Subaru Telescope Ground Layer AO System
すばる望遠鏡 次世代広視野補償光学システム

岩田 生 (New Development Group, Subaru Telescope, NAOJ)

Subaru Next-Gen AO Working Group

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- K. Motohara (Univ. of Tokyo)
- NAOJ:
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  - H. Takami, M. Iye

- Founded in 2011
- 2011/09: Subaru Next-Gen AO WS @ Osaka Univ.
- 2012/08: Study Report
- 2012/11: 光赤天連による中規模計画評価
  - 学術的価値=S、各分野での検討=S、緊急性=A

Ground Layer AO + New NIR Instrument

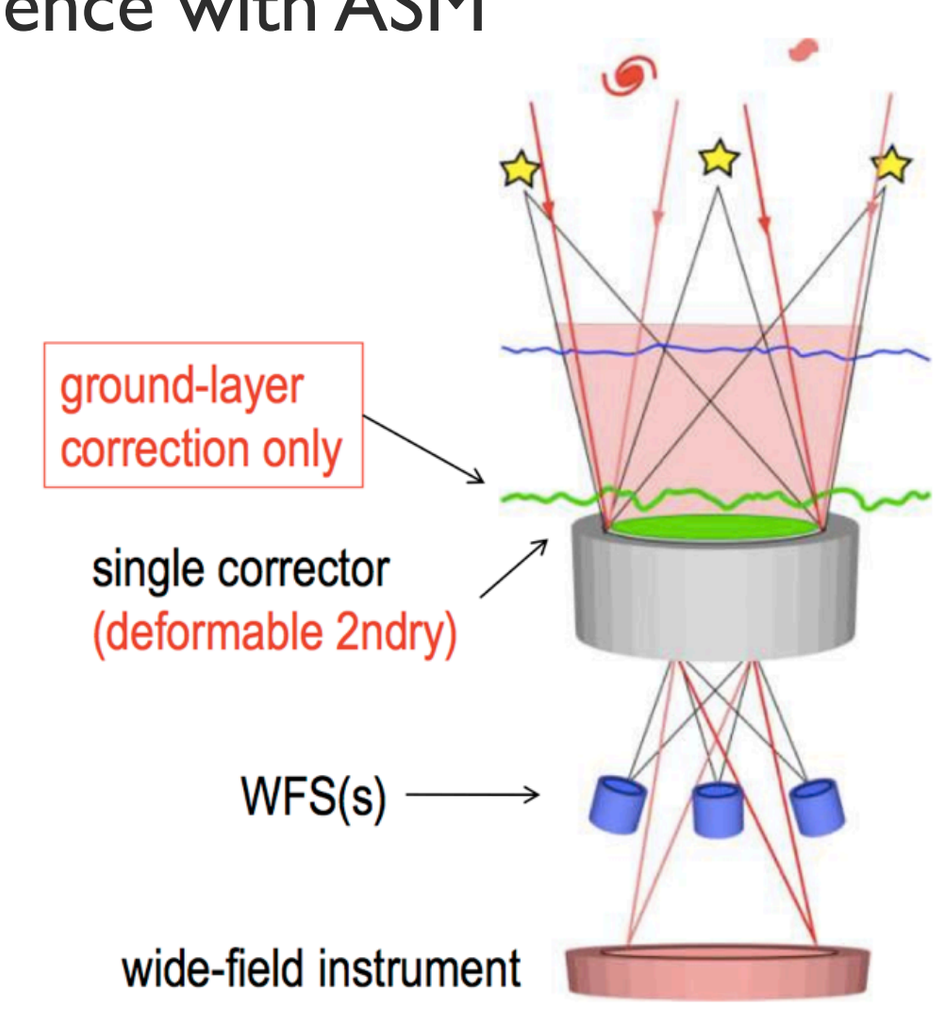
1. Ground Layer AO with Adaptive Secondary Mirror
2. New Near-IR Instrument (Wide-field Imager + MOS)

