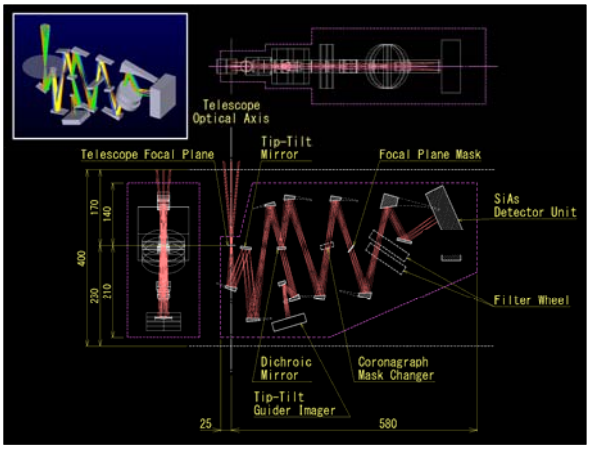
The fact sheet of the SPICA Coronagraph Instrument (SCI)



The SCI is a mid-IR coronagraphic instrument on SPICA for the purpose of studying small-scale structures surrounding bright stars and galactic nuclei, which specifically include extra-solar planets, proto-planetary and debris disks, and dusty tori of active galactic nuclei. The SPICA Coronagraph Instrument (SCI) is designed to have not only imaging but also slit-spectroscopic (R=200) capability. The SCI possesses the capability of low-background spectroscopic coronagraphy over the continuous wavelength range of 4 – 28 μm, which makes the SCI a unique instrument.

Science cases for design driver

Science cases for design driver	Mode*	λ (μm)	R
Planet formation process revealed by thermal history	S	4 – 12	200
H_2 and He in the atmosphere of Jovian exoplanets	S	10 – 28	50
Atmospheric structure of Jovian exoplanets	S	4 – 20	200
Constraining heavy element abundance	S	4 – 20	200
Direct detection and characterization of icy giants	I	10 – 28	2
Solid matter in planet-forming systems	S	6 – 28	200
Formation and supply of solid matter from old stars to the ISM	S I	6 – 28 6 – 28	200 2
Galactic nuclei	S	6 – 28	200

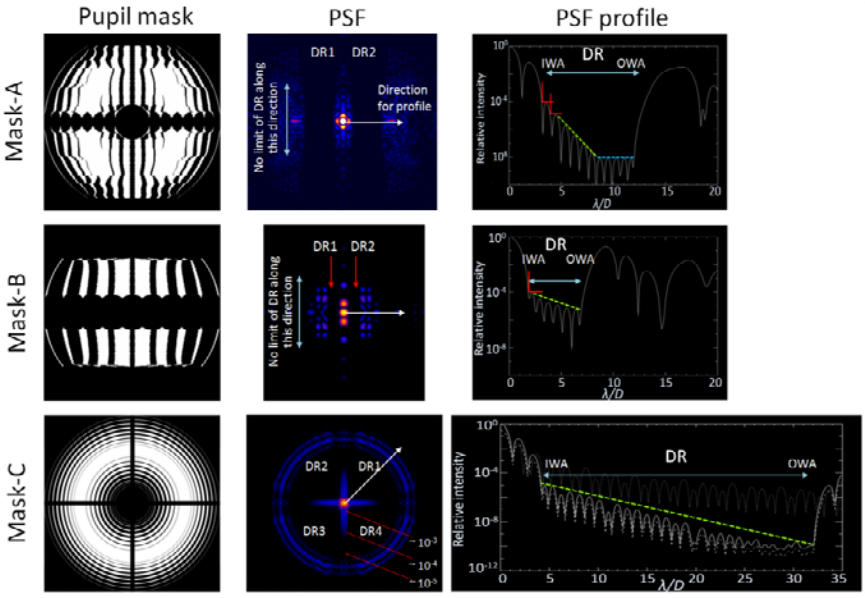
*S: spectroscopy, I: imaging.

