Possible contribution to ULTIMATE Subaru

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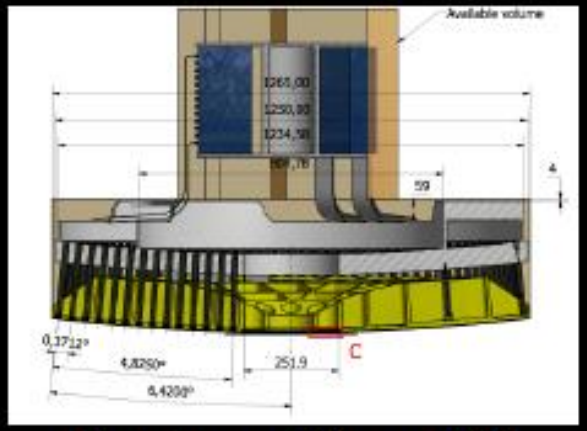
Subaru collaboration

- Started from 2008 for the development of Hyper SuprimeCam
  - ASIAA is responsible for the filter exchanger unit, CCD procurement & test, WFC test system
- HSC Hardware delivered to Hawaii in late 2012
- HSC started science operation in March 2014
- Prime Focus Spectrograph started from 2010
  - Prime Focus Instrument AIT in Taiwan
  - The metrology camera will be delivered in few months
- Help on the detector upgrade of MOIRCS
- Supporting software engineer in Hilo in 2017

ULTIMATE telescope upgrade

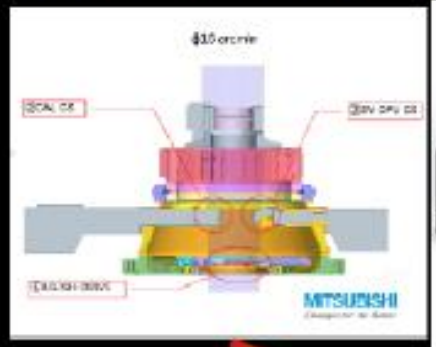
(1) Adaptive Secondary Mirror



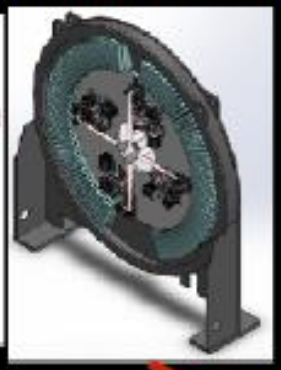
Preliminary Subaru ASM design by Microgate ADS

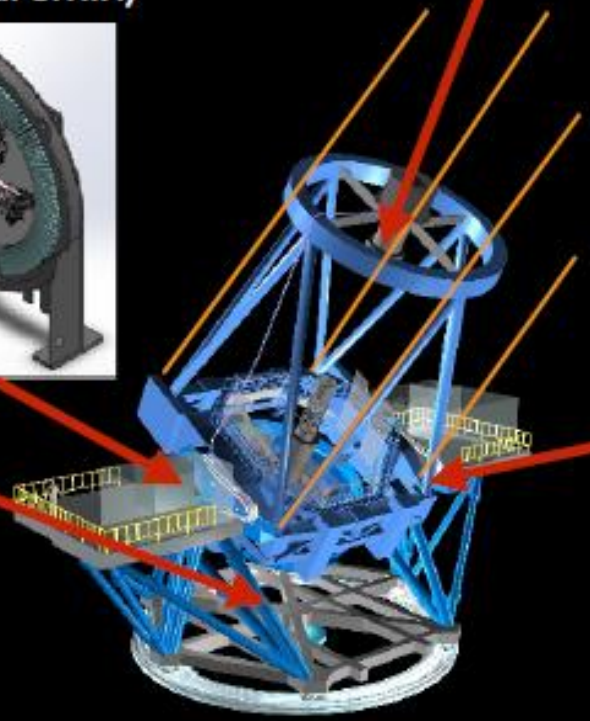
(3) Wavefront Sensors

Cs. Focus (FoV~20 arcmin)



Ns.IR Focus (FoV~6 arcmin)





(2) Laser Guide Star system

TOPTICA fiber laser(589nm) x 2
Generate 4 laser guide stars

Collaboration possibilities

Immediate collaboration

- AO188 upgrade project
  - Mechanical design and fabrication of the mount for the LGS diagnostics and steering optics
  - Mechanical mount for the LTAO wavefront sensor unit behind AO188

- GLAO conceptual study
  - Conceptual mechanical design of the Nasmyth instrument rotator (or image rotator)
  - Conceptual design of an ASM/WFS test bench
  - Testing the tip/tilt control with ROI readout for H4RG (or H2RG).

- Wide-field imager conceptual study
  - Optical/Mechanical design
  - Wide-field corrector at Nasmyth and Cassegrain platform

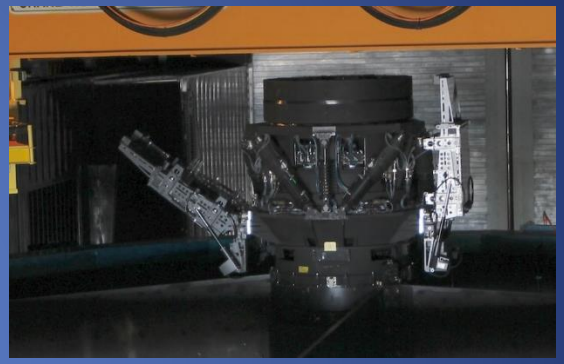
Future collaboration

- GLAO detailed design and fabrication
  - Nasmyth instrument rotator (or image rotator)
  - ASM/WFS test bench (GLAO calibration system)
  - LLT and diagnostics/steering system mount on the telescope
  - WFS adapter flange (WAF) at Nasmyth and Cassegrain flange

- Wide-field imager detailed design and fabrication

Our experience

- Mechanical system
  - FEU for HSC, PFI for PFS
- Optical system
  - Metrology camera for PFS
- Guiding system
  - Tip-tilt system for SPIRou, Guiding system for PFS
- Detector system
  - MOIRCS and WIRCam



We are keen to learn about the AO system through ULTIMATE

Possible items to contribute

- Wide field corrector at Cass and NS
  - Urgent item for CoDR
- Mechanical design for the Ns focus rotator
  - Instrument rotator vs image rotator
- Conceptual design for wide field imager
  - Critical for the GLAO instrument
- Testing the tip-tilt control with ROI readout of H4RG
  - Optional function
- IFU slit mechanism
  - Long tem possible working item

The manpower is still limited in ASIAA due to the PFS development.

Summary

- ASIAA is willing to contribute to the development of ULTIMATE with limited manpower at this stage
- The development items in ASIAA would need more discussion to define the scope
- Sending students to join the AO development is possible