

Science & Role of Focal Plane Camera (FPC) of SPICA

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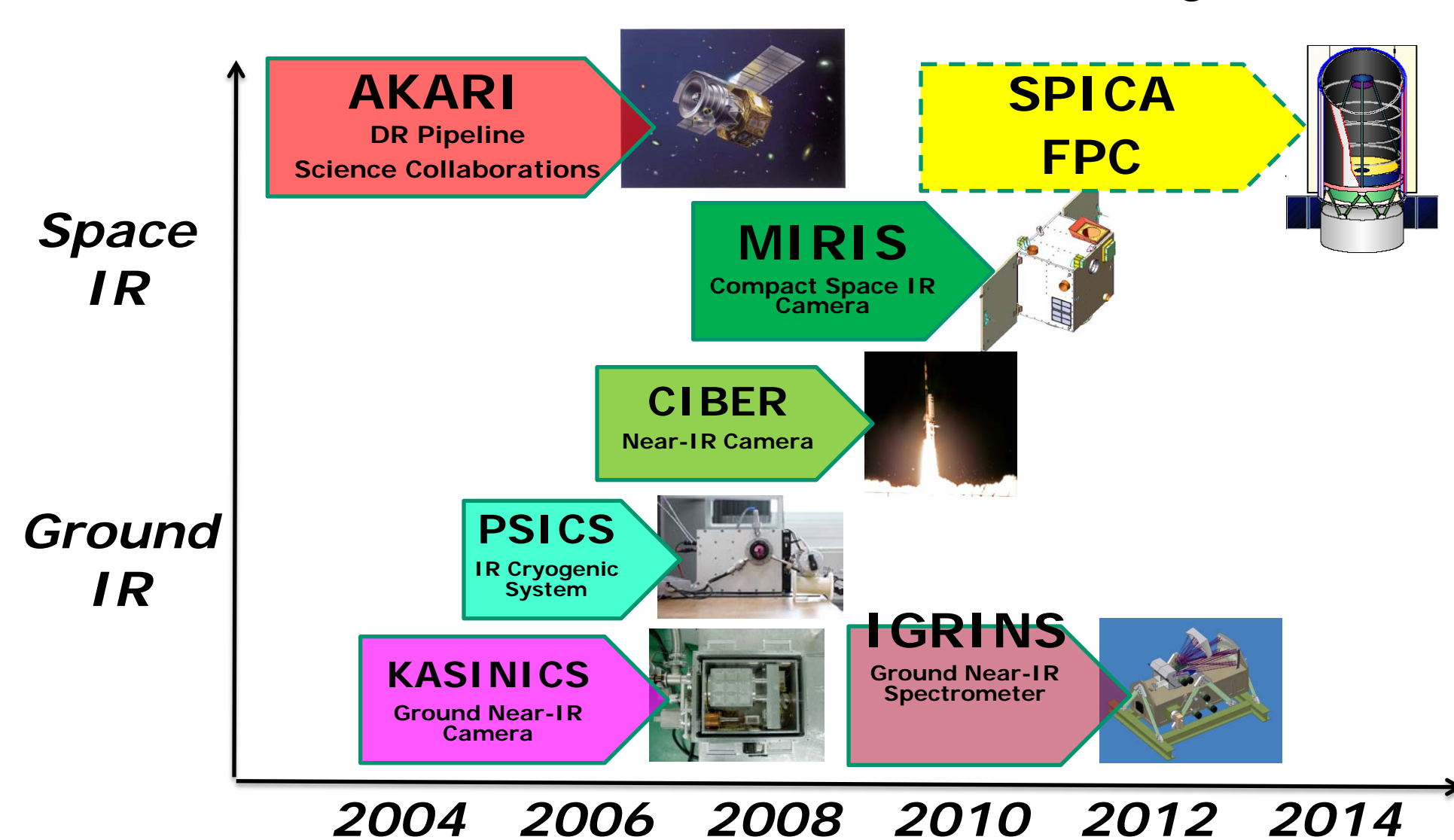
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1. Introduction

