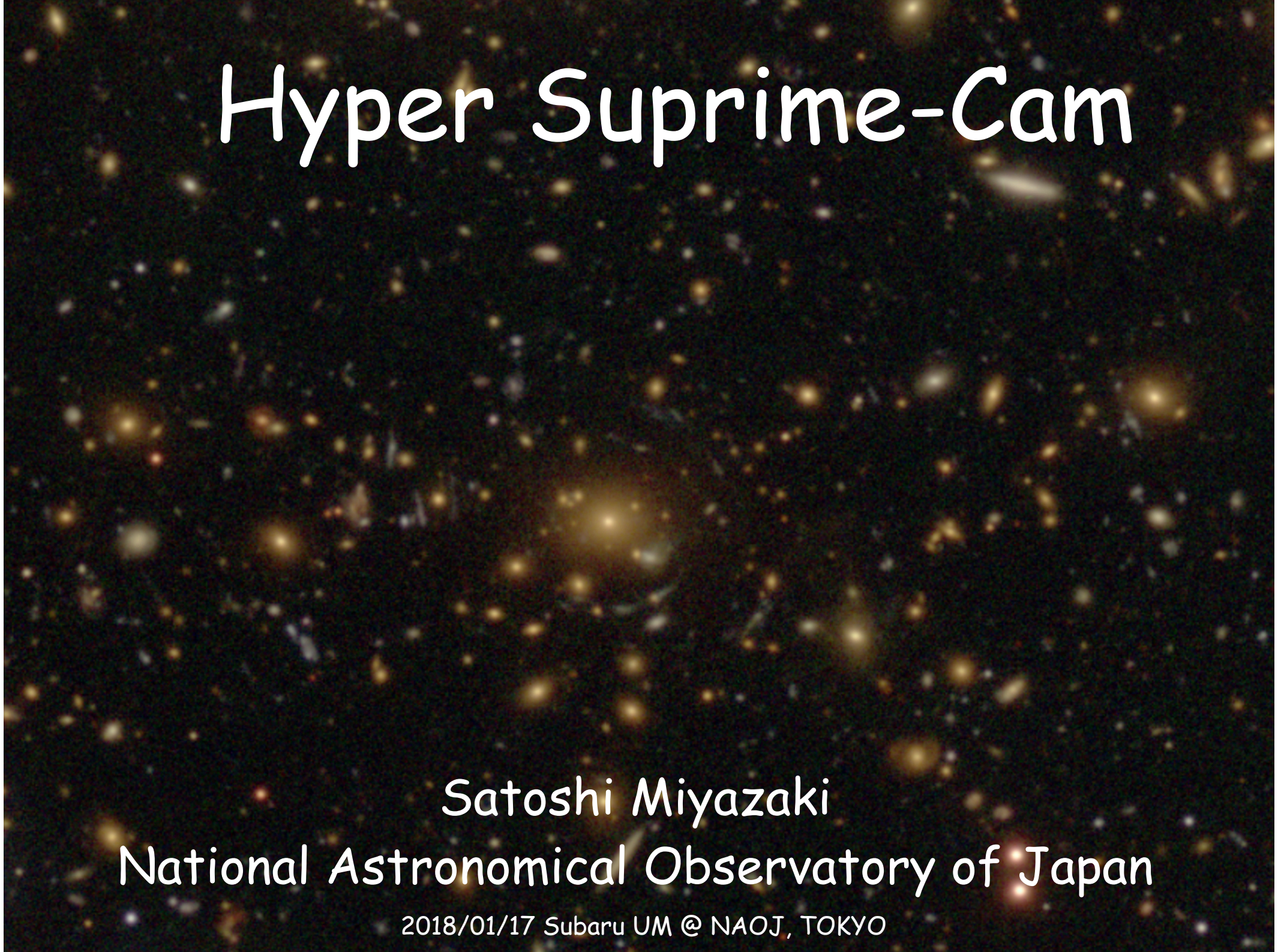
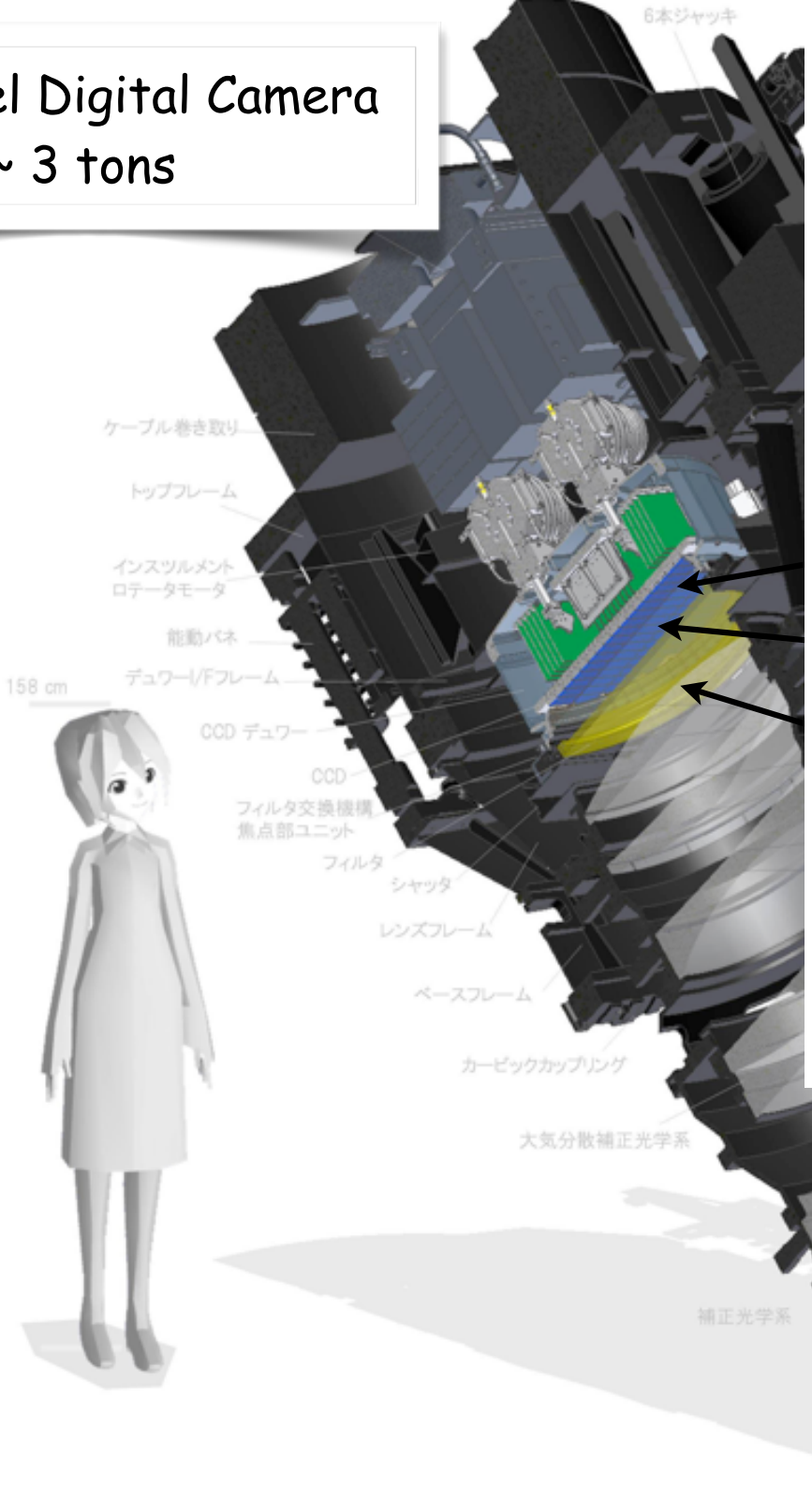
Hyper Suprime-Cam

