

Status of Wide Field Imager (WFI)

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Kosuke Kushibiki (Advanced Technology Center, NAOJ)

Short summary of WFI

Basic specification

Size	~ 2 x 2 x 1.91 m ³
Weight	~ 3 ton
Field of view	~ 14' x 14'
Spatial sampling	0.1"/pixel
Filters	3 Broad-band 10 Medium-band Many Narrow-band
Expected limiting mag. (good seeing, airmass=1, 1 hour, 5σ, point source)	Y: 25.6 mag(AB) J: 25.5 mag(AB) H: 25.2 mag(AB) Ks: 25.4 mag(AB)

Funding

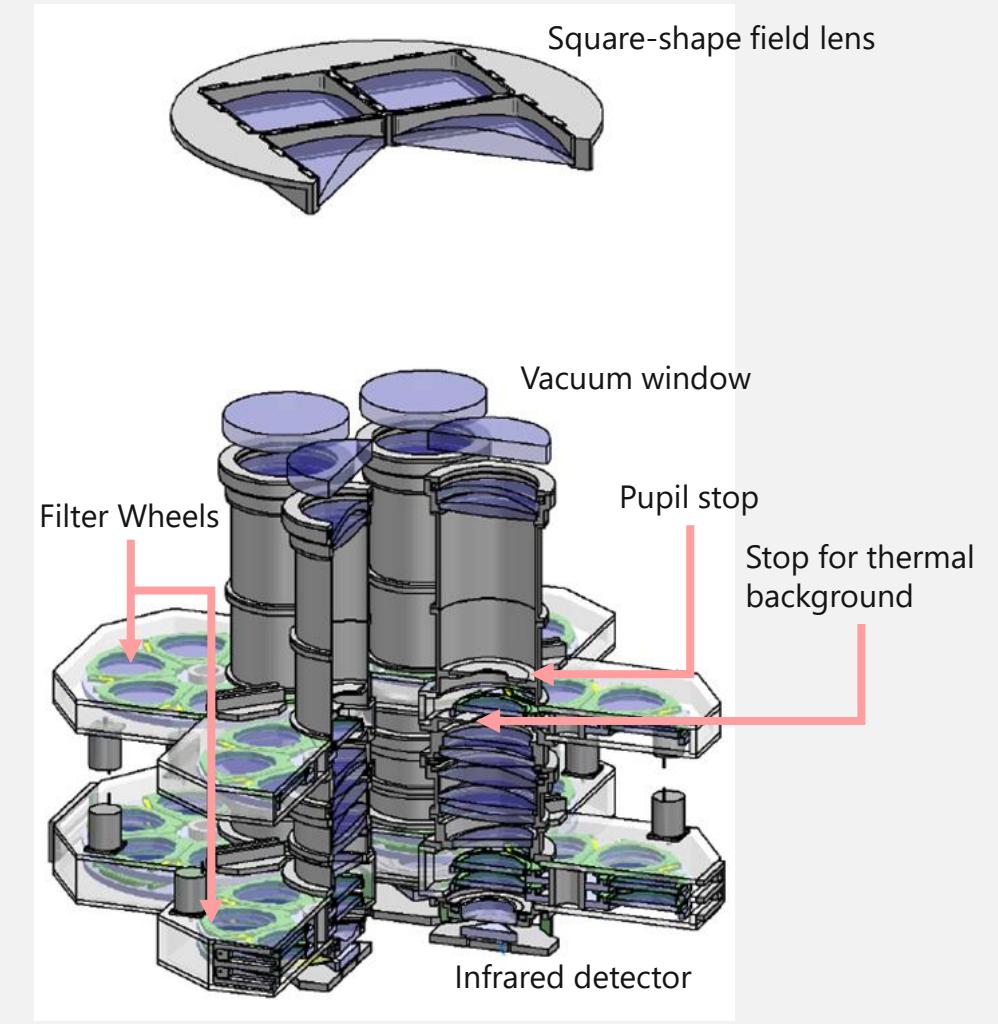
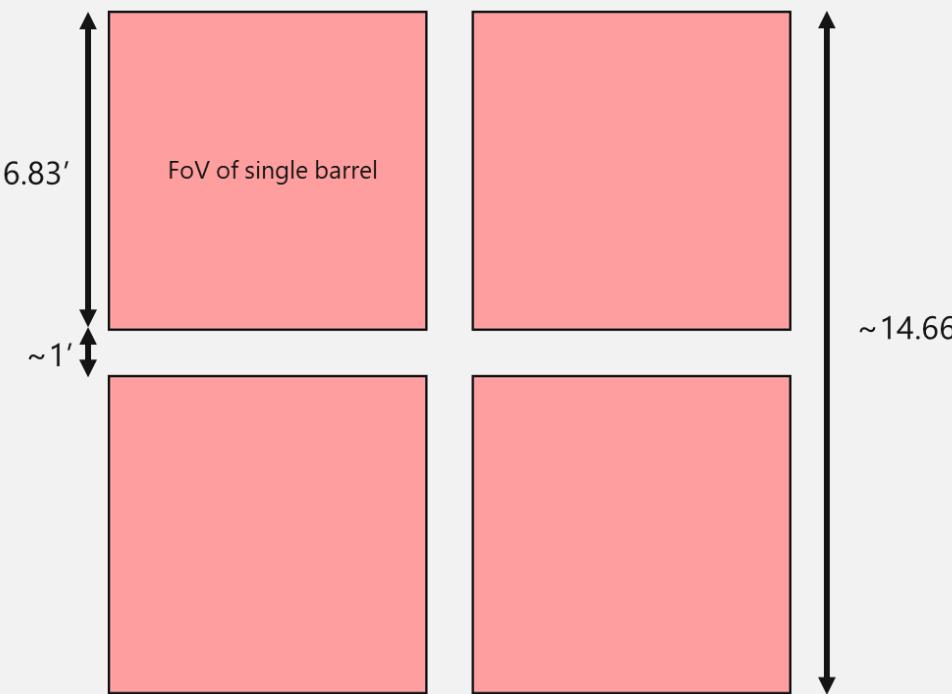
- JSPS KAKENHI (Grant-in-Aid Specially Promoted Research)
 - PI: T. Kodama (Tohoku Univ.)
 - Total ~4.5M USD (700M JPY)
 - 7 years (2024 – 2030)



