



Hyper Suprime-Cam



Satoshi Miyazaki

National Astronomical Observatory of Japan

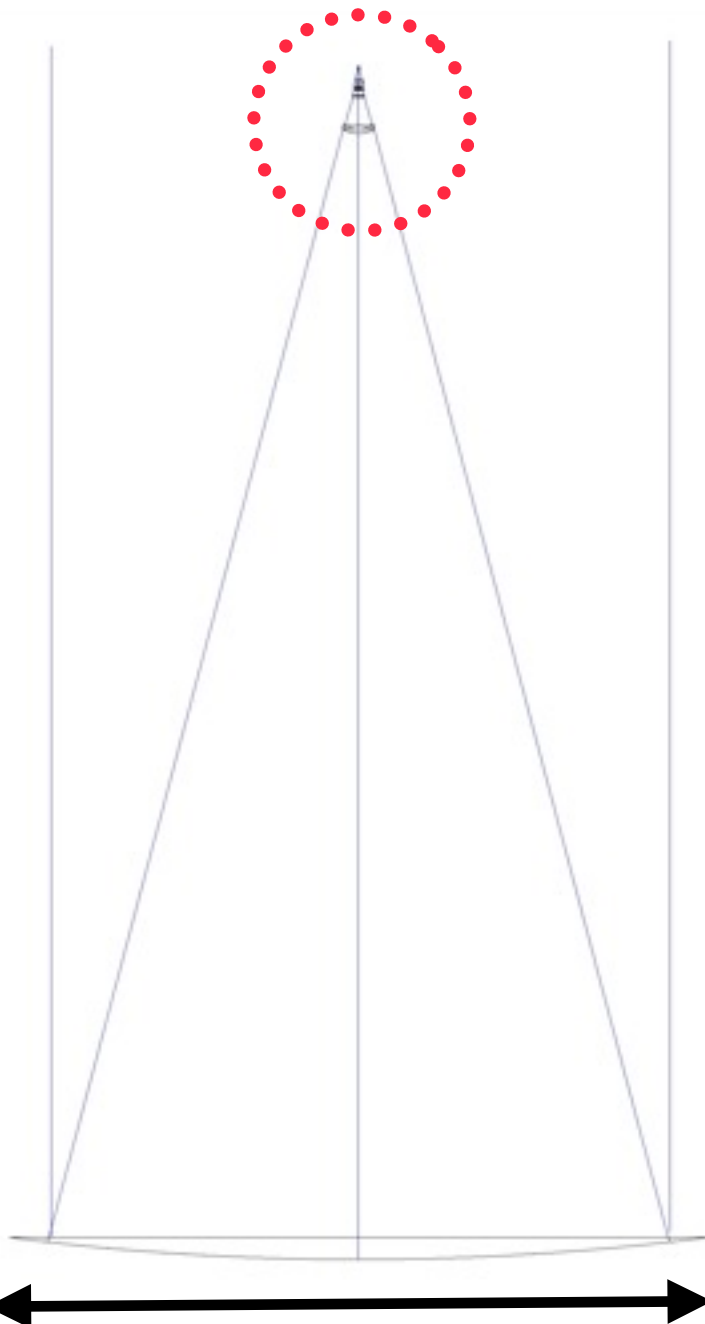
Satoshi Miyazaki

NAOJ

Friday, October 28, 2011



Subaru Prime Focus



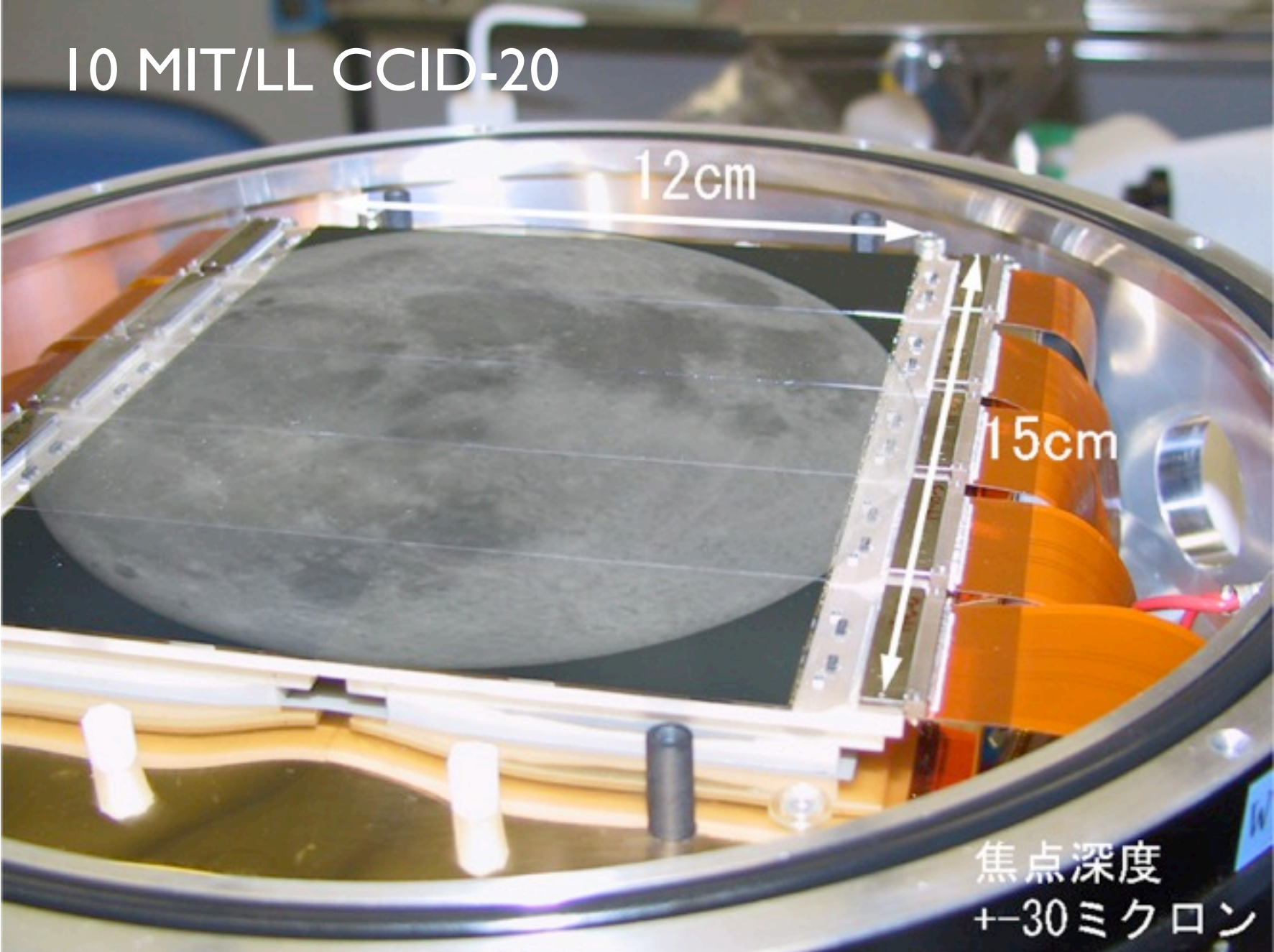
F/2.0

FOV 30 arcmin

< 0".2 FWHM

PM 8.2 m

Suprime-Cam





Opt-Mechanical Engineering



0".18 fwhm (V)
(~13 μm)

