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”SAFARI” — a far-IR imaging spectrometer for SPICA

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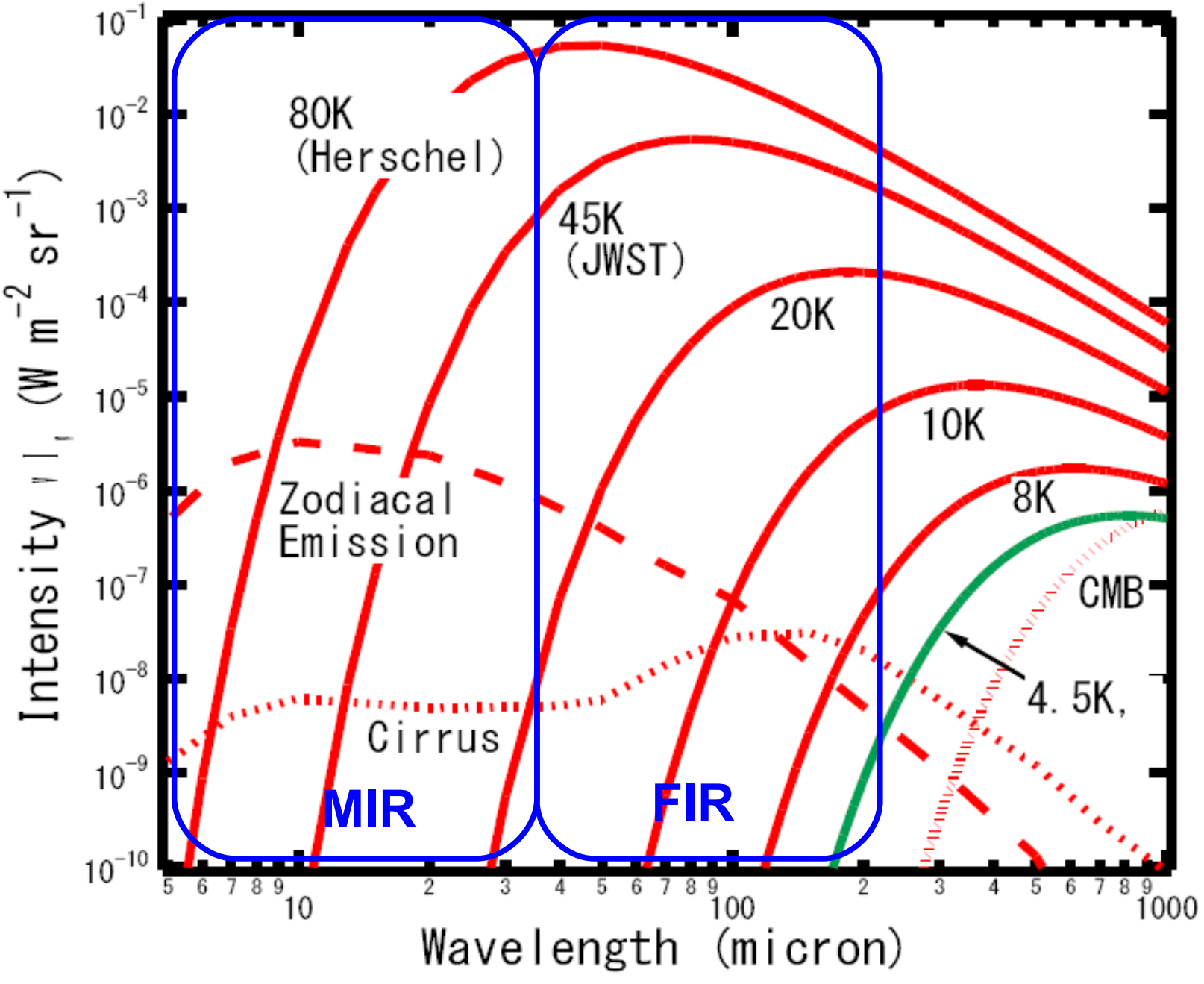
SPICA — a **Cooled** Telescope!



