Development of Focal Plane Camera (FPC) of SPICA

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(nW/m²/sr)/

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1. Introduction

- Based upon the previous collaboration in IR projects betwee n Korea and Japan, Korea (KASI) propose the near-infrared instrument for SPICA, FPC (Focal Plane Camera).
- The FPC consists of two parts; one is FPC-S (fine Guider) an d the other is FPC-S (Science).
- The FPC-G is a part of AOCS for high-accuracy attitude cont rol - Pointing Stability 0.036 arcsec(3σ) @ 0.5 Hz.
- The primary function of the FPC-S is the back-up system of ٠ FPC-G and it also performs scientific observations.
- It has a capability of wide-band imaging as well as imaging spectroscopy using LVF (Linear Variable Filter).
- Korea Astronomy & Space Science Institute (KASI) will dem onstrate technologies of FPC through NISS mission.



2. Specifications of the FPC

Parameters)	Specification	
	FPC-G⊅	FPC-S)
Optics	Refractive optics with lens	
Detector Array	1K x 1K InSb≯	
Field-of-View	5 arcmin. x 5 arcmin.♪	
Pixel Scale	0.3 arcsec.≯	
Readout Speed	2 sec≯	100 - 600 sec)
Wavelength Range	I band (0.8µm)♪	0.7 – 5.2µm ≯
Wavelength Resolution	R=5⊅	R=5 (imaging) - 20 (spectroscopy))
Filter Positions	single channel》	10 (1 blank, 1 back-up of FPC-G, 5 wide band filters, 3 LVFs♪
Sensitivity)	21.5 mag (AB), 5σ	27.3 mag (AB), 600 sec, 3σ, imaging 26.3 mag (AB), 600 sec, 3σ, LVF♪
Operating Temperature	Structure at 4.5K, Detector at 10K♪	
Cold Mass	5 kg⊅	7 kg (with 20% margin)♪
Heat lift at 4.5K [mW])	2 / 0.2 (observing / stand-by)♪	
Electric Power [W]	12 / 12 (observing / stand-by)♪	



Allocation of FPC & Optical Design



3rd mode: 426 Hz 4th mode: 556 Hz Tilt mode of Filter Wheel) (Bending mode of Barrel and

3. Scientific Targets

3.1 Legacy Programs

- Near-Infrared Spectroscopic Survey with FPC for Cosmic IR Backg round and Extragalactic Sciences (NIRSS)
 - ✓ Wide Field Spectroscopic Survey with LVF (R~20)
 - ✓ Primary Science: Cosmic Infrared Background Radiation: **Fluctuation and Spectrum**
 - Measurement of the spectrum of the sky to examine the nature of the excess background emission
 - Detection of the fluctuation of the sky brightness caused by



Absolute brightness of CIB wavelength (µm))

✓ Secondary Sciences: Lyman Break Galaxies up to redshift 10, Emission Line Galaxies

 Understanding of high redshift star formation history of the Univer se and the reionization

> Mpc² -2

DOC

Direct detection of Lyman break galaxies (z~5 - 10)





LBG samples from HST observation (Bouwens et al. 2 008). The red square shows the pixel scale of FPC-S. \flat

• Parallel Imaging Survey for the dete • Warm Mission ction of rare objects

- ✓ LBGs, Quasars, ULIRGs, Ultra-cool brown dwarfs ...
- ✓ Wider areal and spectral coverage
- ✓ ~50 deg² (26 AB mag., 5-yr lifetime)
- ✓ Survey of high-z supernovae ✓ Spectroscopic Survey of SNRs
- Deep and wide survey for the extrag alactic study

Spectroscopic survey of star forming

3.2 Target of Opportunities: Comet Observations, Gamma Ray Bursts

4. Development & Test Plan



UV luminosity function at $z \sim 4$, 7, 8 and 10 (Bouwens et al. 2 011). Two vertical lines show the sensitivity limit at rest fram e for $z \sim 6$ and 10, respectively.)

z~10

regions