Current Status of SPICA

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1. Mission Summary of SPICA

- Top-level Goal
  - To reveal the process in which the universe has become enriched with heavy elements(*) and dust, leading to the formation of habitable worlds.
    (*) elements except hydrogen and helium, mainly referring to carbon, oxygen, nitrogen
- Framework and Current Status
  - An International mission based on the Japan-Europe partnership
  - After the re-examination process in JAXA as one of candidates of the strategic medium class missions of space science, SPICA successfully passed the Mission Definition Review by JAXA in November 2015.
  - SPICA is to submit a proposal for a call for candidates of medium-class missions in ESA Cosmic Vision(CV/M5). The proposal is under preparation by the SPICA team consisting of mainly Japanese and European scientists.

- SPICA Baseline Specifications
  - Telescope: effective aperture 2.5 m, cooled below 8K by cryocoolers provided by JAXA
  - Range of core wavelength: 17–230 mm
    (High-resolution spectroscopy in 12–18 mm)
  - Orbit: Halo around S-E L2
  - Launcher: JAXA H3 Rocket
  - Launch Year: 2027–2028

SPICA Current Status

1. Mission Definition Revised

- Revised Design of the Mission Payload
  Telescope Primary Mirror Φ2.5m 8K ,
  Planck-like configlation
- Optimization of Science Instruments for the mail science goals
- Higher sensitivity, more powerful facility as a result
- Exoplanet transit spectroscopy instrument is now omitted from the base-lien plan (it is optional)
- Reviews for the new design
  - International Science Review (Paris、7/15)
  - Mission Definition Review by
    ISAS Space Science Advisory Committee(9/19)-(11/6 closed)
  - ISAS internal program review (12/3)(to be closed with some A/I)

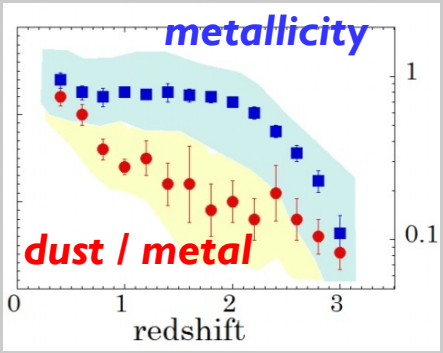
2. Preparation for ESA CV M5

- Japan/European Consortium Meeting (9/30-10/1, Bordeaux)
- Proposal being drafted by science working groups

3. JAXA's SPICA International Science Advisory Board

Science Goal (1): Metal and dust enrichment through galaxy evolution

Spectroscopic studies of the processes of metal and dust enrichment and their interplay with star formation and AGN activities through galaxy evolution from the early to the present Universe.

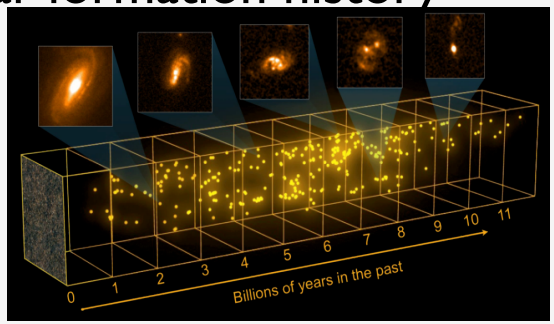


Spatially-resolved, high-z analogs or relics

~4,000 nearby galaxies at <100 Mpc

Spectral mapping

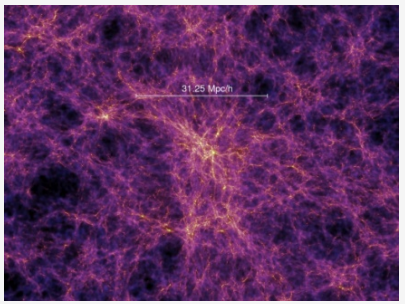
Over the peak of the cosmic star-formation history



~60,000 galaxies at z = 0.5 – 4
1,000 SF galaxies & 1,000 AGNs for detailed study

