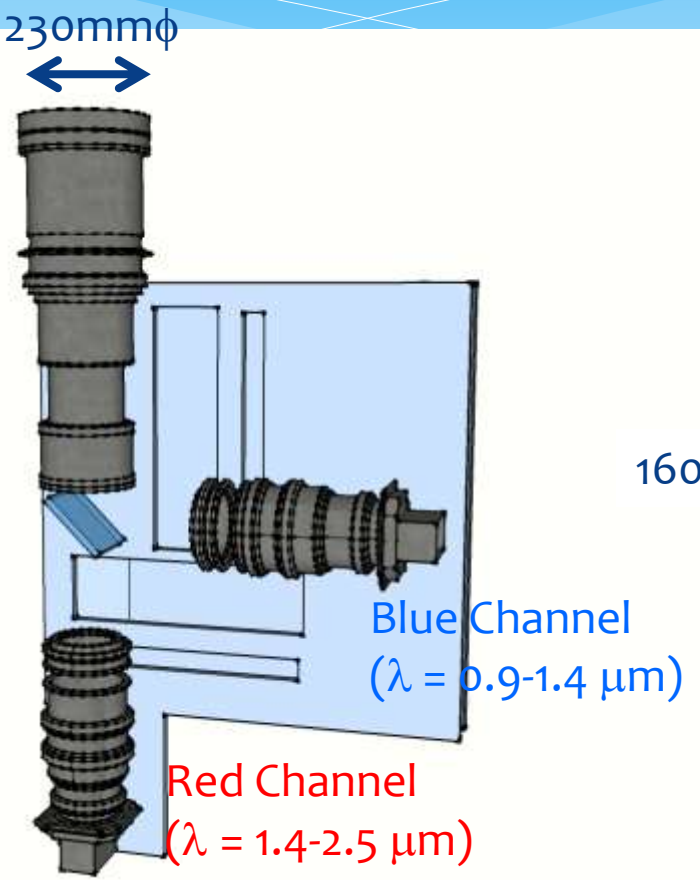
SWIMS Dewar Layout

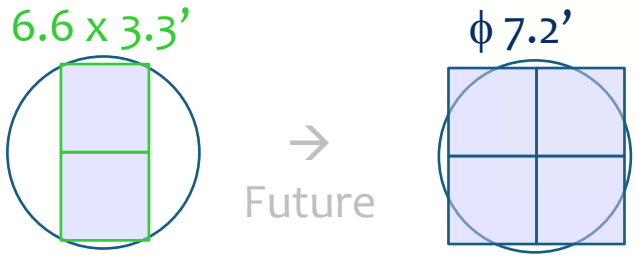


SWIMS Optics

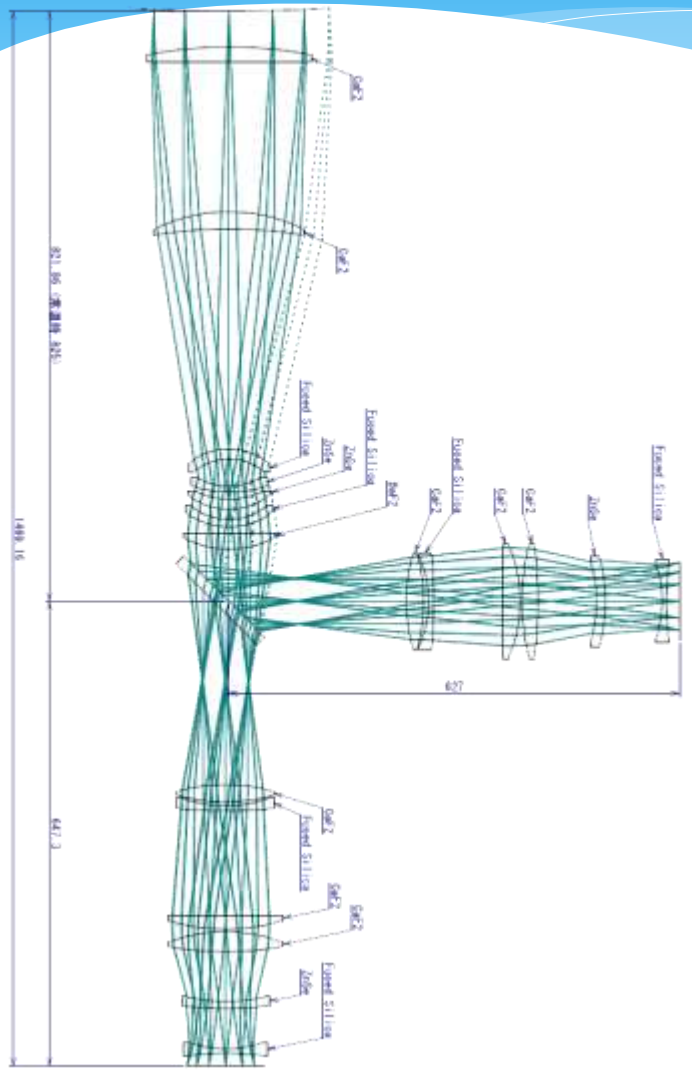
(Design/Fabrication : Optcraft)

* Split collimated beam using a Dichroic Mirror(DM) at 1.4mm
* Final F-ratio=4.8 : 0.13”/pix
* Independent filter wheels for NBFs to avoid wavelength offset