Four-barrel optics

Entire FoV ($\Phi 20'$) is covered by four identical optics

- Four filter wheels per barrel (only three drawn)
- One HAWAII-4RG detector ($4K \times 4K$ pixels) per barrel
- Each covers $6.83' \times 6.83' \rightarrow$ Effective $13.66' \times 13.66'$



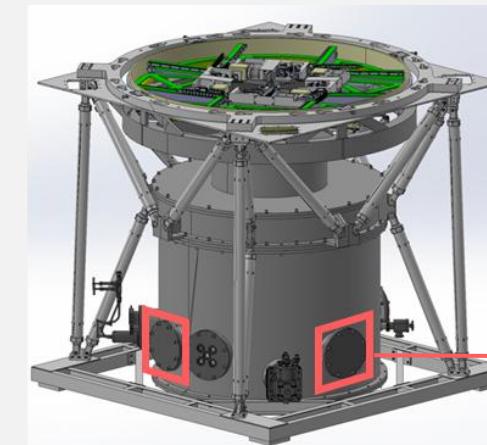
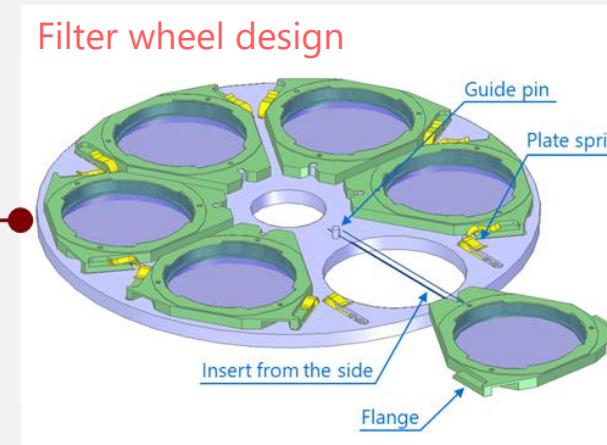
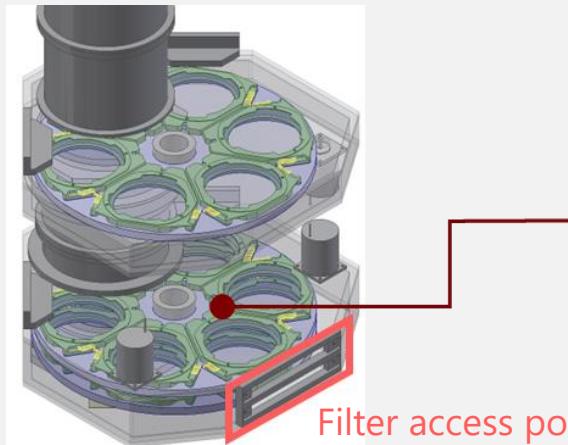
Filters of WFI