Unbiased spectroscopic survey

Beyond the peak, first mineral, aromatics

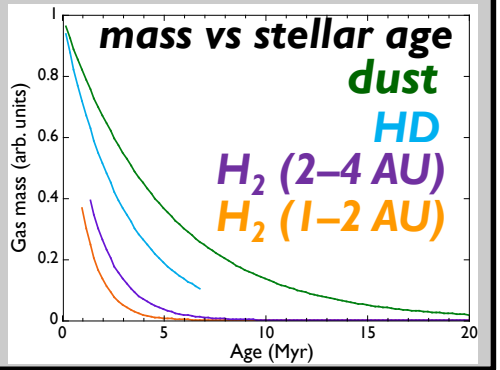


>100 galaxies at z = 4 – 10

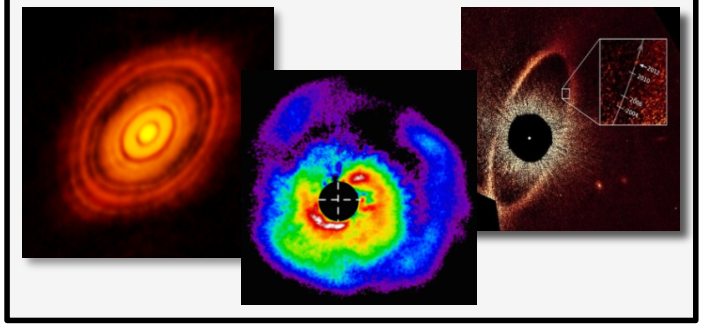
Targeted spectroscopy

Science Goal (2): Planetary formation to habitable systems

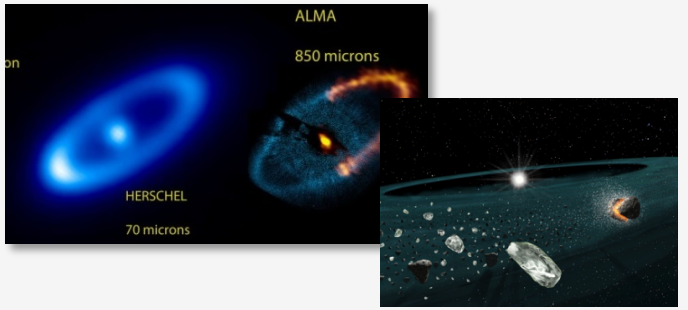
Spectroscopic studies of the processes of gas dissipation and dust evolution in planet-forming disks at various stages.