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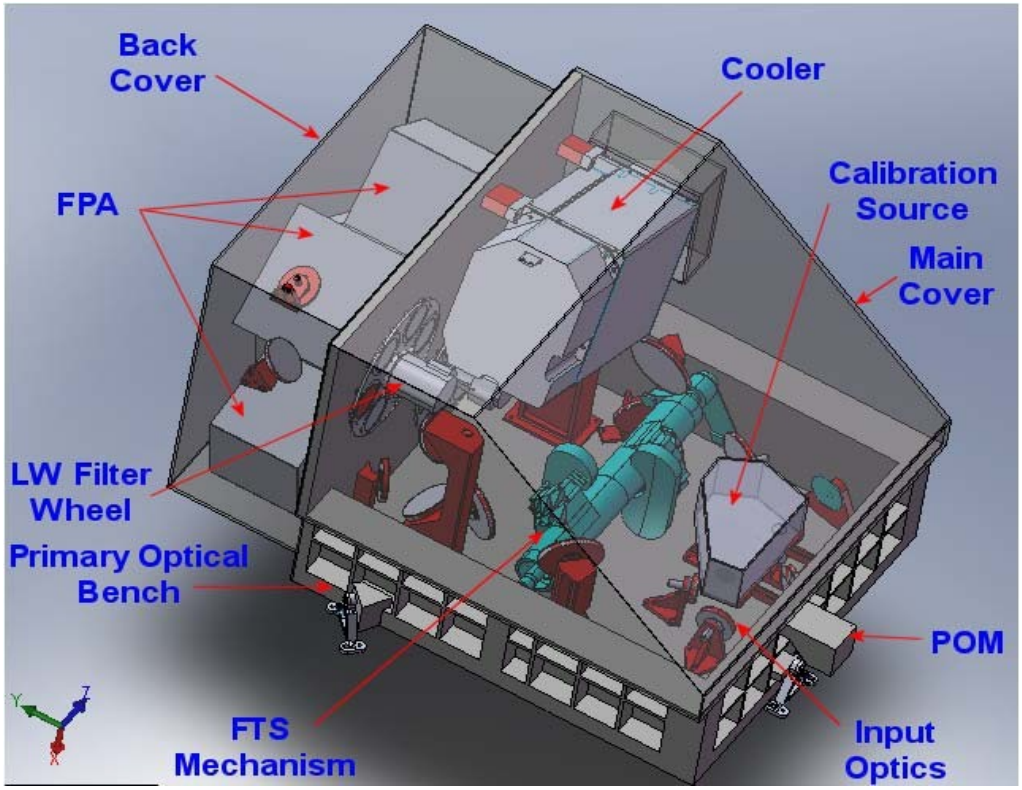
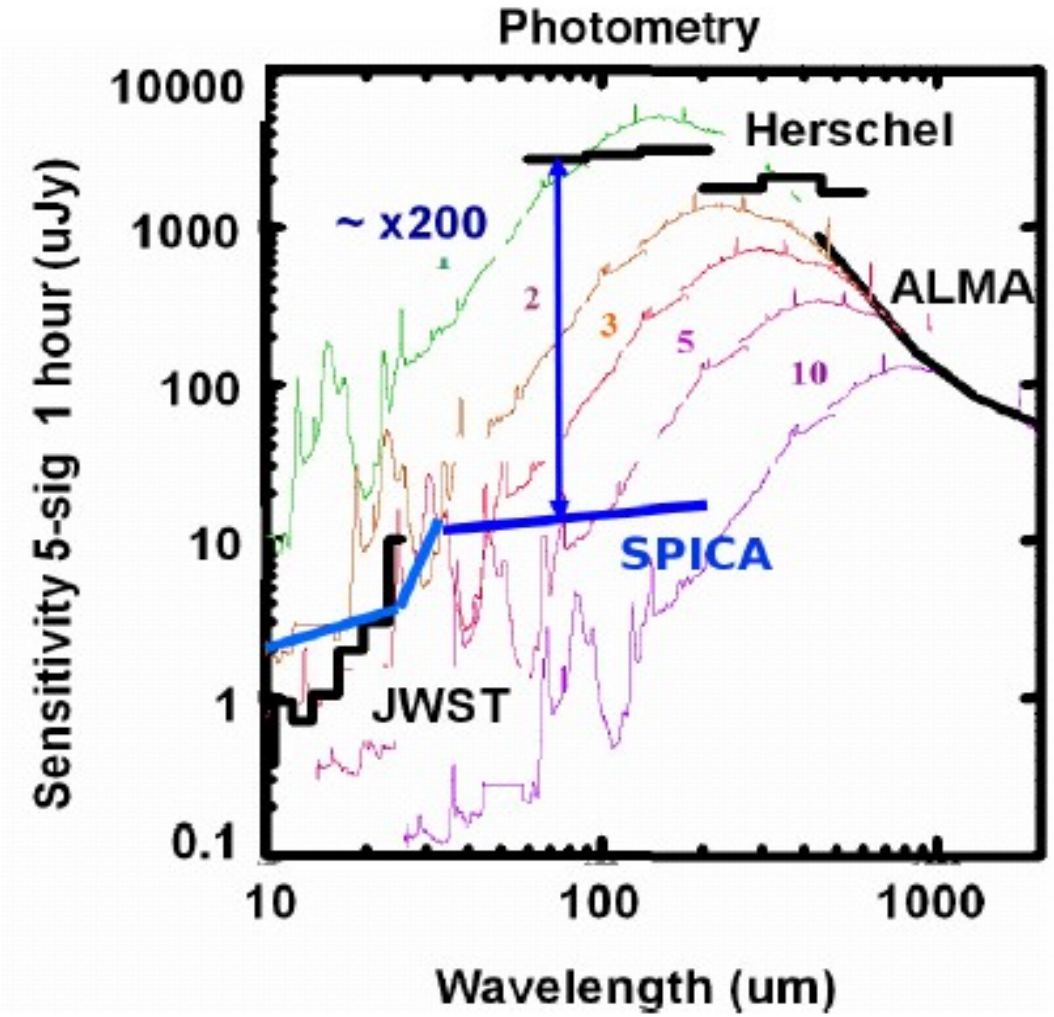
SAFARI – SPICA FIR Instrument Requirements and Specifications



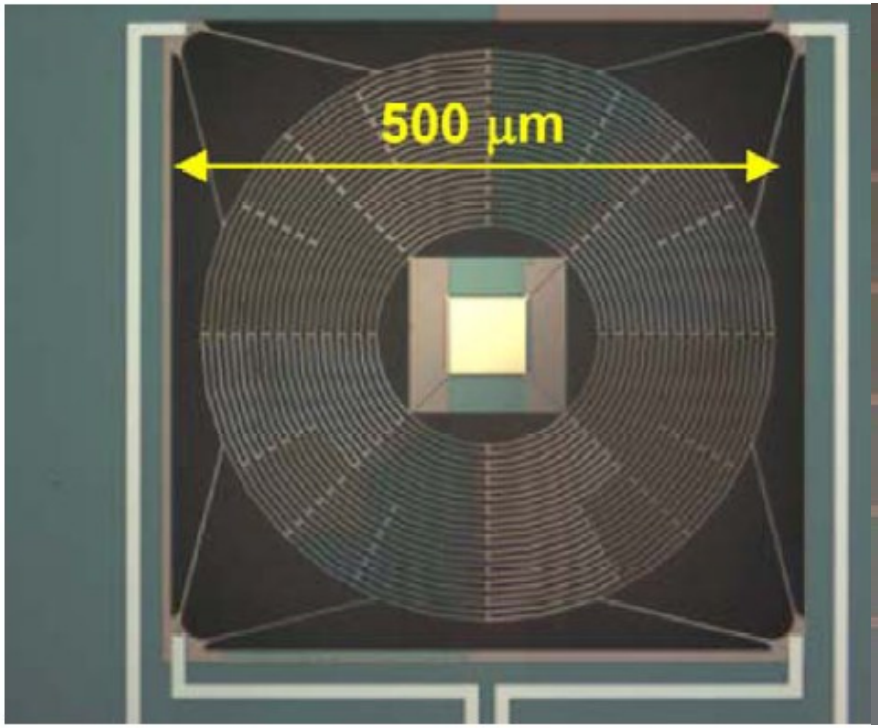
- Instantaneous wavelength coverage **35 to 210 micron**
- Camera mode with **R~3 to 5**
- Multiple spectroscopy mode **R = 2000** @ 100 micron
- Diffraction-limited spatial resolution (**3.6~11.5 arcsec**)
- Field of view **2x2 arcmin**