WFI can support various BB, MB, and NB filters

- Dual MB filters (two pass-bands in one filter) to reduce the number of filters
- Nine NB filters are not sufficient to cover proposed observations → Exchangeable filter wheels

	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
Wheel 1	Open	<1.65μm pass	>1.65μm pass	J	H	Ks	
Wheel 2	Open	Y/H3	J1/K1	J2/K3	H1/K4	H2/K2 with H/Ks	
Wheel 3	Open	IR-clear	NB1	NB2	NB3	NB4	
Wheel 4	Open	NB5	NB6	NB7	NB8	NB9	

Fix
Exchangeable!



NB filter workshop

Discuss science cases using ULTIMATE-Subaru WFI NB filters

- September 19th, 2025, at NAOJ Mitaka
 - 16 talks
 - 41 registrations
- Various science topics
 - Solar system objects
 - Galactic center
 - Galactic plane
 - Star-forming regions
 - Nearby galaxies
 - High-z universe
 - Reionization era
 - Cosmic noon galaxies

Mini Workshop on Narrow-band Filter Science for ULTIMATE-Subaru

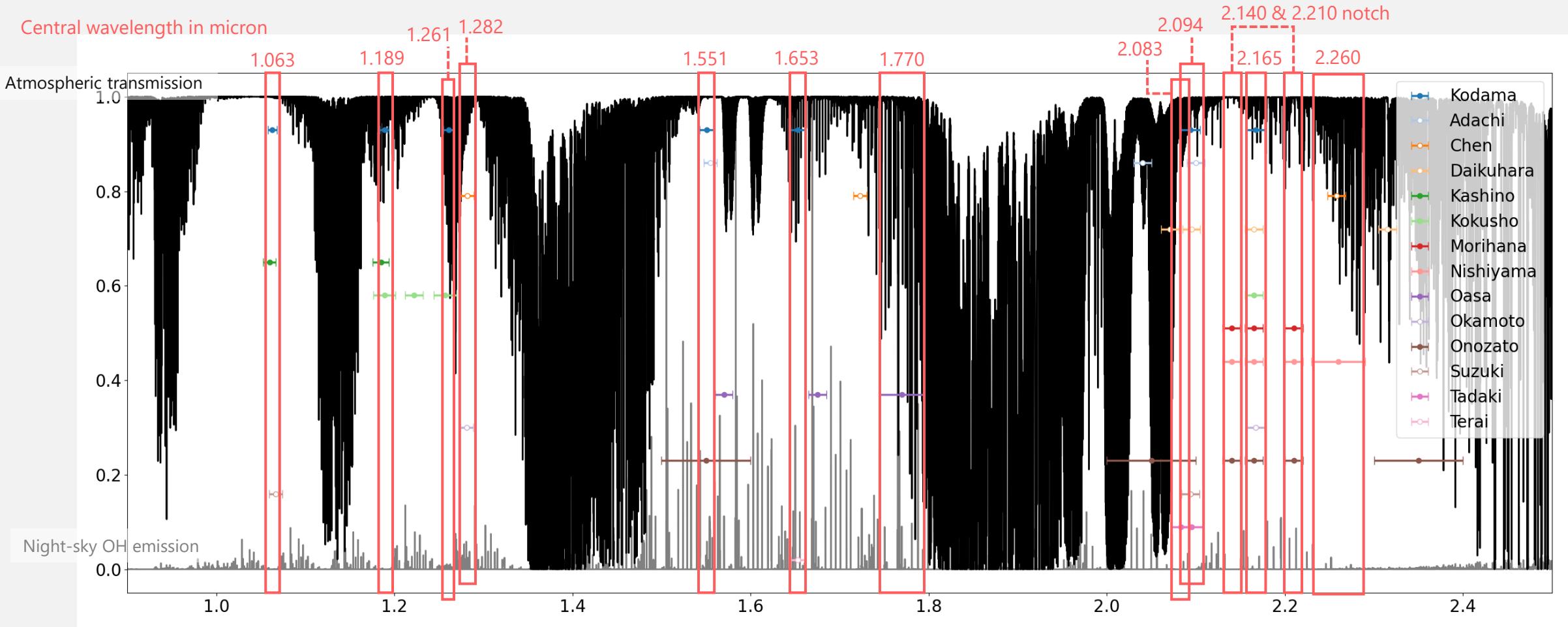
September 19, 2025 @ Lecture room, NAOJ Mitaka + Online (Zoom)

