

 ULTIMATE-START:
Subaru **T**omography **A**daptive optics
 Research experimen**T**

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What is ?

ULTIMATE-START is a laser tomography AO experiment project with

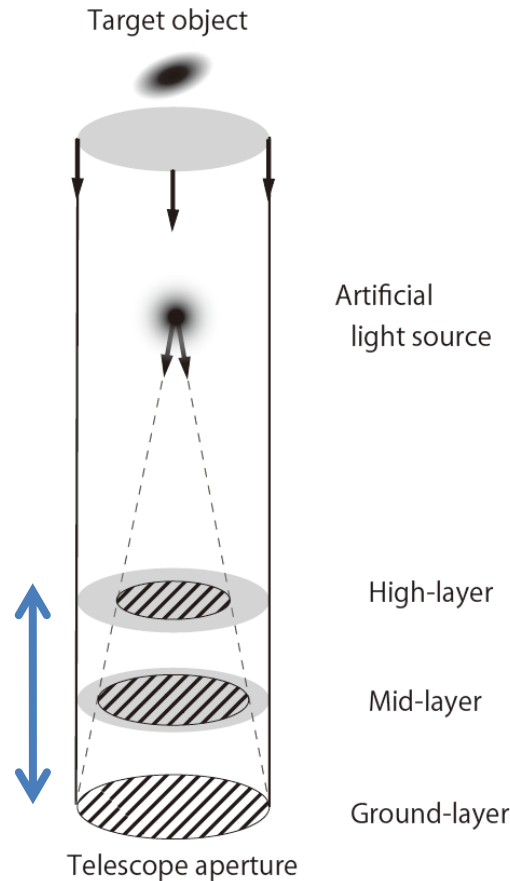
- **Launch 4 LGSs** with TOPTICA SodiumStar and existing LLT.
- AO188 DM upgrade with ALPAO **64x64 elements DM**.
- **Tomography** wavefront sensing unit in closed loop operation with AO188

What is Laser Tomography Adaptive Optics ?

Single LGS AO

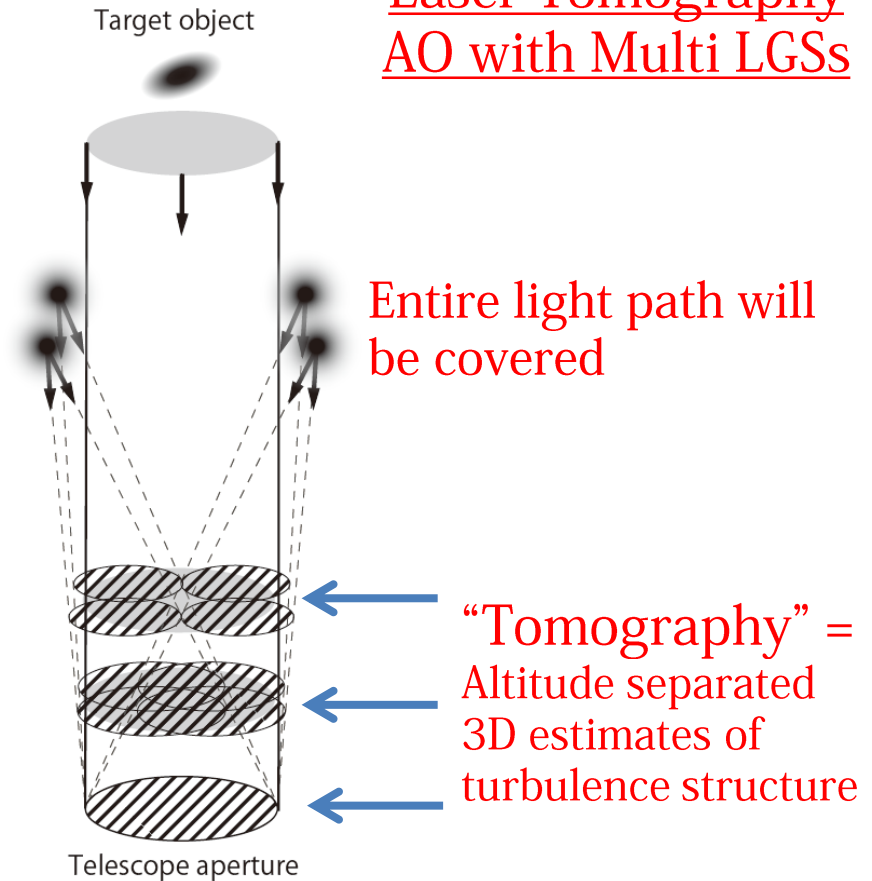
Volume outside the cone will not be covered
“cone-effect”