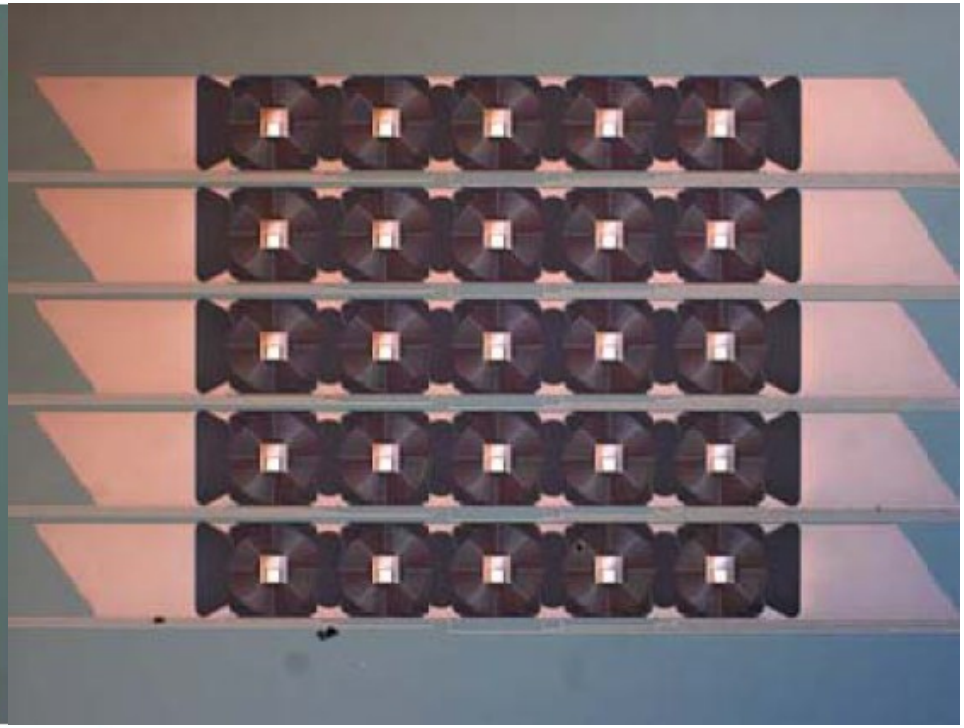


- Line sensitivity of **<2x10^{-19} W m^{-2}** (5-σ 1 hour)
- Continuum sensitivity of **<20 uJy**

Detector array wavelength bands

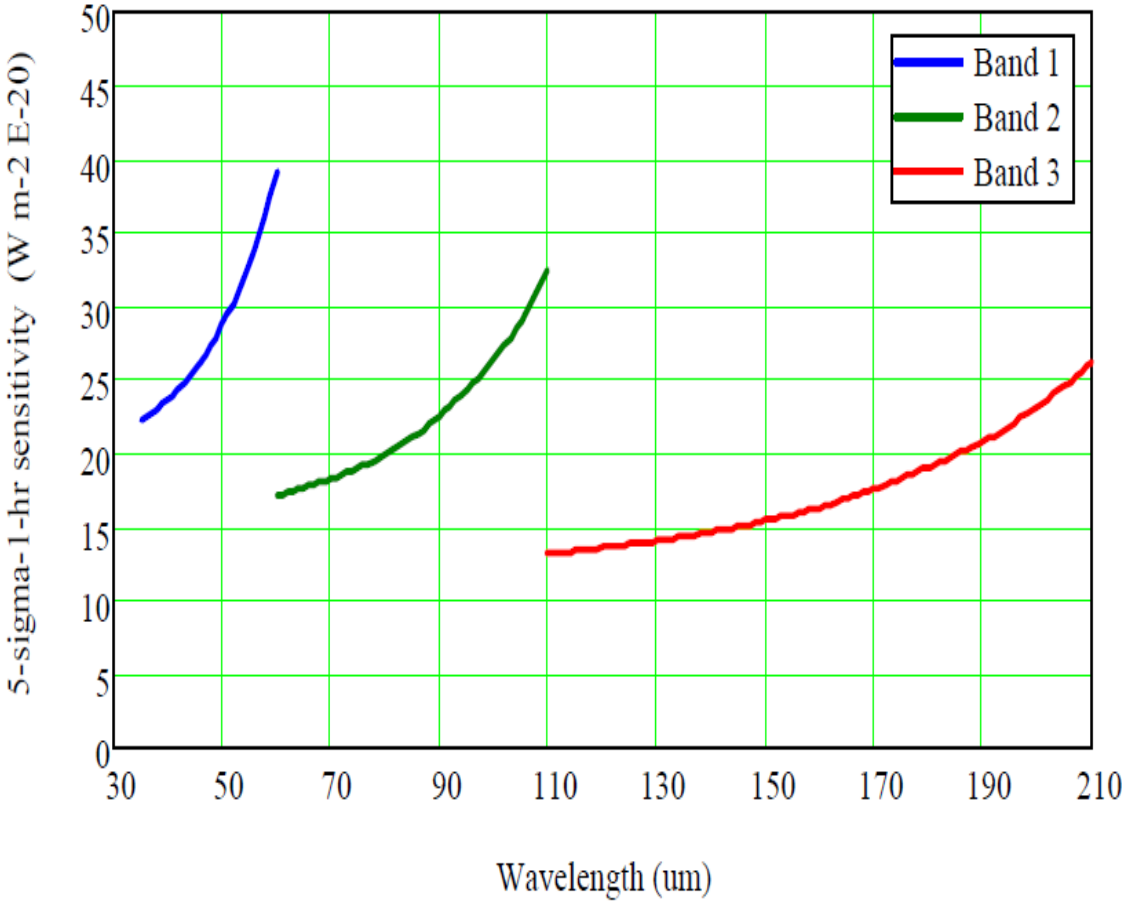
	Band	λ_c	Pixel Size on sky	Number of pixels	Field size
	μm	μm	arcsec		Arcmin
SW	34-60	48	1.8	64x64	1.92
MW	60-110	85	3.05	38x38	1.93
LW	110-210	160	5.75	20x20	1.917