* Each focal plane is covered by 2 H2RGs



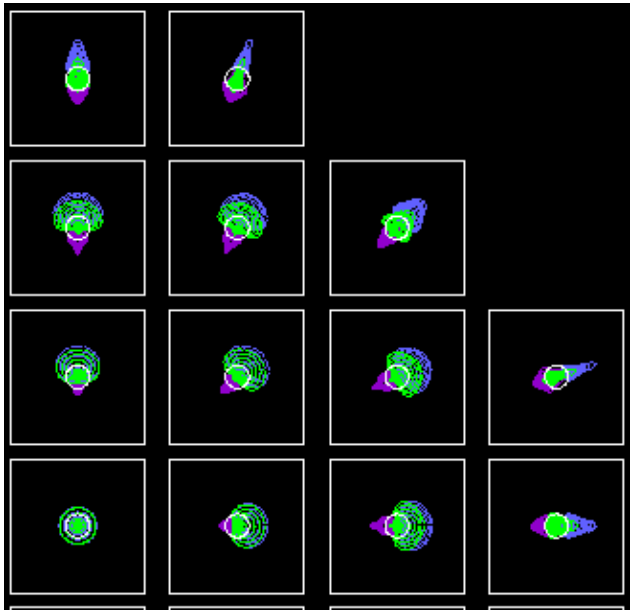


SWIMS on Subaru/Cassegrain

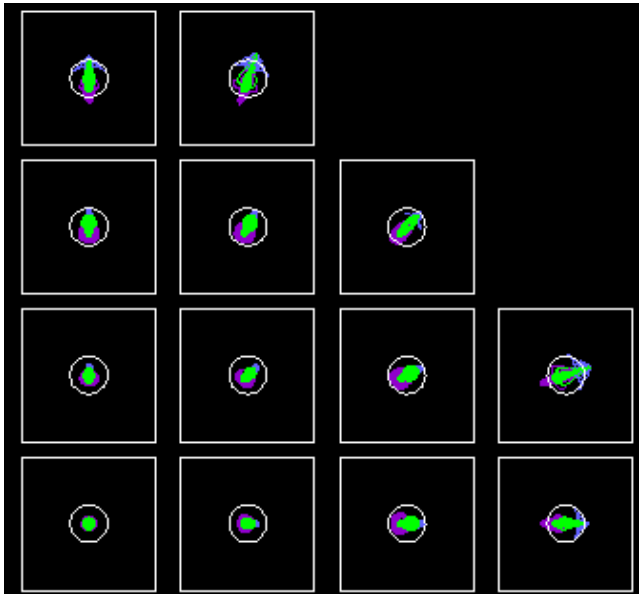


* TAO 6.5m not available before 2016
* First science with Subaru
* Collimator design optimized for Subaru
  (Re-optimized to TAO by changing the collimator unit)
* FoV of 6.6’ x 3.3’ (MOIRCS : 7’x4’)
* 0.10”/pix

