Higashi-Hiroshima Observatory

- Construction finished in 2006
- Only 20 min by car from campus (503m above sea level)
- Better seeing relatively within Japan (FWHM ~1.1 arcsec by DIMM)
- Better weather among Japanese sites (~40% nights observable)
- Sky brightness R~19 mag/arcsec^2 in dark nights

503m above see level

Modification of Kanata 1.5-m telescope

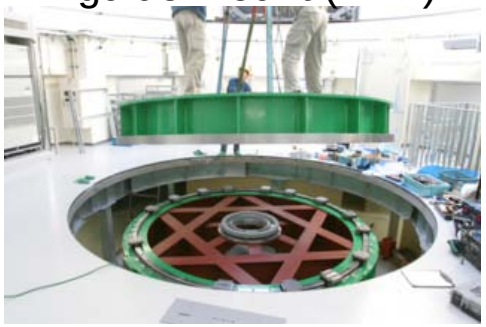
Originally constructed as a simulator of Subaru telescope in 1994 at Mitaka campus, NAOJ

Before moved to Hiroshima,

- Driving/control system replaced
- Speed up of telescope pointing
  （1deg/s ⇒ 5deg/s in azimuth）

  30 seconds in average to take to finish pointing to the next object
- Automatic focus switching system
- (New ceramic secondary mirror)

R-guide mount (THK)



→ Capable of prompt observation of GRB, etc.

Kanata telescope & Instruments

Second Nasmyth

高速分光器 : (京大・広大)
1秒間に30フレームのレートで可視分光観測を行える

First Nasmyth

HOWPol: (広島大)
1露出型広視野偏光撮像装置。
ガンマ線バーストの初期残光の偏光観測に特化

Cassegrain

TRISPEC : (名古屋大Z研; 渡辺ほか05)
可視赤外線3バンド同時撮像分光装置
HONIR : （広島大・2010年～）
可視赤外線3色同時カメラ

かなた望遠鏡の主力観測装置
可視・近赤外線の多バンドで同時に撮像、分光、偏光観測が可能

かなた望遠鏡

- 旧・赤外シミュレータ(NAOJ)
- 主鏡有効径: 1.5m
- 方位軸速度: 5°/秒

1mクラスの望遠鏡としては破格の速度

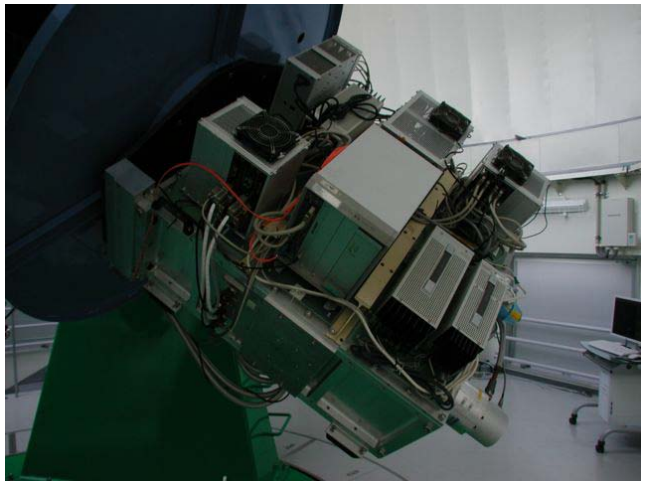
- 2006年秋より観測開始
  5割近い観測率
- 8割型は広島大主導の観測（約1割は他大学等による観測）

TRISPEC

Developed by Z-lab team of Nagoya Univ (Watanabe et al. 2005)