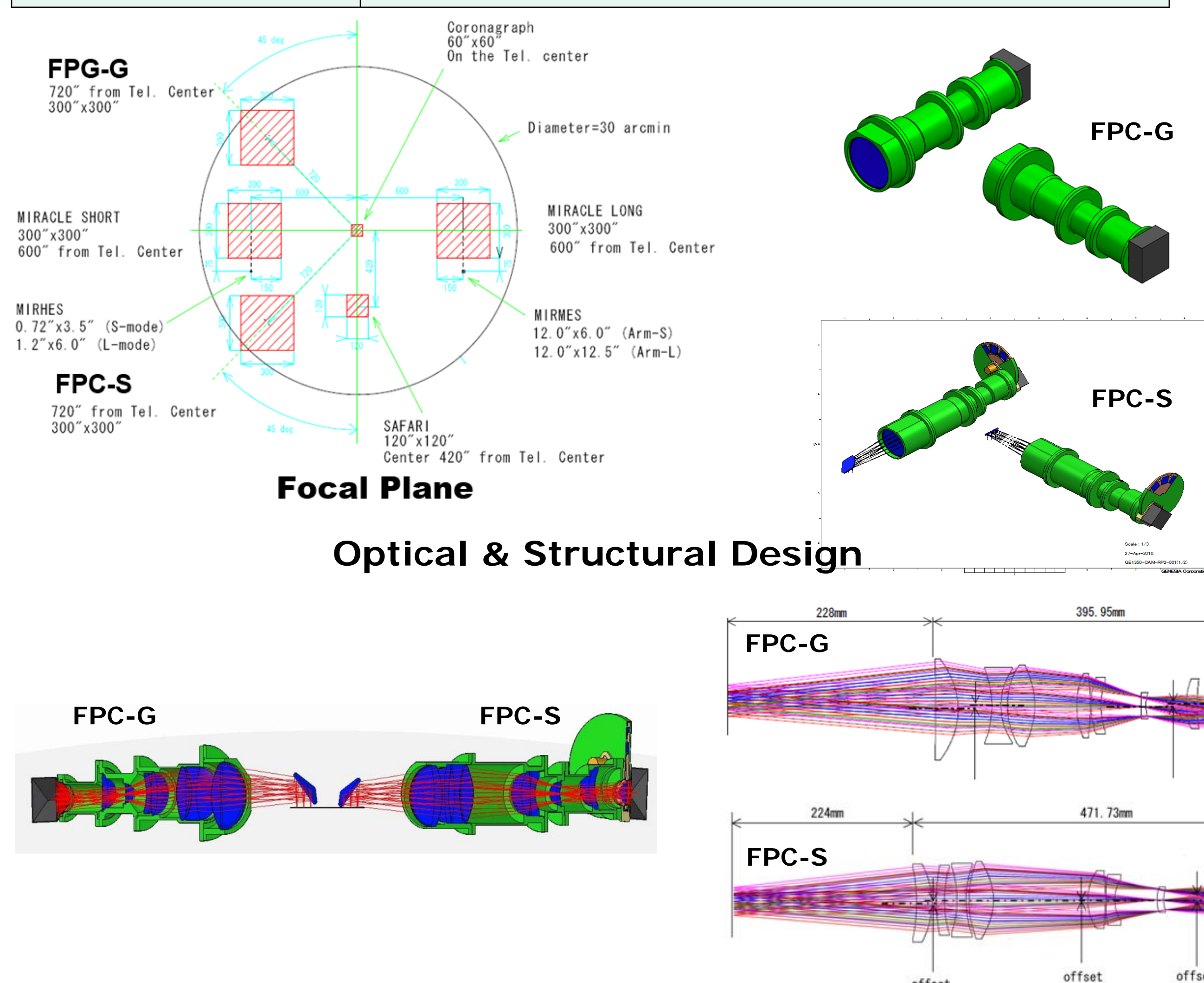
- Based upon the previous collaboration in IR projects between Korea and Japan, Korea propose the near-infrared instrument for SPICA, **FPC (Focal Plane Camera)**.
- The FPC consists of two parts; one is **FPC-G** (fine Guider) and the other is **FPC-S** (Science).
- The FPC-G is a part of AOCS for **high-accuracy attitude control** - Pointing Stability **0.036 arcsec**(3 σ) @ 0.5 Hz.
- The primary function of the FPC-S is **the back-up system of 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 lead the development, assembly and test of the FPC.