CANON

Satoshi Miyazaki



Accuracy ~ 1 μm
Smoothness 0.1 μm
Stroke 20 mm
Load 2000kg

MITSUBISHI

NAOJ





Image Quality: vs MegaCam

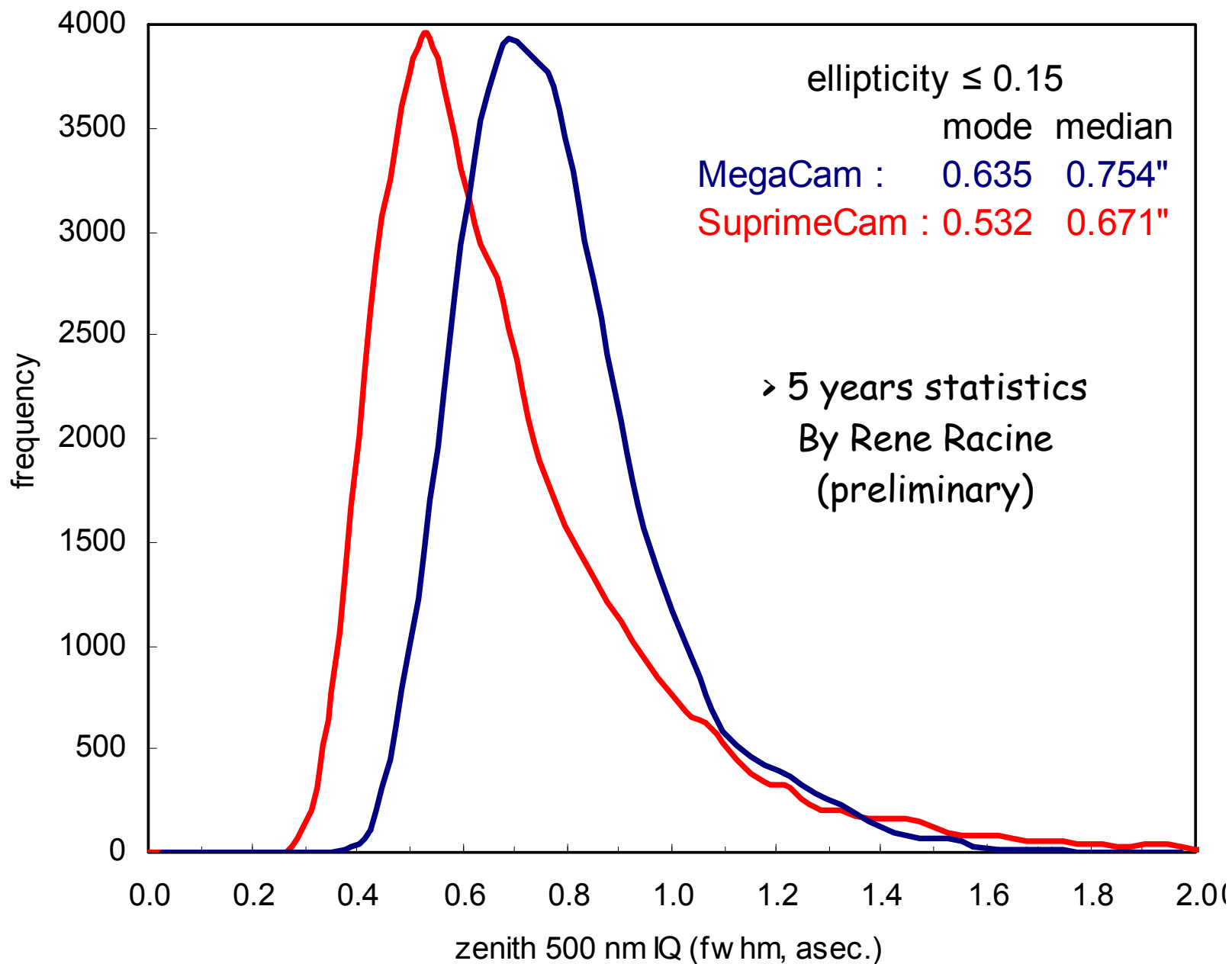
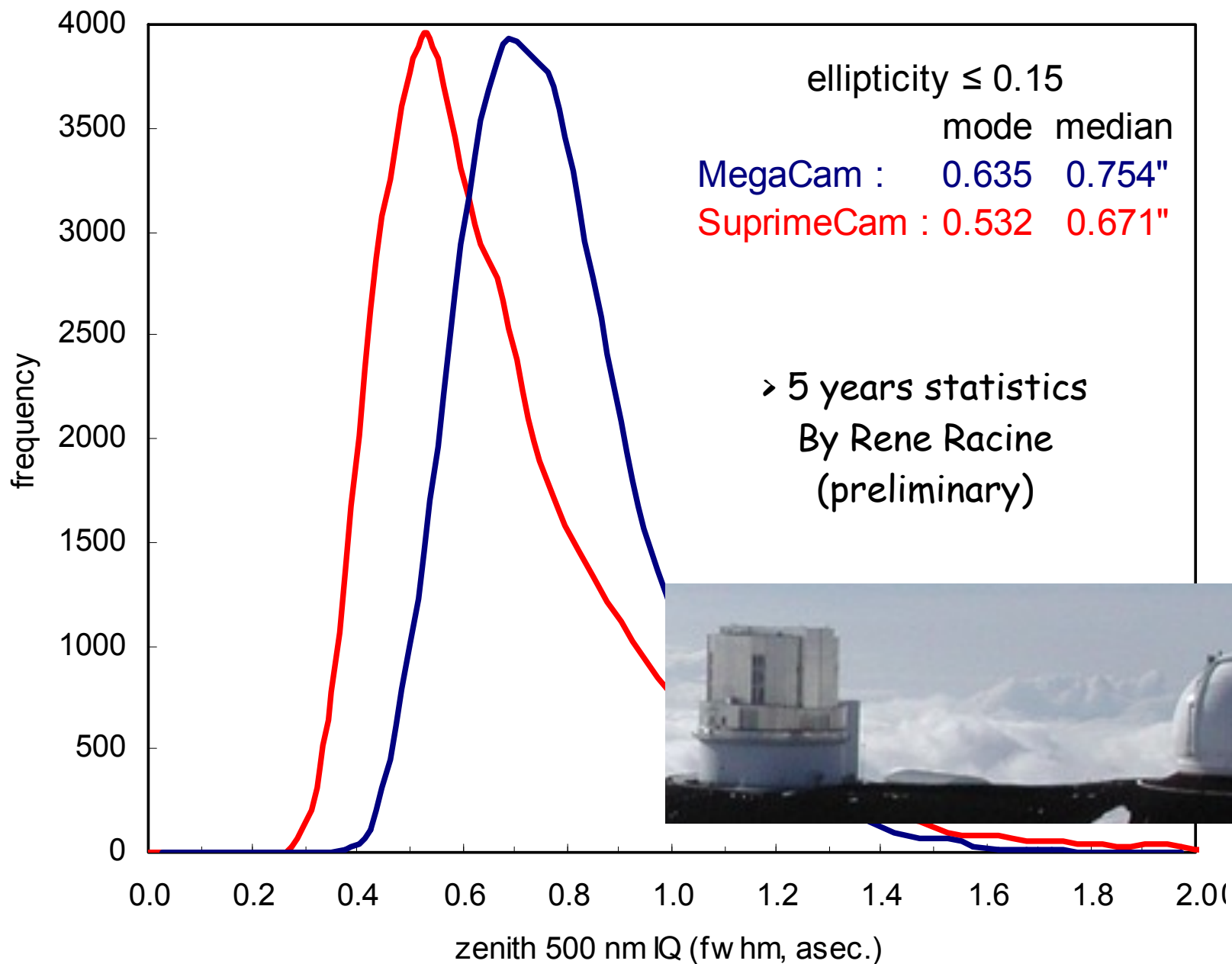


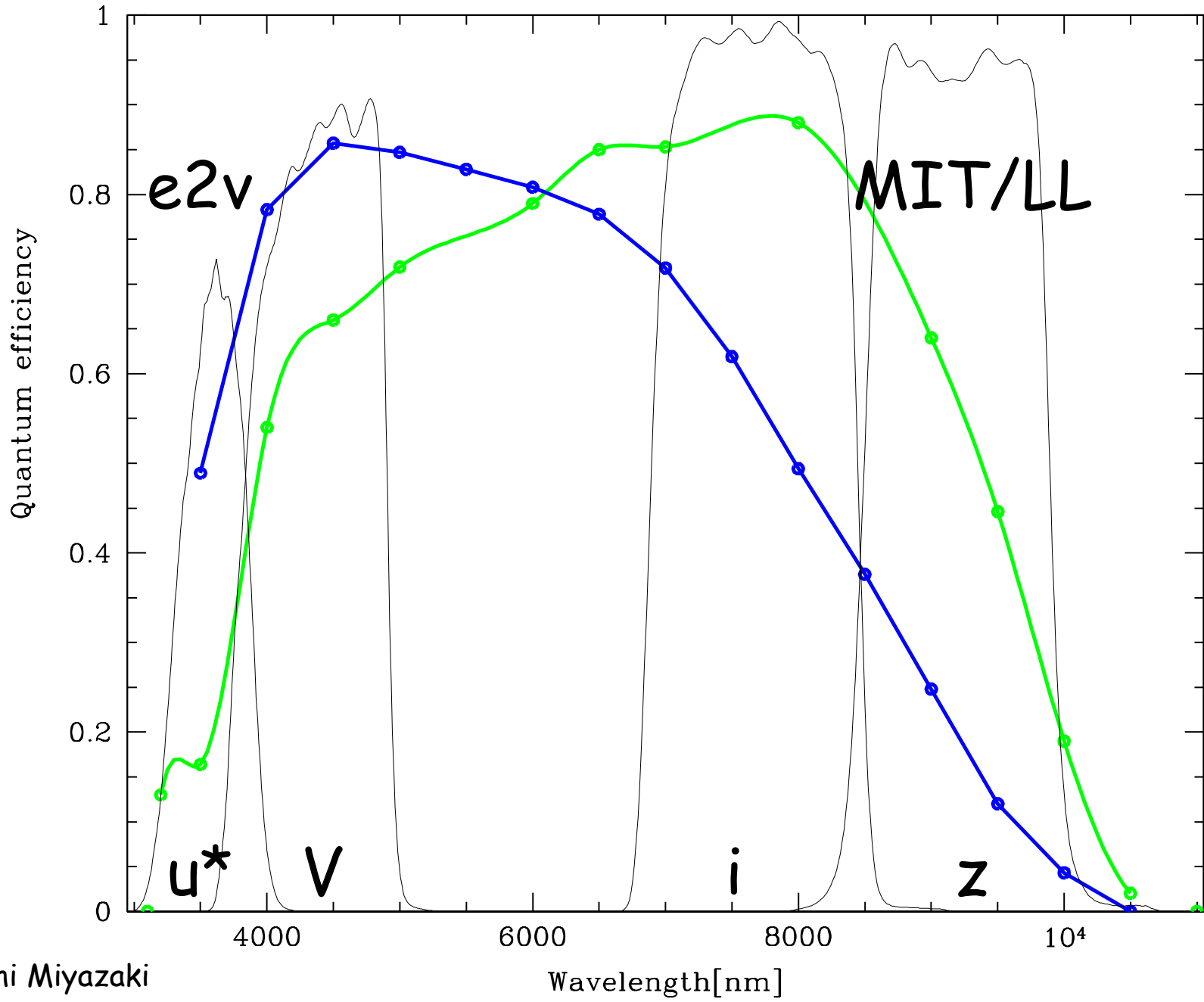


Image Quality: vs MegaCam





Red Sensitivity





Science Cases

- High Z objects hunts

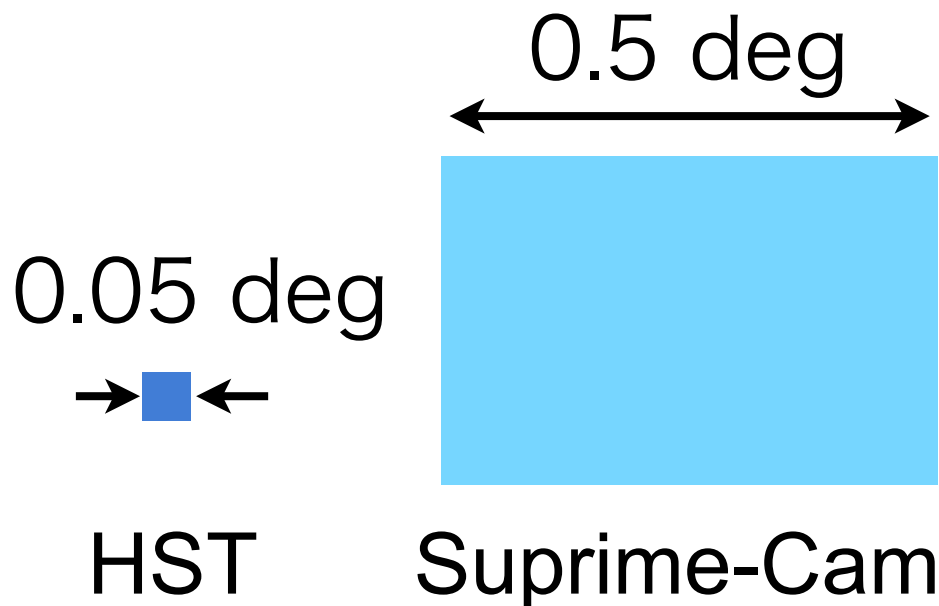


Science Cases

- High Z objects hunts
- Weak lensing observation of clusters of galaxies
 - High resolution mass map (Umetsu et al.)
- WL Blind Cluster Survey 33 deg^2 (Miyazaki et al. 2002, 2007, Hamana et al. 2009)