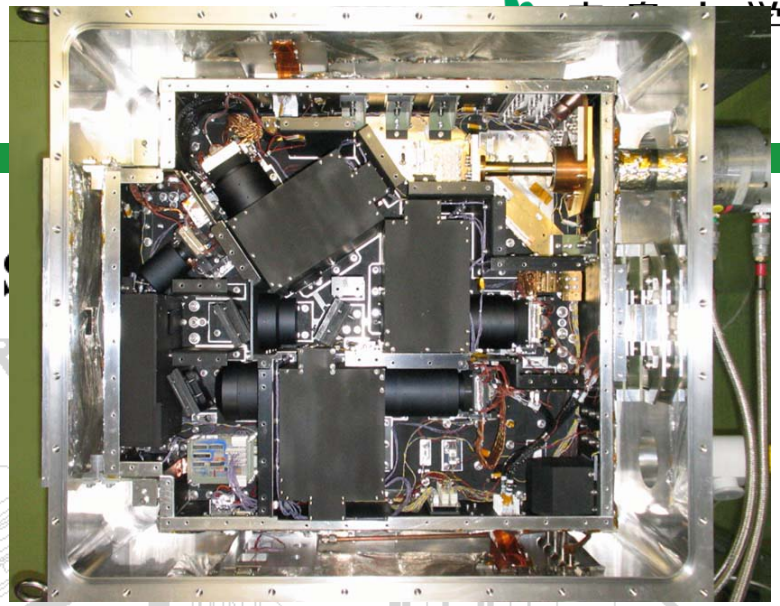
(originally designed for Subaru, UKIRT, UH 2.2m)

Current PI: Masaru Kino, Shuji Sato,



Simultaneous observation in 1 optical an 2 NIR bands is capable (imag, spec, pol).

TRISPEC: Schematic view



Watanabe+ 2005

TRISPEC: Observation mode and specification

- Imaging mode

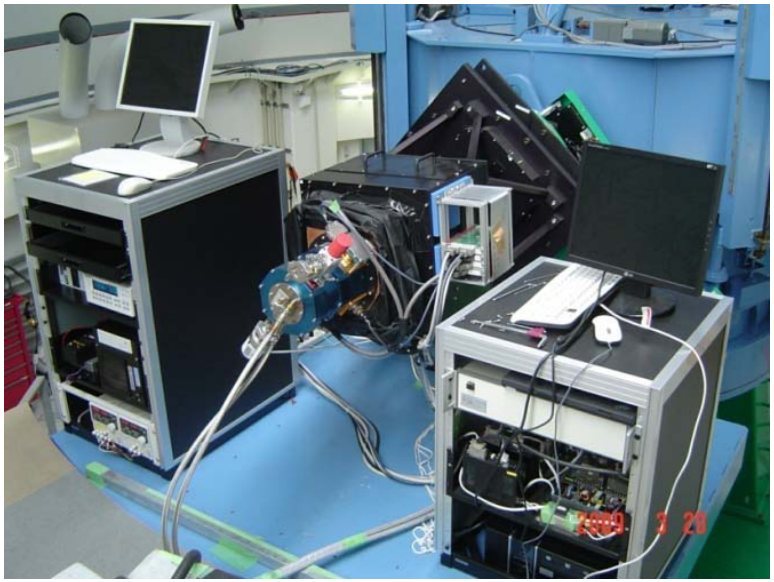
Channel	Opt	IR1	IR2
Detector	SITe CCD (512x512)	InSb (256x256)	InSb (256x256)
Field of View	7.0'x7.0'		
Pixel scale	0.82"/pixel	1.65"/pixel	1.65"/pixel
Filters	B, V, R, I	J, H	Ks, K, H_2
Limiting mag	18.5 (10min, 10σ)	16.8 (10min, 10σ)	15.1 (10min, 10σ)

- Spectroscopy mode

Channel	Opt	IR1	IR2
Wavelength	0.45–0.90 micron	0.90–1.85 micron	1.85–2.50 micron
λ/Δλ	138	142	360
Limiting mag	16.7 (60min, 10σ)	15.5 (60min, 10σ)	13.3 (60min, 10σ)

※ Polarimetry (imaging, spec) mode is also available.
※ Pixel scale is larger than typical seeing size for Kanata telescope

HOWPol:

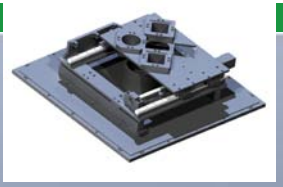


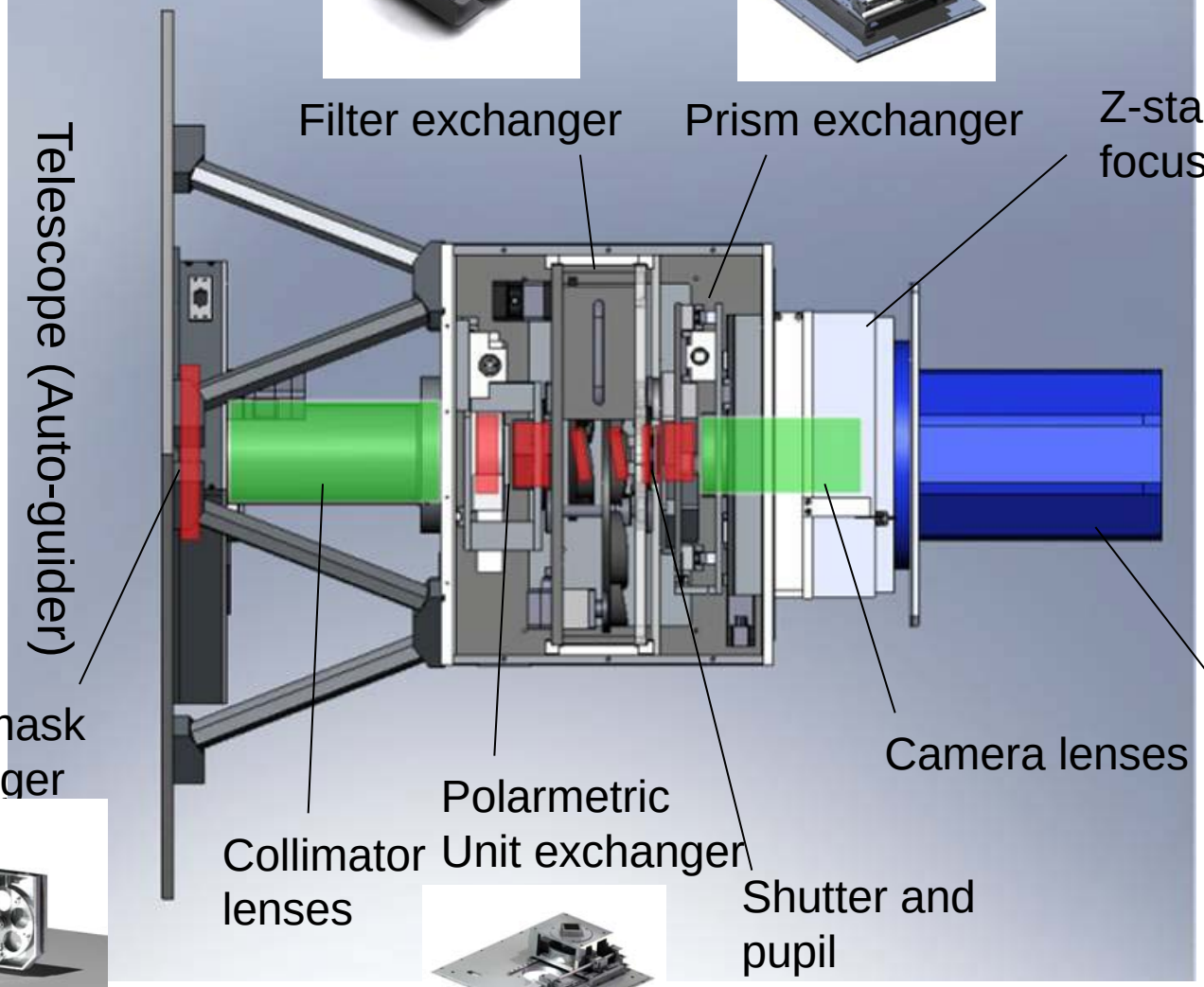
Hiroshima One-shot Wide-field Polarimeter

