



SUBARU Telescope: Upgrade & De-commission of the present instruments

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(SUBARU Telescope)

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- (*) : Please see Terada-san's poster for more detail information and see Tomono-san's poster for Telescope upgrade items.

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1. De-commissioning plan

☞ CISCO

- S07A (2007 Feb): Just for backup

☞ AO36+CIAO

- **S07B** (2007 Aug ~ 2008 Jan): **Open use**
- **S08A** (2008 Feb)~: **PI instruments** (e.g., HIPWAC)

☞ **No plans for other instruments**

☞ **A/Is:**

- Recycle of CISCO & CIAO/AO36?
- Upgrade path on Cs focus AO?

☞ **New Instruments under developing:**

- AO188 / Laser Guide Star (LGS)
- Optical: Hyper Suprime Cam / (WFMOS) / K3DII(*)
- IR: HiCIAO(*) / FMOS (*): PI instruments

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2. Upgrade items: Optical instruments

Name	Item	Contents (*)	Cost	Schedule
FOCAS	CCD upgrade	<ul style="list-style-type: none"> • Cryocooler / Dewar upgrade • CCD / Electronics upgrade • Software upgrade 	\$100~200k	FY2006: Design FY2007: Design/Fabrication/Tests FY2008: Tests/Engineering Obs.
S-Cam	CCD upgrade	<ul style="list-style-type: none"> • Cryocooler / Dewar upgrade • CCD / Electronics upgrade • Software upgrade 	\$5~10k	FY2006: Design/Fabrication/Tests FY2007: Tests/Engineering Obs.
	Slitless Grism spectroscopy	<ul style="list-style-type: none"> • Grism fabrication • TCS software upgrade (if need) 	Kakenhi (U. Tokyo) ~\$300k	FY2006: Design/Fabrication/Tests FY2007: Fabrication/Tests Tests/Engineering Obs.
HDS	CCD upgrade	<ul style="list-style-type: none"> • CCD / Electronics upgrade • Software upgrade 		No plan (man power limited)
	Fiber Multi-object / Image Sclicer	<ul style="list-style-type: none"> • Hardware (Optics etc.) design • Software upgrade 		No plan (man power limited)

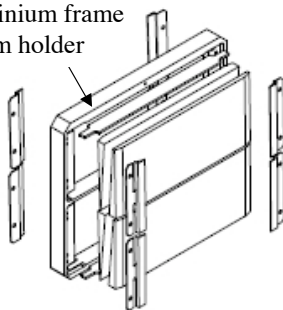
Keywords (*)Status: **Red** (almost done), **Blue** (on going), **Green** (Not yet)

- **Fully depleted CCD (FDCCD)** by Miyazaki et al.
 - ◇ High QE (70~80% @1μm), No fringe pattern, Lower Readout noise (4e⁻ → 2.5e⁻)
- New Electronics (**M-Front2**) by Nakaya et al.
 - ◇ Faster Readout time (50 → 15 second)
- New cooler: **Pulse Tube Cryocooler**
 - ◇ Maintenance free : Longer lifetime (5,000 → 50,000 hours)

