

The fact sheet of SPICA Coronagraph Instrument (SCI)

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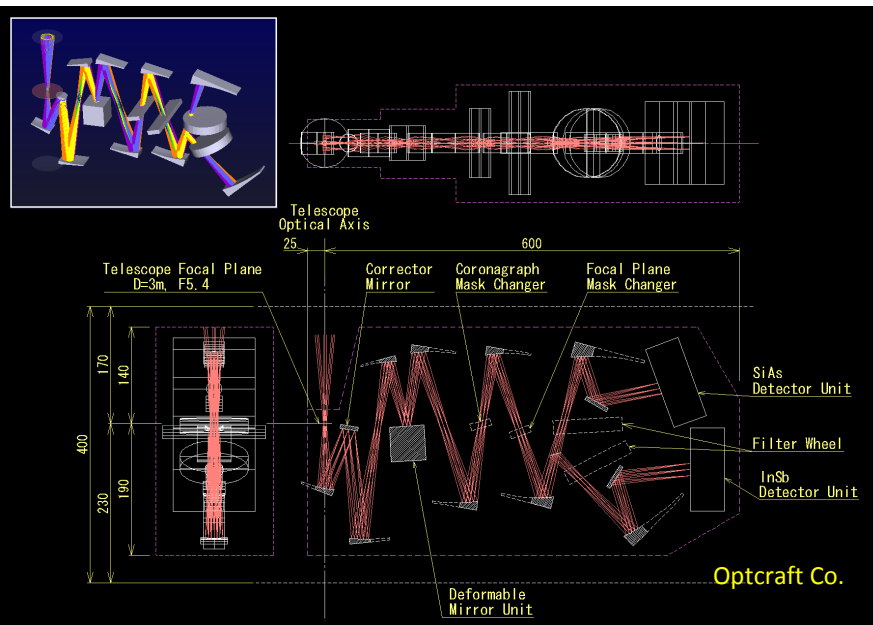
Abstract

SPICA Coronagraph Instrument (SCI) is a MIR high dynamic range imager/spectrometer designed for the study of exoplanets. The primary target of SCI is Jovian exoplanets, whilst use for observation of other targets are also possible. Coronagraphy is realized by binary shaped pupil masks. The baseline design without a deformable mirror (DM) provides contrast of 10^{-4} . The contrast of advanced design with DM is better, toward 10^{-6} .

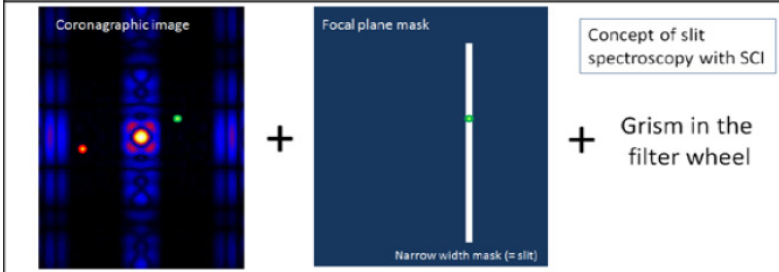
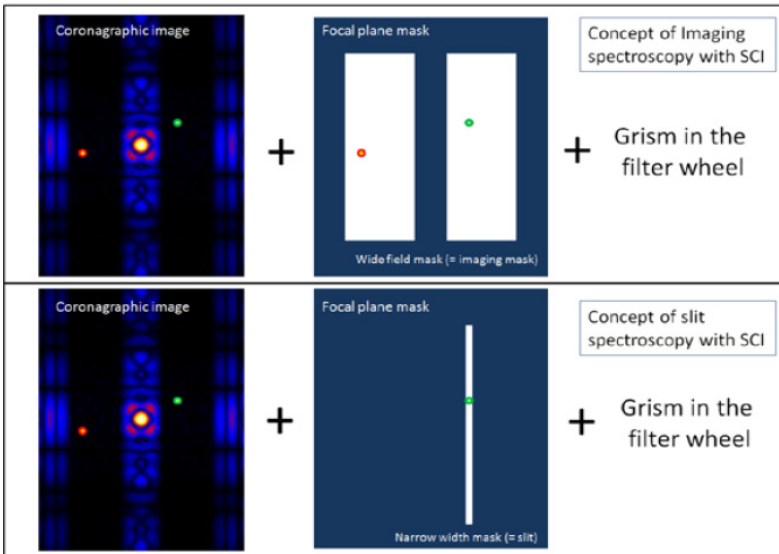
Specifications