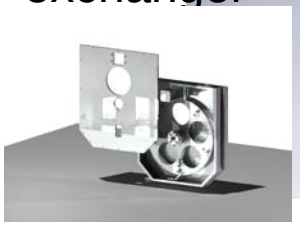
PI: K. Kawabata

Field of View	15' diameter (imaging mode)
Wavelength	450nm-1100nm
Mode	Wide-field imaging (15' circle) Imaging polarimetry (Capability of one-shot polarimetry) Spectroscopy (λ /d_λ ~ 400 - 2000)
Detector	Two 2k-4k back-illuminated, fully-depleted CCDs (Hamamatsu)

Mechanics





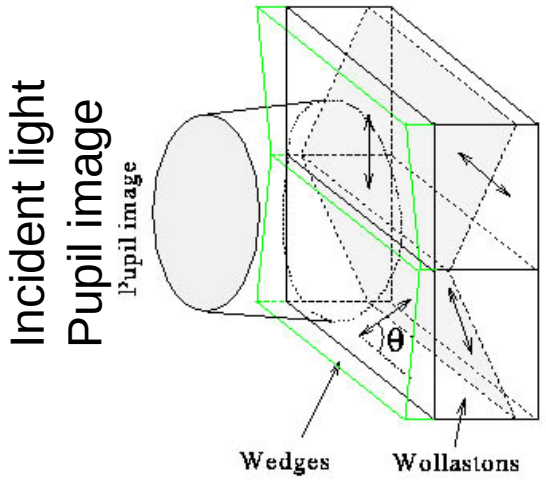


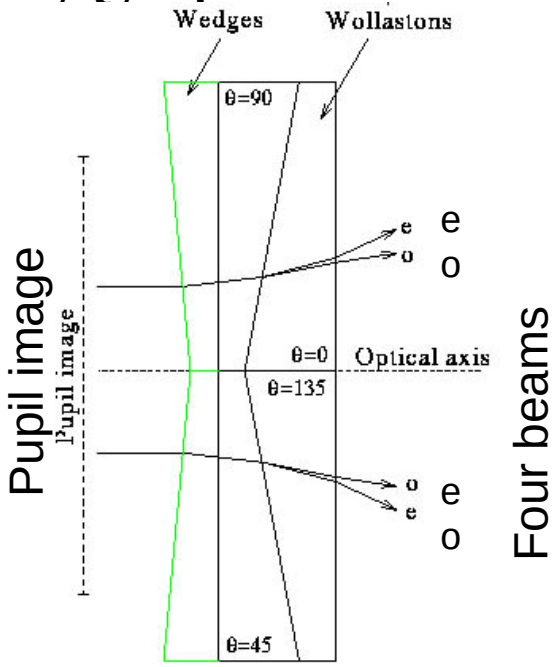
Chiyonobu+（2007）

Double wedged Wollaston prism

Generally, two or four exposures at different position angles of polarizer/retarder are necessary for derivation of Stokes *I*, *Q*, *U* parameters in optical polarimetry

But, introducing a `Double wedged Wollaston prism' (Oliva 1997) at the pupil position, we can obtain *I*, *Q*, *U* parameters from a single exposure.