Program

09:30-09:35	趣旨説明 / 小山佑世 (NAOJ)
09:35-09:50	ULTIMATE-Subaru プロジェクト進捗 / 小山佑世 (NAOJ)
09:50-10:05	ULTIMATE-Subaru WFI進捗 / 櫻引洸佑 (NAOJ)
10:05-10:20	WFI開発・科研費チームのNBプラン / 児玉忠恭 (東北大)
10:20-10:35	近赤外線広視野狭帯域フィルター探査で探る宇宙再電離 / 柏野大地 (NAOJ)
10:35-10:50	Exploring Cosmic Noon with Narrowband Filters / 但木謙一 (北海学園大)
10:50-11:05	(Coffee break)
11:05-11:20	Spatially Resolved Properties of HAEs at z~2.2 from JWST/NIRCam / 陳諾 (東北大)
11:20-11:35	Star Formation and AGN Activities in the Protoclusters using ULTIMATE-Subaru WFI Narrow-band / 大工原一貴 (ISAS/JAXA)
11:35-11:50	Environmental dependence of metal enrichment across cosmic noon / 安達孝太 (東北大)
11:50-12:05	Probing Large-Scale Structures around Quasars at z>6 using LAEs and LBGs / 鈴木悠太 (愛媛大)
12:05-13:30	(Lunch break)
13:30-13:45	ULTIMATE-Subaru/WFI による太陽系小天体サイエンス / 寺居剛 (NAOJ)
13:45-14:00	Nearby galaxy sciences with ULTIMATE-Subaru / 岡本桜子 (NAOJ)
14:00-14:15	Study of stellar populations in the Galactic center using ULTIMATE narrow-band filters / 西山正吾 (宮城教育大)
14:15-14:30	(Coffee break)
14:30-14:45	ULTIMATE-Subaru Galactic Plane Survey using unique narrow- and medium-band filters / 森鼻久美子 (NAOJ)
14:45-15:00	Large-area emission-line mapping of supernova remnants using narrow-band filters / 國生拓摩 (名古屋大)
15:00-15:15	Stellar population and structure survey of the Galactic plane using near-infrared narrow- and medium-band filters / 小野里宏樹 (NAOJ)
15:15-15:30	若い超低質量天体の狭帯域測光探査観測 / 大朝由美子 (埼玉大)
15:30-15:45	(Coffee break)
15:45-16:40	議論
16:40-16:45	Closing Remarks

Summary of proposed filters

- Currently discussing how to optimize filter wavelength and width to cover as many science cases as possible