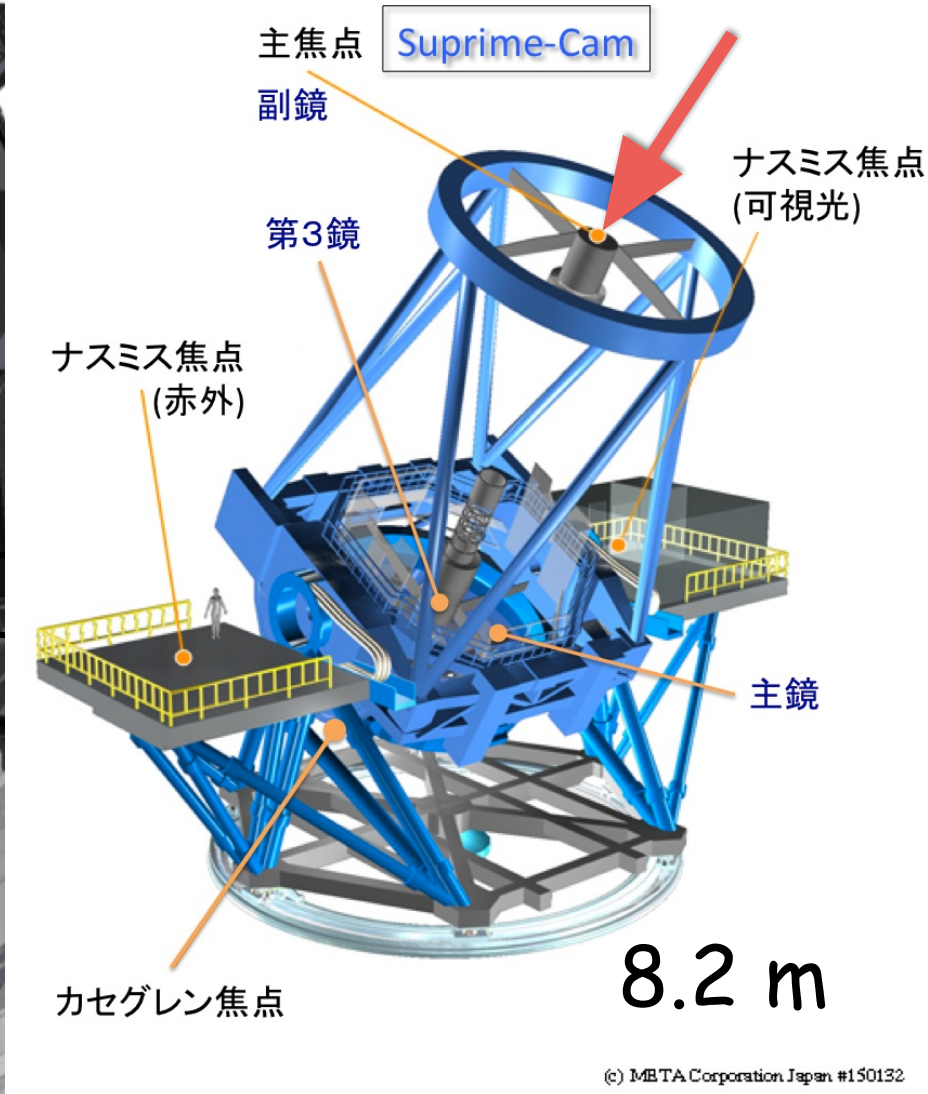


Satoshi Miyazaki
National Astronomical Observatory of Japan

2018/01/17 Subaru UM @ NAOJ, TOKYO

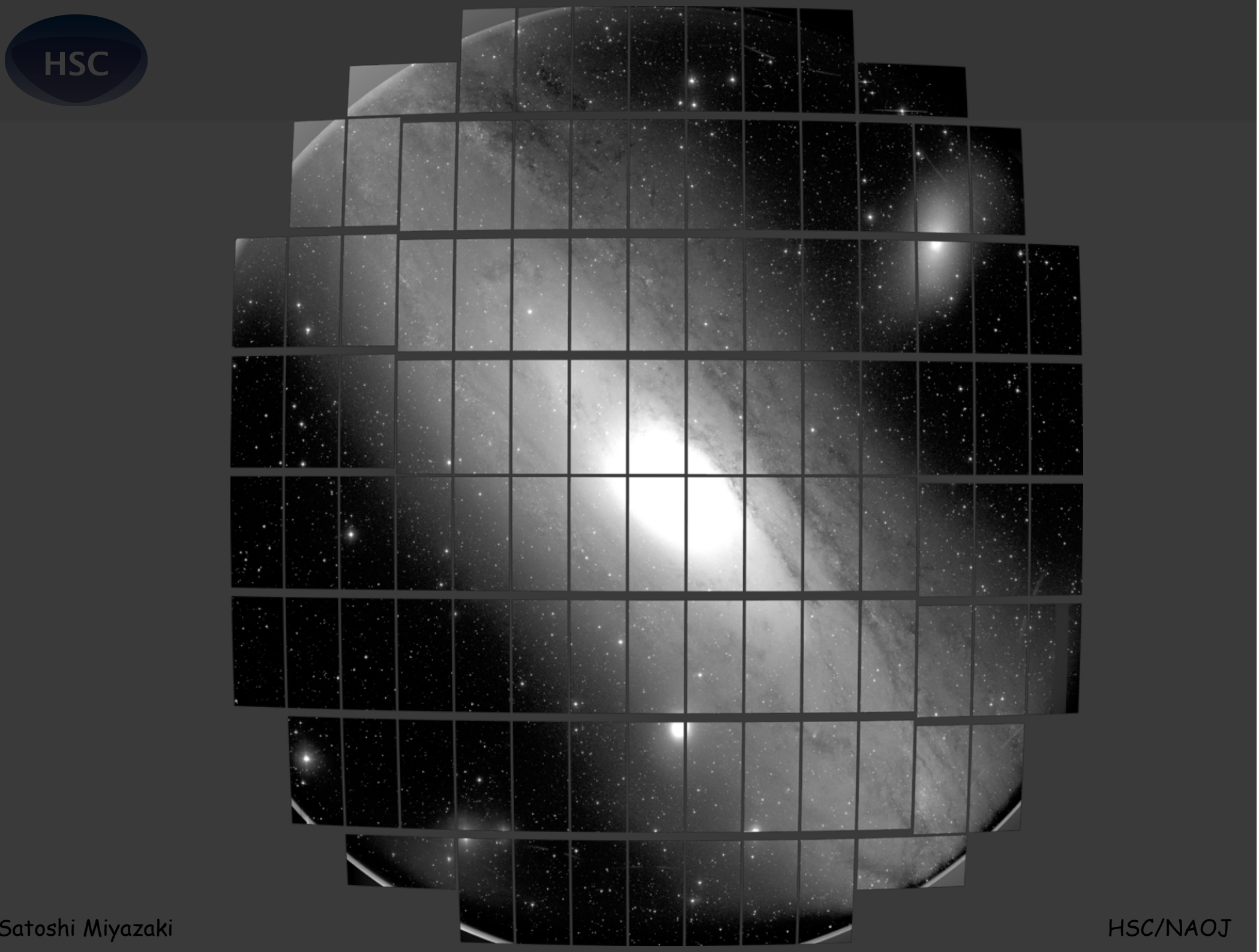
~ 1 G pixel Digital Camera
3 m tall ~ 3 tons