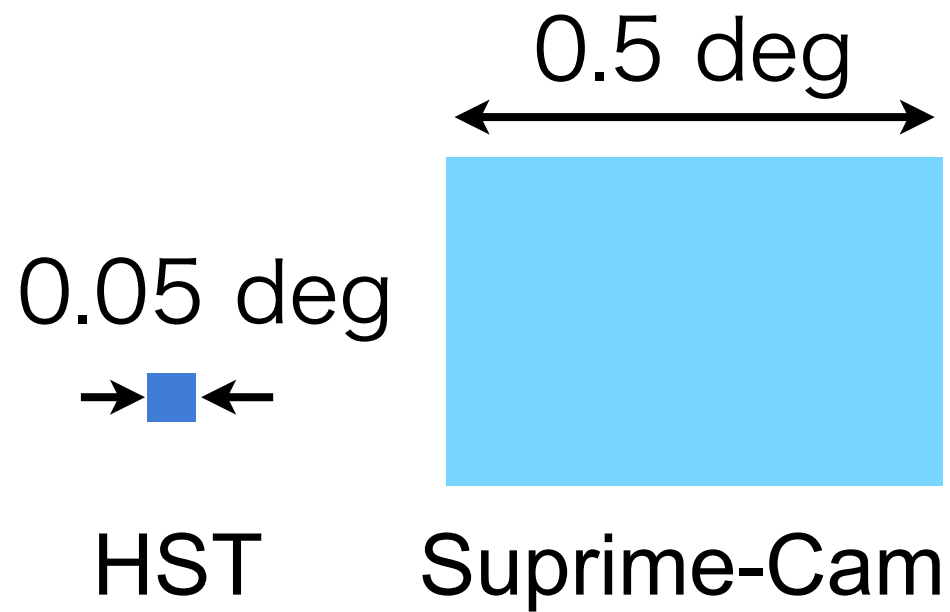
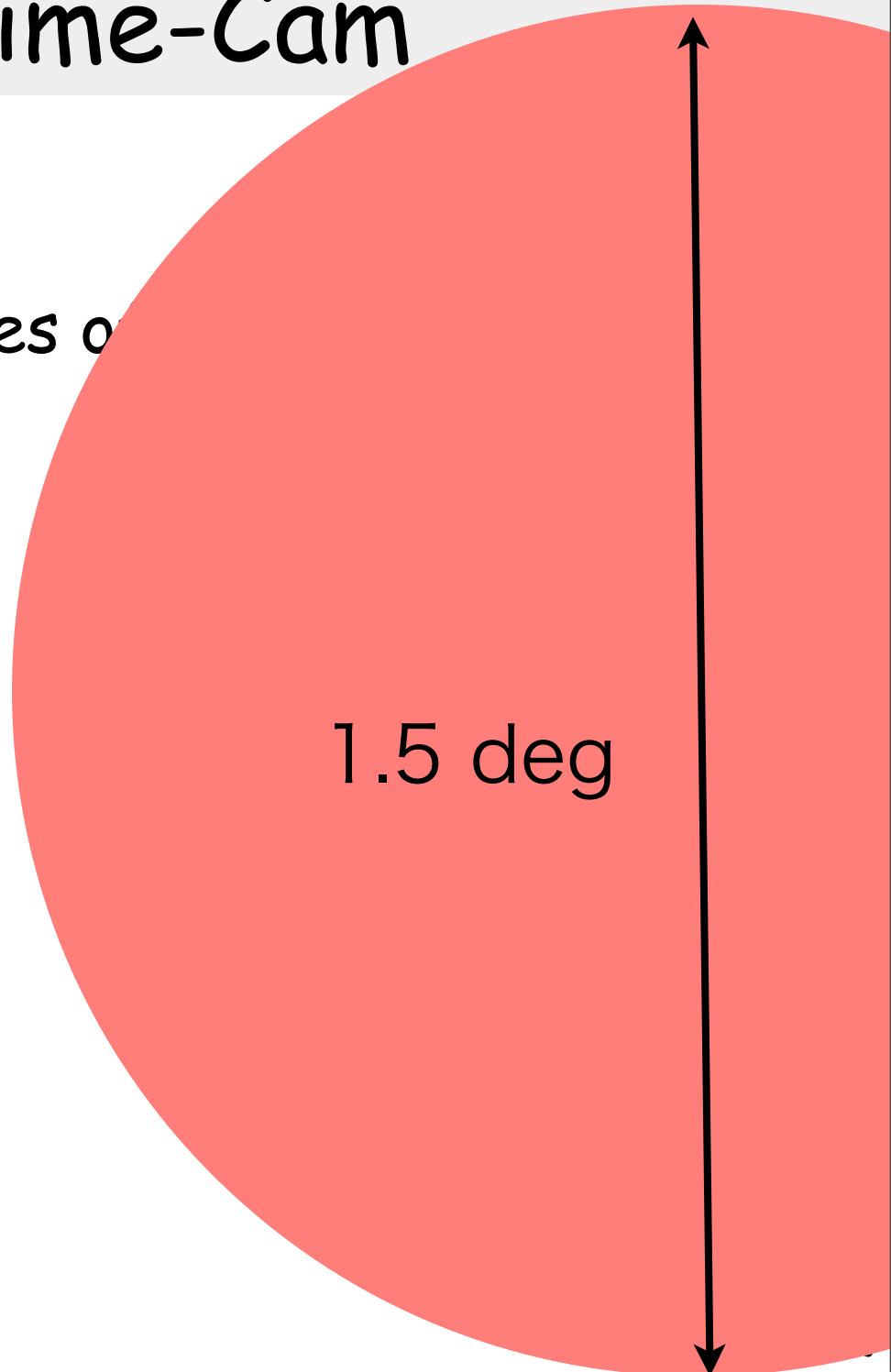
Hyper Suprime-Cam

- Widening of FoV
- By keeping two key features of SC
 - Superb Image Quality
 - High red sensitivity



Hyper Suprime-Cam

- Widening of FoV
- By keeping two key features of
 - Superb Image Quality
 - High red sensitivity





HSC and eROSITA

Suprime-Cam → HSC

XMM → eROSITA



The Team

Academic:

Industrial:

NAOJ

Canon

U-Tokyo, IPMU

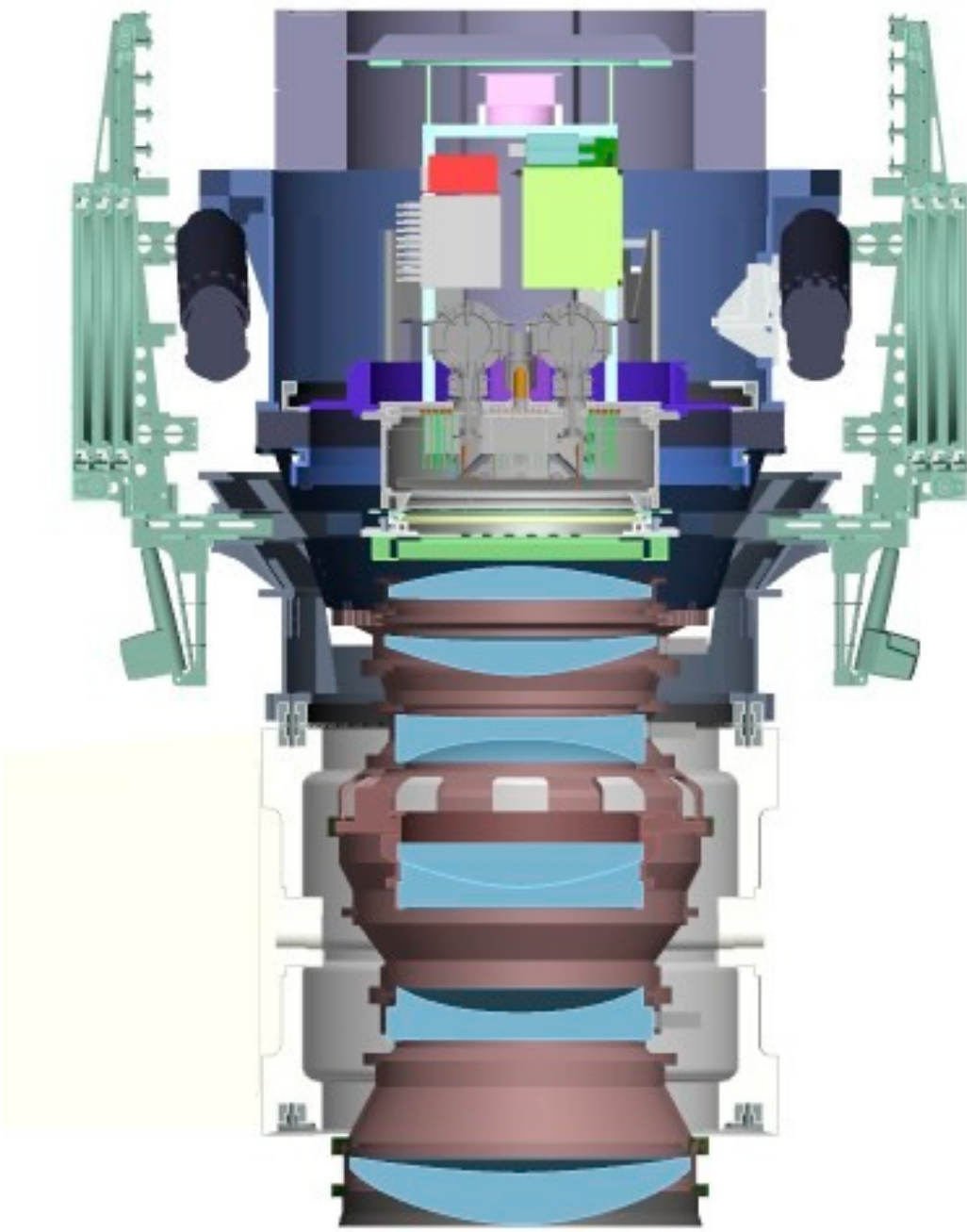
Mitsubishi

Hamamatsu

ASIAA (TW)

Princeton U.(US)