Status of WFI development

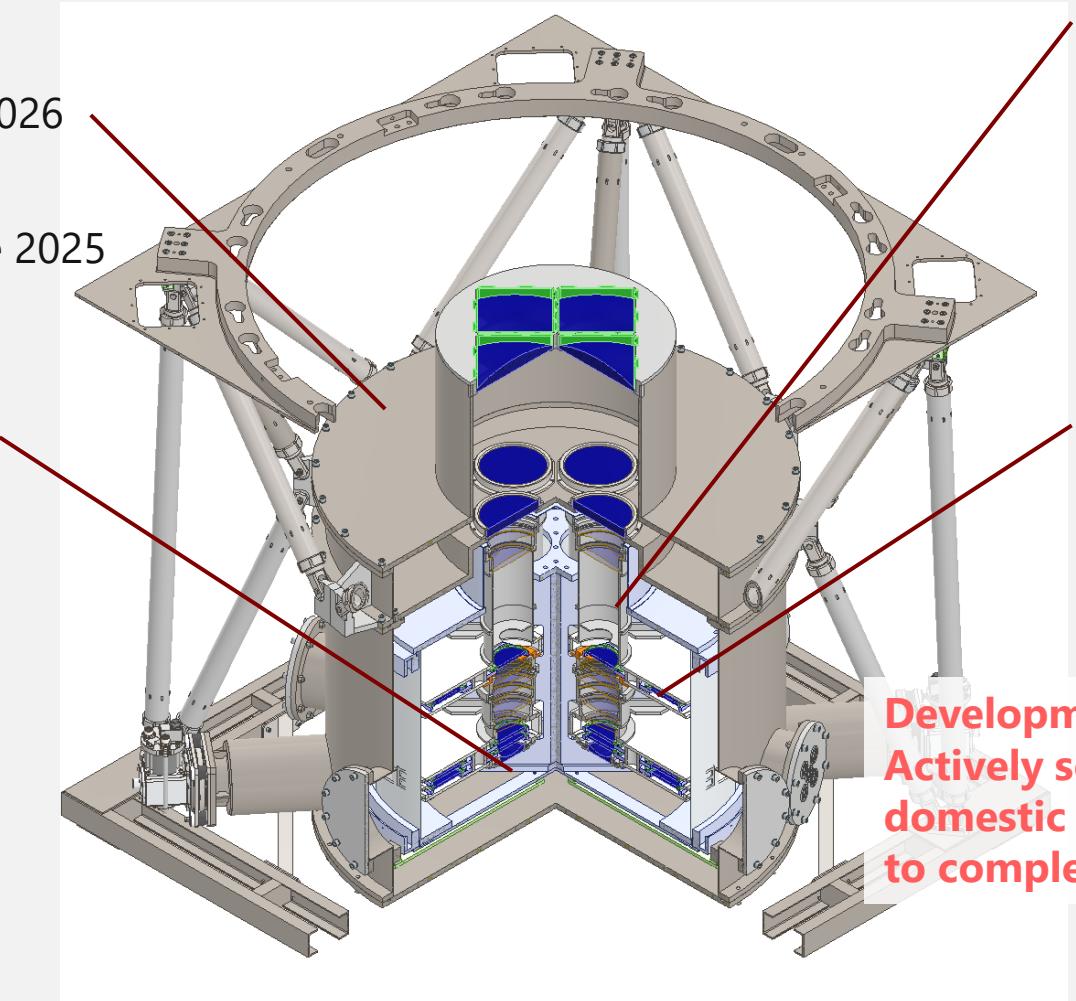
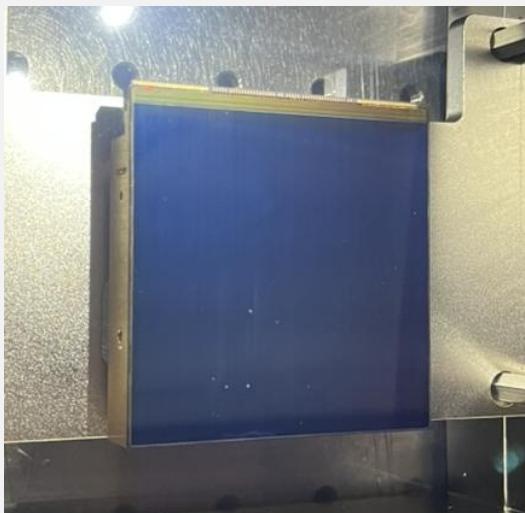
Cryostat