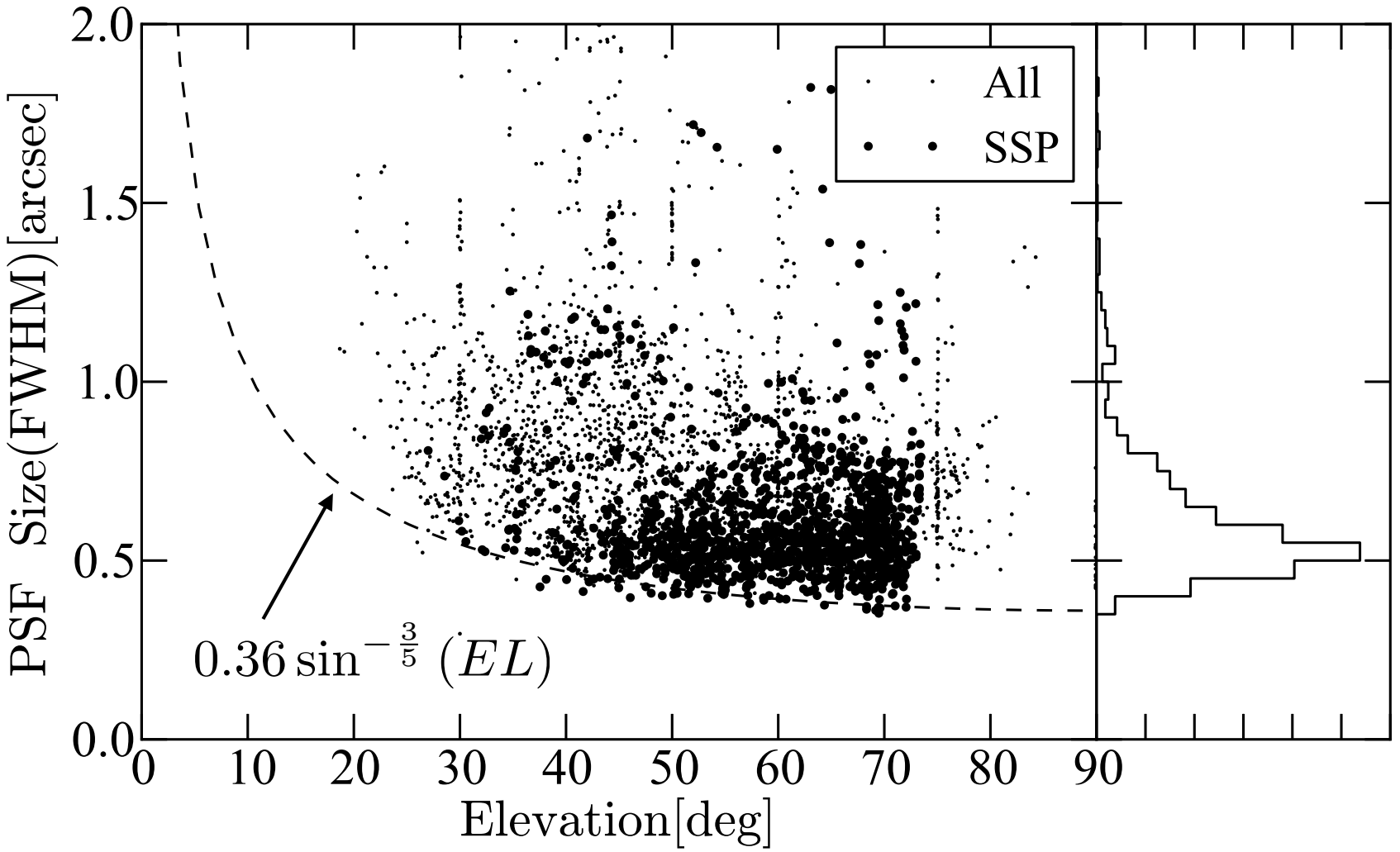
← Lens

HSC/NAOJ


HSC
Satoshi Miyazaki
HSC/NAOJ

Seeing Statistics

HSC-i band

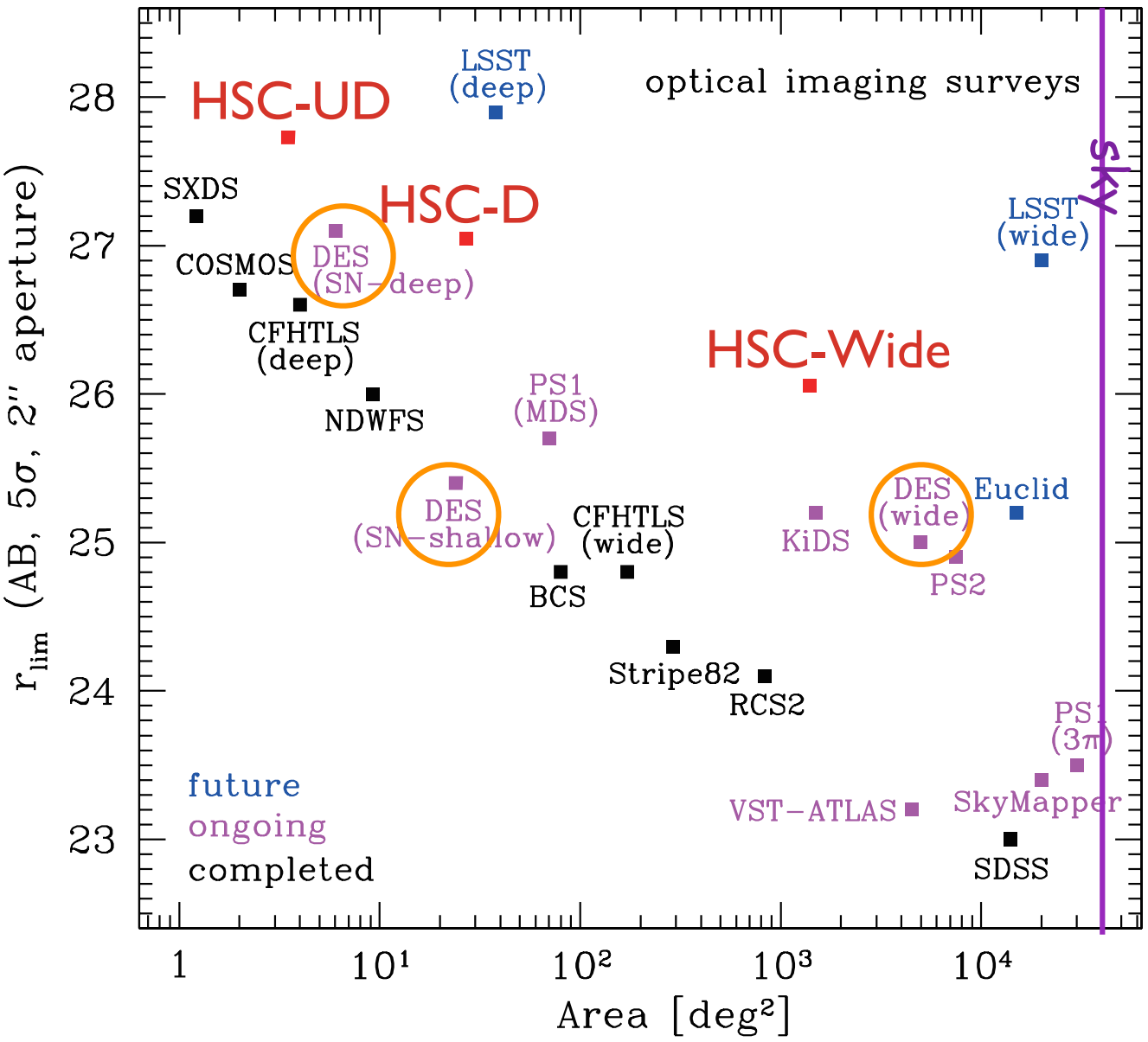


median 0".56 for SSP

Mostly seeing limited imaging realized

Miyazaki et al. (2018a) in press

HSC SSP Survey: Three layers



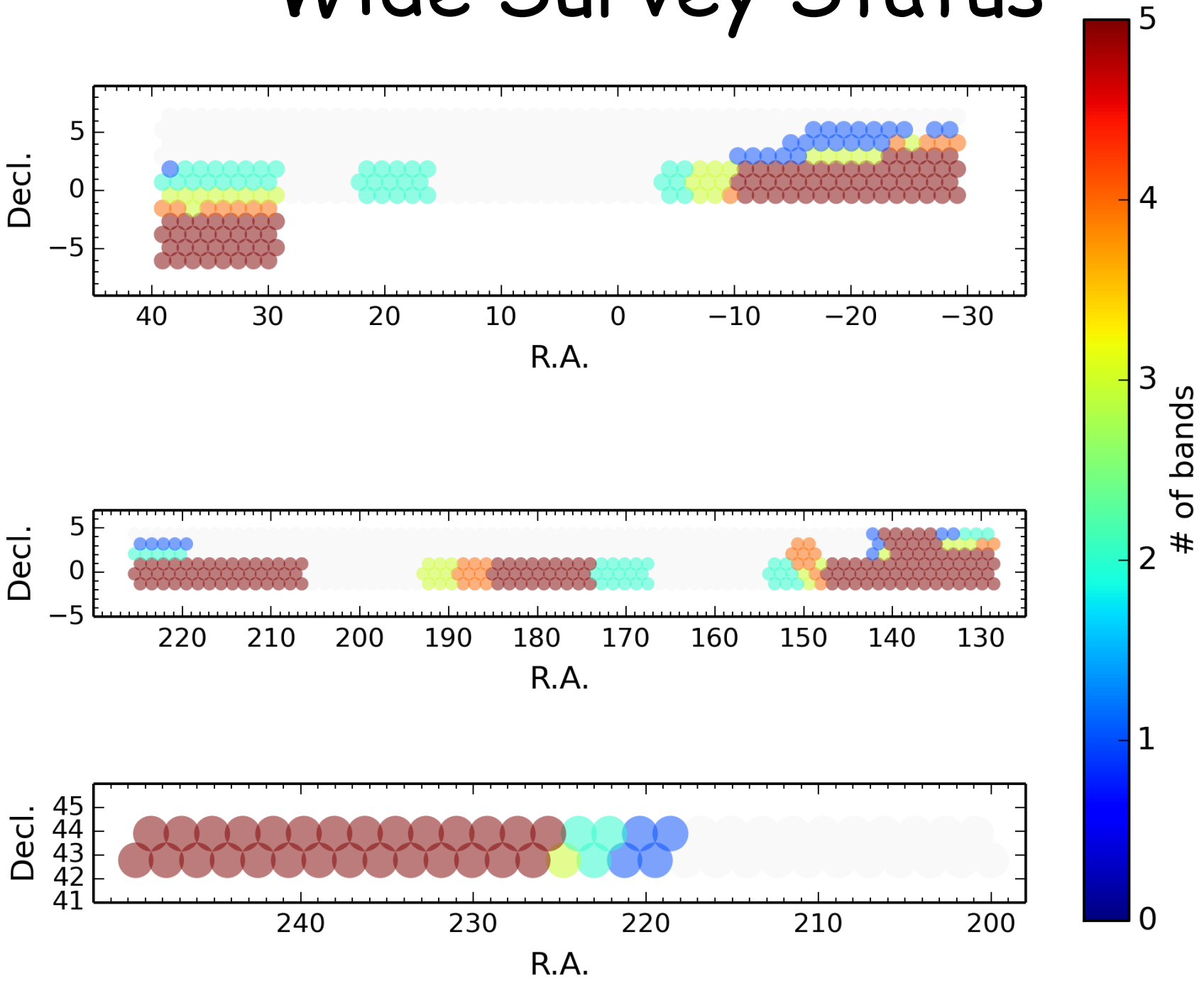
- Three-tier survey
  - Wide: 1400 sq. degs, i~26
  - Deep: 28 sq. degs, i~27
  - Ultradeep: 3 sq. degs, i~27.7