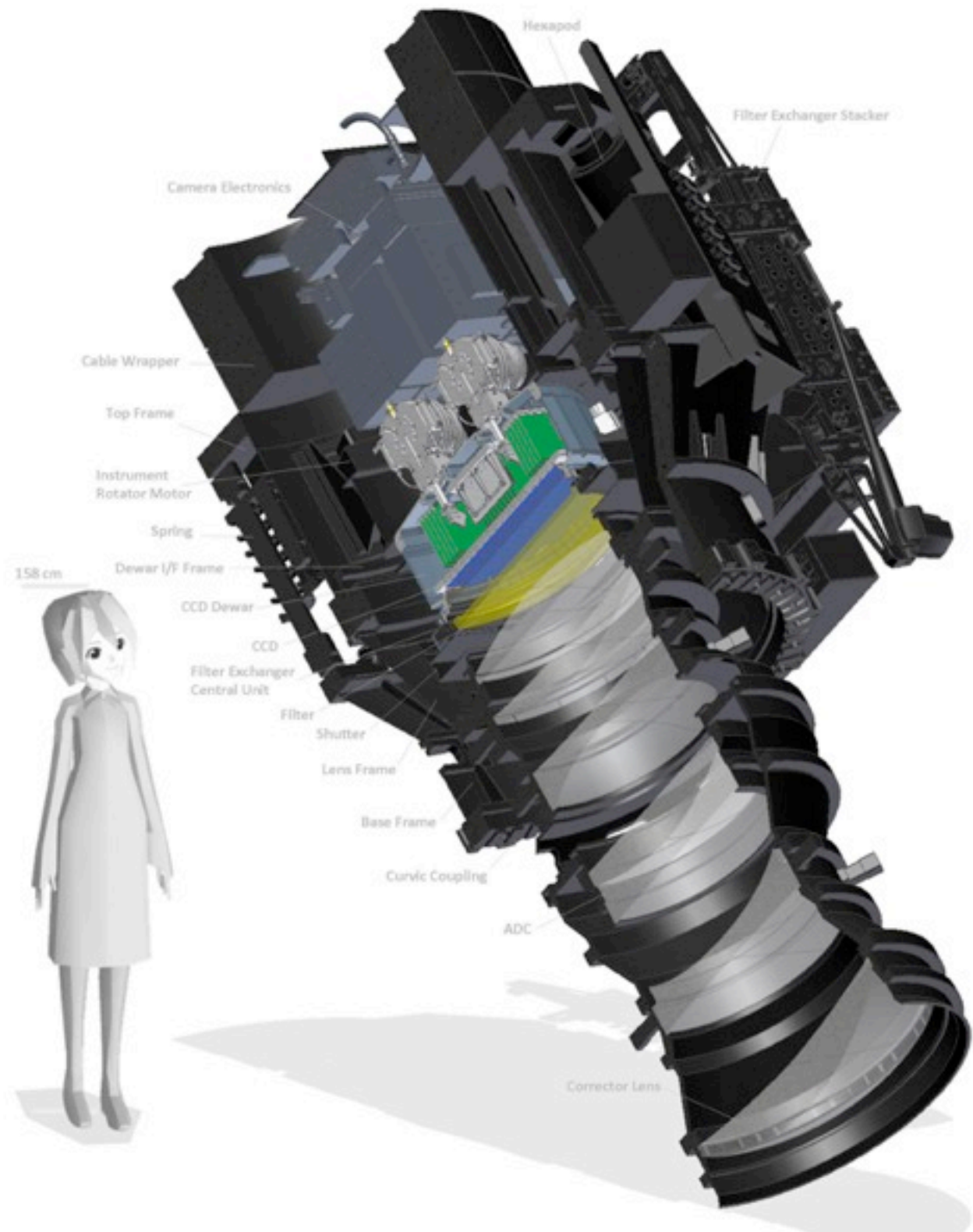
HSC



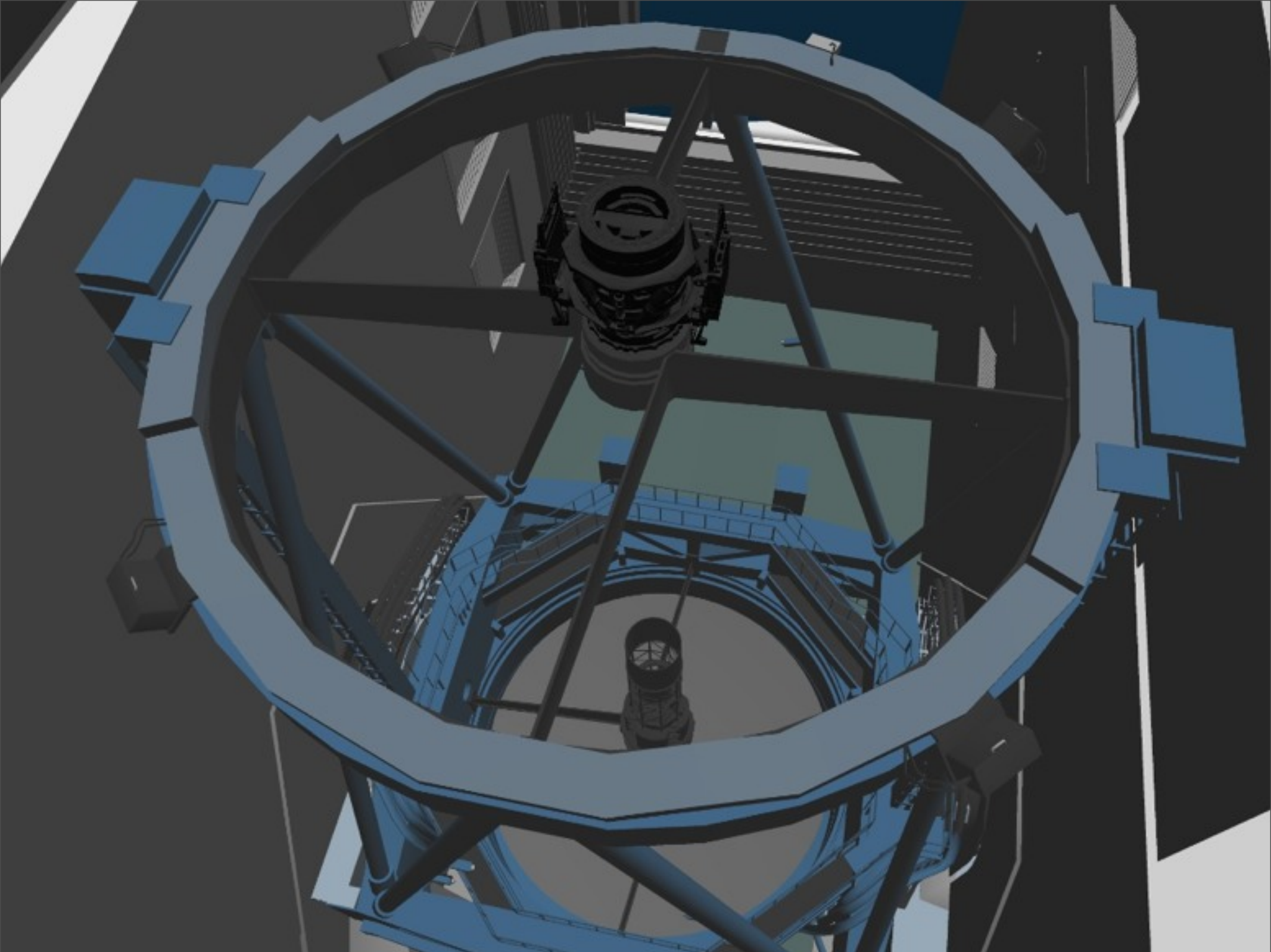
PFU

Camera

WFC



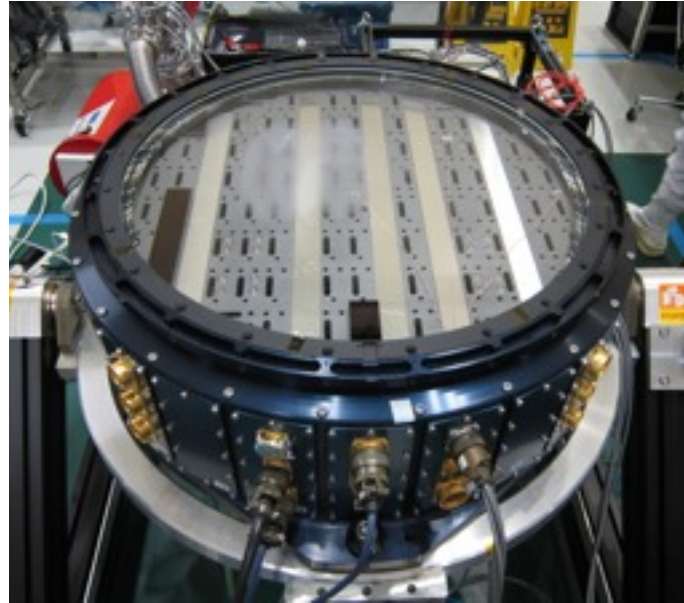
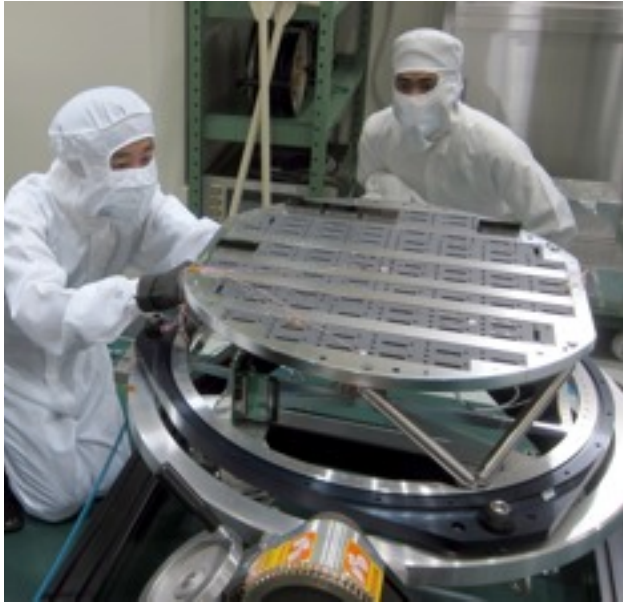
FOV $\varnothing 1.5$ deg
870 Mpix
 $0''.18/\text{pix}$