Gas dissipation in proto-planetary disks



Changes of mineral and ice properties in debris disks



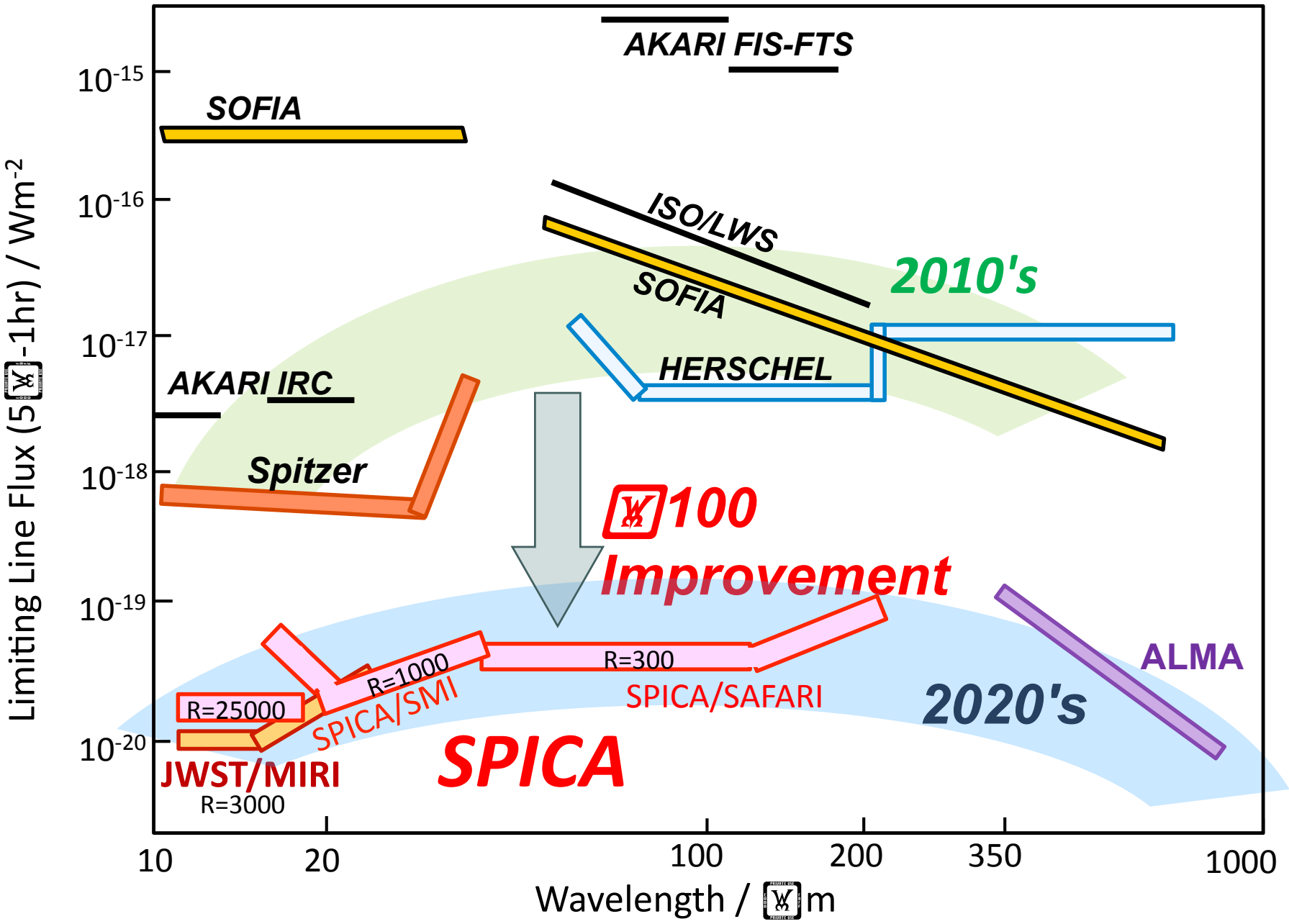
>200 proto-planetary disks

>1,000 debris disks with mid-IR excess down to the solar system level

Targeted spectroscopy

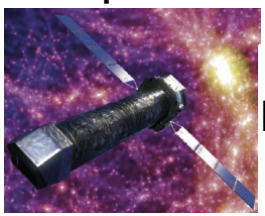
Unbiased spectroscopic survey

SPICA Sensitivity

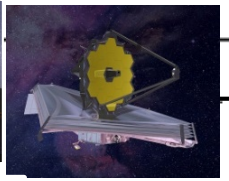


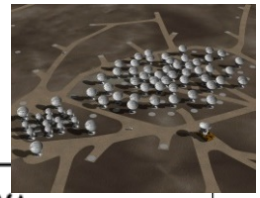
SPICA Synergy with Other Astronomy Facilities