300 nights
from 2014 - 2019

Full depth area

Created at 2017-03-08 14:37:02

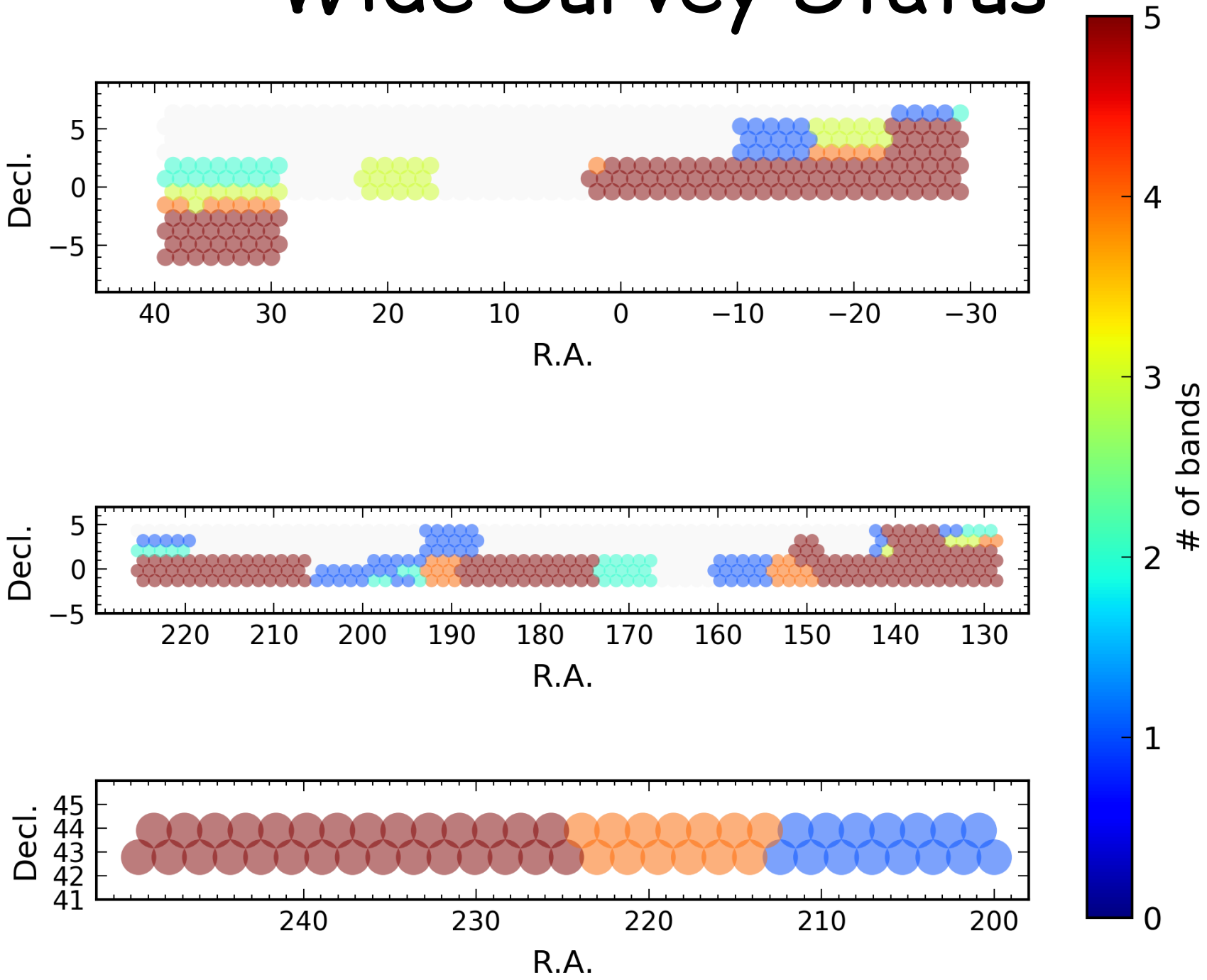
Wide Survey Status



Full depth area

Created at 2017-09-28 09:08:03

Wide Survey Status



Survey Status

Status

- ~ 150 nights done with 80 % of planned pace
  - Weather prospect was a bit optimistic.
  - More frequency of the filter exchanges to carry out time-domain survey

Countermeasures being considered

- Reduction of CCD readout time
- Giving up part of Width or Depth
- Submit another proposal

Collaborations with external teams

- Established collaborations with external groups, initiated by approaches from the external groups (not from us)
- Exchanged MOU and now carrying out the collaboration
  - Spitzer/IRAC data (SPLASH; Peter Capak + COSMOS): 2012 Def -, UltraDeep fields, galaxy evolution
  - CFHT U-band data (scientists from Canada, France, China): 2014Aug -, ~320 CFHT hours (270hrs already taken), galaxy evolution, photo-z
  - UKIRT NIR (JHK) data (Arizona/Steward): 2014Aug-, ~240 UKIRT hours (205hrs taken), galaxy evolution, photo-z
  - Keck spectra (Caltech/JPL): 2016-, ~40 Keck nights (33 Keck nights+200hrs VLT+3 MMT nights), photo-z, galaxy evolution
  - Atacama Cosmology Telescope (ACT) CMB data (ACT group): Sunyaev-Zel'dovich clusters, CMB lensing
  - XMM-XXL X-ray data (XXL team): galaxy clusters, AGN

eROSITA

- MoU with eROSITA-DE (2017)
  - Collaboration on overlapped survey area
  - Shallow (Txmm ~ 2 ks) but wide (>~ 500 deg^2)

How is it like ?

Try

hscmap.mtk.nao.ac.jp

and use the bookmarks its menu
to enjoy the uniqueness

PASJ Special Issue Feb 2018

Technical papers:
Camera: Miyazaki
Survey Design: Takada and Strauss
Data Release: Tanaka
Shear Catalog: Mandelbaum
Pipeline: Bosch
Photo-z: Tanaka
Huang: Synpipe 1
Murata: Synpipe 2

Low-z Galaxy working group:
Andy Goulding: Morphology of AGN hosts
Johnny Greco: UDGs in groups (tentative)
Masao Hayashi : NB-selected emission-line objects
Jean Coupon : magnification bias up to z~2
Atsushi Nishizawa: red fraction of culster galaxies
Hung-Yu Jian : galaxy population in clusters

High-z galaxy working group:
- Yuichi Harikane, "Galaxy-Dark Matter Halo Connection Revealed by the Subaru Hyper Suprime-Cam Survey"
- Yoshiaki Ono, "The Bright End of the Galaxy Luminosity Functions at z=4-7 based on the Subaru Hyper Suprime-Cam Survey"
- Akira Konno, "First Results of Subaru/Hyper Suprime-Cam 24deg^2 Narrowband Survey: Lya Luminosity Functions at z=5.7 and 6.6"
- Hisakazu Uchiyama, "Correlation between protoclusters and quasars at z~4"
- Jun Toshikawa, "Systematic Search of Protoclusters at z~4 in the Subaru Hyper Suprime-Cam Survey"
- Takatoshi Shibuya, "Subaru Hyper Suprime-Cam Narrow-Band Survey for Lya Emitters: Selection and Lya Properties for Lya Emitting Objects at z~6-7"
- Takatoshi Shibuya, "Optical and NIR Spectroscopic Observations for z~6-7 Very Luminous Lya Emitters Identified in the Subaru Hyper Suprime-Cam Survey"
- Masami Ouchi, "Clustering of Lya Emitters at z=~6-7 Revealed by Early Subaru Hyper Suprime-Cam Survey"
- Akio K. Inoue, "A simulation of Ly-alpha emitters in the reionization epoch for the Subaru Strategic Program with Hyper Suprime-Cam"

Strong lensing Working Group:
* SUGOHI I: Photometric and Spectroscopic Search for Strong Lenses in the HSC Survey, A. Sonnenfeld et al.
* Hunting with CHITAH: Strong-lens candidates from the first-year data of the Hyper Suprime-Cam survey (tentative) J. Chan et al.
* Joint SL and WL analysis of HSC group/cluster lenses (tentative) A. Jaelani et al.
* Mass distribution of group-scale lenses from HSC (tentative) A. More et al.