Performance of Optics
(Subaru Design)

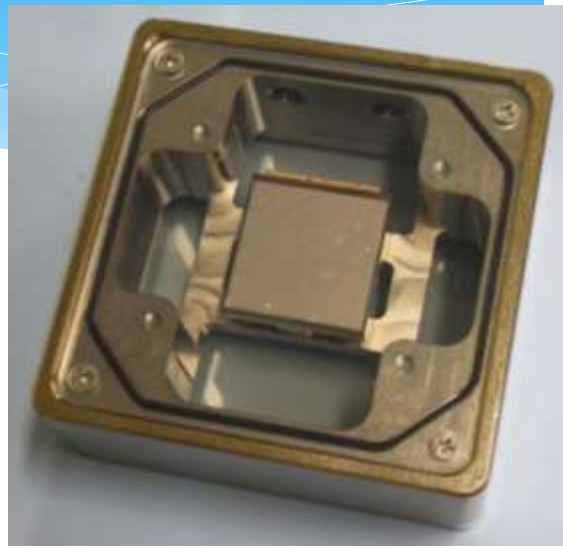


Blue Channel



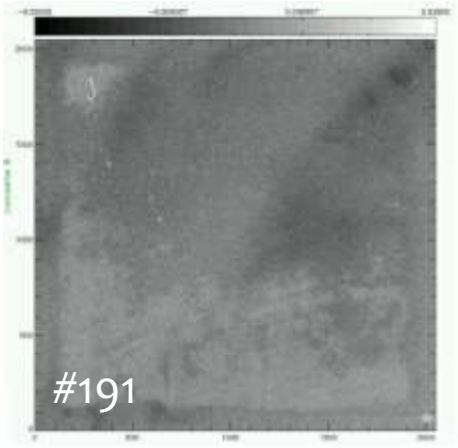
Red Channel

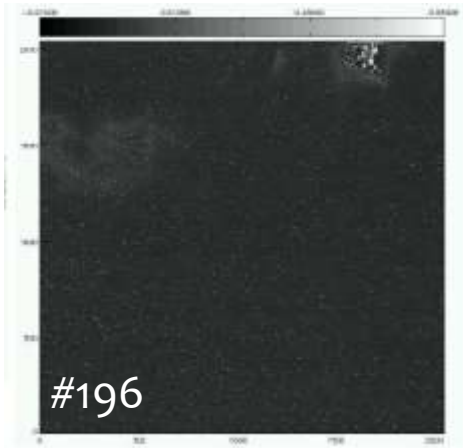
Focal Plane Arrays

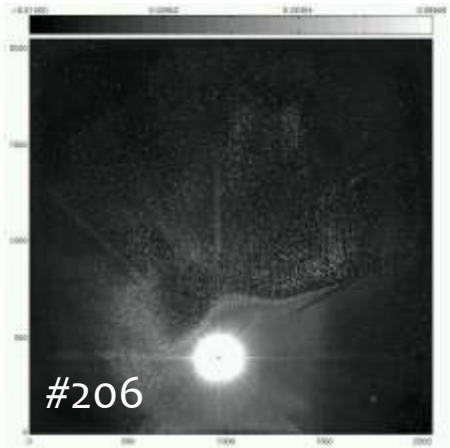


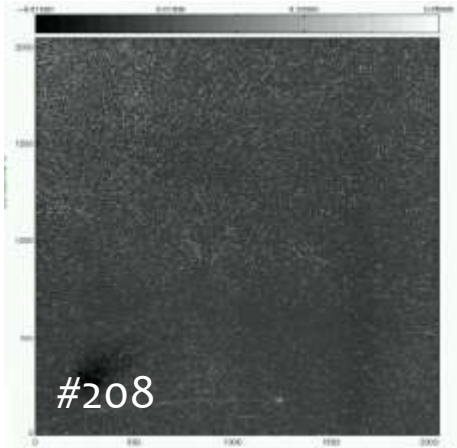
* 8 HAWAII2 RGs / 2.5μm cutoff