Low-G detector targeted to SAFARI sensitivity goal requirements

Detector Sensitivity vs. NEP



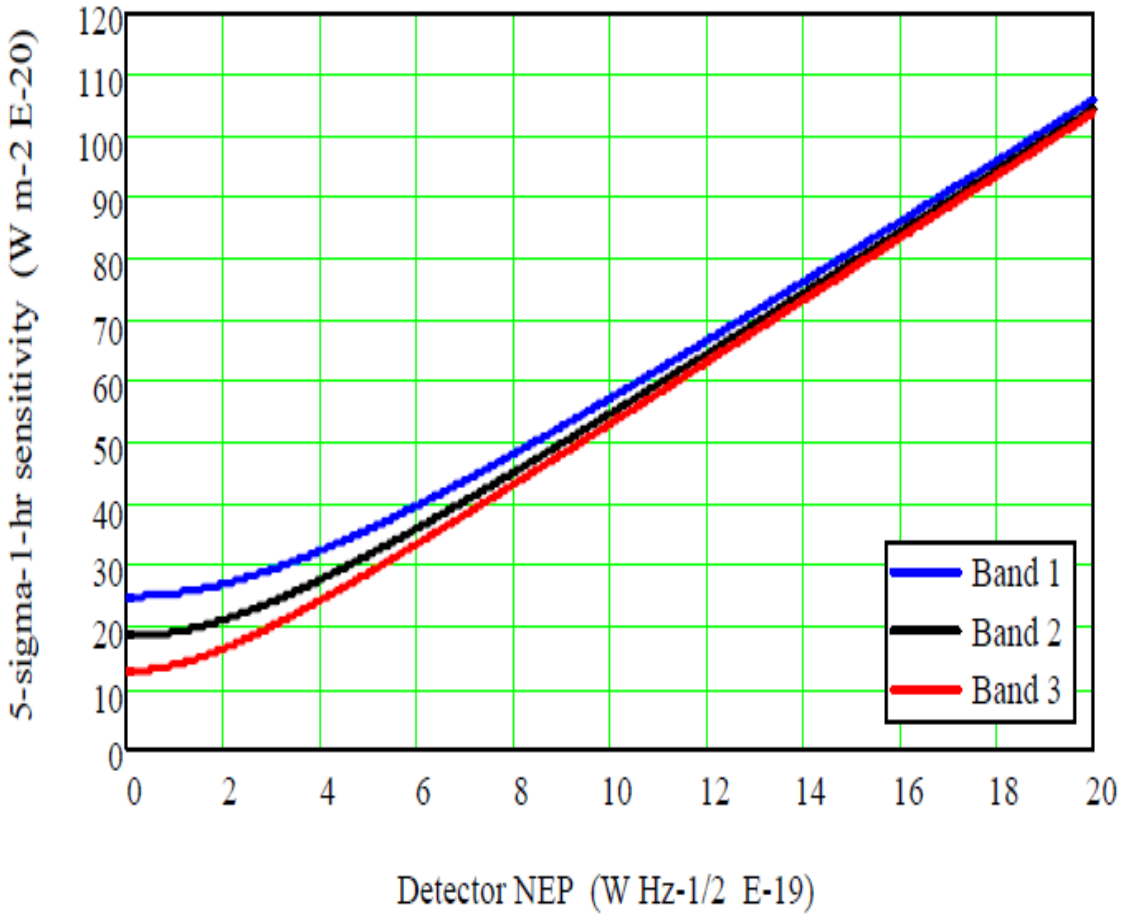


Figure 3: Impact of detector NEP on the resolved line sensitivity

NEP = 2×10^{-19} WHz$^{-1/2}$ is good enough.