- In detailed design
- Production and delivery in JFY 2026

Detector

- First H4RG was delivered in June 2025
- Current budget can cover only one H4RG

→ Need additional budget to get the remaining three detectors



Optics

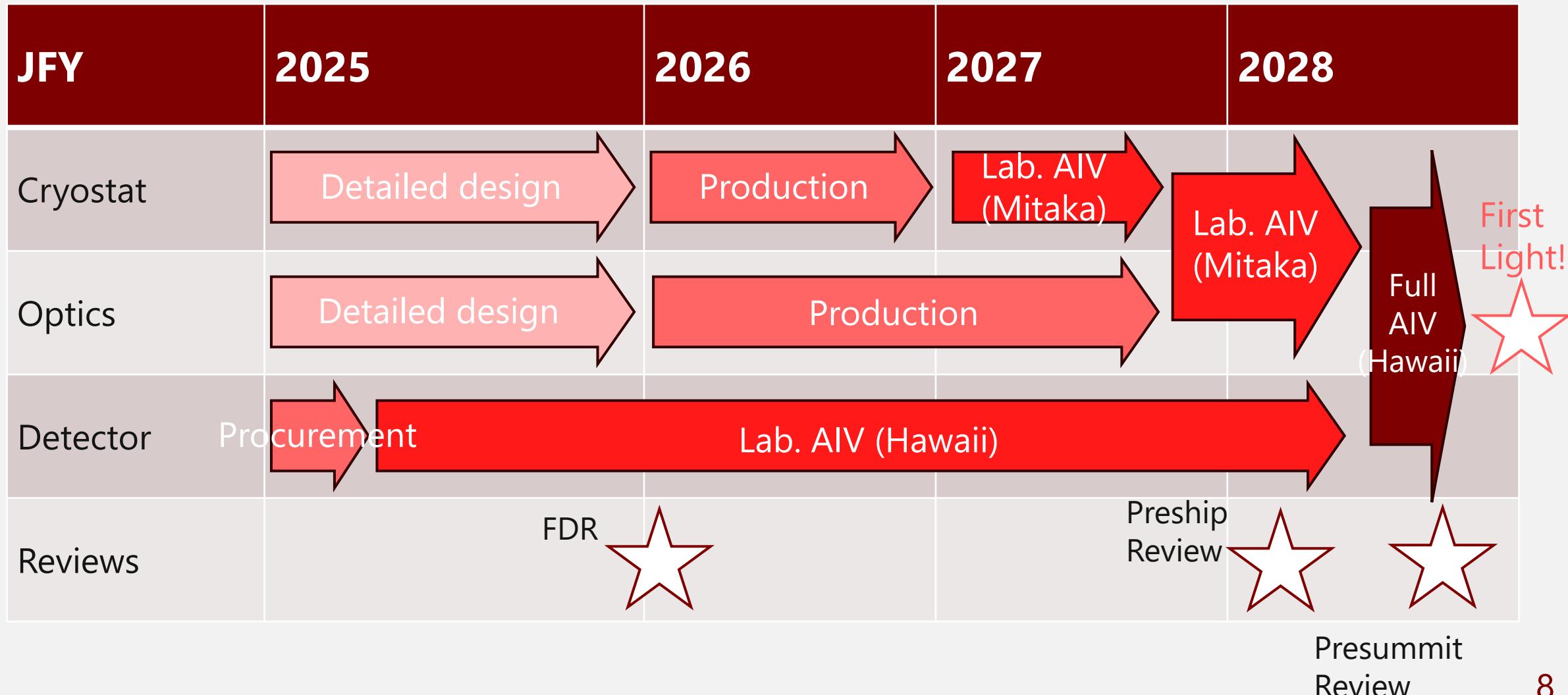
- In detailed design
- Production in JFY 2026-2027
- Current budget can cover only two optical barrels

→ Need additional budget for the remaining two optical barrels

Filters

- In discussion of filter specifications
- Production in JFY 2026-2028

Schedule



Summary

- **WFI is a near-infrared imager** for the ULTIMATE-Subaru project. **JSPS KAKENHI** promotes the development
- Unique characteristics of WFI include...
 - **Wide field of view** covered by four-barrel optics
 - Four filter wheels per optical barrel
 - One H4RG par optical barrel
 - **Various filters**
 - Dual-MB filters
 - Exchangeable filter wheels for NB filters
- Development status
 - Cryostat and optics are **in the detailed design phase**
 - One H4RG was already delivered
 - Soon define the NB filter specifications based on the discussion in the workshop
- **Production will start from JFY 2026**, and **the first light observation is targeted in JFY2028**