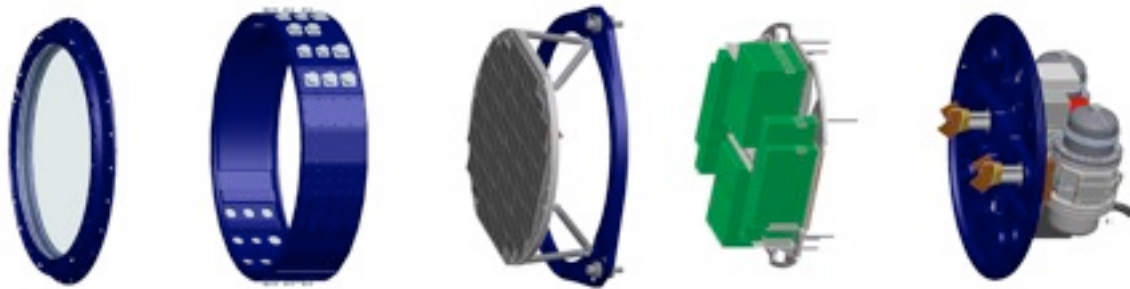
Friday, October 28, 2011



Camera Dewar & Electronics



Front End Electronics



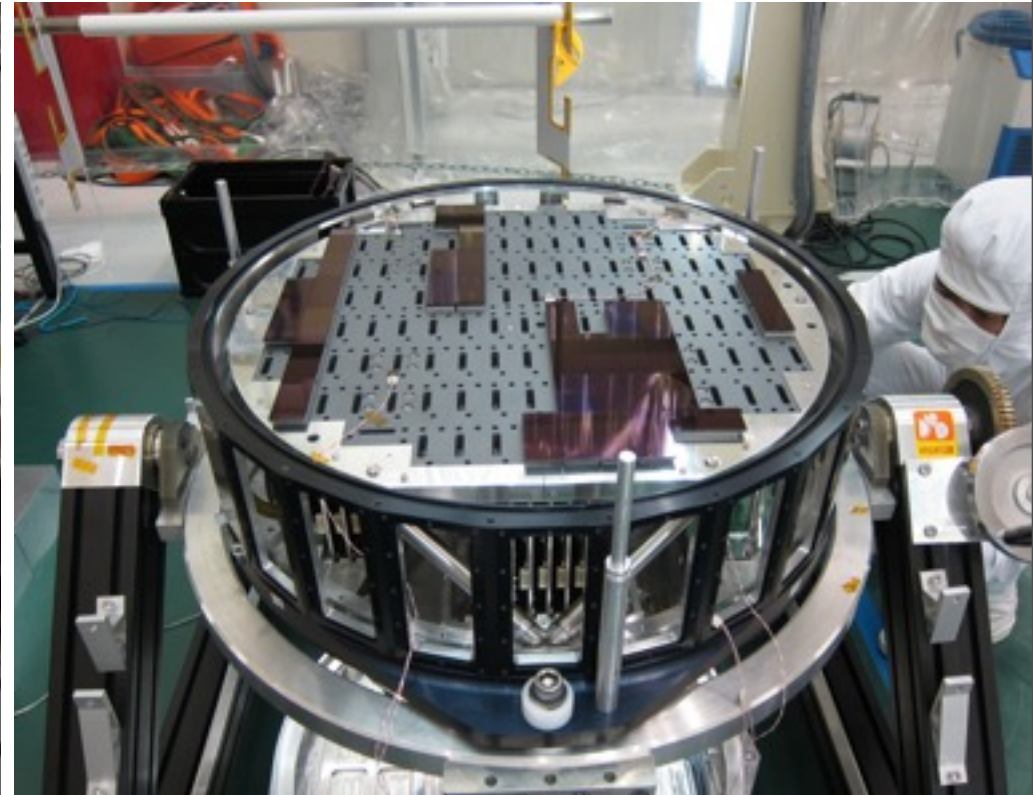
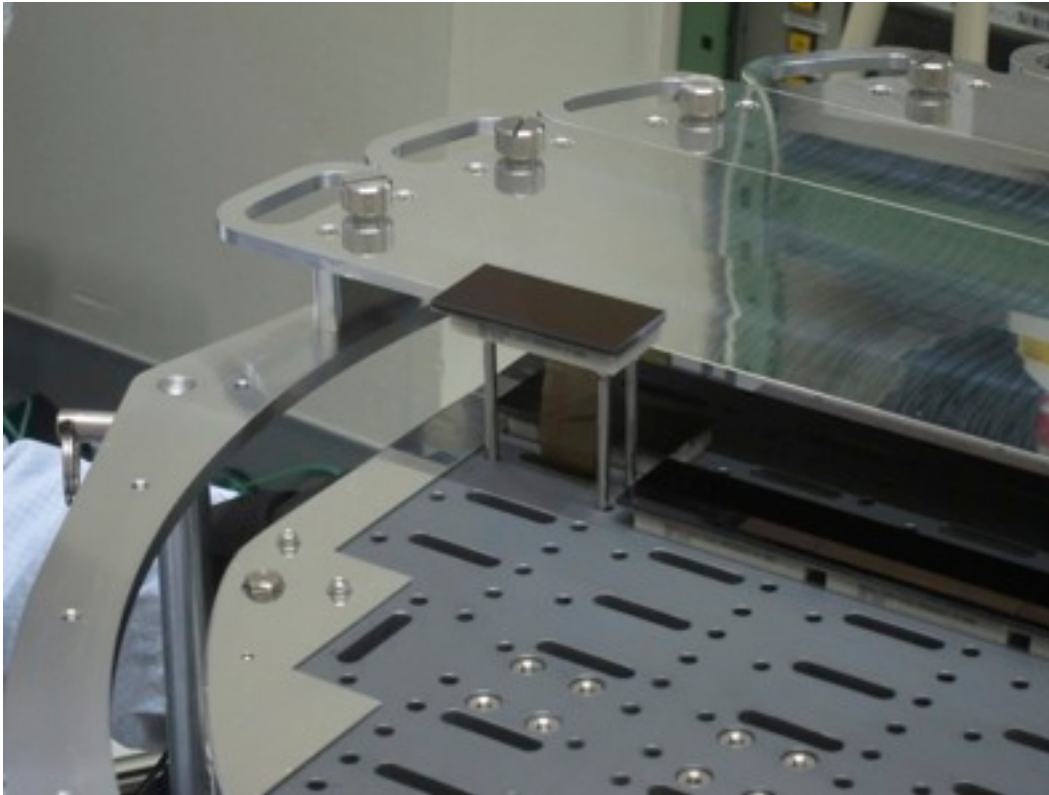
Manufacturing and assembly Completed