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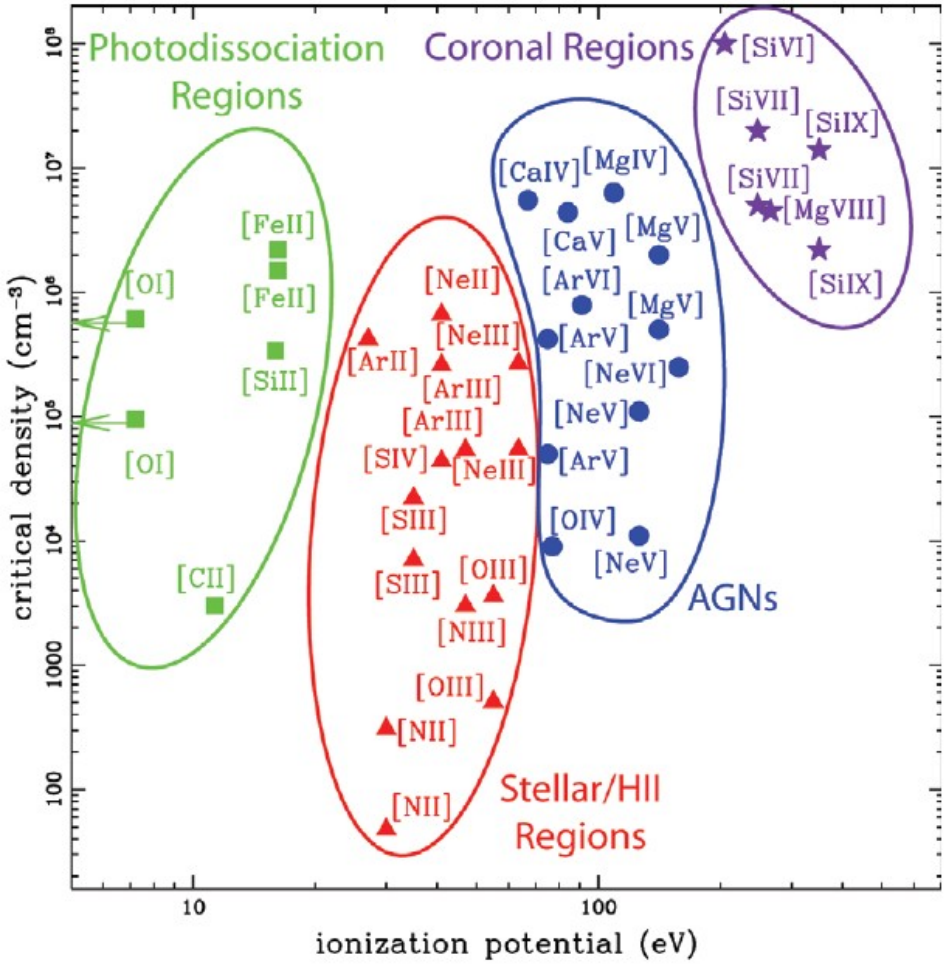
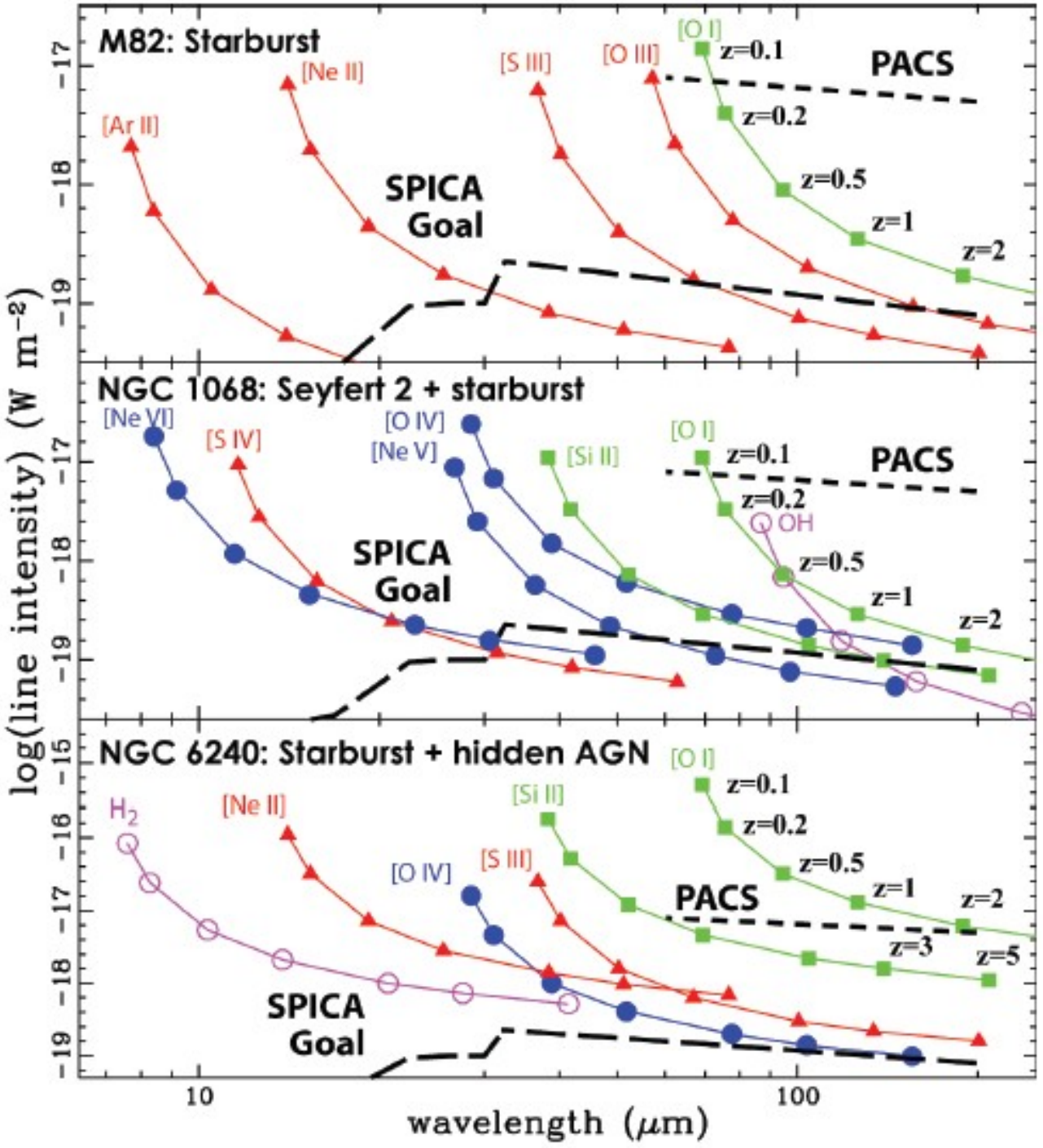
Tagetted Spectroscopy @z=1 galaxies:





Though dwarf SB (M82: 4x10^{10}Lsu is hard to be detected, LIRGs can be detected with SAFARI