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S-Cam Grism Module

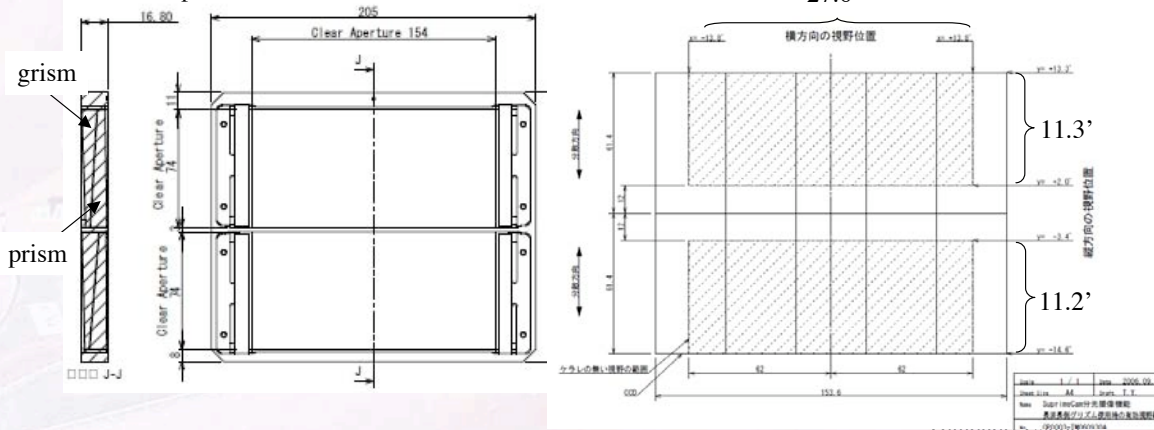
Aluminium frame =grism holder



Blue grism : 400 – 700 nm R~40-50 (made 1st)
Red grism : 625 – 840 nm ... Hα,Hβ,Lγα
75/mm:blaze angle 4.3deg

FOV is divided by 2 grisms
 → reasonable dispersion and img quality
 → slightly vignettted

Compliant with a size of usual filters



3. Upgrade items: IR instruments

Name	Item	Contents (*)	Cost	Schedule
IRCS	Higher Dispersion (R=20k -> 70k) ($\lambda=1.4\sim 5.5\mu\text{m}$)	<ul style="list-style-type: none"> • Si Immersion Grating fabrication • Design: Optics / Mechanics • Detector / Electronics upgrade • Software upgrade • Development of NIR gas cell 	\$500k~\$1M	FY2005~06: R&D FY2006~08: Design/Fabrication FY2009~: Tests/Eng.Obs.
	Wider λ coverage KL (2.1~4.0 μm) zJH (0.9~1.8 μm)	<ul style="list-style-type: none"> • KL prism: Design / Fabrication • CISCO's z/J/K Grism recycle 	\$15~110k	FY2005: R&D/ Eng.Obs. FY2006: Design FY2007~08: Fabrication/ Tests FY2009~: Tests/Eng.Obs.
	Polarimetry	<ul style="list-style-type: none"> • Wiregrid Polarizer: installation • Wollaston Prism: Design 	~\$40k	FY2007~08: Fabrication/ Tests FY2009~: Tests/Eng.Obs.
COMICS	Polarimetry	<ul style="list-style-type: none"> • Mechanics fabrication • CdS/CdSe waveplate fabrication 	~\$80k	FY2007~08: Fabrication/ Tests FY2008~: Tests/Eng.Obs.
MOIRCS	Filter upgrade	<ul style="list-style-type: none"> • Filters: Design / Fabrication 	Each ~\$7k	FY2006~07: Design/Fabrication FY2007~: Tests/Eng.Obs.
	Grism upgrade	<ul style="list-style-type: none"> • J-band VPH (R=3000) • H-band VPH (R=3000) • z/J/H-bands R1300 Grism 	~\$30k	FY2006~07: Design/Fabrication FY2007~: Tests/Eng.Obs.
	32ch Faster Readout	<ul style="list-style-type: none"> • Electronics upgrade • Software upgrade 	~\$50k	FY2006~07: Design/Fabrication FY2007~: Tests/Eng.Obs.
	Detector Upgrade (e.g., Hawaii2RG)	<ul style="list-style-type: none"> • Detector / Electronics upgrade • Software upgrade 	>\$1M	No plan (Budget limited)

(*)Status: Red (almost done), Blue (on going), Green (Not yet) Tomonori Usuda

4. Expectations for Subaru Users

☞ Requirements for new items / functions

Please continue letting us know your requirements, which are helpful for us to **set priorities** of the items.

☞ Collaboration w/ Universities -> How do you think about?

- Case 1: On going Upgrade items

- ✧ Core person in Hilo / Some budget / **No human resources**
- ✧ Graduate students stay in Hilo to work with the core persons
- ✧ Concrete Plan A: 32-ch faster Readout w/ Nakaya-san
- ✧ Concrete Plan B: IRCS high dispersion w/ Terada-san

- Case 2: non-active Upgrade items

- ✧ Some Budget / No core person and human resources
- ✧ Make a group in an university to work for one of the items