Integrated and degenerated turbulence

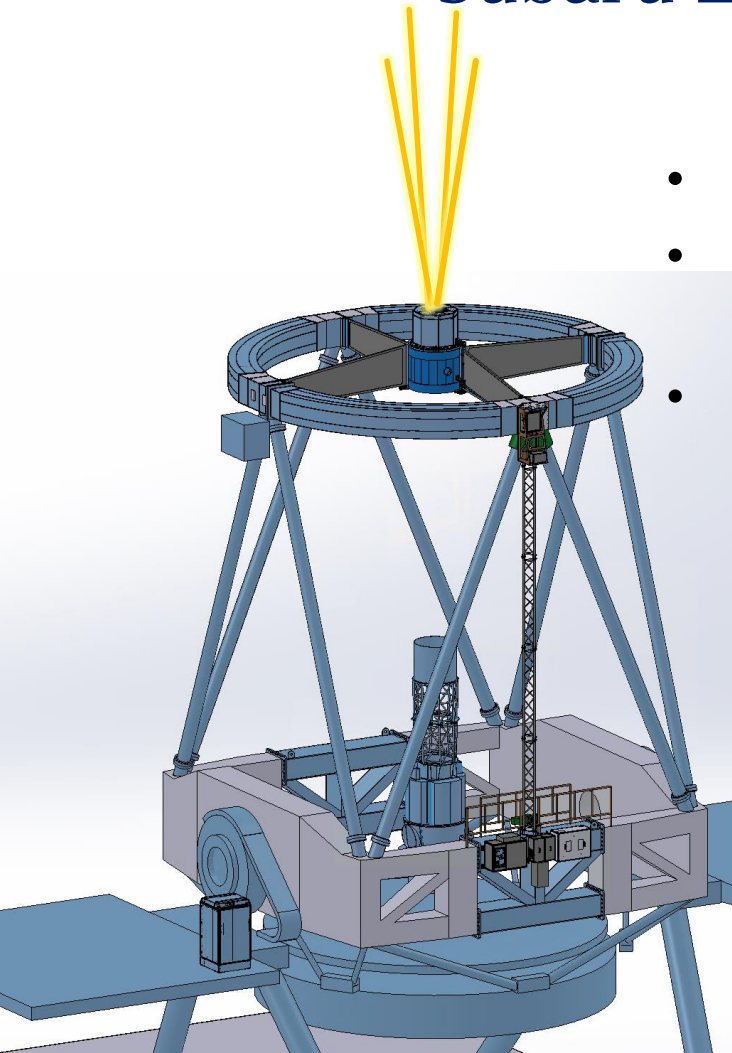


Laser Tomography AO with Multi LGSs

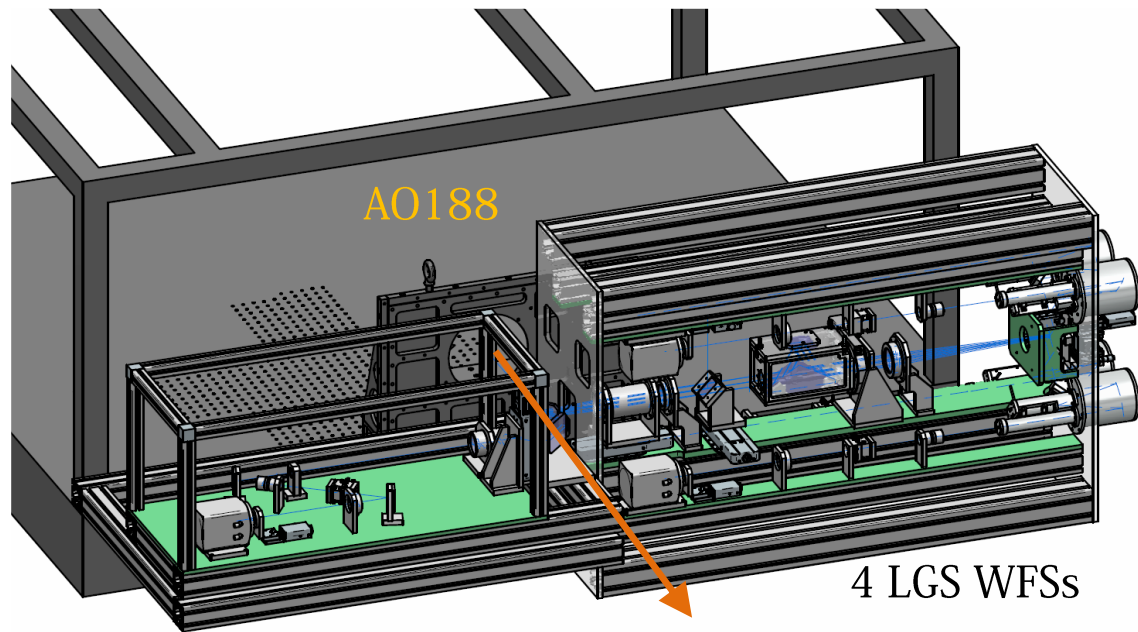
Entire light path will be covered



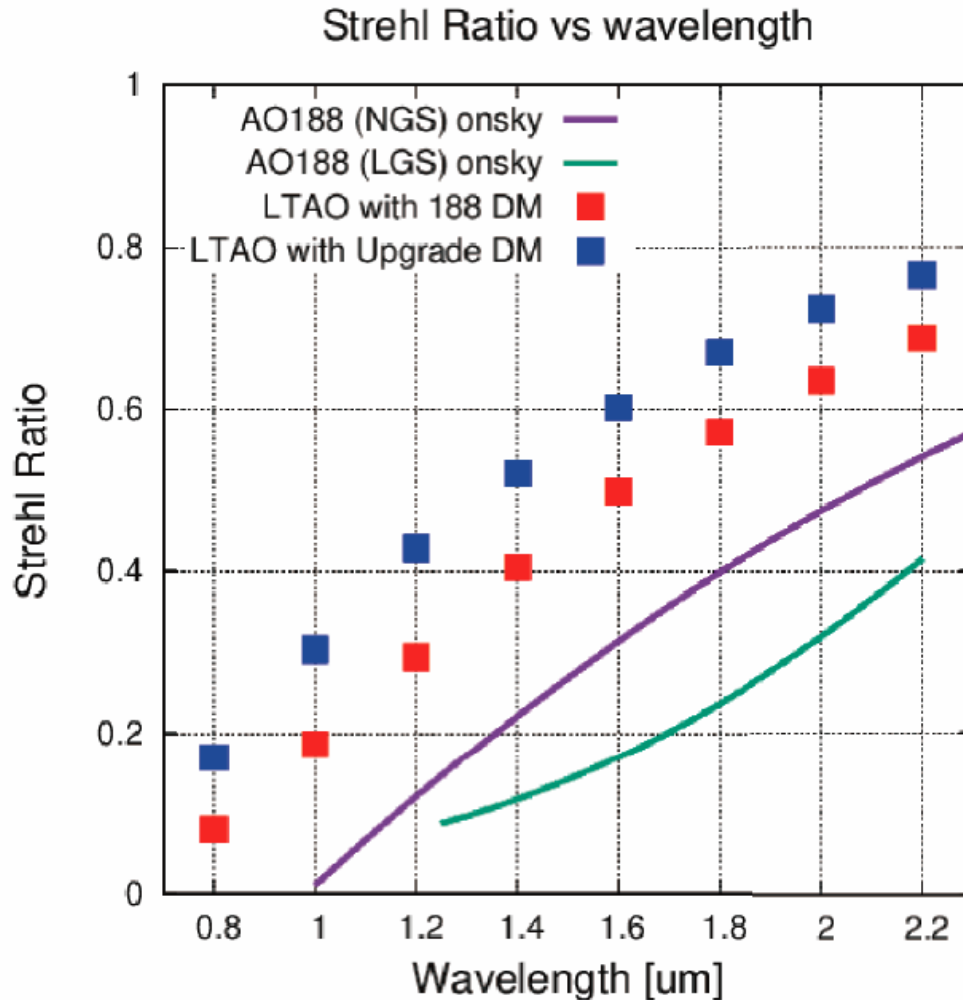
Subaru LTAO system overview



- Launching 4 LGSs with TOPTICA SodiumStar
- Tomography wavefront sensing unit with sCMOS camera, Hamamatsu OrcaFlash 4.0 v2
- DM upgrade with 64x64 elements ALPAO DM



What is the advantage ?



- Moderate AO correction in
i, z, y bands
= 3DII
- Good AO correction in
J,H,K bands
= IRCS

- Based on end-to-end system performance simulation.
- On-axis bright NGS tip-tilt measurement is assumed.