Korea's involvement in IR Projects



2. Specifications of the FPC

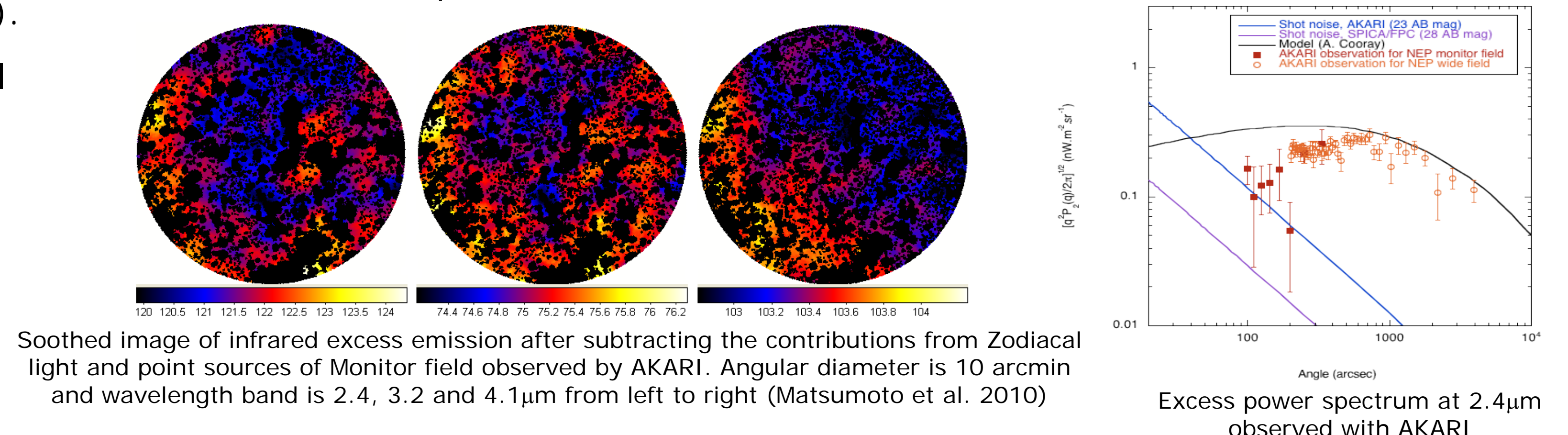
Parameters	Specification	
	FPC-G	FPC-S
Optics	Refractive optics with lens	
Detector Array	1K x 1K InSb	
Field-of-View	5 arcmin. x 5 arcmin.	
Pixel Scale	0.3 arcsec.	
Readout Speed	2 sec	100 – 600 sec
Wavelength Range	I band (0.8 μ m)	0.7 – 5 μ m
Wavelength Resolution	R=5	R=5 (imaging) – 20 (spectroscopy)
Filter Positions	single channel	10 (1 blank, 1 back-up of FPC-G, 5 wide band filters, 3 LVFs)
Sensitivity	21.5 mag (AB), 5 σ	27.3 mag (AB), 600 sec, 3 σ , imaging 26.3 mag (AB), 600 sec, 3 σ , 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)	



3. Scientific Targets

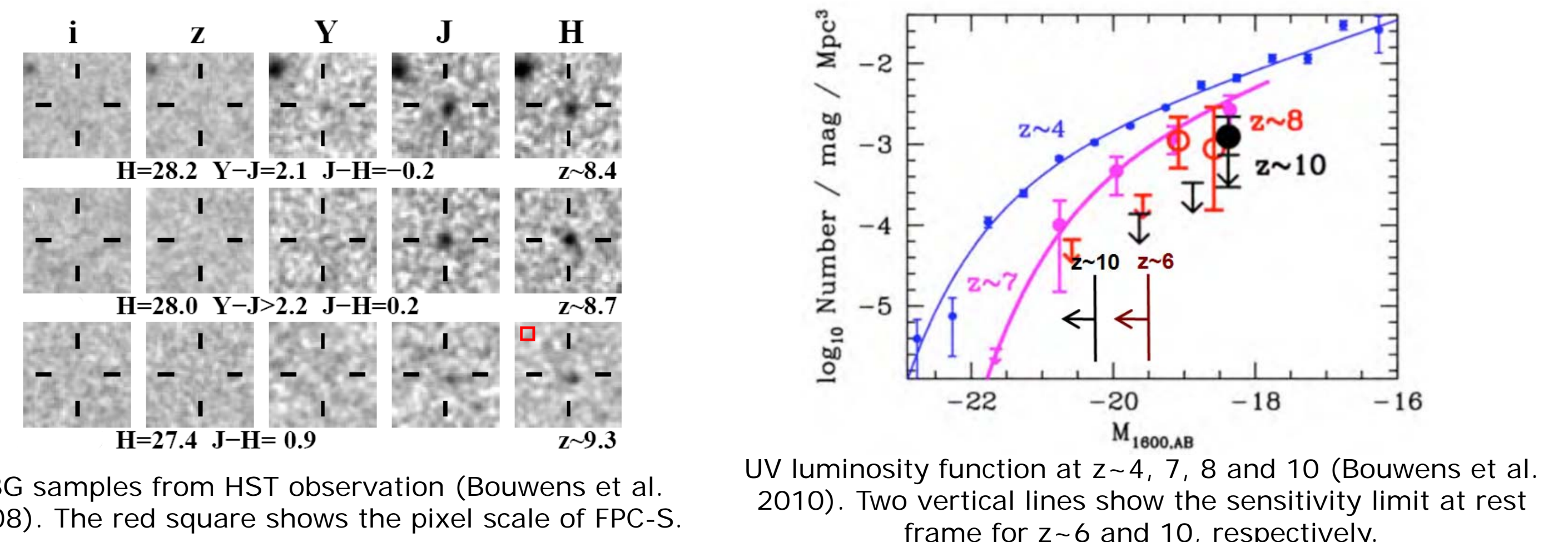
3.1 Legacy Programs

- Near-Infrared Spectroscopic Survey with FPC for Cosmic IR Background 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 Pop.III stars.