- → Seeing Improvement (FWHM 0.4”→0.2”) over FoV >15’
  - **High Spatial Resolution Competitive to HST**
  - **Higher Sensitivity Equivalent to 2x Telescope Aperture*1**
  - **6x Wider Field of View*2**
- Targeted to Start Operation in 2020

*1For point sources.
*2 Relative to MOIRCS

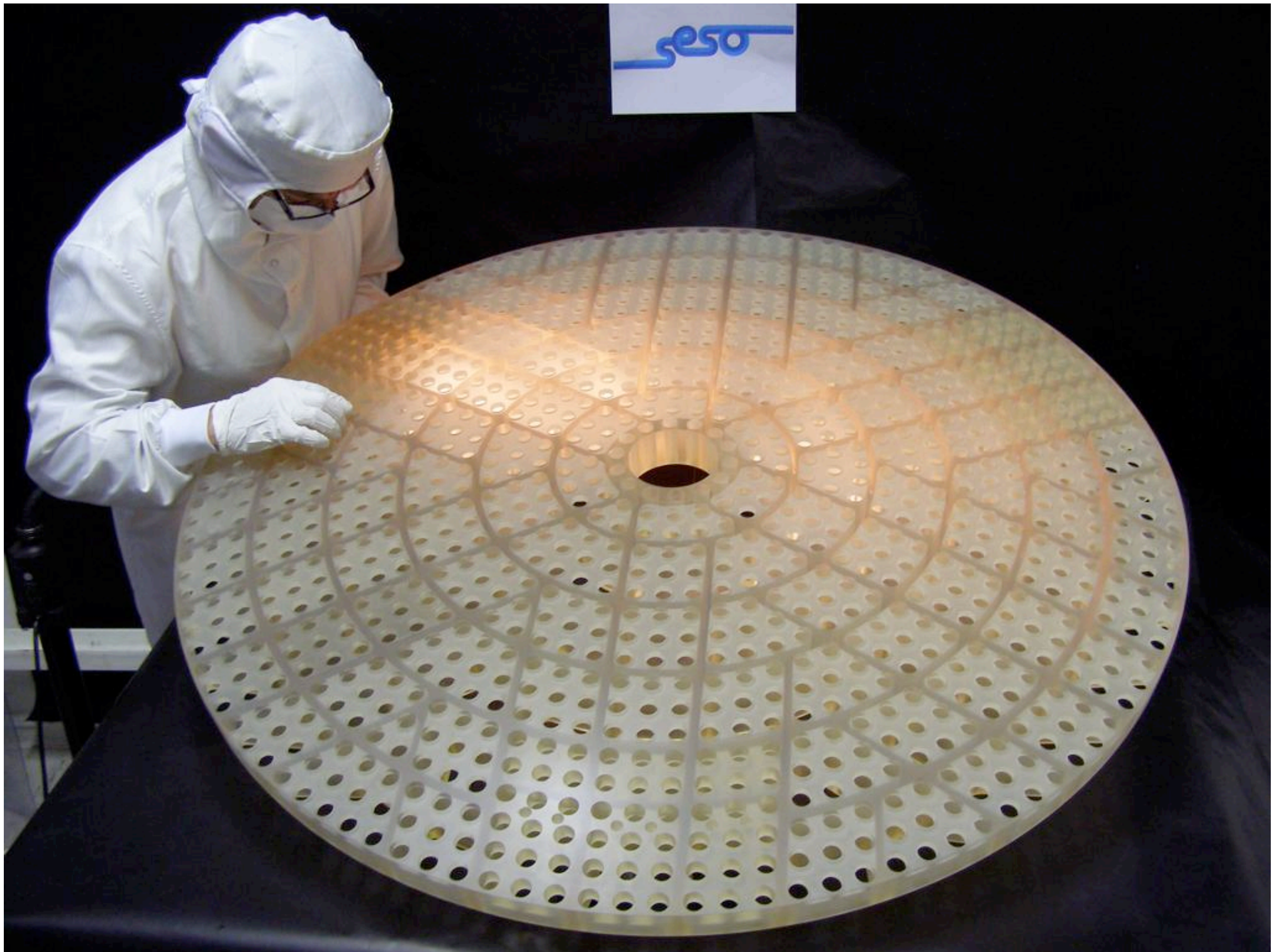
Ground Layer Adaptive Optics (GLAO)