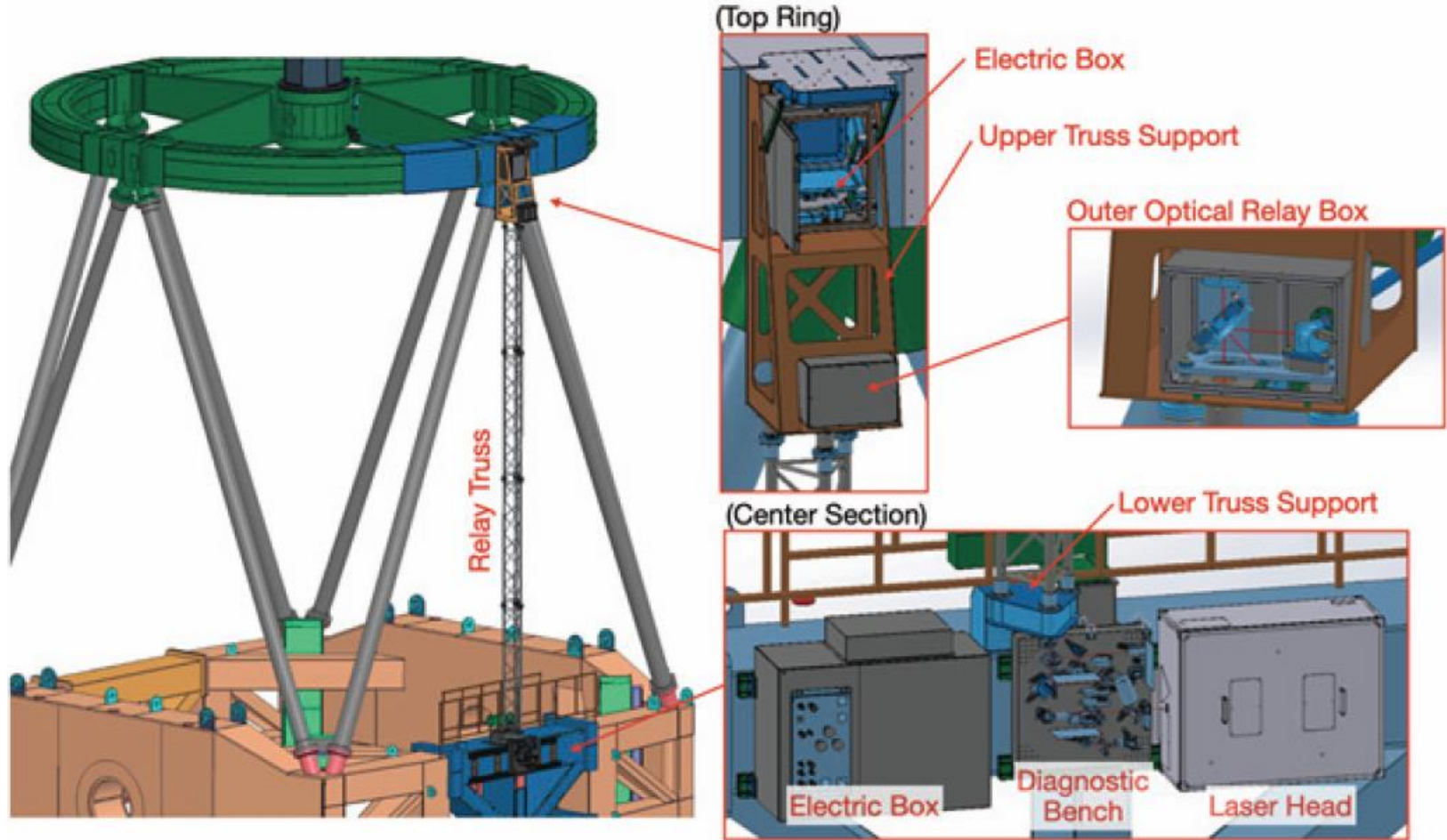
Schedule

- LGS system installation is scheduled early 2021.
- Tomography wavefront sensing unit will be assembled in early 2021. Parts fabrication is underway.
- Upgraded DM installation will start mid 2021.

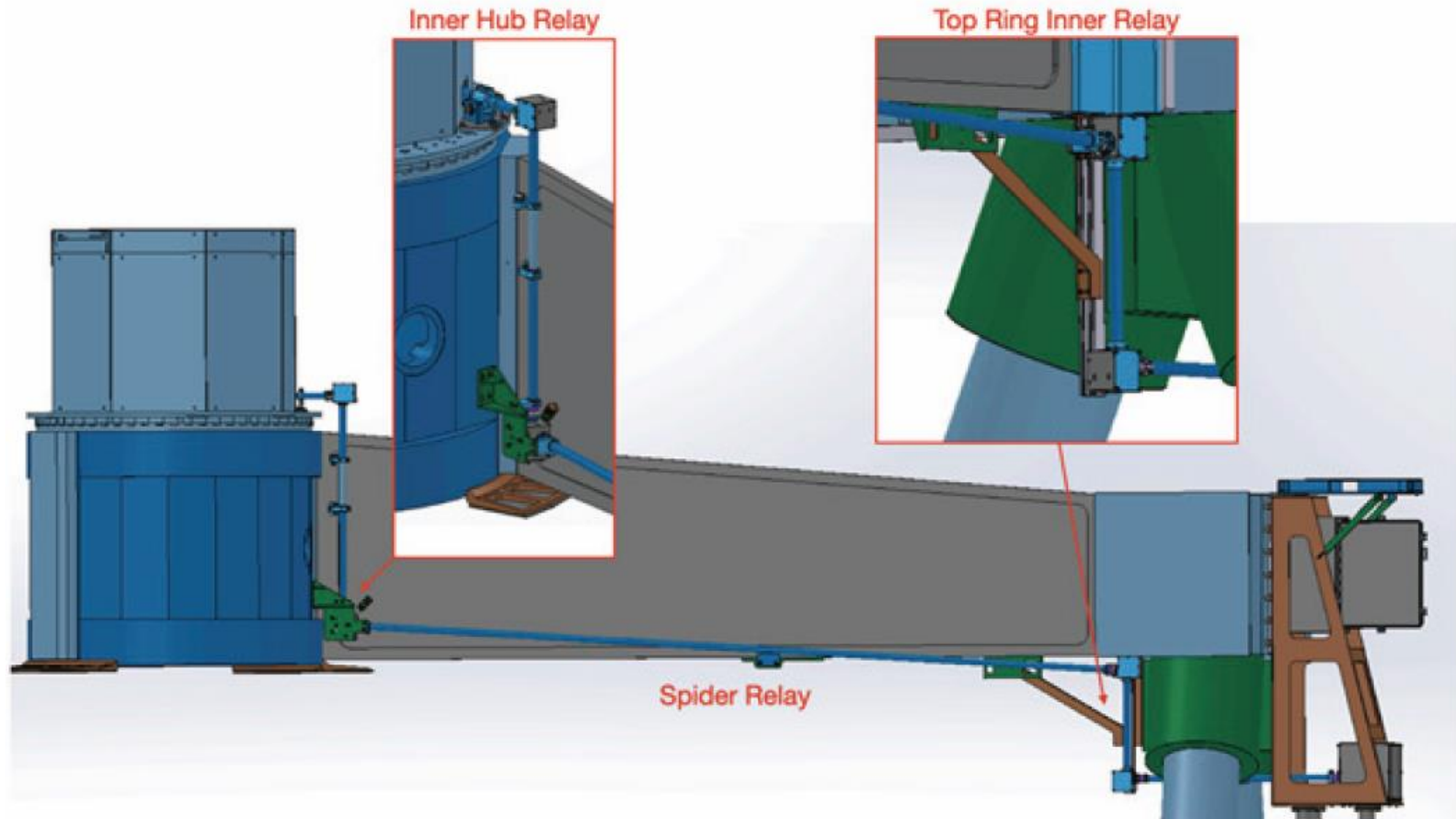
**A science workshop on integral field spectroscopy
with high resolution AO-corrected image, June 2021.**