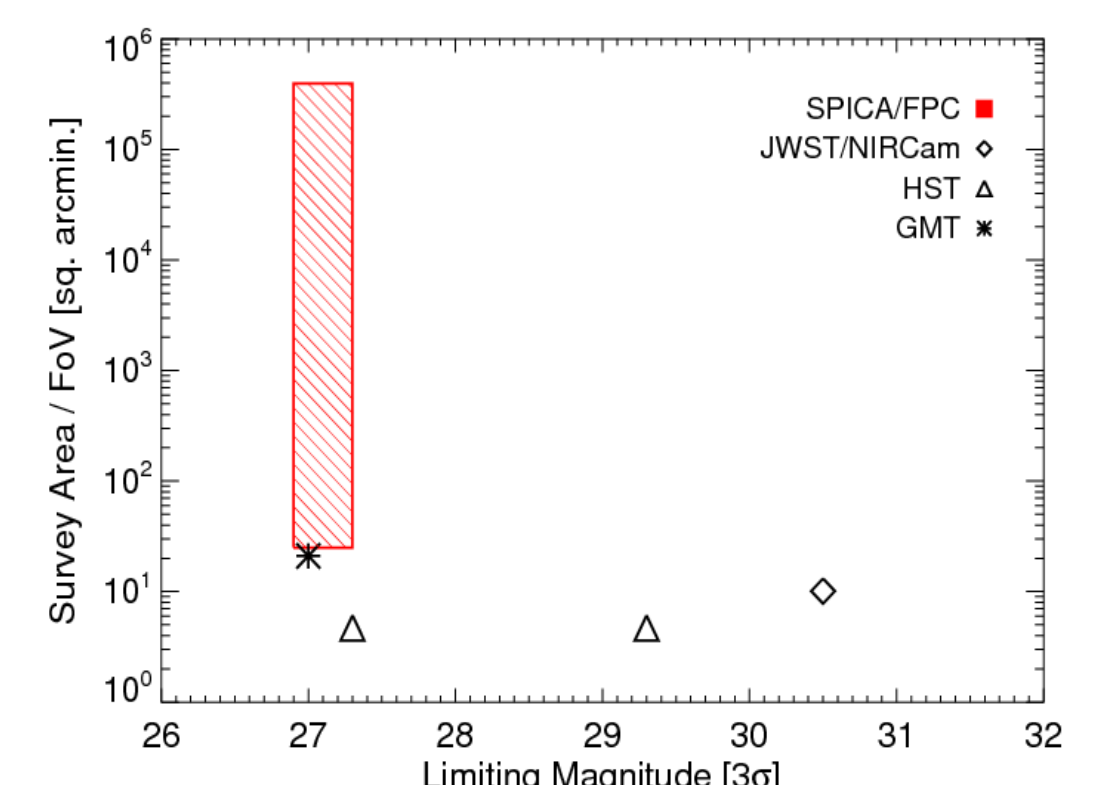


Secondary Sciences: Lyman Break Galaxies up to redshift 10, Emission Line Galaxies

- Understanding of high redshift star formation history of the Universe and the reionization
- Direct detection of Lyman break galaxies (z~5 – 10)



- Parallel Imaging Survey for Extragalactic Sciences
 - Parallel observations with other instruments
 - Wider areal and spectral coverage
 - 180 deg² (5-year lifetime, 4 filters)



3.2 Target of Opportunities: Comet Observations, Gamma Ray Bursts

4. Development & Test Plan

Sub-system	Task	2010 SDR	2011	2012 PDR	2013 CDR	2014	2015	2016 SAR	2017
Barrel	• Lenses - Design - Fabrication/coating - Assembly/test (warm)								
	• Filter wheel - Design - Fabrication - Assembly/test (warm)								
Focal Plane Assembly	• Mechanical parts - Design - Fabrication - Assembly/test (cold)								
	• Integration/test (cold)								
Warm Electronics	• IR detector/FPB - ROIC test (warm) - IR detector test (cold)								
	• Housing - Design - Fabrication - Assembly/test (cold)								
FPC-G Simulator	• Integration/test (cold)								
	• Electronics - Design - Fabrication - Assembly/test - Structure/harness - Design - Fabrication - Assembly/test - Software • Integration/Calibration								
FPC-S Simulator	• Algorithm • Simulator • Calibration / Test								

* Related Papers

Bouwens et al. 2008, ApJ, 686, 230 Bouwens et al. 2010, Nature, Submitted Matsumoto et al. 2010, ApJ, Submitted