  => Currently only 4 procured/delivered
* SIDECAR ASICs for readout
* Covers central 6.6'x3.3' FoV@Subaru
* 0.1"/pix sampling

Dark Current < 0.005e-/s





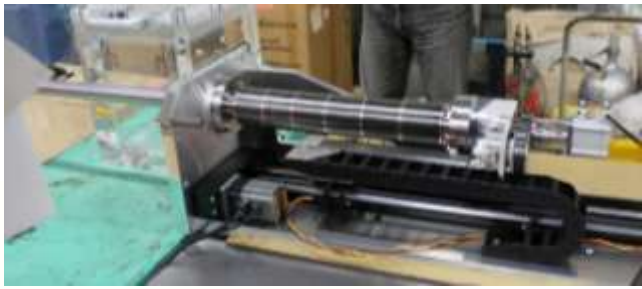


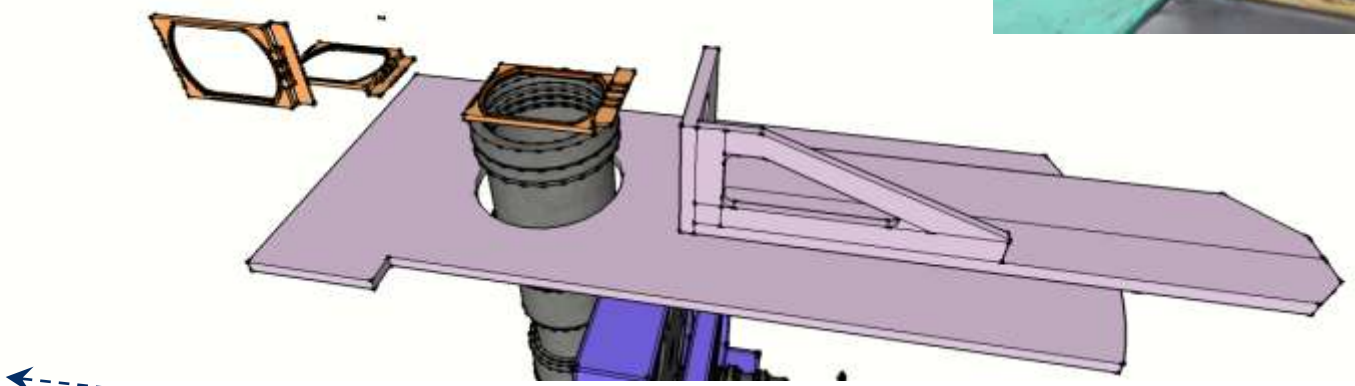


MOS Slit Plate Exchanger

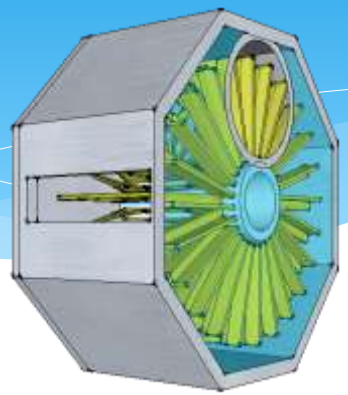
(Design/Fabrication : Sentencia)