**Let's discuss possible upgrades of 3DII instruments
to realize your science case !**

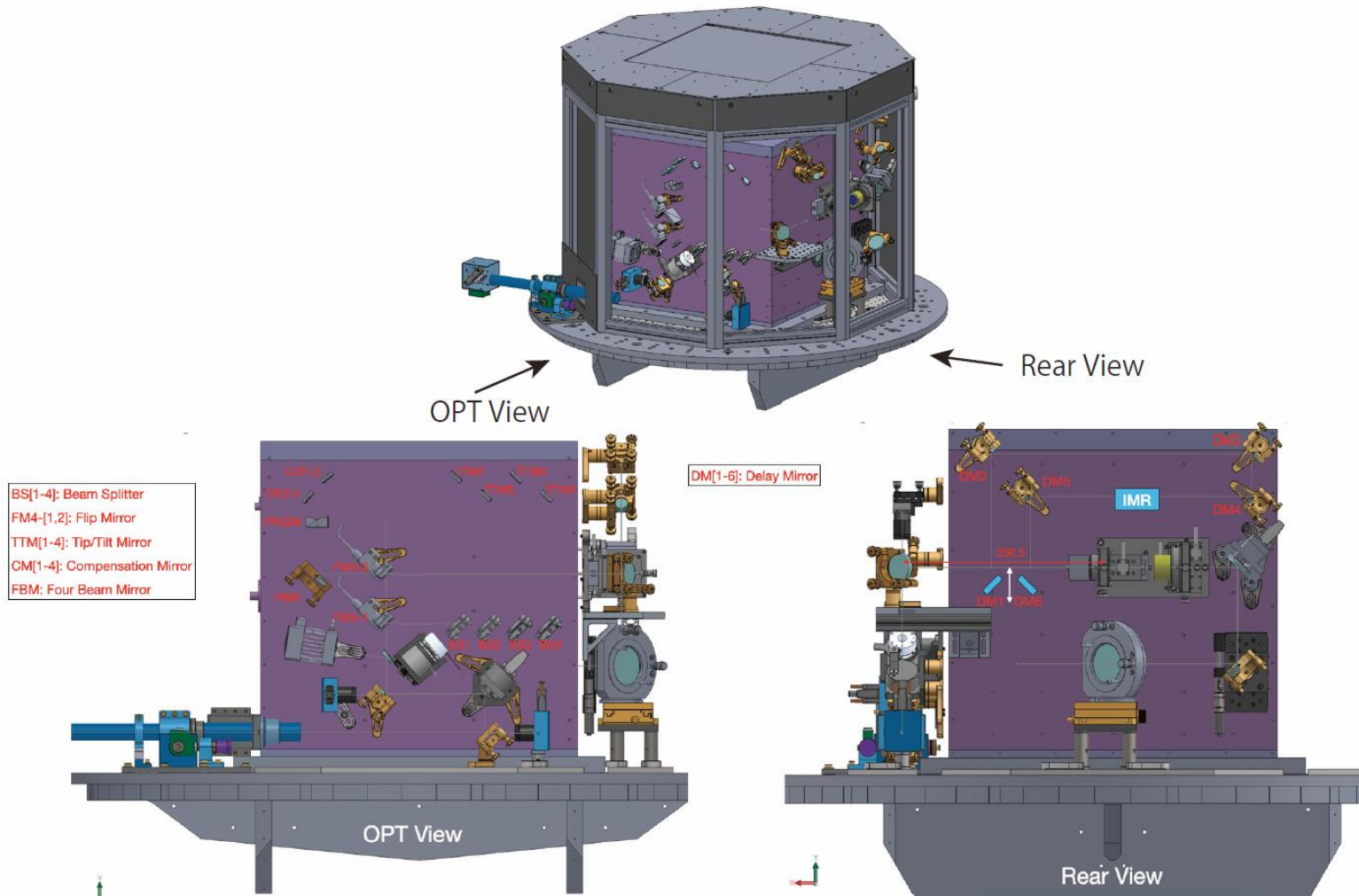
LGS relay (I)



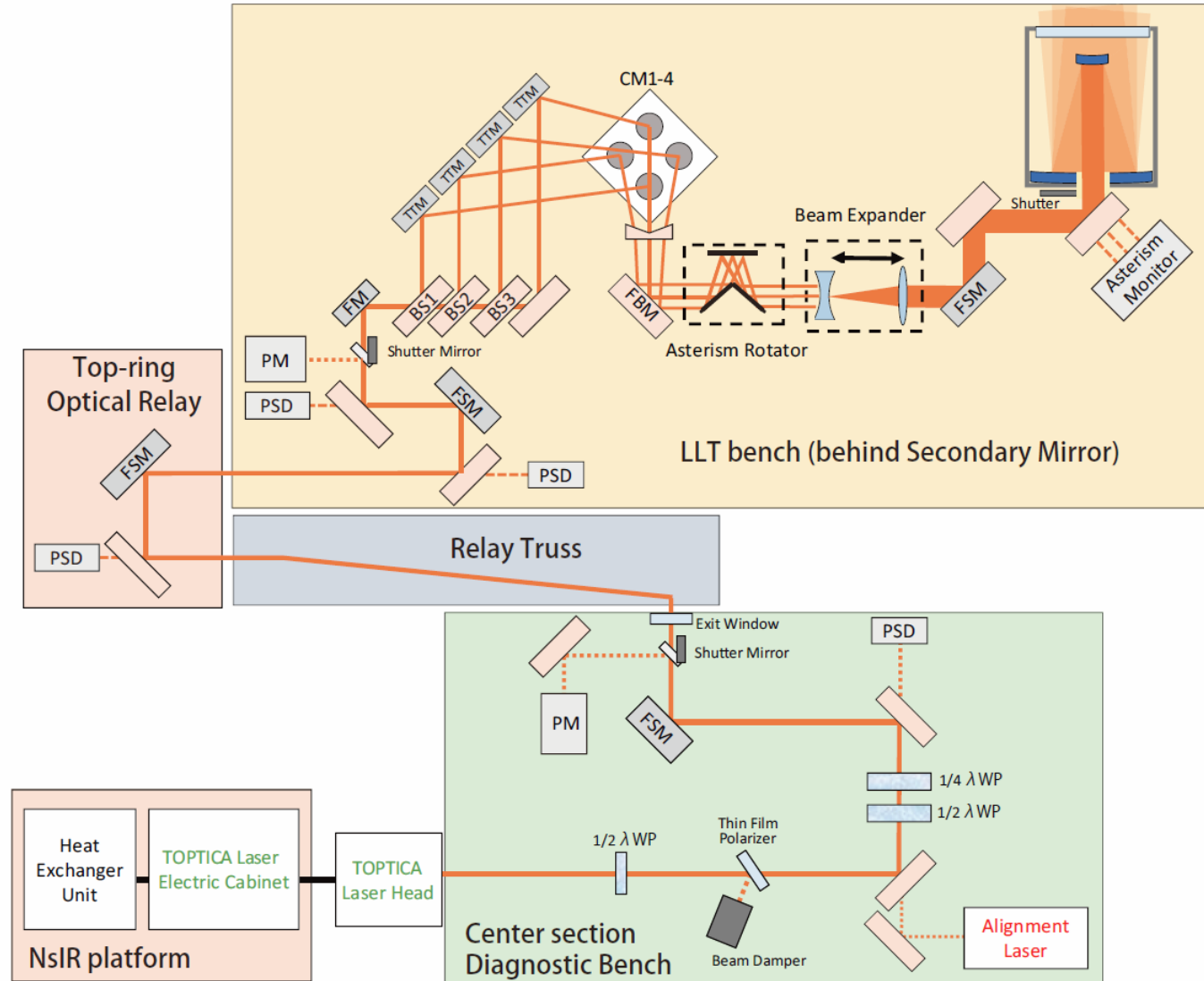
LGS relay (II)