HSC Camera Assembly

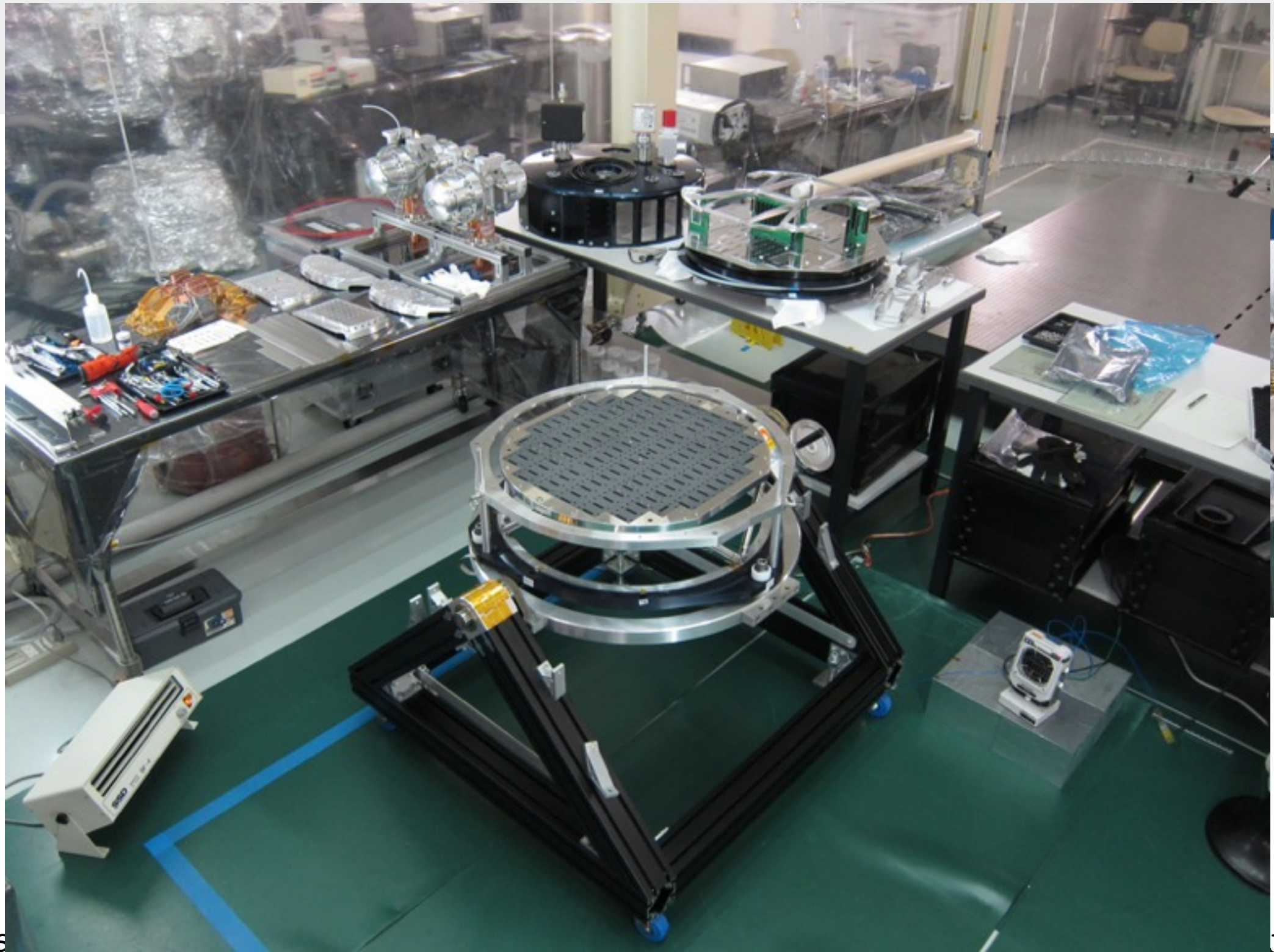


CCD Mounting



33 Eng. grade CCDs installed. (Aug, 2011)

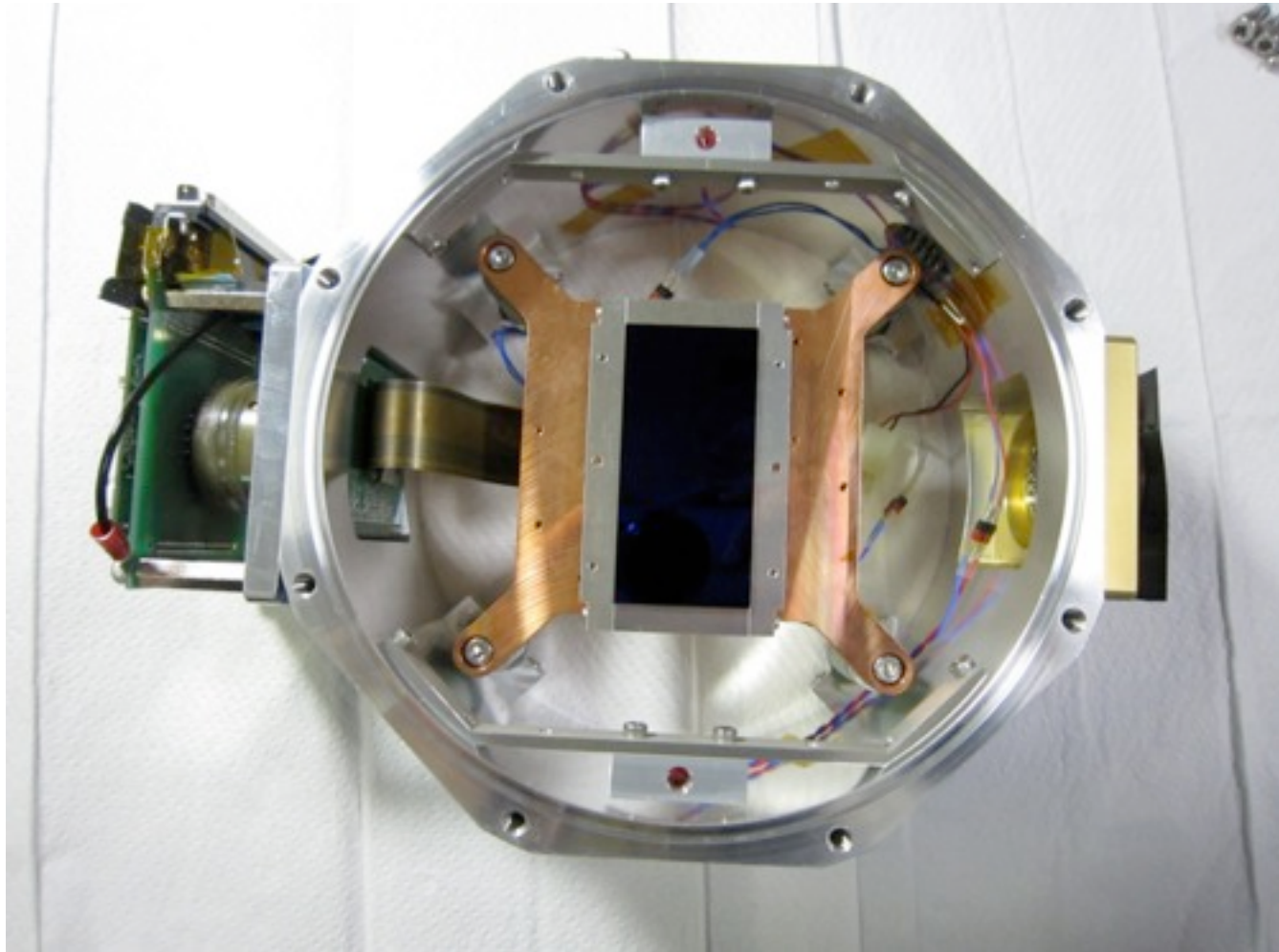
Verification of mounting process completed



S

J

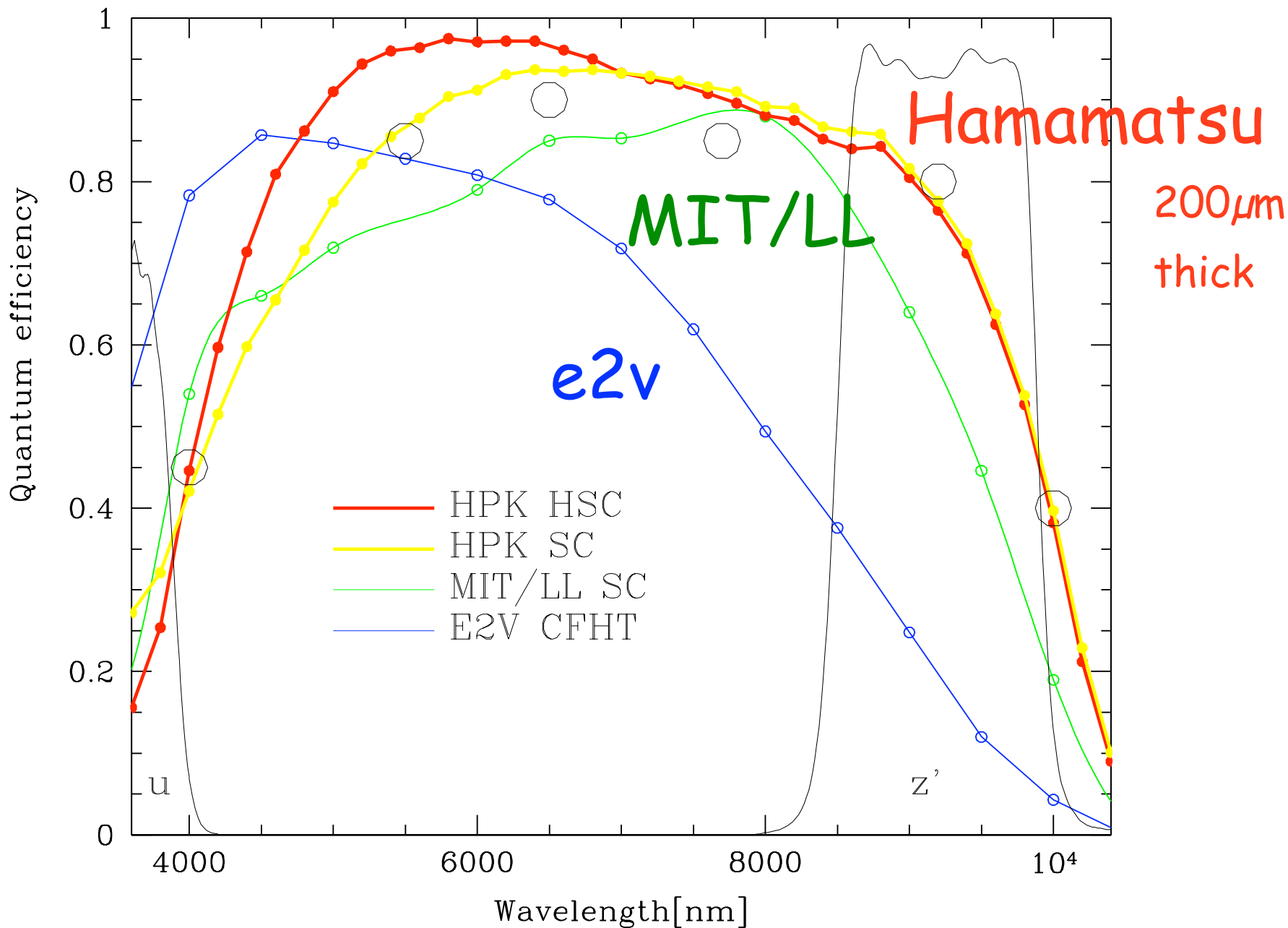
CCD from Hamamatsu



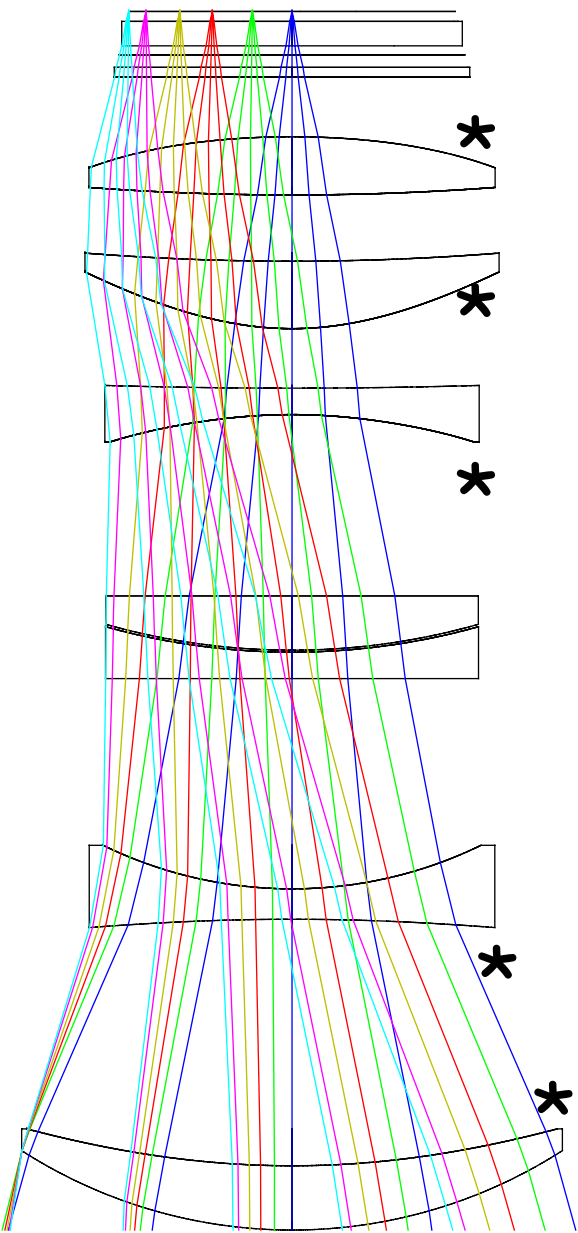
- 116 (+10 spare) CCDs already tested and waiting for installation in Nov. 7~22



