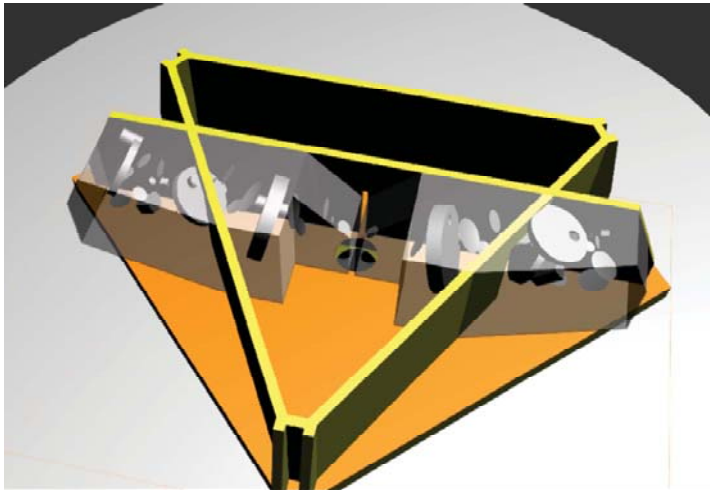
MIRACLE
Mid-InfRAred Camera without LEns

- Mid-IR Imaging Camera & low-res. spectroscopic capability
  - Wide-Field with high spatial resolution via Silicon BIB detector array (Si:As 2Kx2K, Si:Sb1Kx1K,Si:X 128x128)
  - Reflective optics : broad-band, high efficiency, low probability of ghost
  - Observing Efficiency: superior than JWST
- Continuous coverage at 5-38μm by 2 channels (MIRACLE-S : 5-26μm, MIRACLE-L : 20-38μm)
  - E.g. Star-formation activity upto z=4 by using PAH features at 8μm
- FoV: 5'x5' Imaging, 5' long slit for spectroscopy
  - FoVs of MIRACLE-S & -L are separated
  - Cluster of Galaxies / entire nearby galaxy in a Single Shot
- λ/Δλ=5 (Imaging) 200(Spec.)
  - Useful for PAH, Graphite, H_2O ice
- Angular resolution: diffraction limited (0.35"@5um)



MIRACLE on IOB

SPI
Space Infrared Telescope for

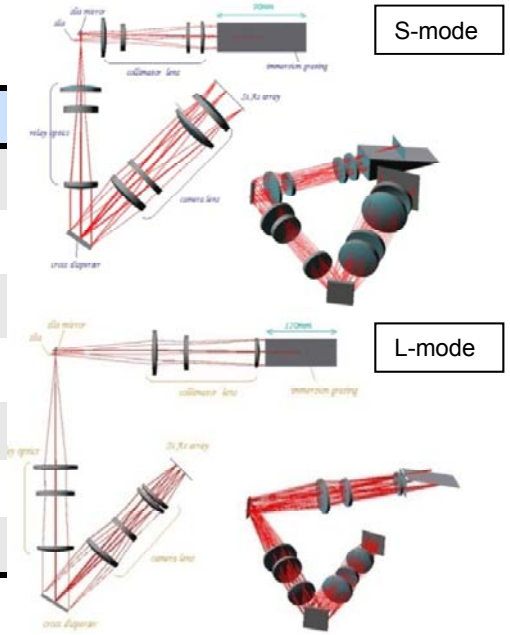
MIRHES
Mid-IR High-resolution Echelle Spectrograph

Overview Compact high-dispersion spectrograph with Imersion Grating consisting of Short-mode (S-mode)、Long-mode (L-mode)