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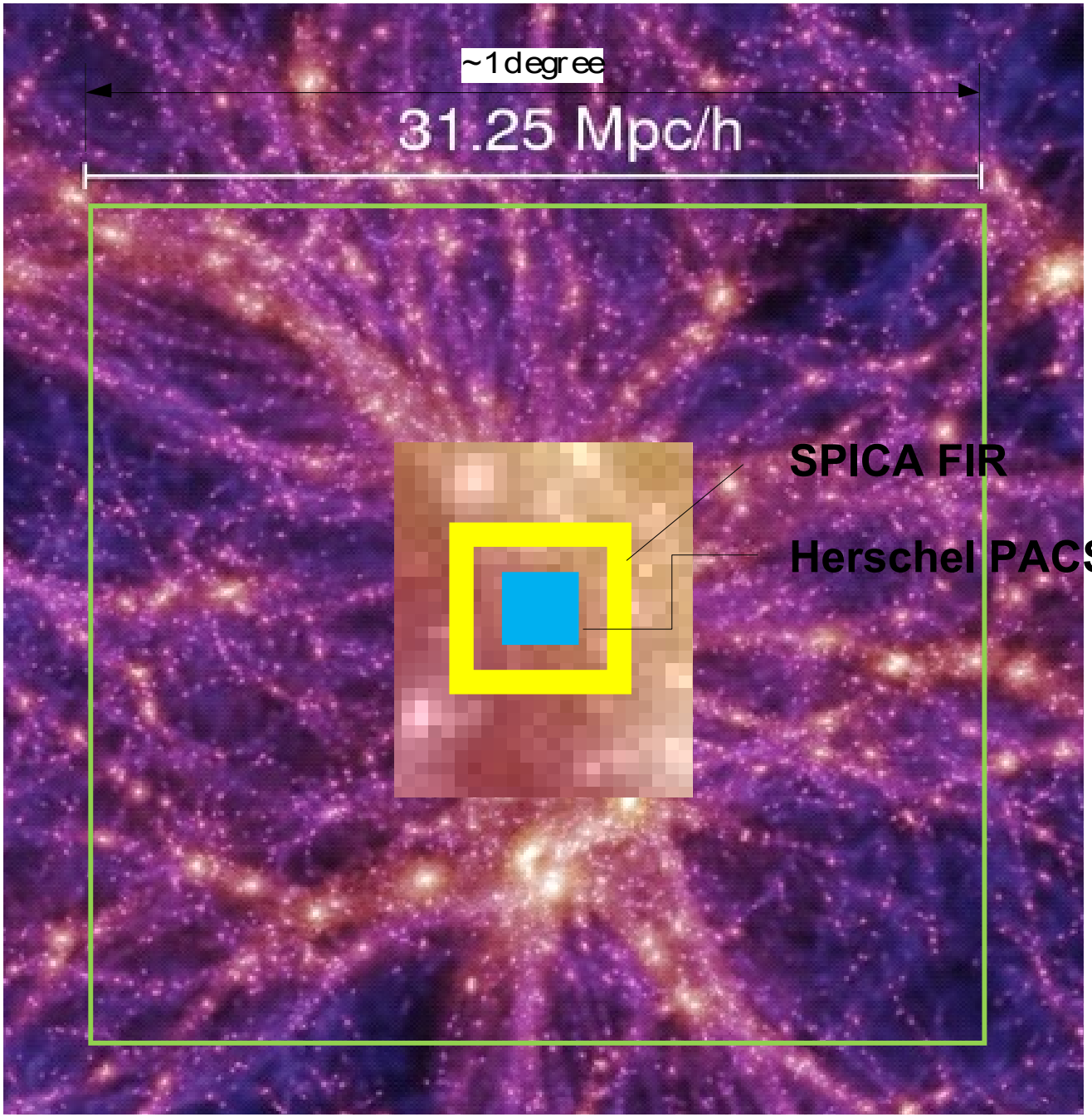
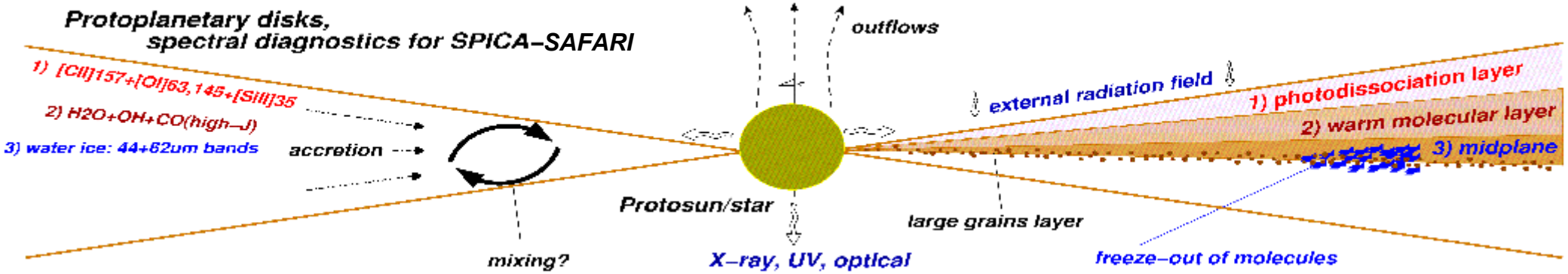
SAFARI 900 hour spectral survey



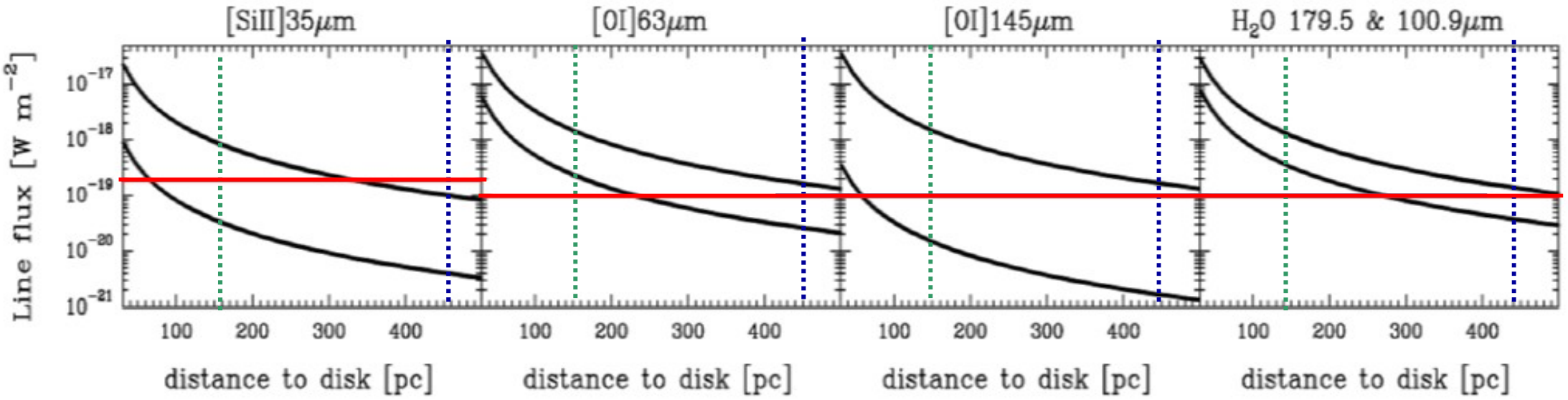
The formation of planetary systems

Several hundred exo-planets discovered to-date, however the formation and evolution of planetary systems is poorly understood