AGN working group:
- He, Akiyama et al: Clustering analysis of z~4 quasars
- Matsuoka et al: Spectroscopic identification of z~6-7 quasars (SHELLQs Paper II)
- Akiyama, He, Ikeda et al: Luminosity function of z~4 quasars
- Shirasaki, Strauss: The environment of quasars at intermediate redshifts
- Terashima: X-ray bright optically faint sources
- Onoue: Galaxy environment around multiple QSO system

Cluster working group:
** Hironao Miyatake: ACTpol xc HSC
** Elinor Medezinski: Planck xc HSC
** Miyaoka-san and Nobu: x-ray properties of selected HSC clusters
** Masamune Oguri: camira cluster sample
** Hung-Yu: on quenching of galaxies in clusters
** Yen-Ting Lin: evolution of BCG, stellar mass function, and radio galaxies in camira
** Atsushi Nishizawa: red fraction evolution
** Surhud More: splashback radius -- although this may be merged with Atsushi's paper above, still TBD

Galactic Archeology Working Group:
Halo Structure using BHB stars

Weak lensing working group:
Mandelbaum: Shear catalog
Miyatake: Cosmological constraints by CMASS/BOSS galaxy clustering and the HSC-BOSS galaxy-galaxy weak lensing measurements
Miyatake: Weak lensing measurement of ACTPol clusters
Medezinski: Weak lensing measurement of Planck clusters
Medezinski: Source selection for cluster weak lensing
Leauthaud: Comparing light profiles of massive galaxies and WL measurements with hydro sims
Speagle: Application of FRANKENZ (Josh's photoz code) to HSC and validation using g-g lensing
Mandelbaum: GREAT3-like simulations paper
Miyazaki: shear selected clusters
Oguri: Wide area mass maps in 2D and 3D
Oguri: Mass-richness relation of CAMIRA clusters

Solar System working group:
Yoshida & Terai: Jupiter trojans (to ApJ?)
Terai & Yoshida: Hilda group (to ApJ?)
Terai: Colors of known TNO's

40 papers

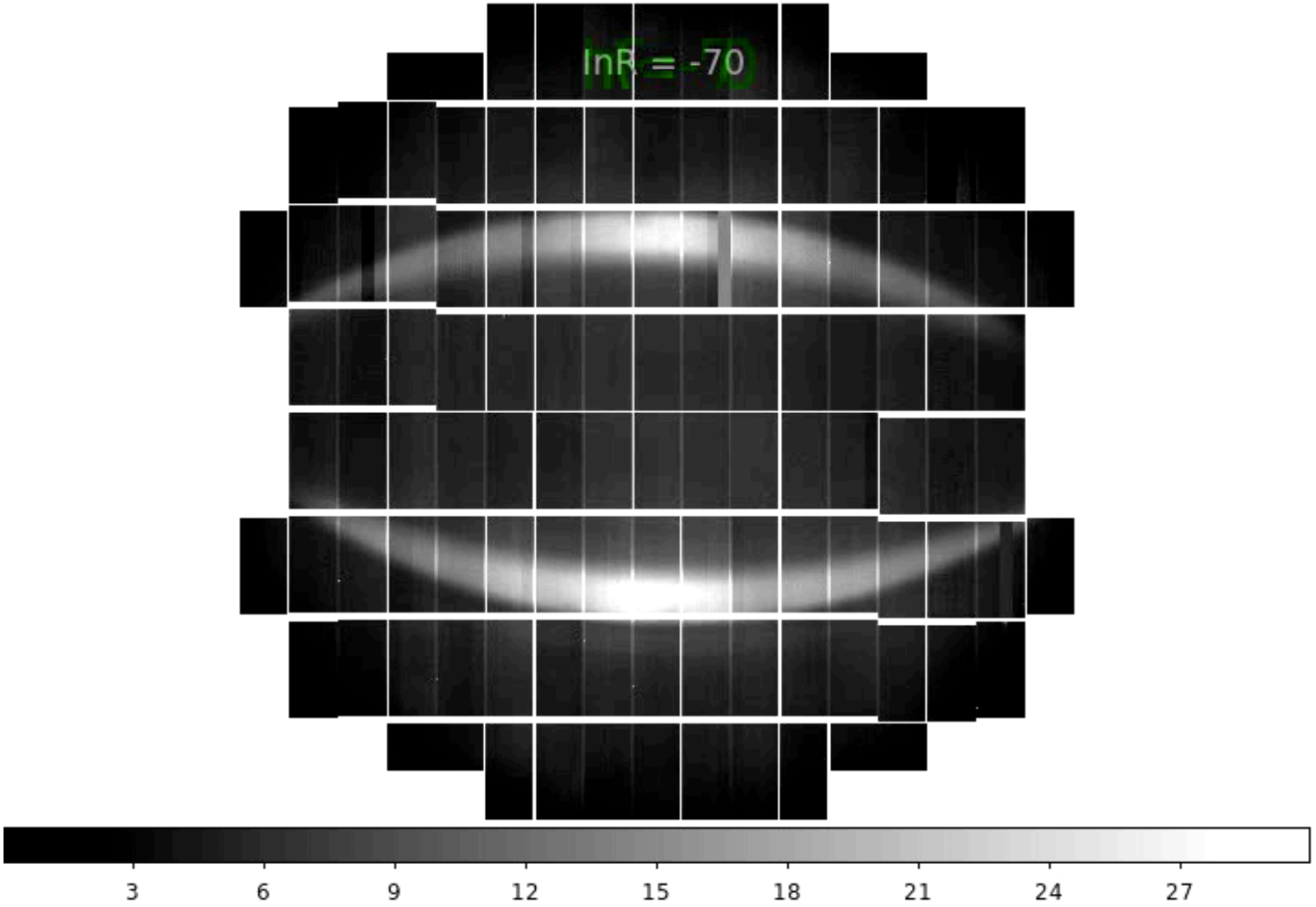
Data Product

Release	Date	Layer	N filter	Area (deg^2)	Files (TBytes)	N object	Version hscPipe
Public Data Release 1	2017-02-28	UltraDeep	7	4	8.6	3,225,285	4.0.1
		Deep	7	26	16.6	15,959,257	4.0.1
						658,163	4.0.1
						880,792	2.12.4a
						548,142	2.12.4a
						183,707	2.12.4d
						954,672	3.4.1
						973,579	3.8.5
						747,568	3.8.5
						073,662	3.8.5
						225,285	4.0.1
						959,257	4.0.1
						423,778	4.0.1
						208,918	4.0.2
						269,129	4.0.2
						991,488	4.0.2