- Adaptive Secondary Mirror (ASM)
- Multiple Laser Guide Stars, Multiple Wavefront Sensors
- Tomography of Earth Atmosphere
- Correct Ground Layer Turbulence with ASM

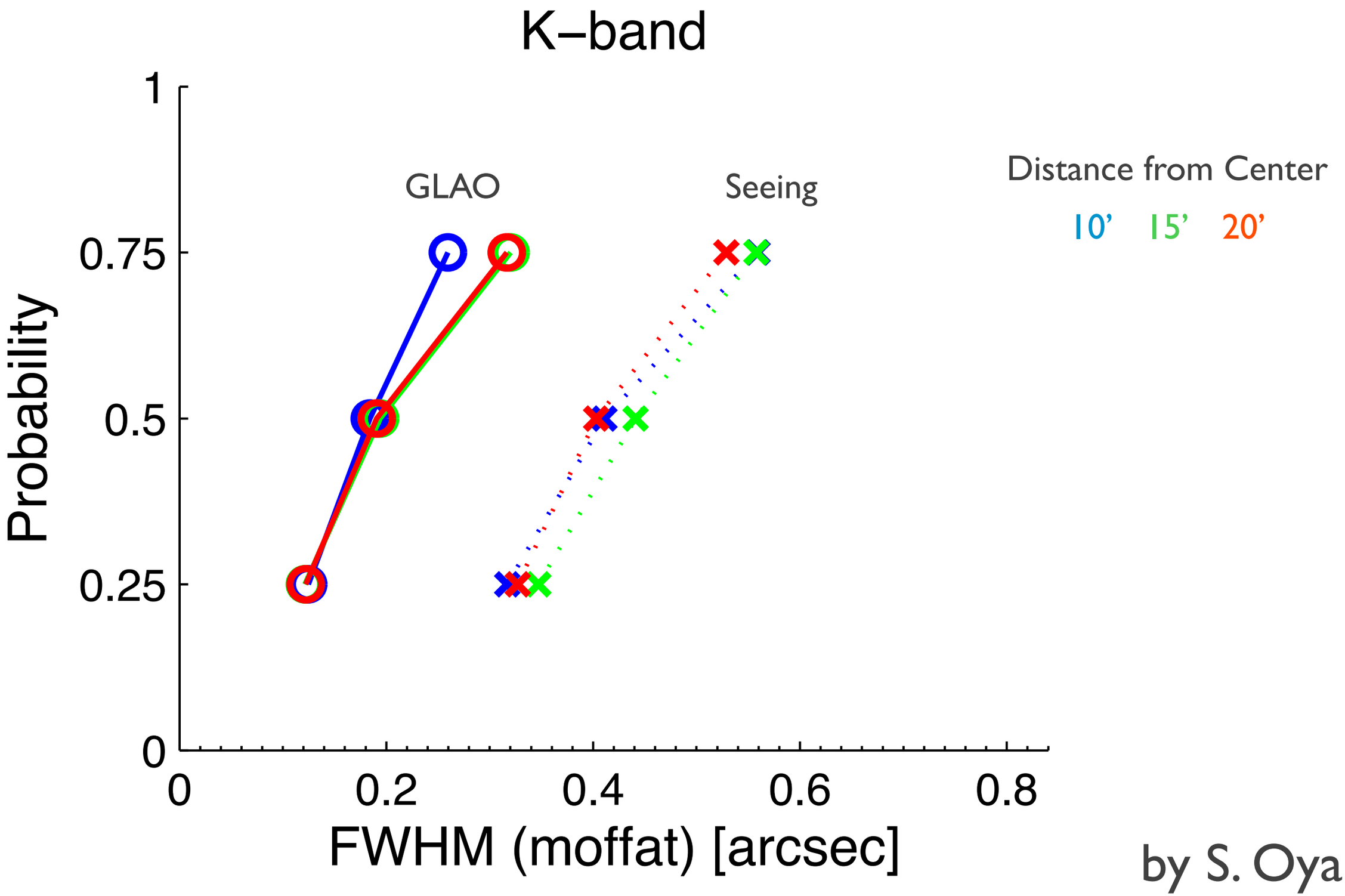