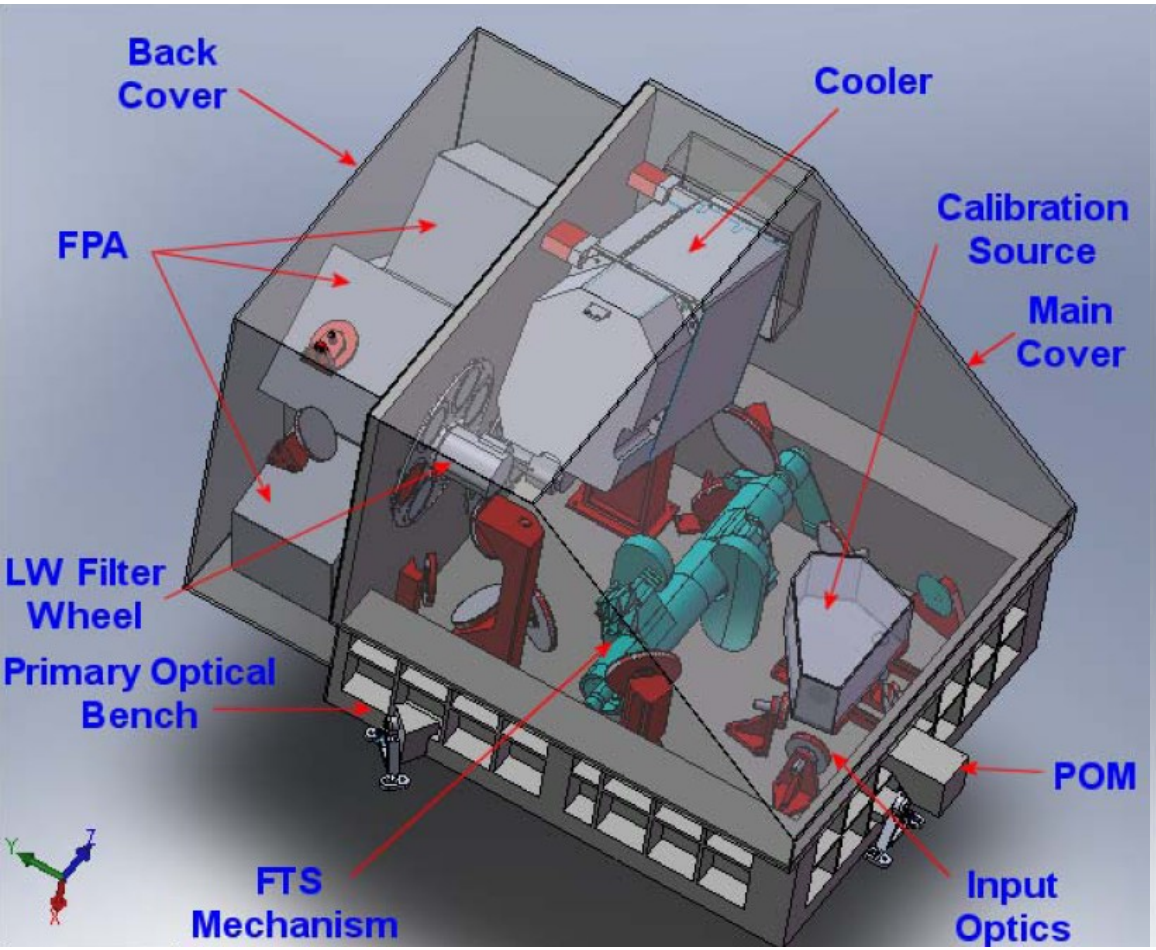
- **MIR/FIR hosts unique diagnostics of the different material phases (eg. gas, dust, ice) in planetary system formation**
- **SAFARI: traces all layers**
  - **Photodissociation layer →major FIR cooling lines**
  - **Warm molecular layer → CO, HCN, CN… ALMA; H_2O, OH.. SAFARI**
  - **Midplane → ices: site of dust coagulation planet formation**
    → dust mineralogy: history of dust
- **By tracing presence and distribution of the gas, dust and ices can:**
  - **Constrain physical conditions and processes in protoplanetary disks**
  - **Test planet formation and evolution theories**