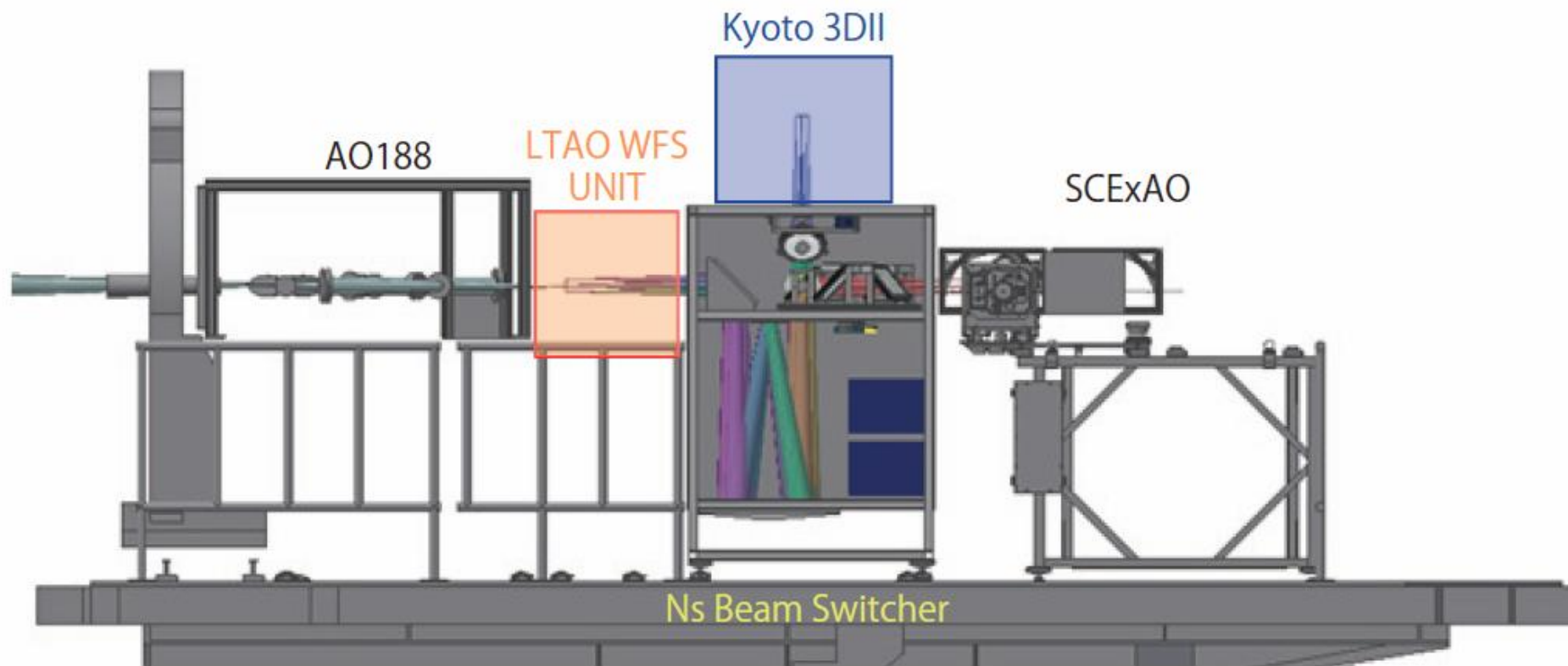
4 LGSs launching optics with LLT



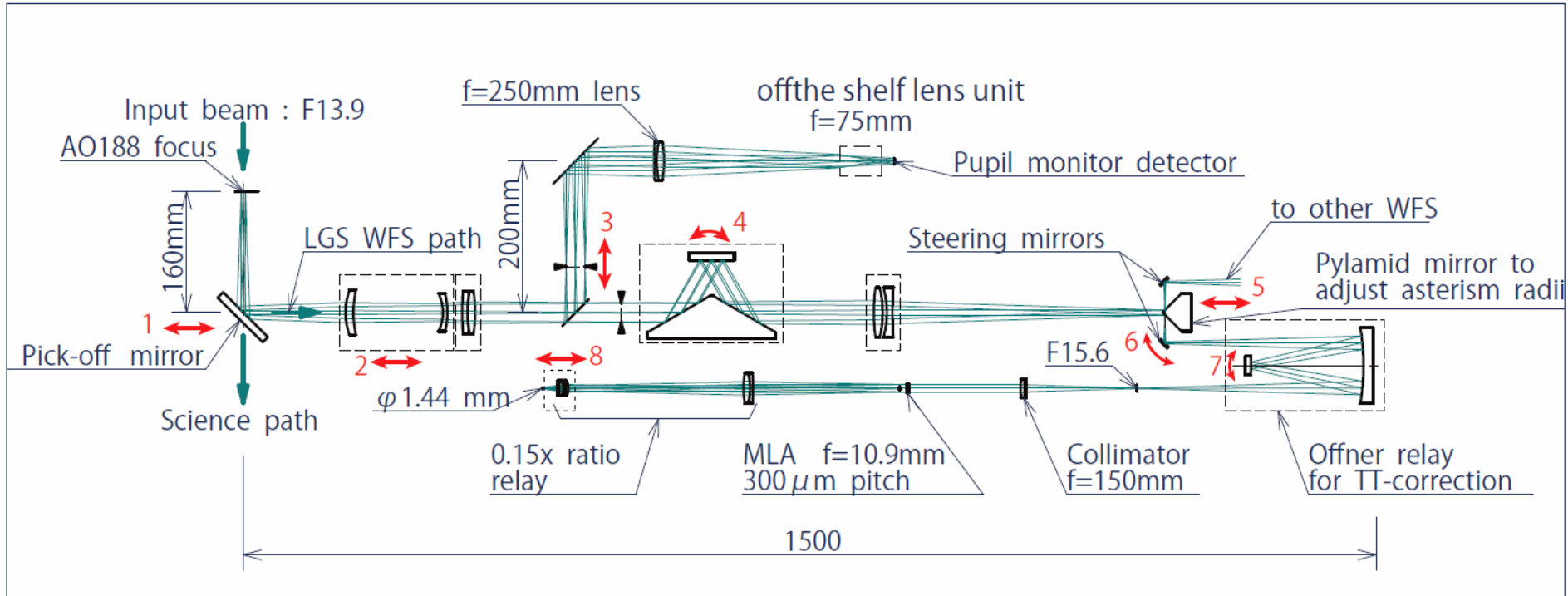
4 LGSs launching optical path