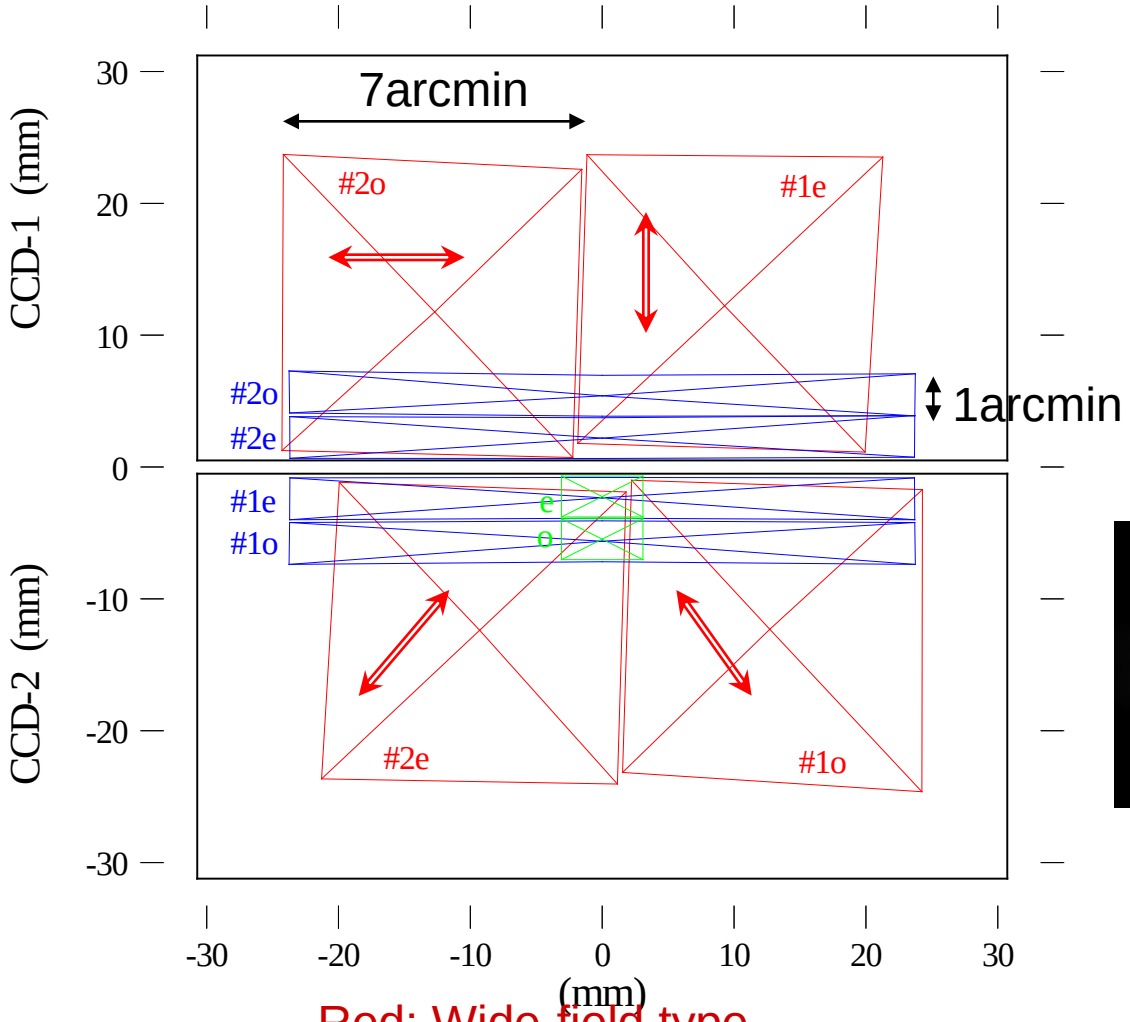


Narrow-field type
MgF2+SiO2
Wide-field type
Calcite

Oliva 1997, A&AS, 123, 589

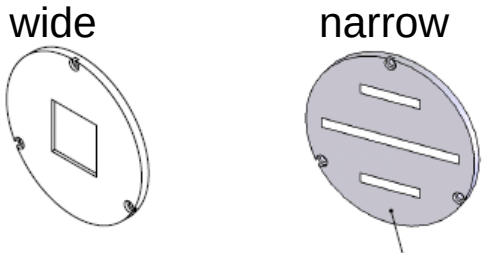
→ **One-shot polarimetry**

Image format for one-shot polarimetry

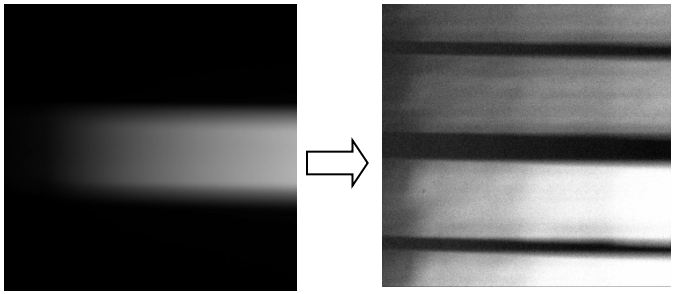


Red: Wide-field type

Blue: Narrow-field type (center slot)