FoV: 10 arcmin
fwhm: < 0.4 [arcsec]
survey possible

Adaptive Secondary Mirror for VLT UT4



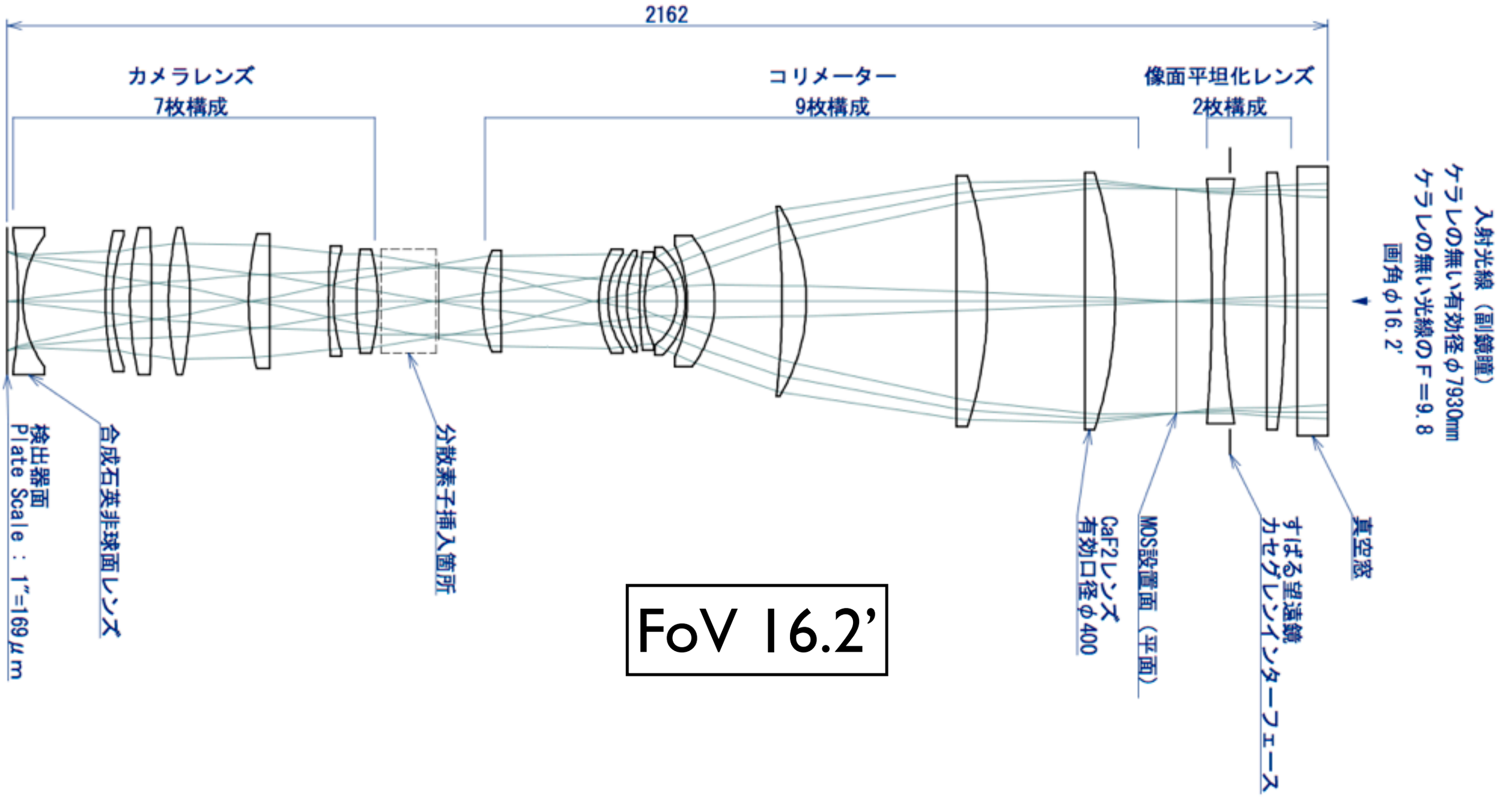
Expected Performance of Subaru GLAO: FWHM Improvement