Observation mode	Coronagraphic imaging Coronagraphic spectroscopy Non-coronagraphic imaging Non-coronagraphic spectroscopy
Coronagraph method	Binary pupil mask
Guaranteed contrast @PSF*	Baseline design 10^{-4} @mask1, 10^{-4} @mask2 Advanced design 10^{-6} @mask1, $10^{-4.5}$ @mask2
Spectral Resolution in	$\sim 20, \sim 200$ @spectroscopy mode
Filter bands in imaging mode	Band-pass filters at both Short, long channels
Inner working angle - Outer working angle	3.3 - 12 λ/D (mask1) 1.7 - 4.5 λ/D (mask2)
Sensitivity and detection limit	See figures shown left
FoV	1' x 1'
Detector and channel	Short channel: 2k x 2k InSb ($\lambda < 5\mu\text{m}$) * Long channel: 2k x 2k Si:As ($\lambda > 5\mu\text{m}$) *
Wavelength coverage	Coronagraph Imaging/spectroscopy 3.5-27 μm ** Non-coronagraph Imaging/spectroscopy 1-27 μm **

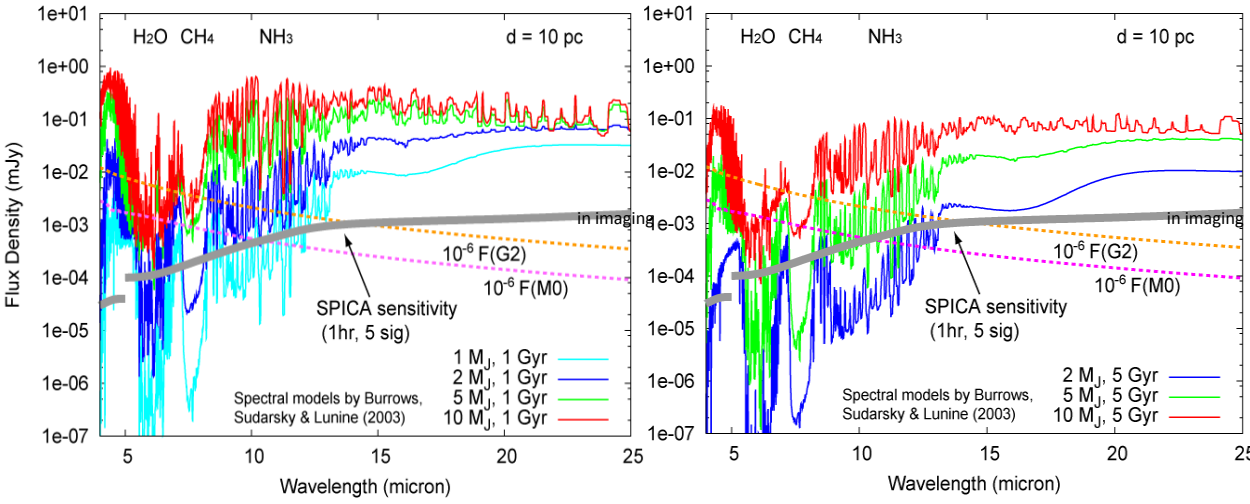
* simultaneous use of Short/long channels is possible at any mode
 ** Dropping 20 – 27 μm is being considered.



Coronagraphic spectroscopy



Sensitivity and detection limit of Jovian exoplanets



Detectable mass of planets

1Gyr
 $10^{-6} : M_{\text{limit}} \sim 1-2M_J$
 $10^{-5} : M_{\text{limit}} \sim 5M_J$
 $10^{-4} : M_{\text{limit}} \sim 10 M_J$

5Gyr
 $10^{-6} : M_{\text{limit}} \sim 5M_J$
 $10^{-5} : M_{\text{limit}} \sim 10M_J$
 $10^{-4} : M_{\text{limit}} \sim \text{no detection}$

* Figures: by M. Fukagawa
 * Estimation: T. Matsuo, T. Kotani, et al

Spacecraft Resources

Resources	Specification	System Allocation
Cold Mass	20 kg with TBD margin	20 kg with 20% margin
Cold Volume [mm]	200 x 650 x 330	100 x 650 x 398
Heat Lift at 4.5K [mW] (observing/standby)	Baseline design 2.6/ 0.1 with 30% margin Advanced design 2.6/ 0.4 with 30% margin	6 / 0.4 with 30% margin
Electric Power [W] (observing/standby)	Baseline design TBD (smaller than values for Advanced design) Advanced design 60 / 16 with TBD margin	60 / 16 with TBD margin

Pointing accuracy requirement	0.06 arcsec (0-p) for 20 min.
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