Focal masks for wide-field and narrow-field polarimetry

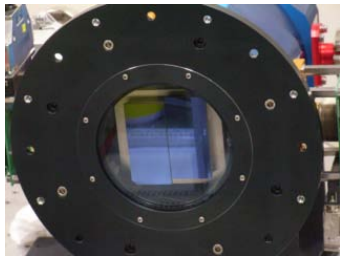


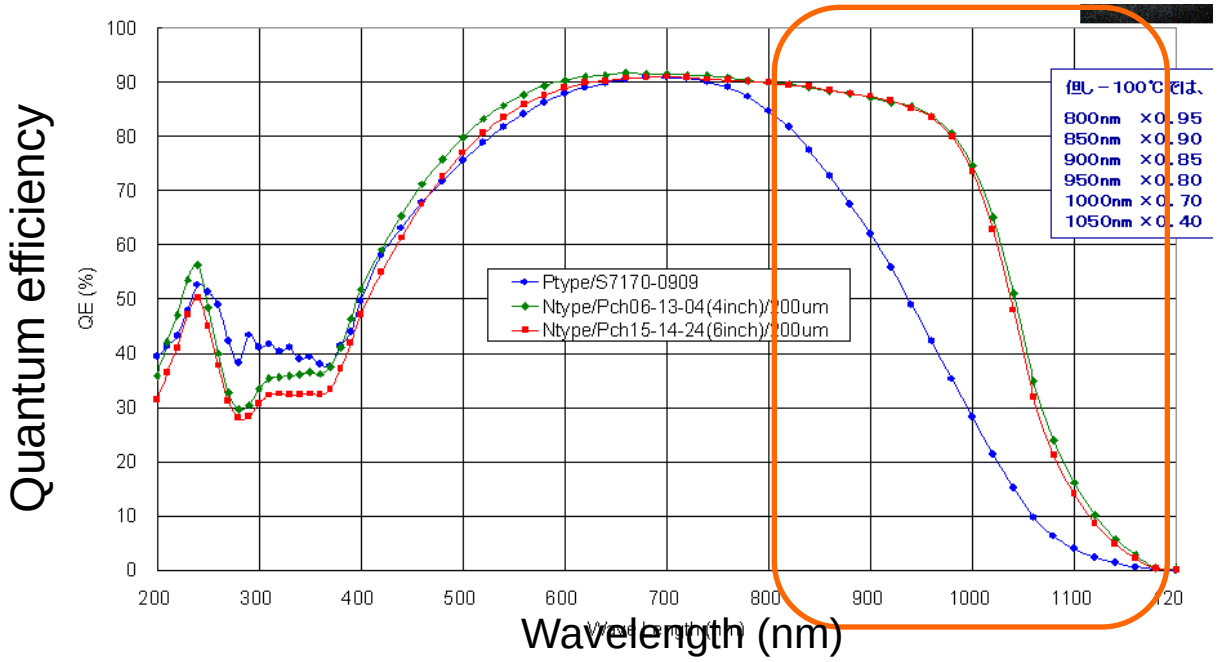
Narrow type mask image

Narrow type Wollaston prism inserted

HOWPol CCD: Back-illuminated, fully depleted CCDs

- Two 2k × 4k CCDs