Tomography Wavefront Sensing Unit



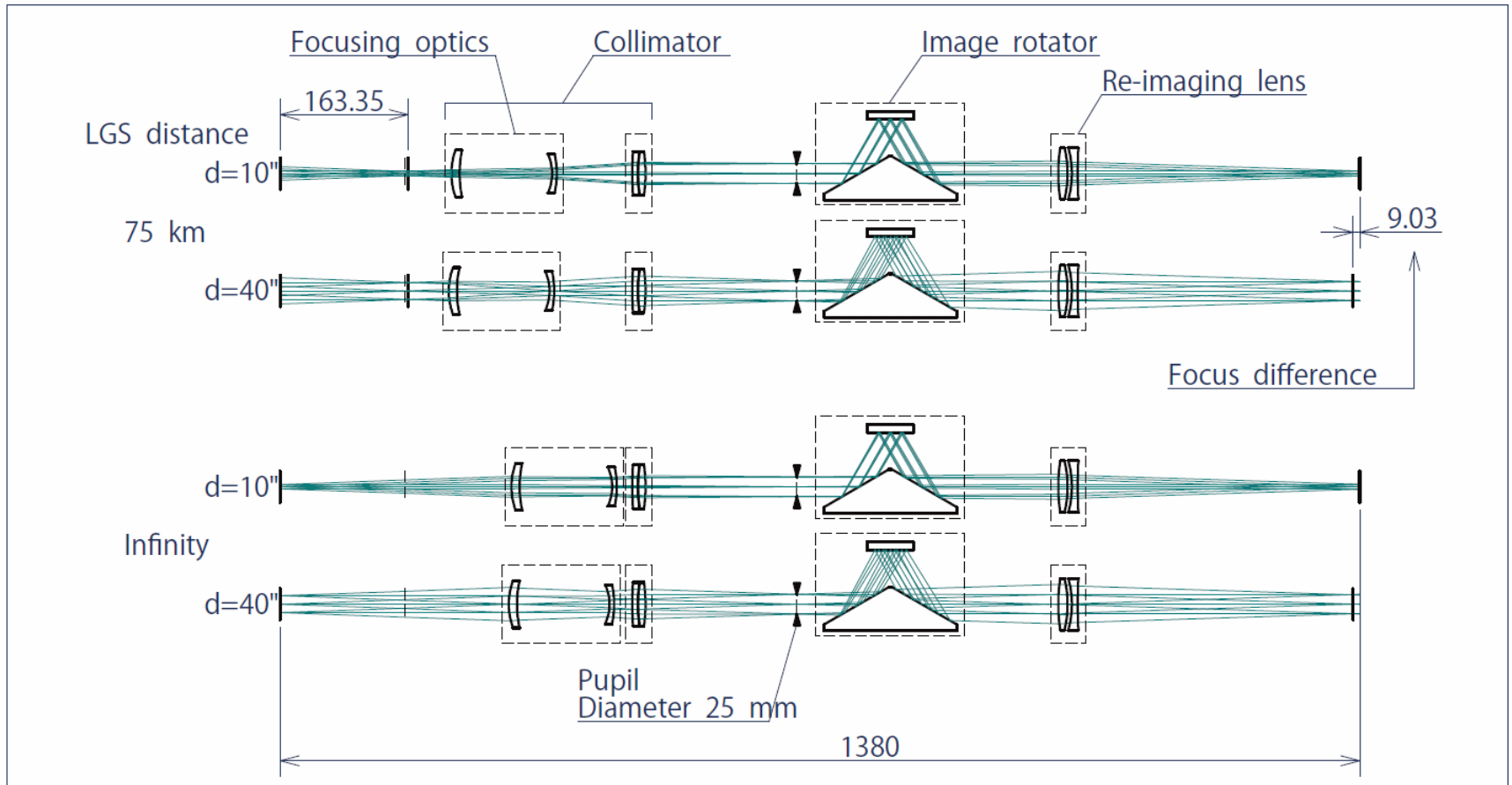
Tomography wavefront sensing unit optical system