* Based on the design of MOIRCS
  * Turret-type mask stocker
  * Robotic mask exchanger

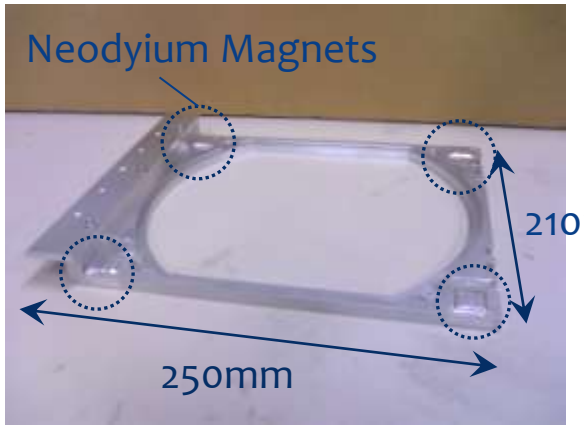




MOS Slit Unit / Holder



* Maximum # of mask slit : 20
* New design with high reliability
  * Magnet – latch (Both at the focus and the stock)
  * Operative even at the TAO Nasmyth focus
  * Curved mask to adjust focal plane curvature



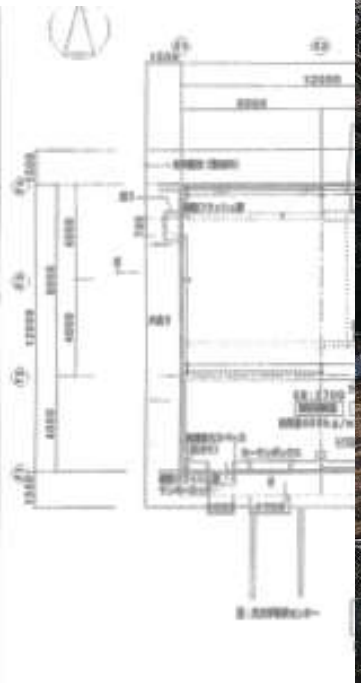
Prototype Mask Holder

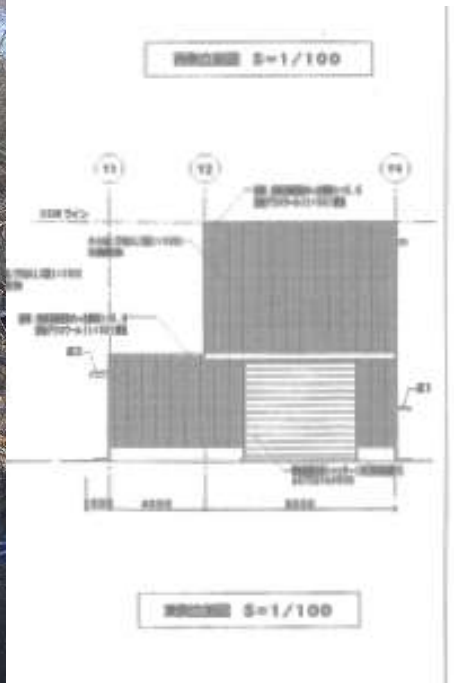
Schedule

* 2010/Nov : Array #1, #2 delivery
* 2011/Jan : Closing design phase
* 2011/Jan : Array #3, #4 delivery
* 2011/Jan : Dichroic mirror delivery
* 2011/Mar : Completion of a new laboratory building
* 2011/Mar: Delivery of the dewar, MOS, optics componetns
* 2011/Q2-2012/Q2 : Assembly, adjustment, etc…
* 2012/Q3 or later : Transport to Subaru, setup
* 2013/Q1 : First Light at Subaru ?