See Next
Masayuki Tanaka's Talk

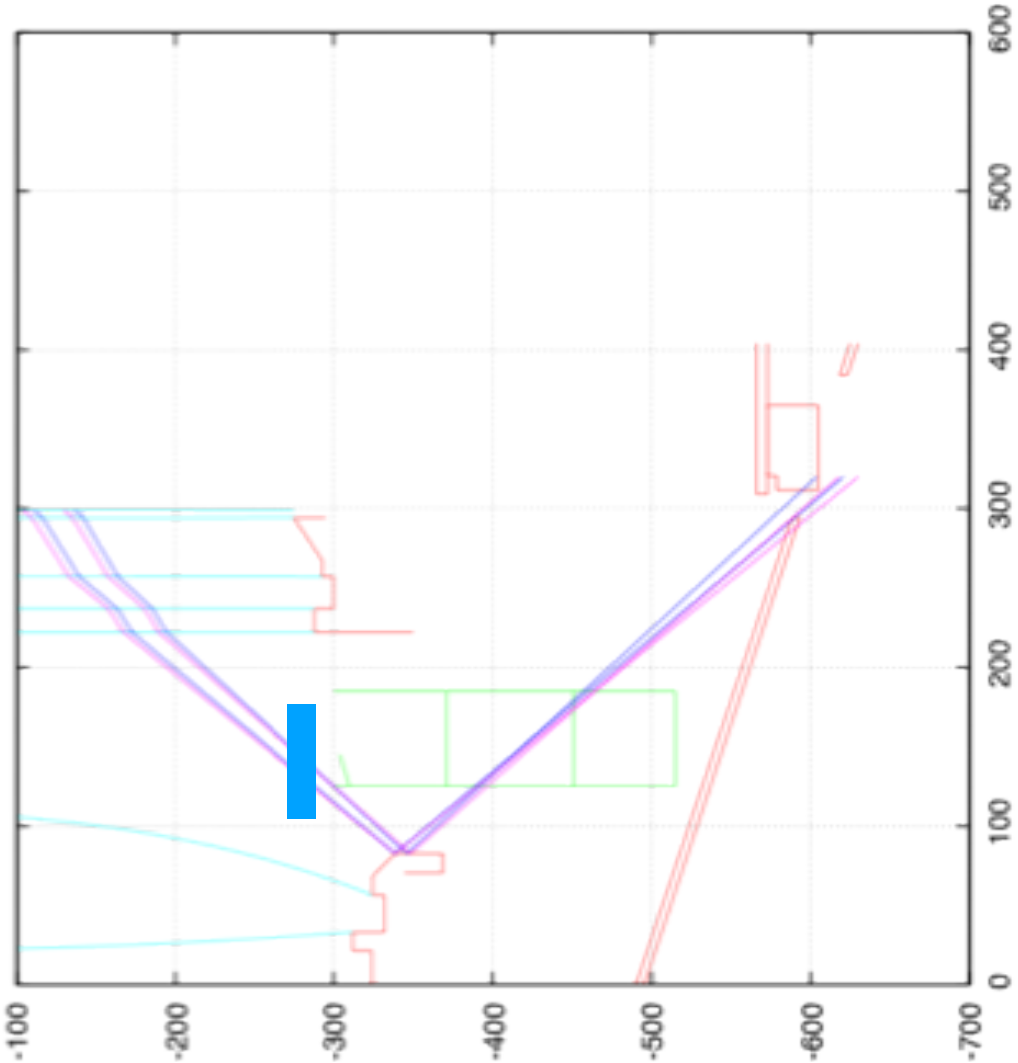
https://hsc-release.mtk.nao.ac.jp/

Y-band Stray Light

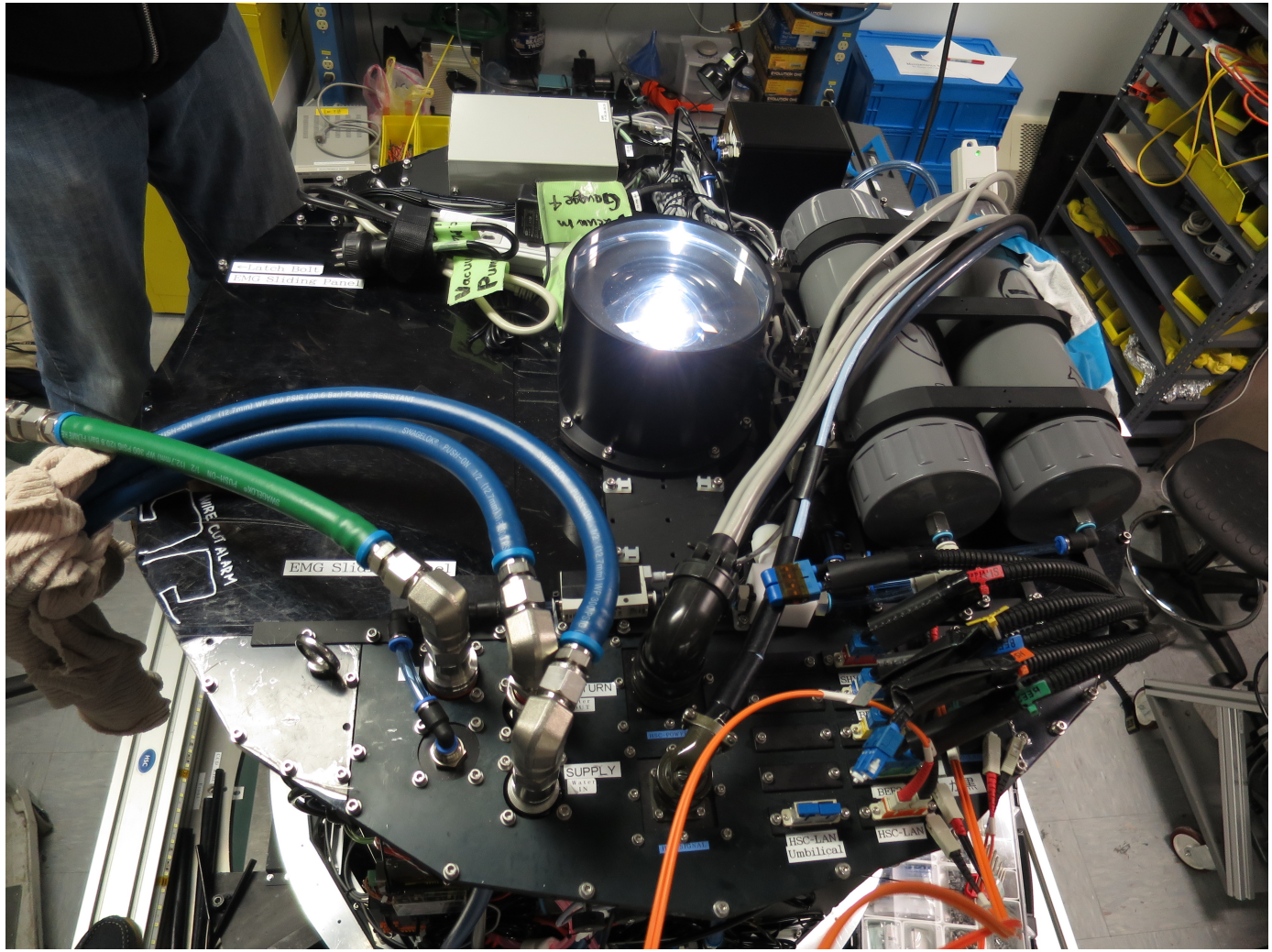


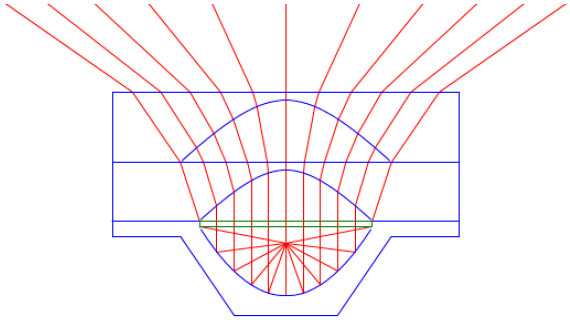
Y-band Stray Light

Light Source identified :
Encoder of Instrument Rotator



New Single Lamp Dome Flat



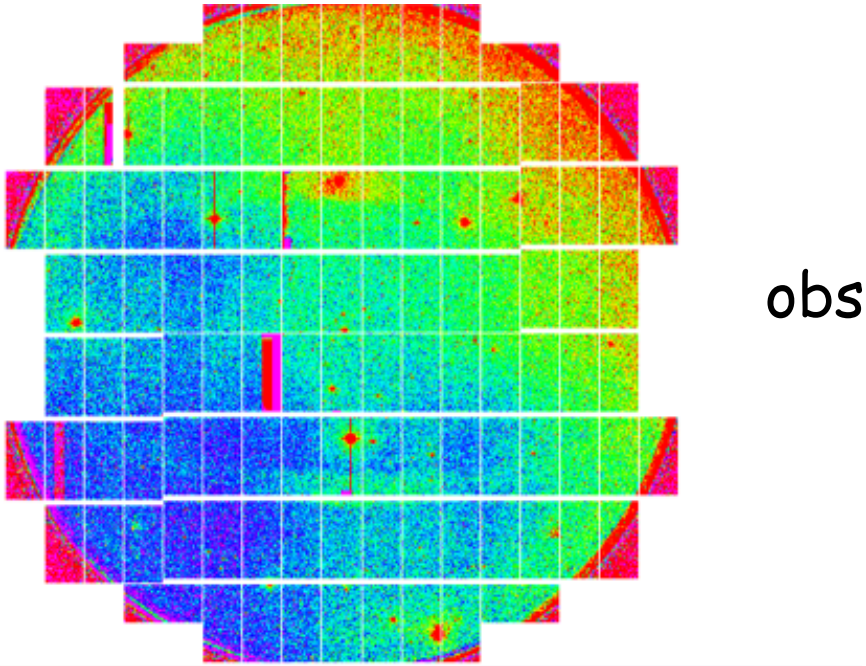


Was installed and have been tested to eliminate the non-uniformity

(Sakurai, Kawanomoto, Komiyama, Gunn)