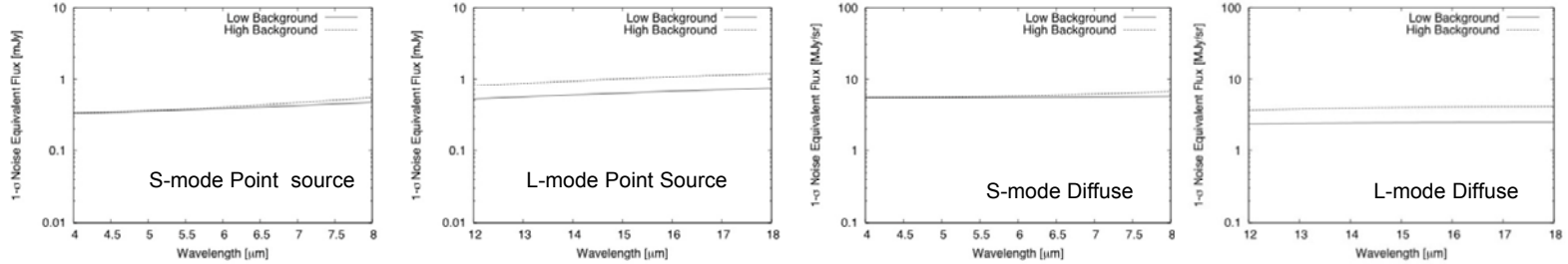
Specifications

	S-mode	L-mode
Wavelength	4–8 μm	12–18 μm
(R= λ/Δλ)	~30,000	~30,000
Slit width	0.72"	1.20"
Slit length	3.5"	6.0"
Dispersion element	ZnSe Imersion Grating	CdTe Imersion Grating
Detector array	2k x 2k Si:As (25 μm/pix)	2k x 2k Si:As (25 μm/pix)
pixel scale	0.29"/pix	0.48"/pix

Optics



Sensitivity ＊600s exposure, RN=10e-, Dark 0.1e-/s, Zodi background(high/low)



・Japanese-led (U. Tokyo/IoA, Kyoto-Sngyo Univ./ISAS)
・High-blaze Echelle grating is also under consideration for L-mode

SPICA
Space Infrared Telescope for Cosmology and Astrophysics

MIRMES

Mid-IR Medium-resolution Echelle Spectrograph

Simultaneous IFU using both Arm-S & Arm-L (Image slicer)

	ARM-S	ARM-L
array format	Si:As (2k x 2k :25 μm/pix)	Si:Sb (1k x 1k:18 μm/pix)
Wavelength coverage	10.0μm-20.0μm	19.5μm-36.1μm
Spectral resolution (R=λ/Δλ)	~1490@13μm	~680@27.8μm
pixel scale	0.403 (“/pix)	0.485 (“/pix)
Slit width	1”.2 x 5 slice	2”.5 x 5 slice
FOV size	12” x 6”.0	12” x 12”.5

Arm-S

Echelle order	λ_{min} (μm)	λ_{max} (μm)
4	15.53	19.97
5	12.71	15.53
6	10.75	12.71
7	(9.98)	10.75

Arm-L

Echelle order	λ_{min} (μm)	λ_{max} (μm)
5	29.5	36.1
6	25.0	29.5
7	21.7	25.0
8	19.5	21.7

※ λ_{min} and λ_{max} are defined as the wavelength at which the grating efficiency drops to 40% of the peak