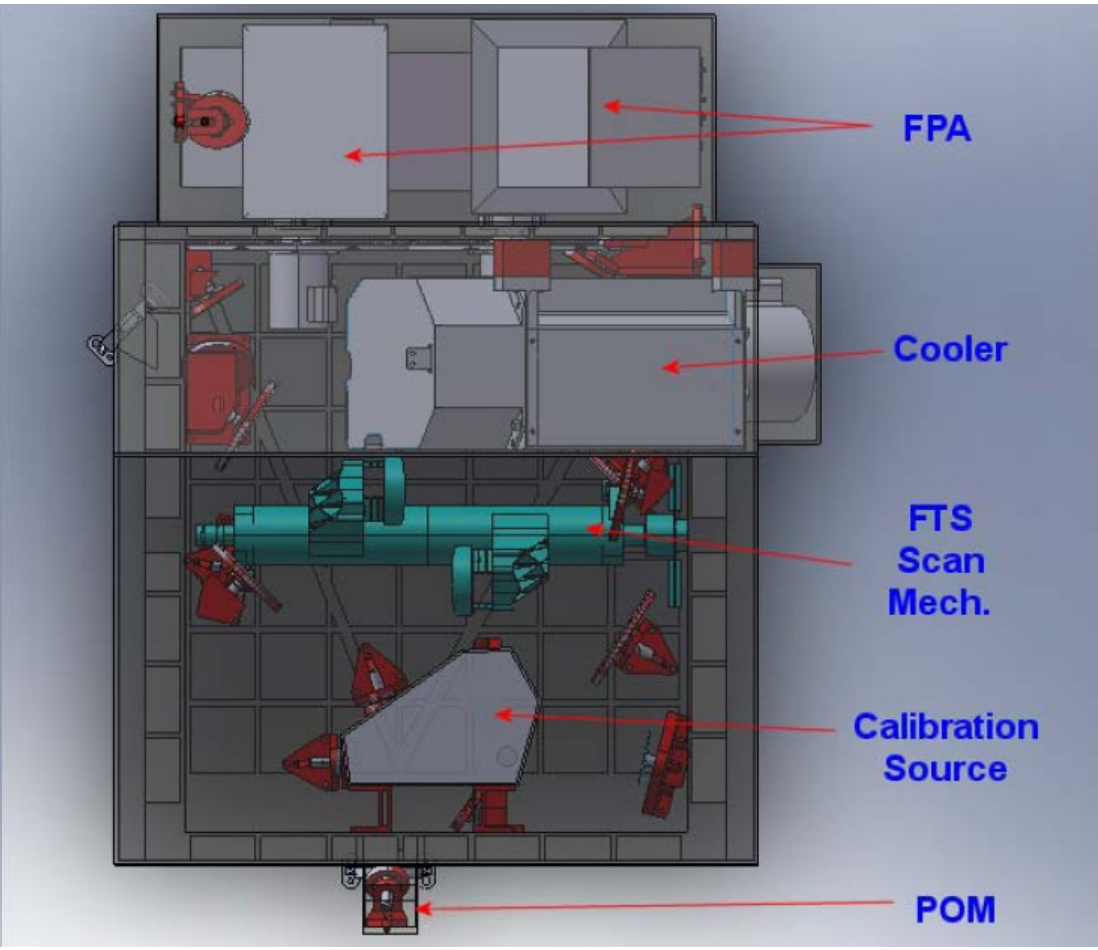
Tracing gas in circumstellar disks

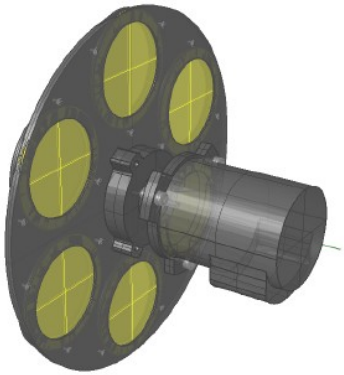


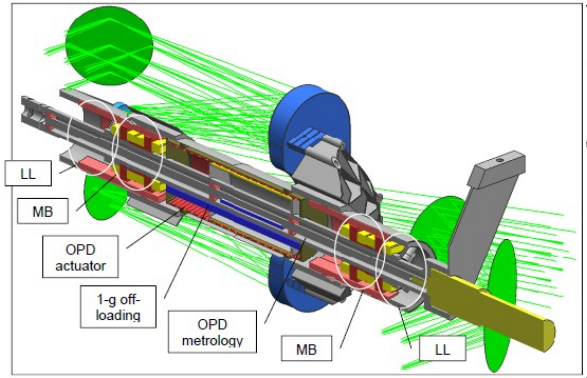
- **Key cooling lines e.g. [CII], [OI] [63,145], [SiII]**
- **Faint, but can detect out to >100pc**
  - **Covering many SFRs regions, low-mass (eg.Taurus) and high-mass (Orion)**
- **Extensive range of host stars and disks → test models**

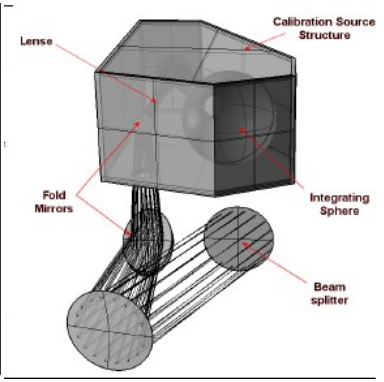
Hardware design

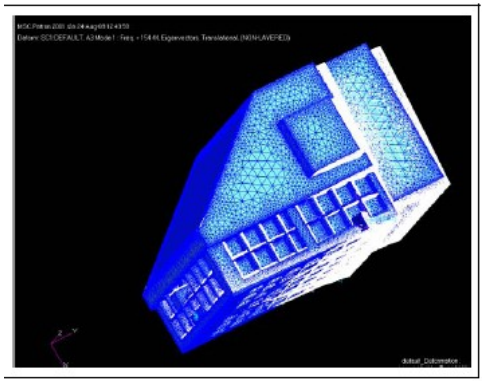












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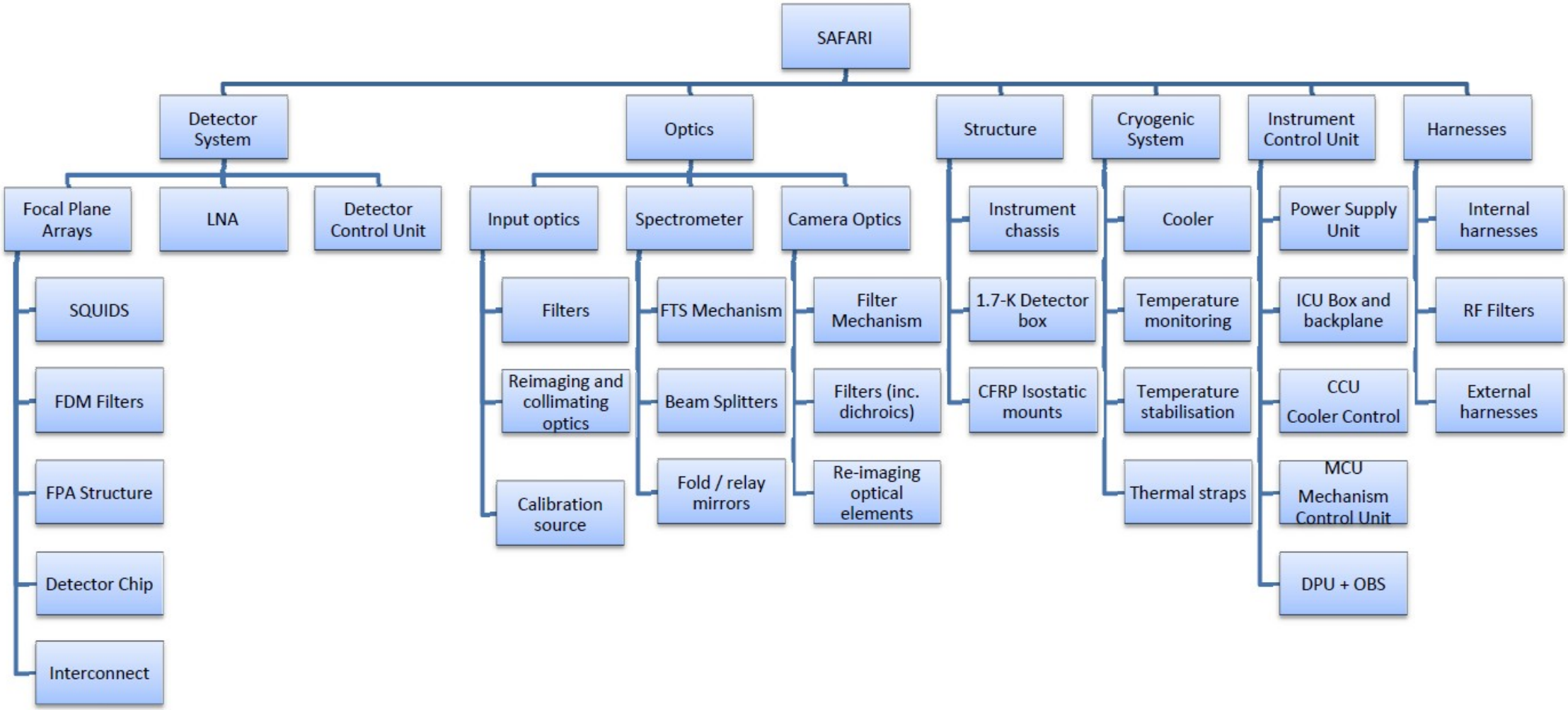
5.2.1 System Design



Schedule

- Detector Technology Selection (June 2010)
- Science Verification Review (October 2010)
- Detector System Design Review (December 2010)
- DM&STM unit delivery (December 2011)
- STM delivery to JAXA (October 2011)
- QM delivery to JAXA (April 2015)
- FM delivery to JAXA (January 2017)
- Launch (2018)