Quantum Efficiency

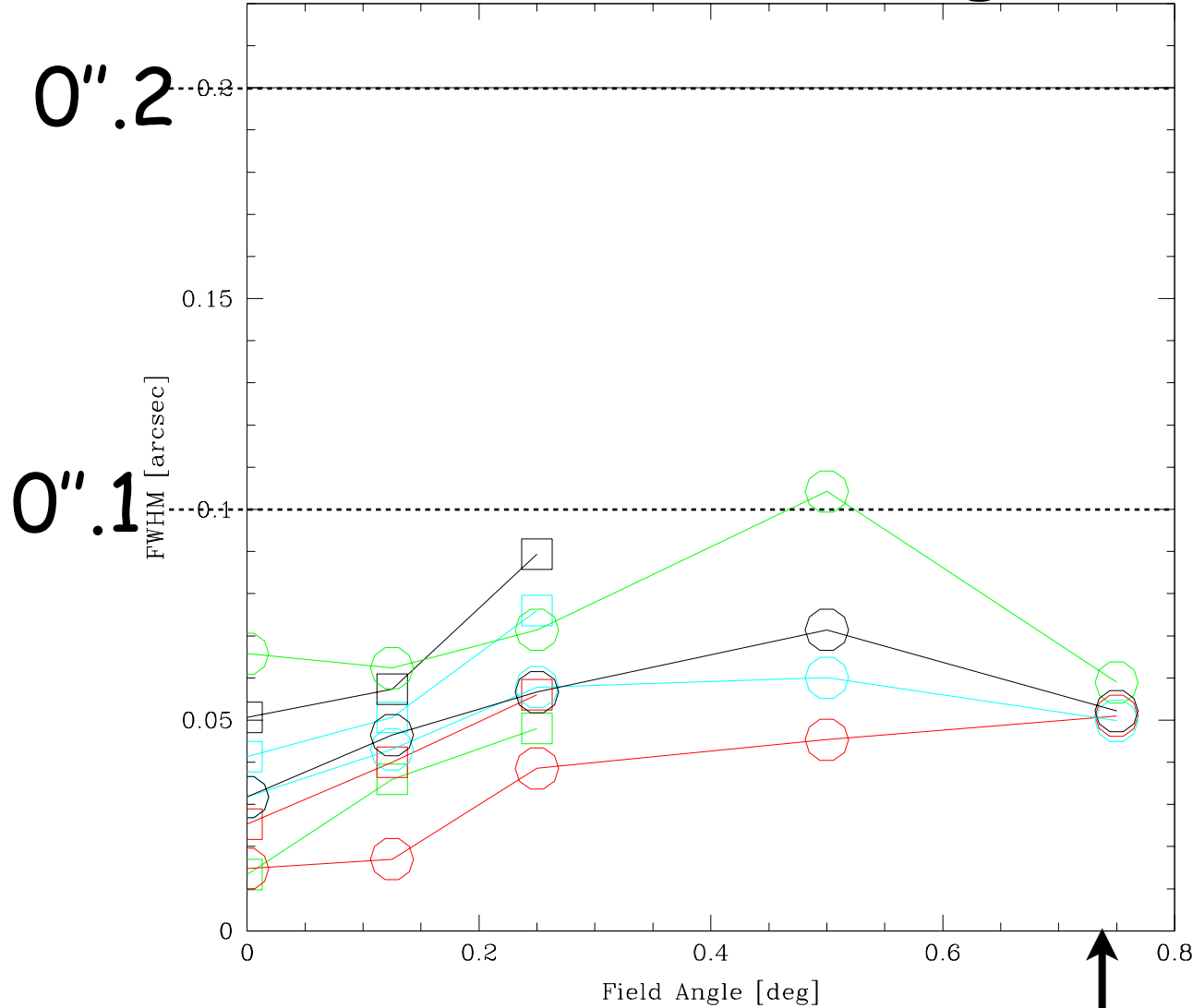


Wide Field Corrector



Aspheric

Off-axis PSF (design)



D=1.5
↑
NAOJ



Wide Field Corrector



Measured Performance
0".18 FWHM in R
Delivered to summit



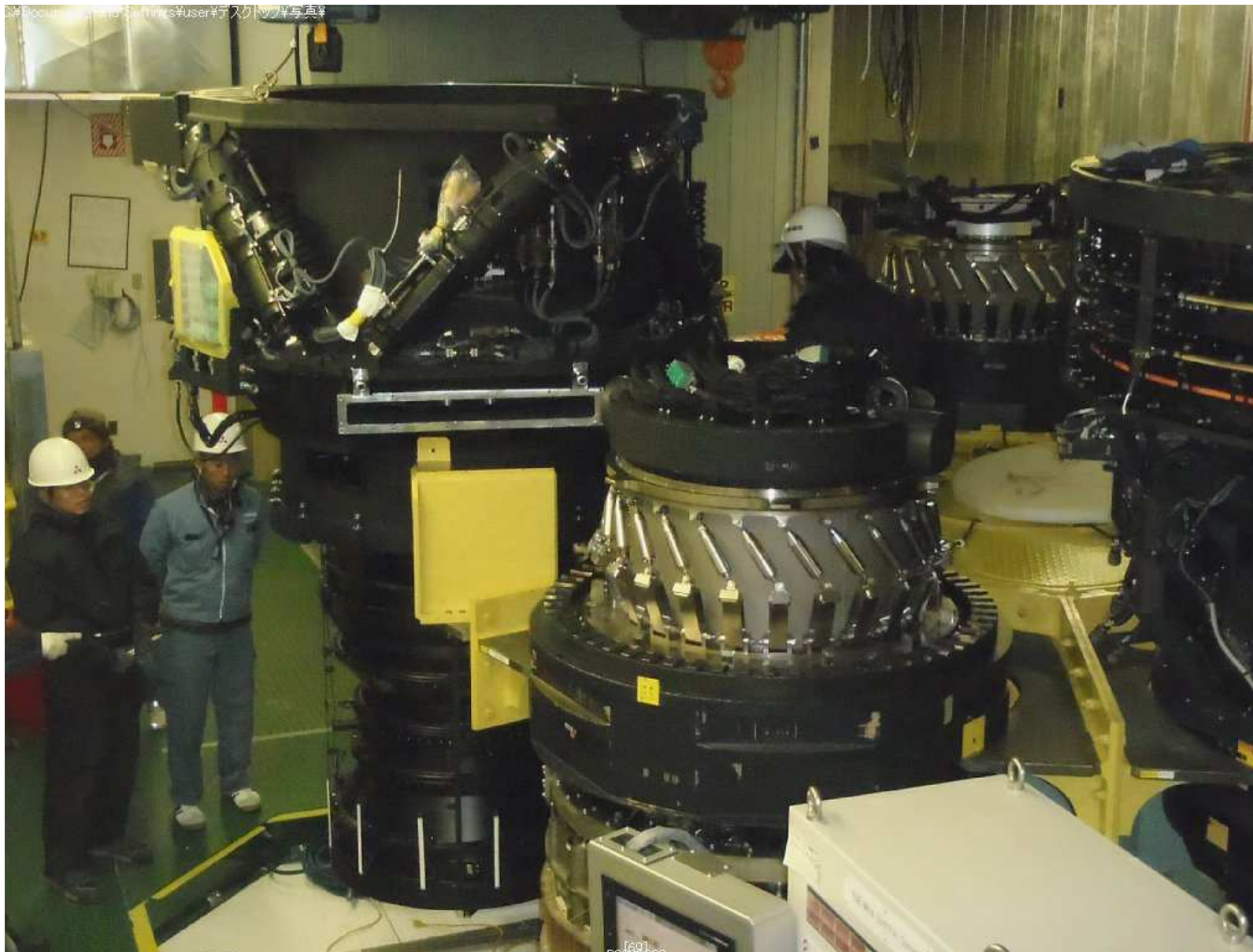
Wide Field Corrector



Satoshi Miyazaki

NAOJ

Prime Focus Unit 2



Delivered to the summit

Data Analysis System

Data Analysis Packages based on SC experiences
Being built on LSST Stack brought through
Princeton Collaboration



Goal: HSC Source catalog of SDSS level qualities



Schedule

10/24~11/07

New PFU and FEU mount test
on telescope

11/07~11/22

CCDs installation in Dewar

1/3

CCD Dewar Delivered

1/17~1/20

Camera+FEU into top-end

Late Jan.

First Light

~ summer 2012

Commissioning run



HSC Survey Design

Planned three Layer Surveys

Wide 1500 sqdeg

Deep 28

Ultra Deep 3.4

~300 nights over 5 years starting 2012/02 will
be requested

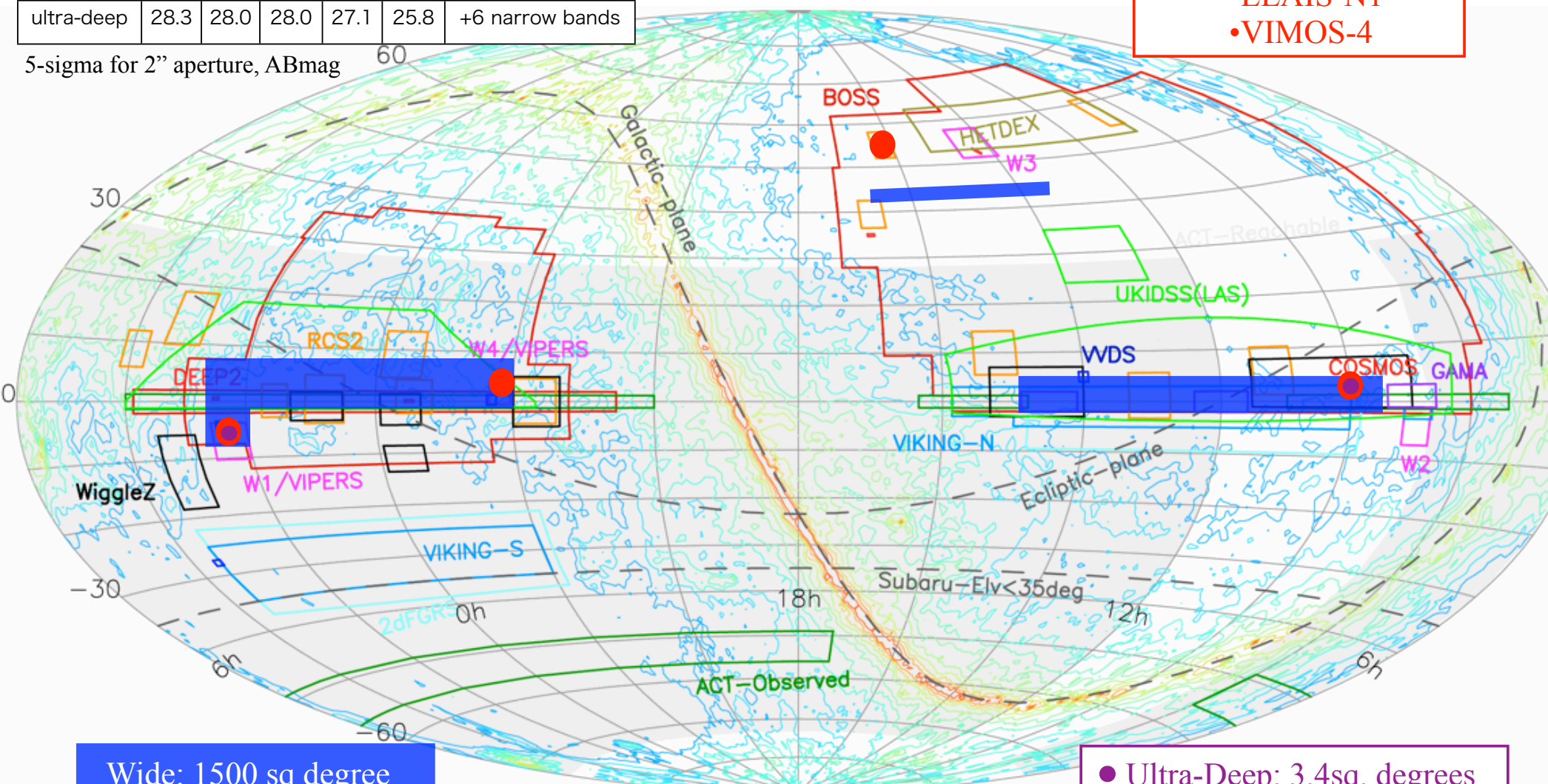
10 times wider, 1 mag deeper, 20 % shaper than
CFHLS-Wide