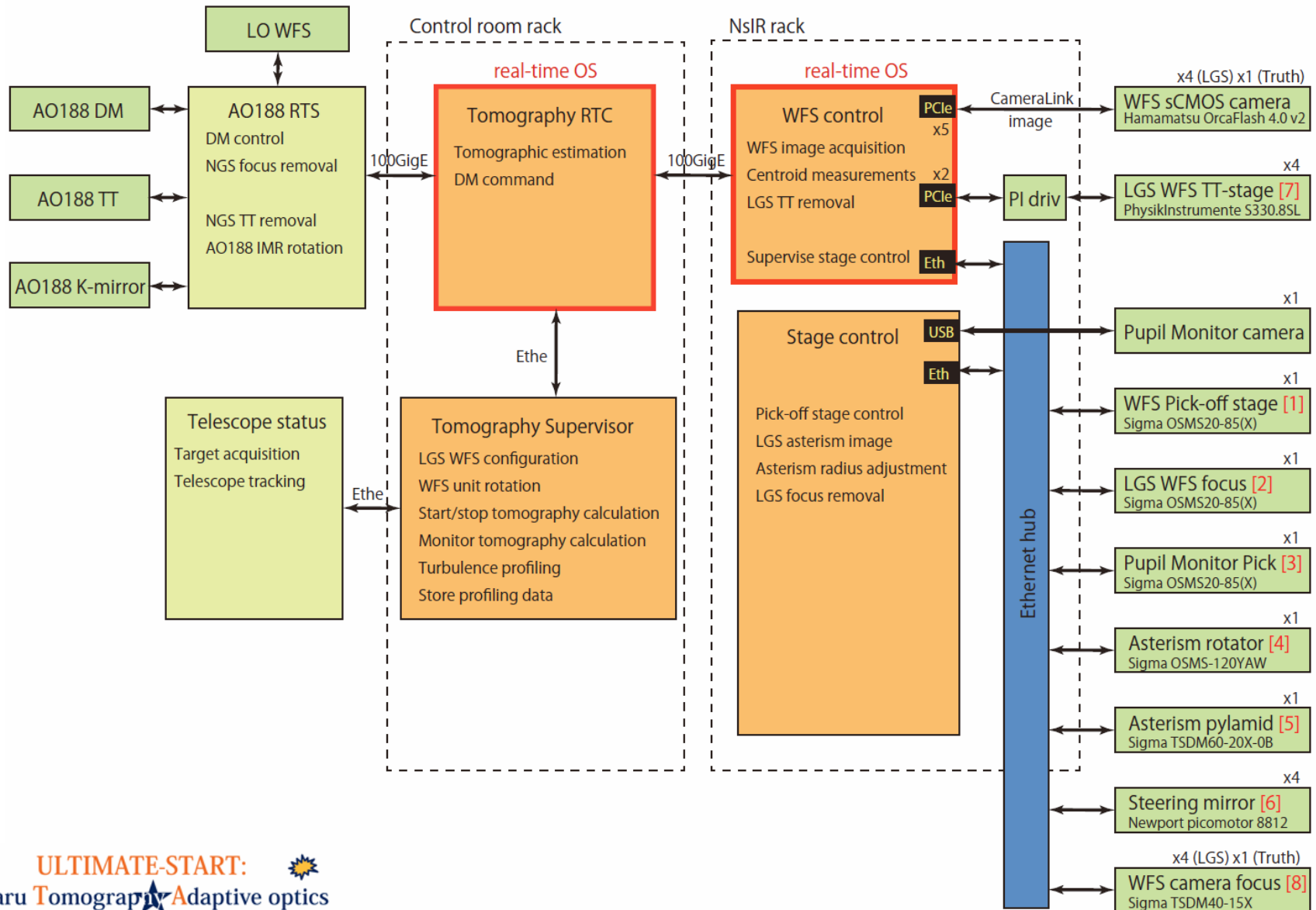
Red allows indicate moving parts

Fore optics of the unit

- LGS altitude variation and asterism diameter change are compensated by the fore optics.



Real-time control system overview



Data acquisition with sCMOS

- Hamamatsu photonics OrcaFlash 4.0 v2 is considered as a detector of the system.