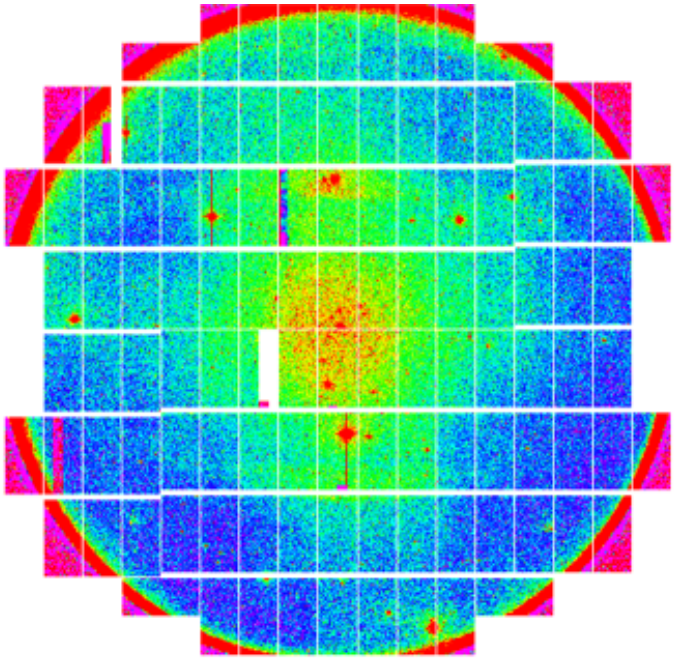
New Single Lamp Dome Flat

Old Four Lamps Illumination



obs/flat

New Single Lamp Illumination



New dome flat data will be examine by comparing the photometry with those analyzed with the old flat data.

HSC Calibration System

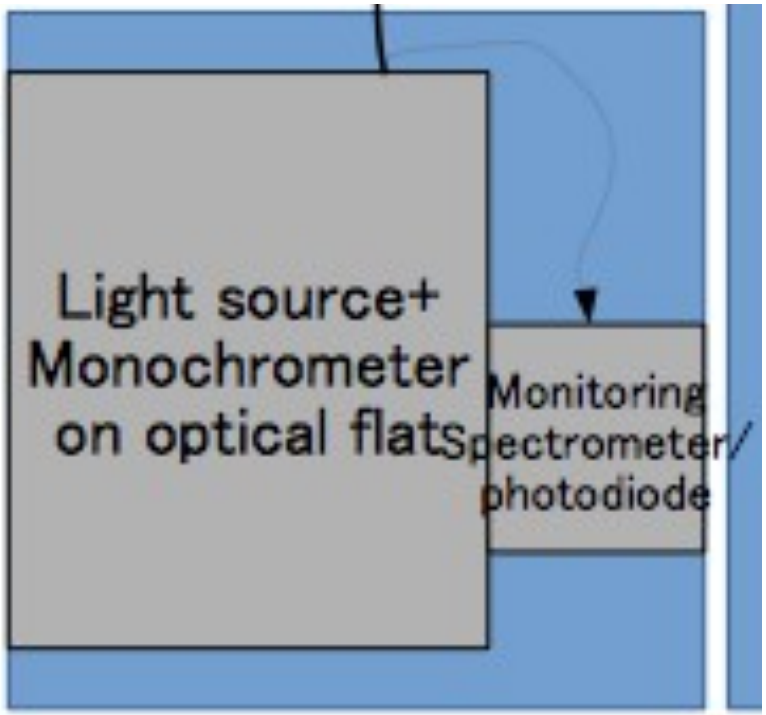
For Long Term Monitoring of wavelength dependence of the HSC Detection Efficiency

(Kawanomoto)

Monochrometer 10kg
Light source 5kg
Cooling system 5kg
Computer etc. 5kg

Optical flat 50kg?

About 1.5m x 0.6m

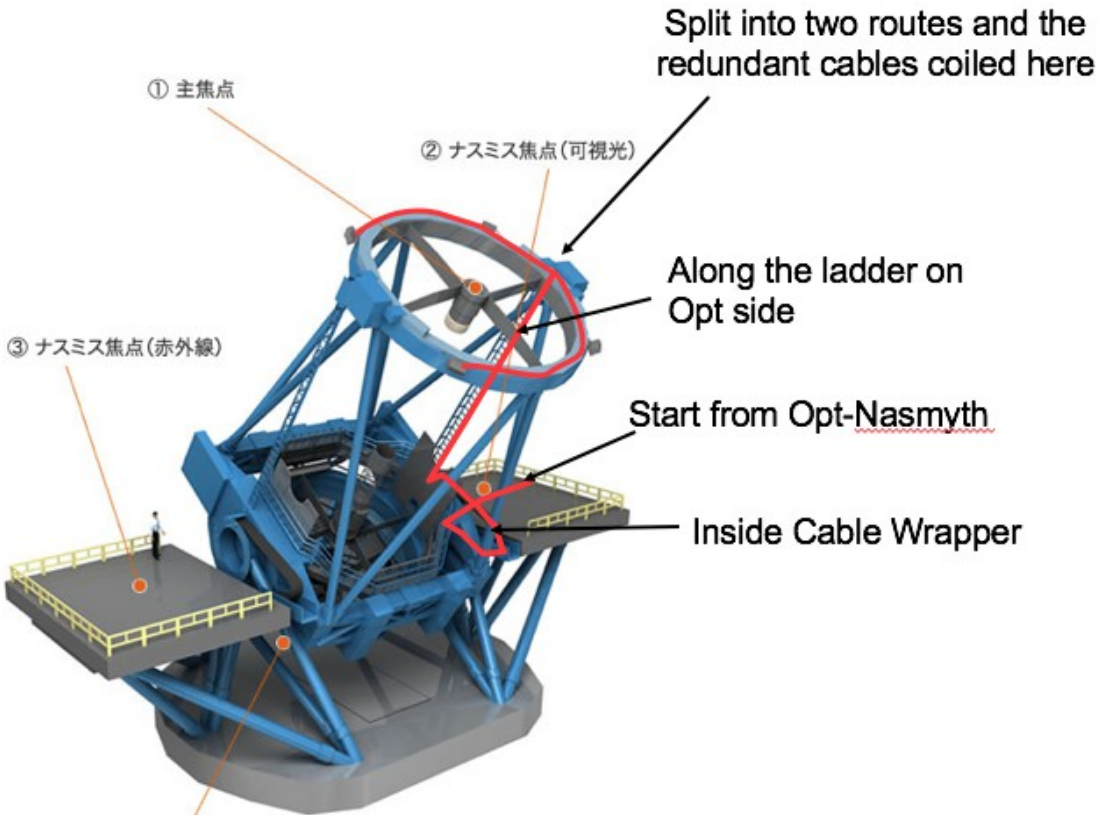


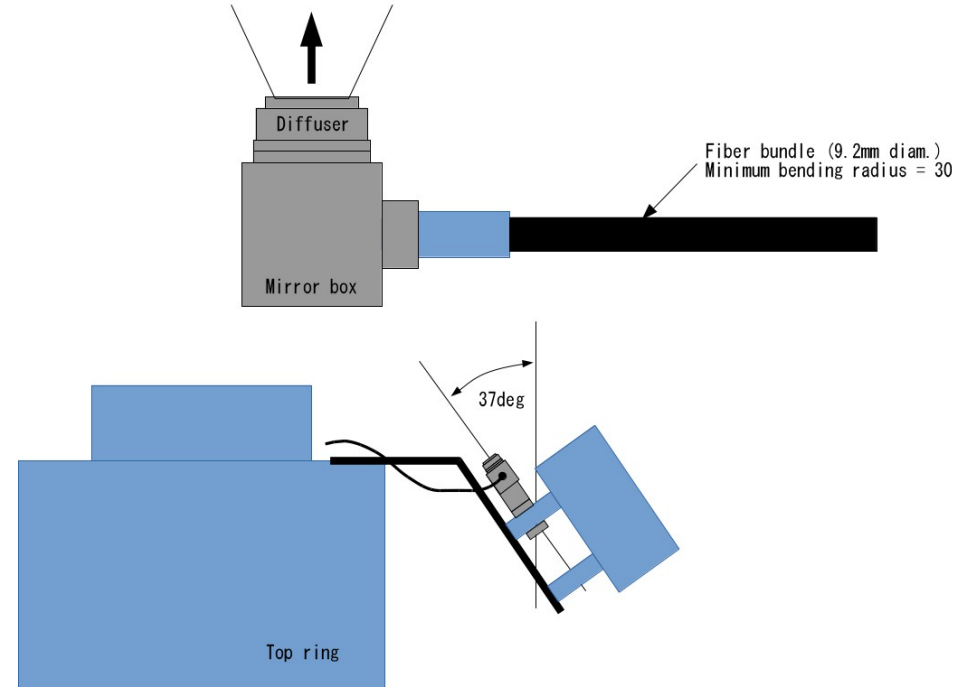
15 W optical power (250 - 2200 nm)
2 nm pitch from 400 - 1,100 nm
exposure 120 - 60 sec / each (12 hours in total)