SPICA
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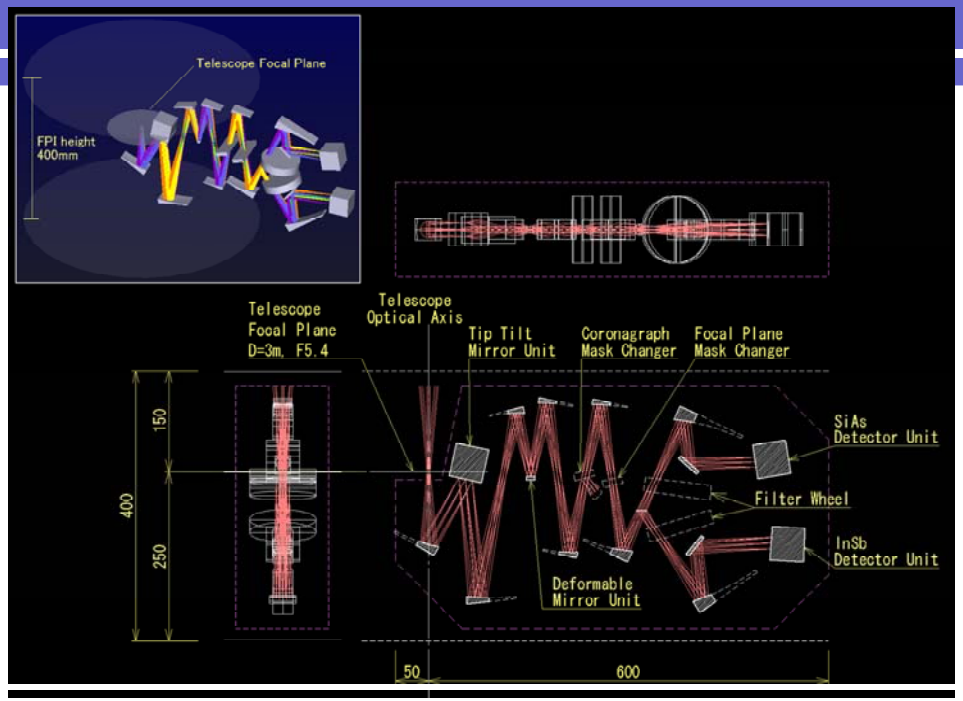
SPICA coronagraph instrument (SCI)



Wavelength (λ)	Long channlel 5<λ<27μm Short channel ~1<λ<5μm (coronagraph mode at λ>3.5μm)
Coronagraph method	Binary pupil mask
Observation Mode	Coronagraph Imaging/spectroscopy or Non- coronagraph Imaging/spectroscopy (simultaneous use of Short/long channels)
Contrast	6th order of magnitude
Spectral Reolution	~20, ~200 in spectroscopy mode
Filter bands in imaging mode	Band-pass filters at both Short, long channels
Inner working angle	3.3 λ/D
Detector array	Si:As (long channel), InSb (short channel)
FoV	1' x 1'

- High-dynamic range coronagraph in the mid-IR
- Key Observing programs
  - Jupiter-like exoplanets
  - Monitoring of planet transit
- Simultaneous use of short/long
  - Optimization of pixel size
  - covers the whole SED of exoplanets
- Wavefront control via deformable mirrors
- High-accuracy attitude control
  - C-TTM（tip-tilt mirrors), C-FPC (Guide sensor)

SPICA
Space Infrared Telescope for Cosmology and Astrophysics

FPC (Focal Plane Camera)

Proposed Korean Contribution of one of Focal Plane Instrument, consisting two cameras:

FPC-G Focal Plane Guide Camera, a part of AOCS for high-accuracy attitude control
Pointing Stability 0.036 arcsec(3σ) @ 0.5 Hz、Control Accuracy: 0.02 arcsec (0-P)

FPC-S Near-IR (0.8 – 5 μm) imaging & spectrometer for Astronomical purposes
Wide-field & high throughput compared with JWST
Back-up system for FPC-G

KASI (Korean Astronomy and Space Science Institute) will lead the development, assembly & test

	FPC-G	FPC-S
Optics	refractive optics with lens	
Detector array	1K x 1K InSb	
Field-of-View	5 arcmin	
Pixel Scale	0.3 arcsec	
Read-out Speed	2 sec	100 -- 600 sec
Wavelength range	I band (0.8 μm)	0.8 – 5 μm
Wavelength Resolution	R=5	R= 5 – 50
	single channel	5 wide band filters + 3 LVF
Sensitivity	21.5 mag (AB), 5σ	26.3 mag (AB), 100 sec, R=5
Operating Temperature	Structure 4.5 K, Detector at 10 K	
Heat dissp. at 4.5K stage	< 1 mW	< 1 mW
Cold Mass	~ 5 Kg	~7Kg