by S. Oya

Wide-Field NIR Imager+Multi-Object Spectrograph

- Optical Design by Optcraft, Inc.



FoV 16.2'

WFNIRIMOS - Specifications under Consideration

Wavelength	0.9-2.5μm	
Plate Scale	0.07-0.1”/pix	
FoV	13.6‘x13.6’	Wider with Split FoVs?
Filters	Broad+Narrow	
MOS	Multi Slit Mask	
λ Dispersion	2000(TBD)	Under Investigation

Science Objectives

- Understanding History of Galaxy Evolution with

  Huge Imaging + Spectroscopic Sample of High-z Galaxies

  - ~Several Thousands of 1<z<3 Galaxies - Morphology, Kinematics, SF Diagnostics, Environmental Effects etc.
- Detection of the Most Distant Galaxies w/ Narrow-band Imaging
  - Finding Galaxies at z>7.5, Exploration of the Cosmic Reionization
- **→ Unique Samples for TMT**

- **'Upgrade' of Subaru Telescope, Benefit for Various Science Cases**

Study Report by Many Contributions:
http://www.naoj.org/Projects/newdev/ngao/

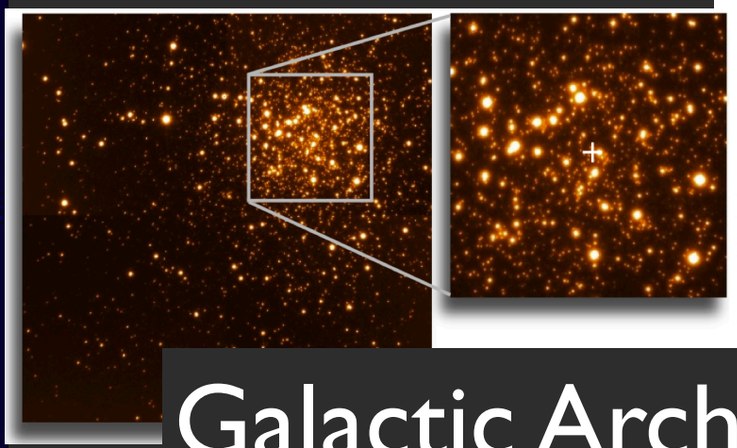
rotation dominated

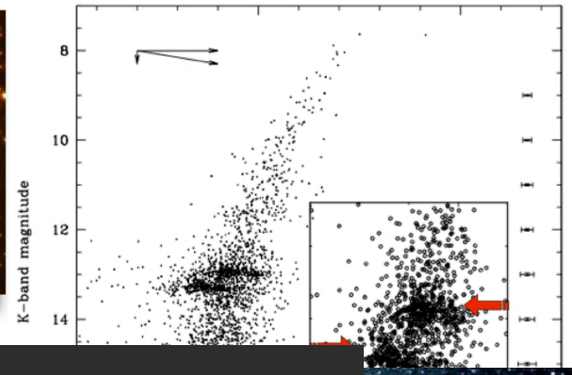
dispersion dominated

merger

1″ (8 kpc)