Specifications

Observation mode	Coronagraphic spectroscopy Coronagraphic imaging
Wavelength coverage	4 – 28 μm
Coronagraph method	Binary pupil mask
Inner Working Angle Outer Working Angle	Mask-A: 3.3 λ/D*, 12 λ/D Mask-B: 1.7 λ/D, 6.5 λ/D Mask-C: 4.4 λ/D, 32 λ/D
Spectral Resolution	200 (spectroscopy mode)
Filters and Grisms	Installed in the tandem-series wheels
Field of View (FoV)	1′×1′
Detector	1k×1k Si:As array (Raytheon)

*Lambda: wavelength, D: telescope diameter.

Coronagraphic images by binary pupil masks



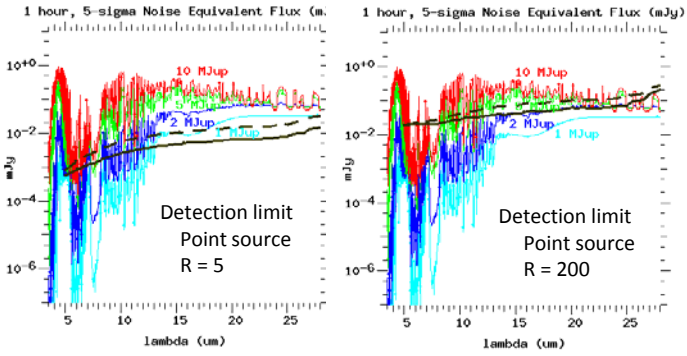
Sensitivity, contrast, and detection limit

Sensitivity
(5σ, 1h integration, w/o speckle noise, low zodi.)

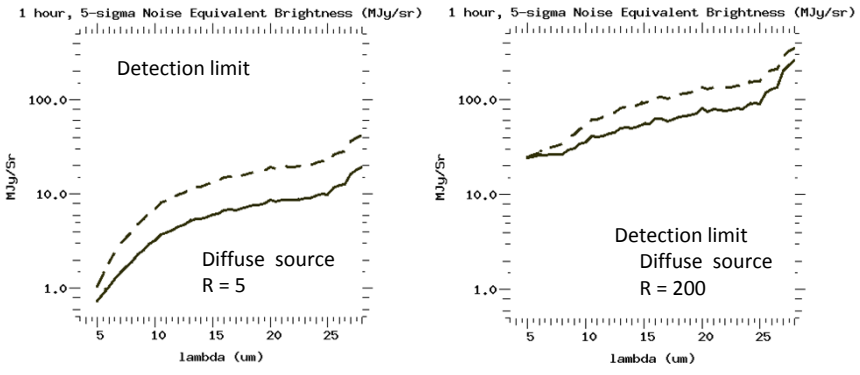
Case of R = 5: (mJy)	Case of R = 200: (mJy)
5×10^{-4} (λ = 5 μm)	2×10^{-2} (λ = 5 μm)
2×10^{-3} (λ = 10 μm)	3×10^{-2} (λ = 10 μm)
5×10^{-3} (λ = 20 μm)	4×10^{-2} (λ = 20 μm)

Contrast
(5σ, 1h integration, K5V primary star)

Limit with PSF subtraction	Raw contrast limit
1.4×10^{-6} (λ = 5 μm)	3.6×10^{-4} (λ = 5 μm)
2.8×10^{-6} (λ = 10 μm)	1.6×10^{-4} (λ = 10 μm)
3.2×10^{-5} (λ = 20 μm)	1.6×10^{-4} (λ = 20 μm)



1h integration time, 5-sigma noise equivalent flux density of a point source. The black solid and the dashed line show the cases of the low- and high background zodiacal emission, respectively. The color plots are the spectra theoretically predicted for a 1 Gyr old, 1 – 10 M_{Jup} mass planet at 10 pc .



1 h, 5-sigma noise equivalent brightness for a diffuse source. The black solid and dashed shows the cases of the low- and high background zodiacal emission, respectively.

The SCI team

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