- 200μm thick depletion layer
- Sensible beyond 1 μm



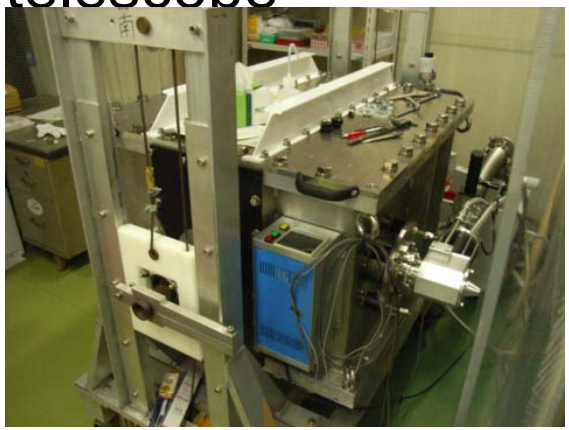


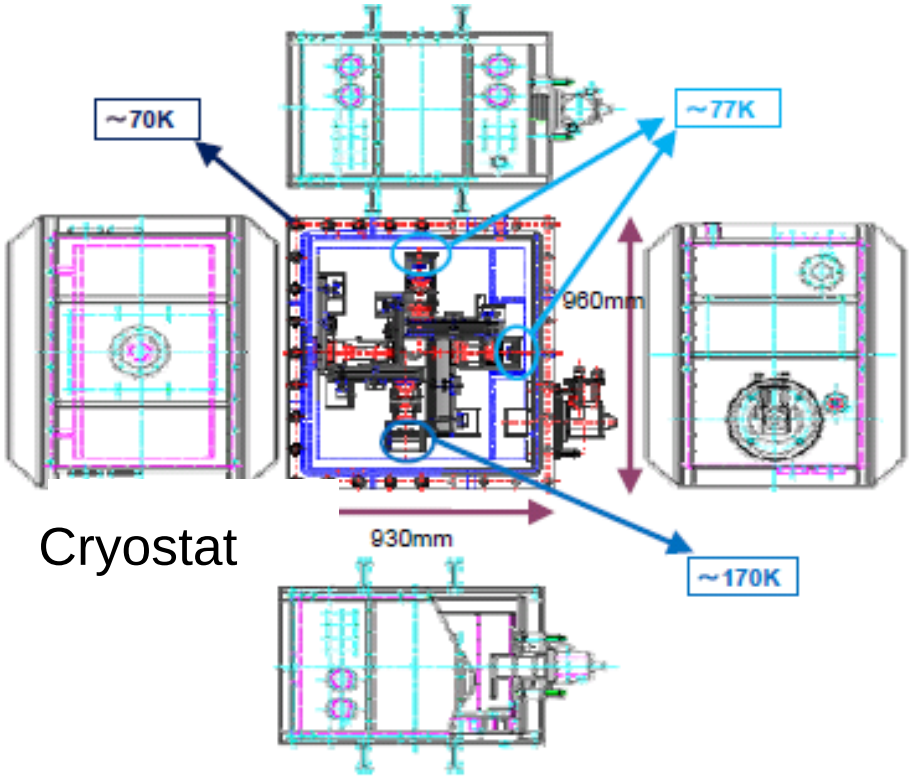
Developed by NAOJ and Hamamatsu Photonics, Inc.
(for Subaru primary-focus Camera; Miyazaki et al. 2005)
2k x 4k x 15um pixel