HSC Calibration System

For Long Term Monitoring of wavelength dependence of the HSC Detection Efficiency

(Kawanomoto)





Will be installed in late March 2018

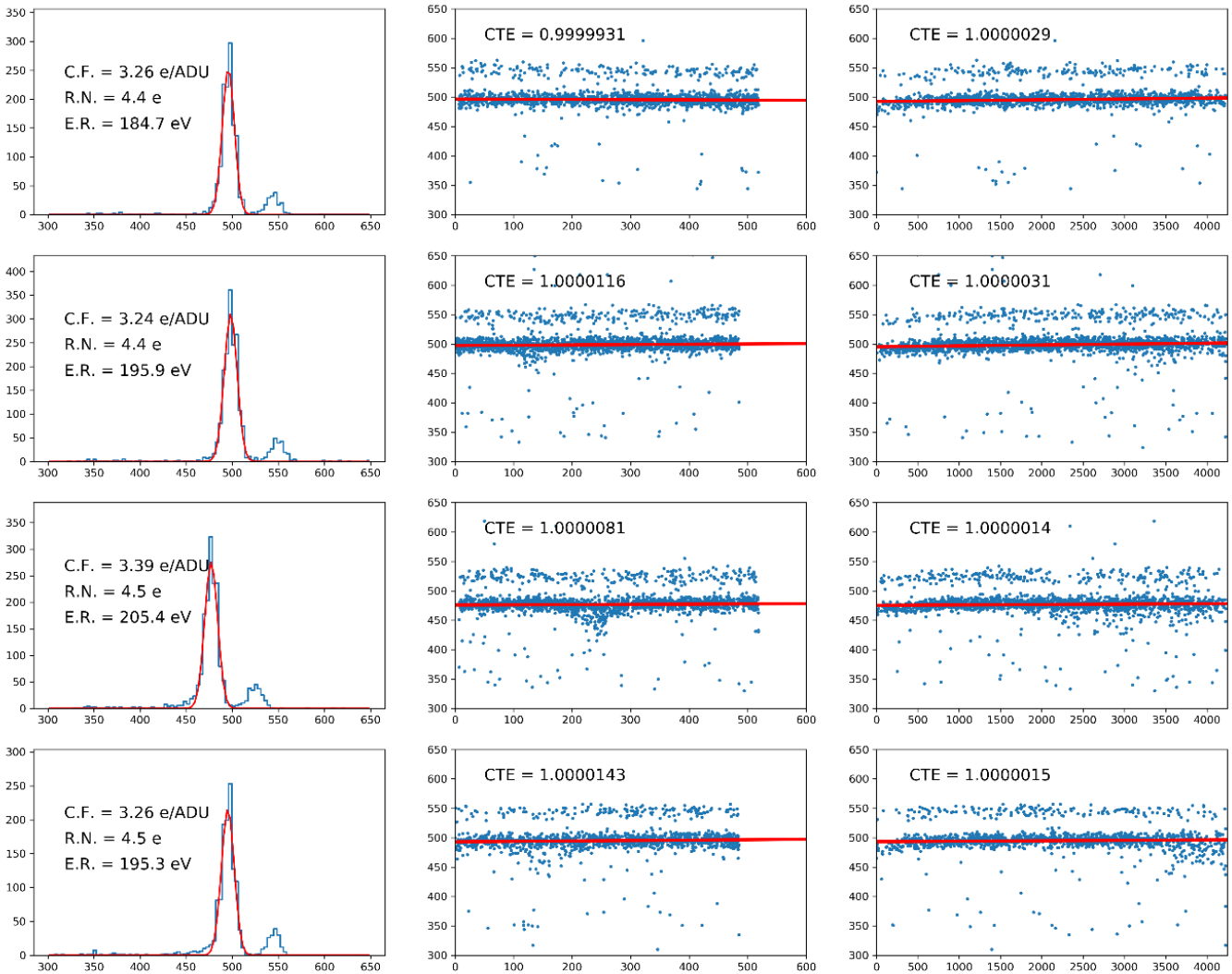
Reduction of Readout Time

(Kamata)

Motivation: To catch up the delay of the SSP schedule

Penalty: Reduction of the system gain (1 e -> less ADU)

Original Clock:



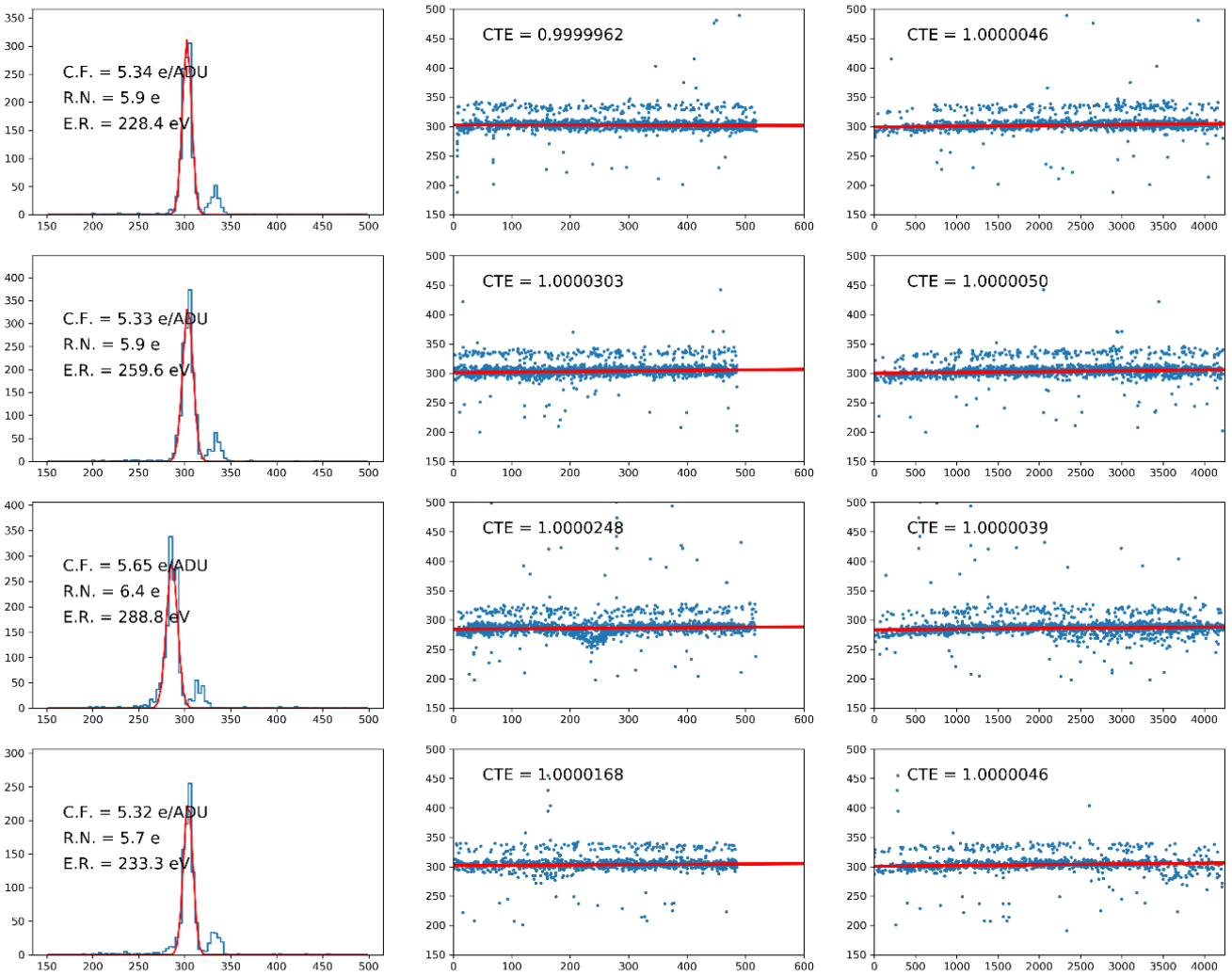
Reduction of Readout Time

(Kamata)

Motivation: To catch up the delay of the SSP schedule

Penalty: Reduction of the system gain (1 e -> less ADU) and the noise

Modified Clock:



Reduction of Readout Time

(Kamata)

Clock	C.F. [e/ADU]	Read Noise [e]	Time between Exposure[sec]
Original	3.3	4.4	32
New	5.3	5.3	26

Engineering scheduled next week