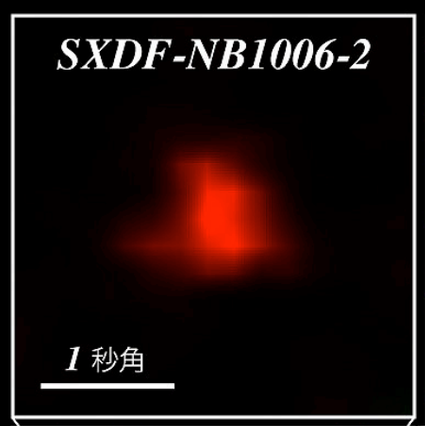
Galaxy Evolution

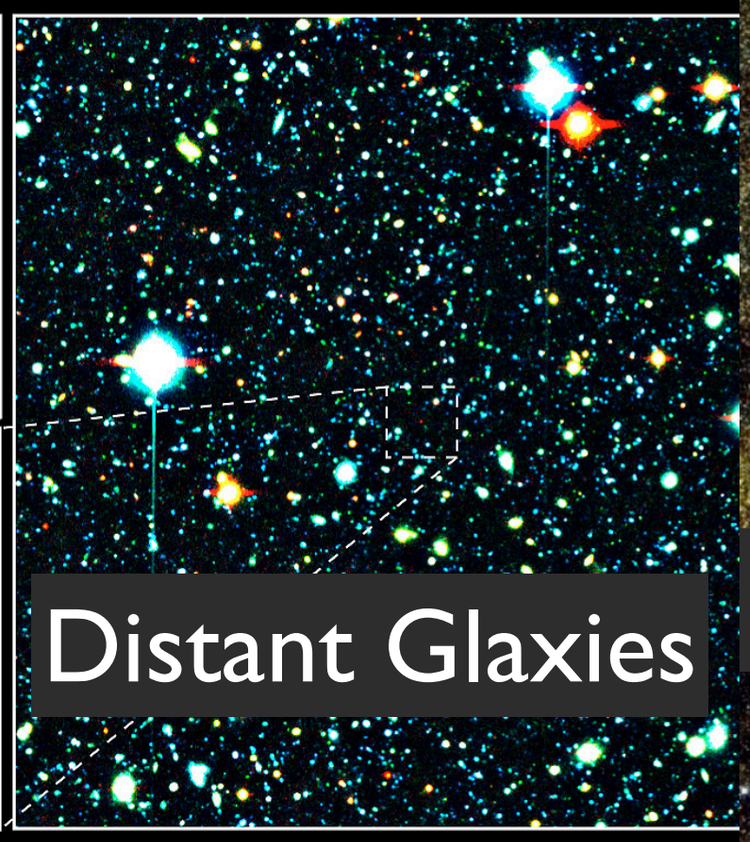




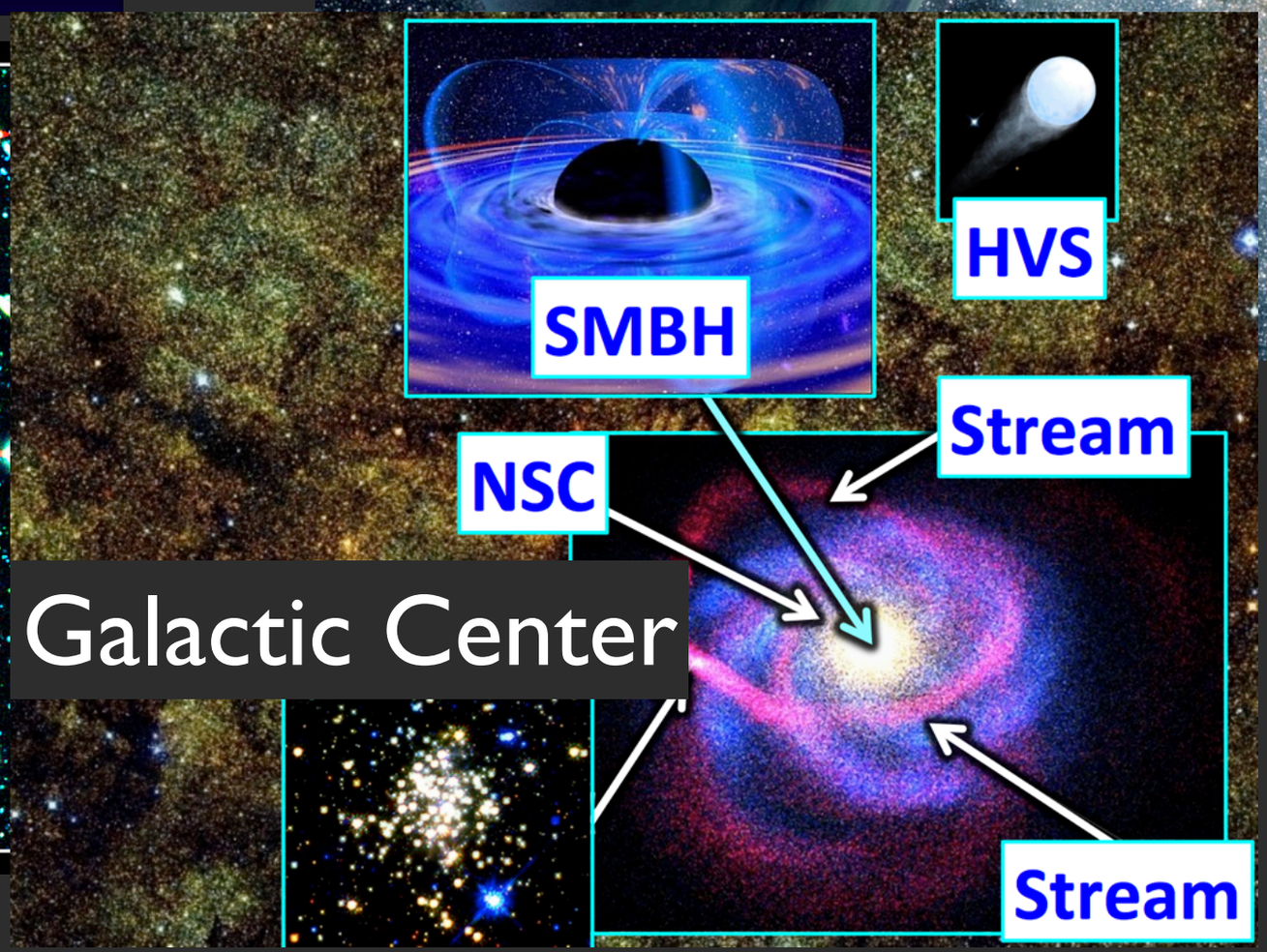
Galactic Archaeology

Exoplanets





Distant Glaxies



Galactic Center

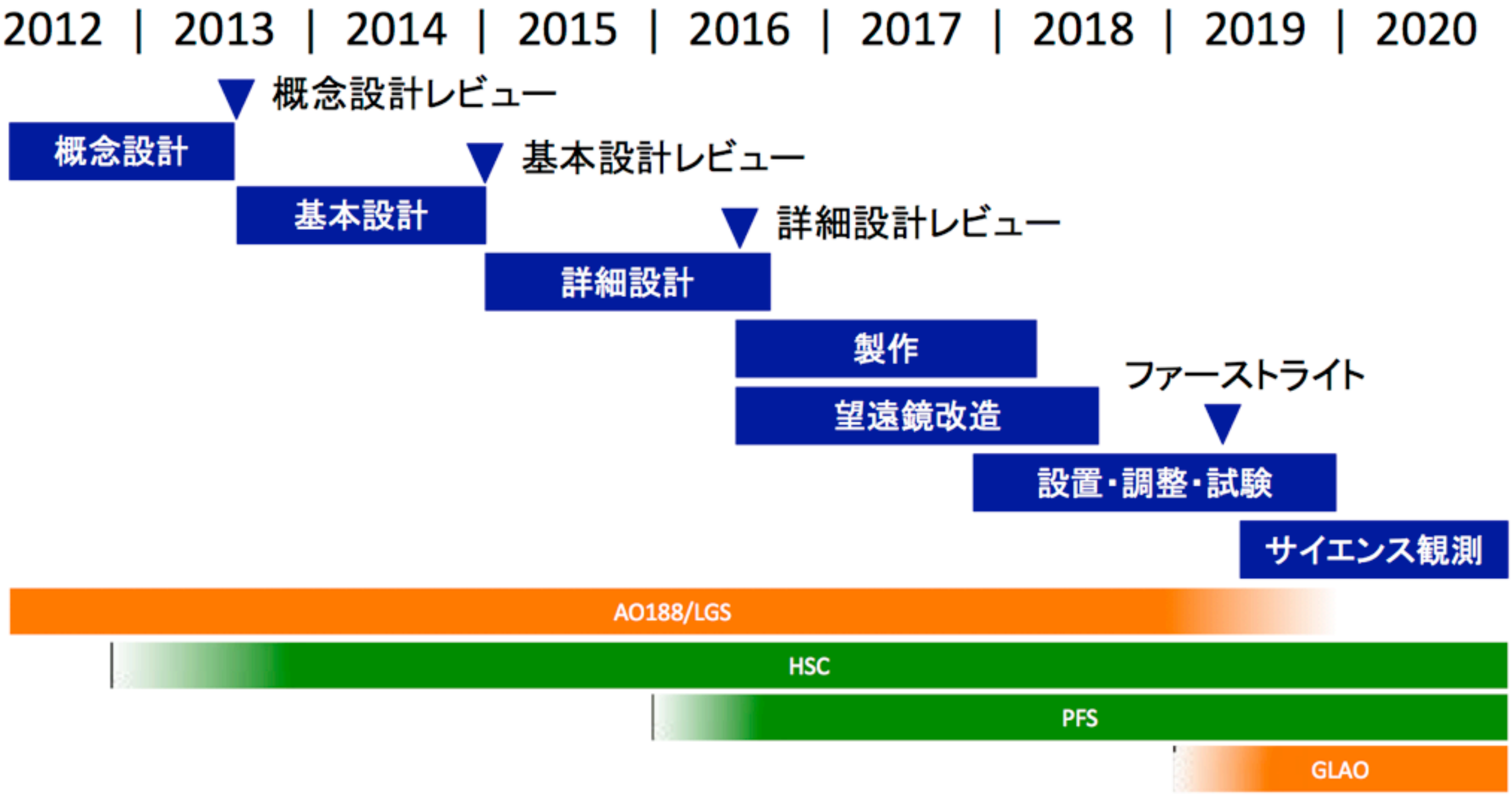
Why GLAO+WFNIRIMOS?

- Need of Competitive NIR Instrument(s) - Based on Recommendations by SAC
- 'Large Survey' is Subaru's Strategy in TMT era
- Uniqueness of GLAO + >10' NIR instrument
- Mauna Kea is Suited for GLAO
- Key Elements of AO for TMT (Tomography, Multiple Laser and WFS, ASM)
- **Pathway from Subaru to TMT**

Issues

- Are Science Cases Strong Enough?
- Funding
- Human Resources
  - Conflict with Resources for TMT?
  - International Collaborations?

Schedule


2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020
概念設計レビュー
概念設計
基本設計レビュー
基本設計
詳細設計レビュー
詳細設計
製作
望遠鏡改造
ファーストライト
設置・調整・試験
サイエンス観測
AO188/LGS
HSC
PFS
GLAO

Current Activities and Plans for 2013

- Conceptual Study
  - Feasibility of WFNIRIMOS
  - GLAO Development Plan
  - More Detailed Simulations for GLAO and Observations
- Kakenhi for AO188 (LGS/WFS) Upgrade Submitted
- GLAO Science WS: 2013/5/16-17?
- Internal Review in Summer 2013
  - Review Points: Scientific Importance, Technical Feasibility, Funding, Consistency with Overall Roadmap of NAOJ / Subaru Telescope / TMT

Your Inputs are Necessary

- This Project is Based on Recommendations by SAC.
- Science Cases
  - What is Required for Subaru in >2020?
  - Next-Gen AO WS, Study Report
    - → Community WS in May, 2013
- Instrument Development
  - Any interests in Japanese Institutes?
  - International Collaborations