New Building at Mitaka

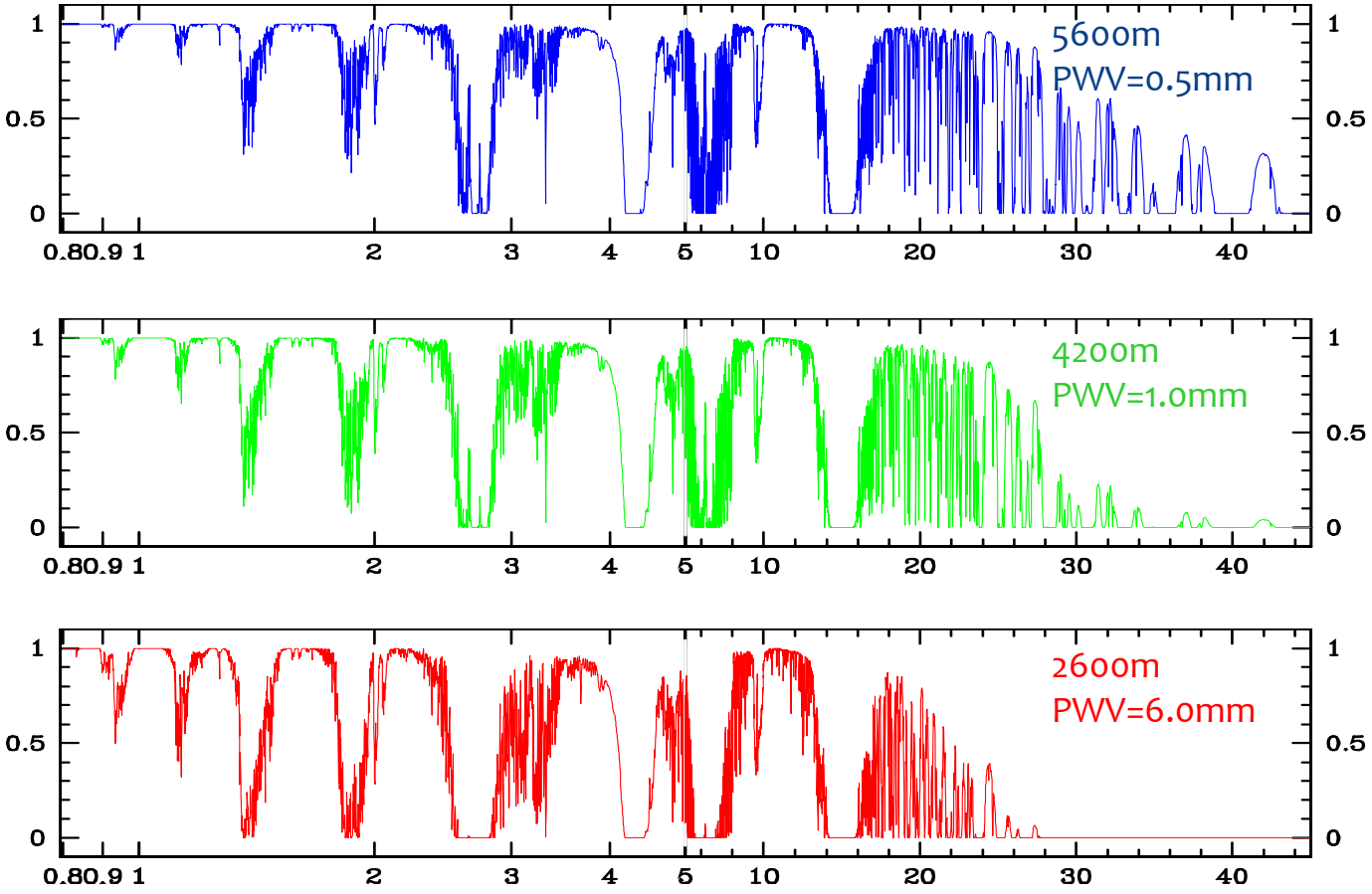
* Wii be completed in mid-March





Mask Catcher Unit

Atmospheric Transmittance



Dichroic Mirror