HSC survey parameters (tentative)

	g	r	i	z	y	
wide	26.2	25.9	26.2	25	24	
deep	22.7	27.4	27.0	25.7	24.5	+3 narrow bands
ultra-deep	28.3	28.0	28.0	27.1	25.8	+6 narrow bands

5-sigma for 2" aperture, ABmag

- Deep: 28 sq. degree
 - XMM-LSS
 - E-COSMOS
 - ELAIS-N1
 - VIMOS-4



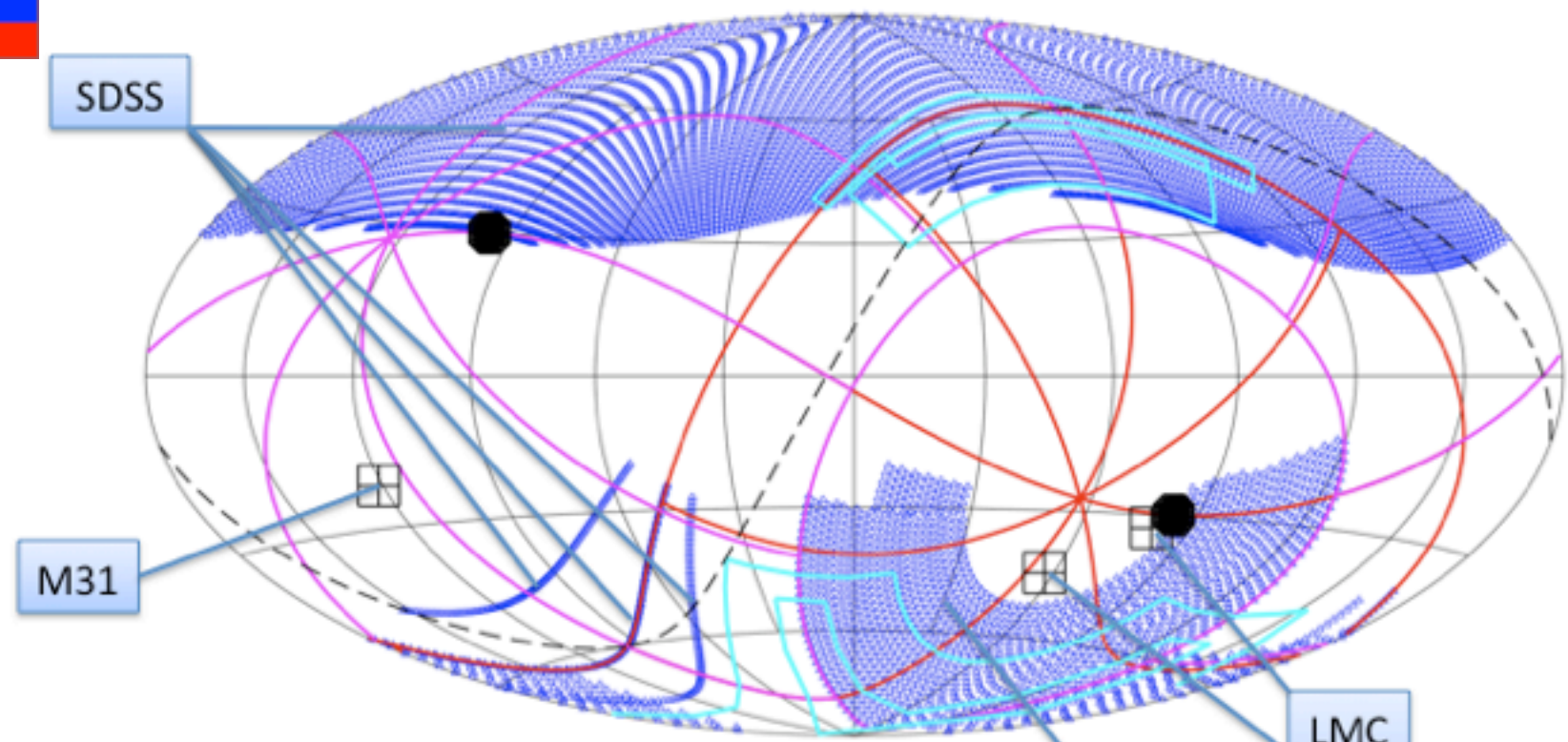
Wide: 1500 sq degree
• 3 fields

- Ultra-Deep: 3.4sq. degrees
 - SXDS/UKIDSS-UDS
 - COSMOS-ultra VISTA

Figure Courtesy of A. Nishizawa

eROSITA sky split

Imaging surveys in galactic coordinates



SDSS

M31

Magenta: Pan-STARRS
Cyan: KIDS and ATLAS (VST)
Red: VHS (VISTA) & Skymapper
Black dashed line: ecliptic
Black dots: ecliptical poles

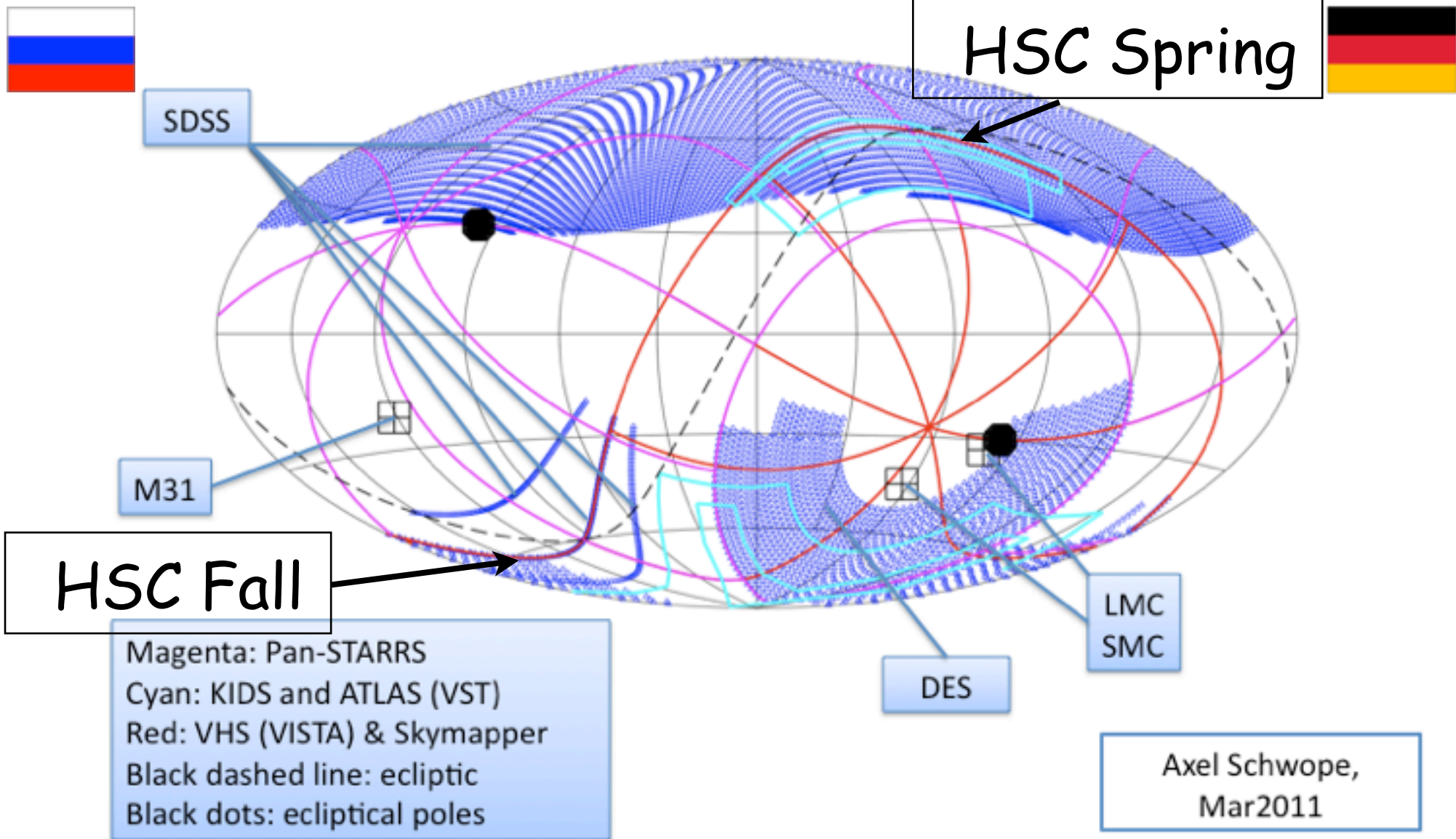
LMC
SMC

DES

Axel Schwöpe,
Mar2011

eROSITA sky split

Imaging surveys in galactic coordinates





Comparison

	Depth	Width
CFHLS	25.0	170
Pan-STARRS	25.4	70
DES	25.2	5,000
HSC	26.2	1,500



Comparison

	Depth	Width	Seeing
CFHLS	25.0	170	0.75
Pan-STARRS	25.4	70	~ 1.1
DES	25.2	5,000	~ 0.9
HSC	26.2	1,500	0.67



Comparison

	Depth	Width	Seeing
CFHLS	25.0	170	0.75
Pan-STARRS	25.4	70	~ 1.1
DES	25.2	5,000	~ 0.9
HSC	26.2	1,500	0.67

Key features: Depth and sharpness



Comparison

	Depth	Width	Seeing
CFHLS	25.0	170	0.75
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HSC	26.2	1,500	0.67

Key features: Depth and sharpness

Accuracy of the determination of WL mass of high z clusters



HSC-eROSITA collaboration

eROSITA → HSC: Location of clusters

HSC → eROSITA: Galaxies colors, locations

HSC → eROSITA: Location of sources

eROSITA → HSC: $L_x(r)$, $T_x(r)$ map

Prime Focus Spectrograph (PFS)

- x 2, 500 fiber fed spectrograph
- sharing WFC/PFU with HSC
- based on WFMOS idea from Gemini
- IPMU lead in collaboration with Caltech/
JPL, LAM, Princeton, ASI/IAA, Brazil
- F.L. ~ 2015 (?)



Conclusion

0.3 LSST* in Jan. 2012

*except time domain



Conclusion

0.3 LSST* in Jan. 2012

1500 deg² Survey 2013-2017

*except time domain

大物実



NAOJ Member snapshot