3-band imager and spectrograph

`Next generation TRISPEC' optimized for Kanata telescope

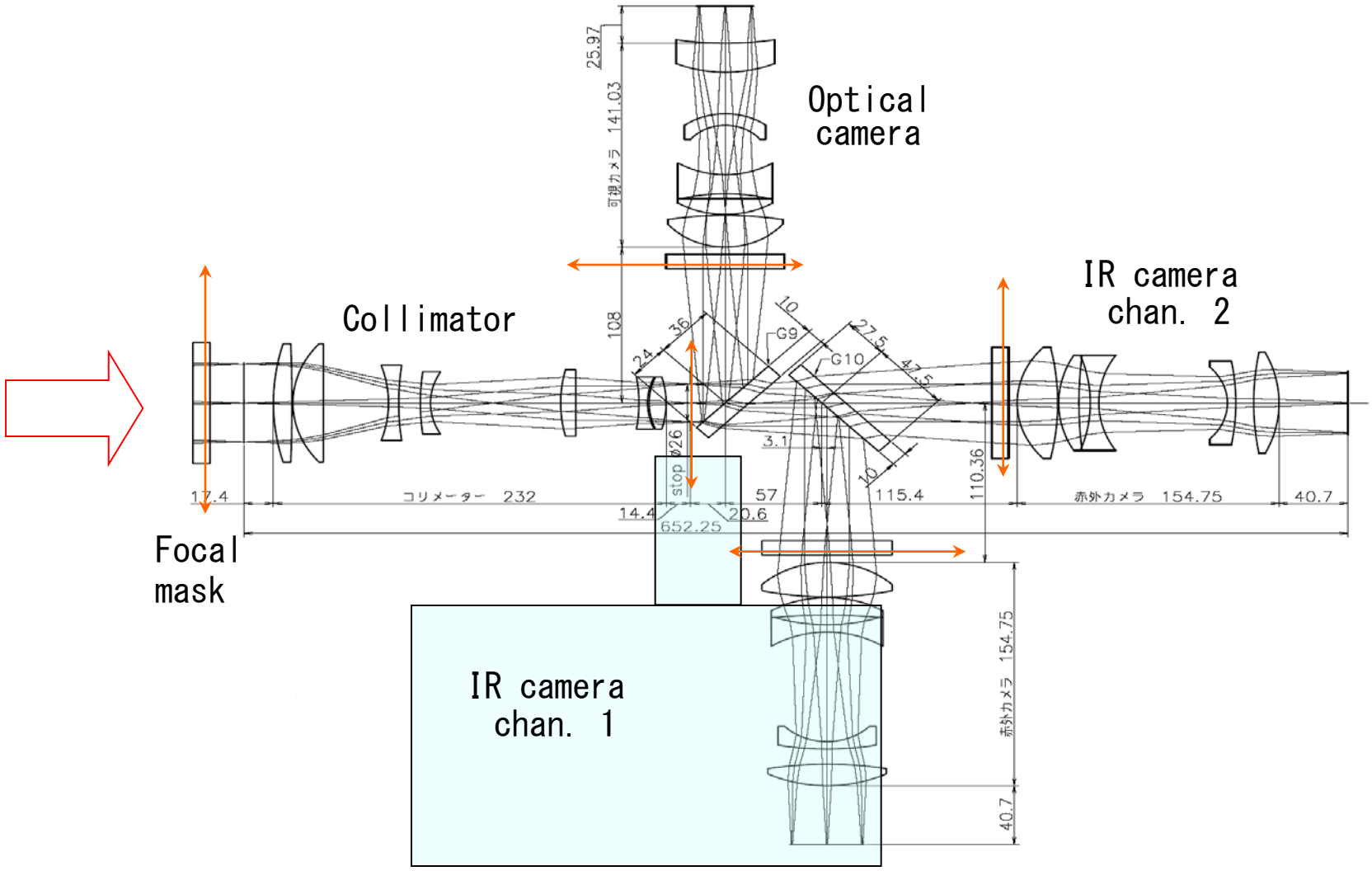
PI: T. Yamashita





Cryostat

Optical design



撮像モード仕様

	TRISPEC	HONIR
Detector format	OPT:512×512 IR2:256×256	OPT:2048×2048 IR2:2048×2048
Field of View	OPT:7分角 IR2:7分角	OPT:10分角 IR2:10分角
Pixel scale	OPT:0.82”/pix IR2:1.65”/pix	OPT:0.29”/pix IR2:0.29”/pix
Exposure effic (5sec)	IR2:40%	IR2(VIRGO):53%(4ch-mode) 88%(16ch-mode)

- **Large format array**
- **Pixel scale fits typical seeing size (~1”)**

→**Avoiding undersampling (sky background supression)**

MESSIA5