ATHENA:
AGN central engine, hot plasma

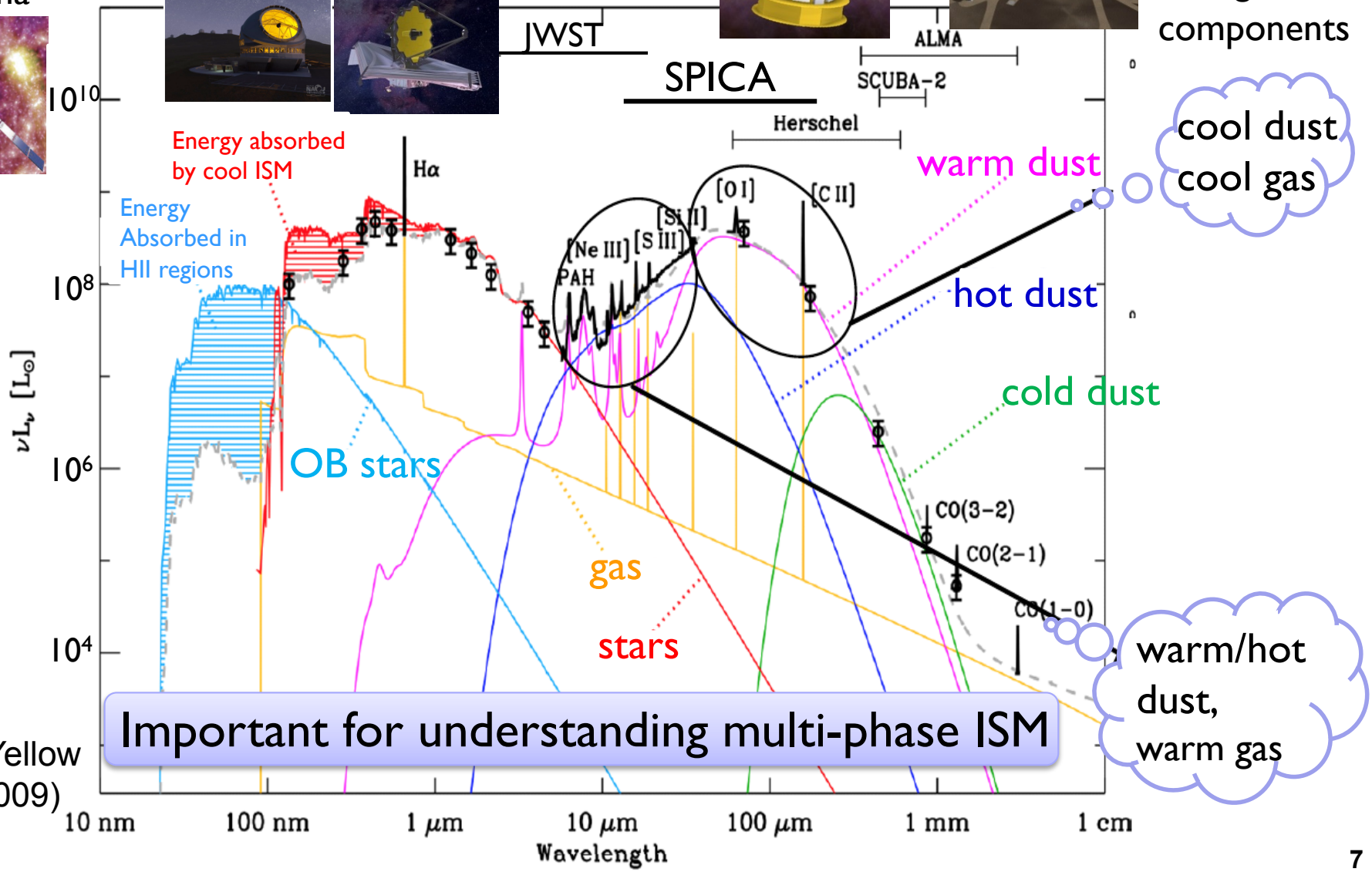


JWST (TMT):
primarily stellar components





ALMA:
cold gas components



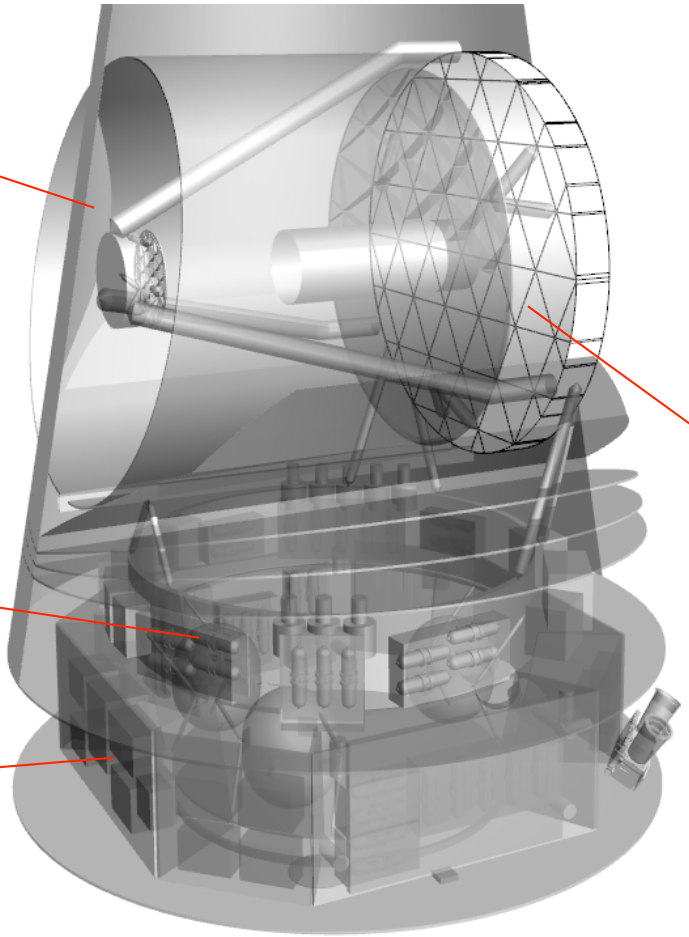
cool dust
cool gas

warm/hot dust,
warm gas

Important for understanding multi-phase ISM

SPICA Yellow Book (2009)

Workshare Plan



Telescope

PLM Cryogenic System

Cryocoolers

SVM

Launch (H3)

Operation (NAOJ)

Focal Plane Attitude Sensor

Focal Plane Instruments

SPICA FIR Instrument (SAFARI)

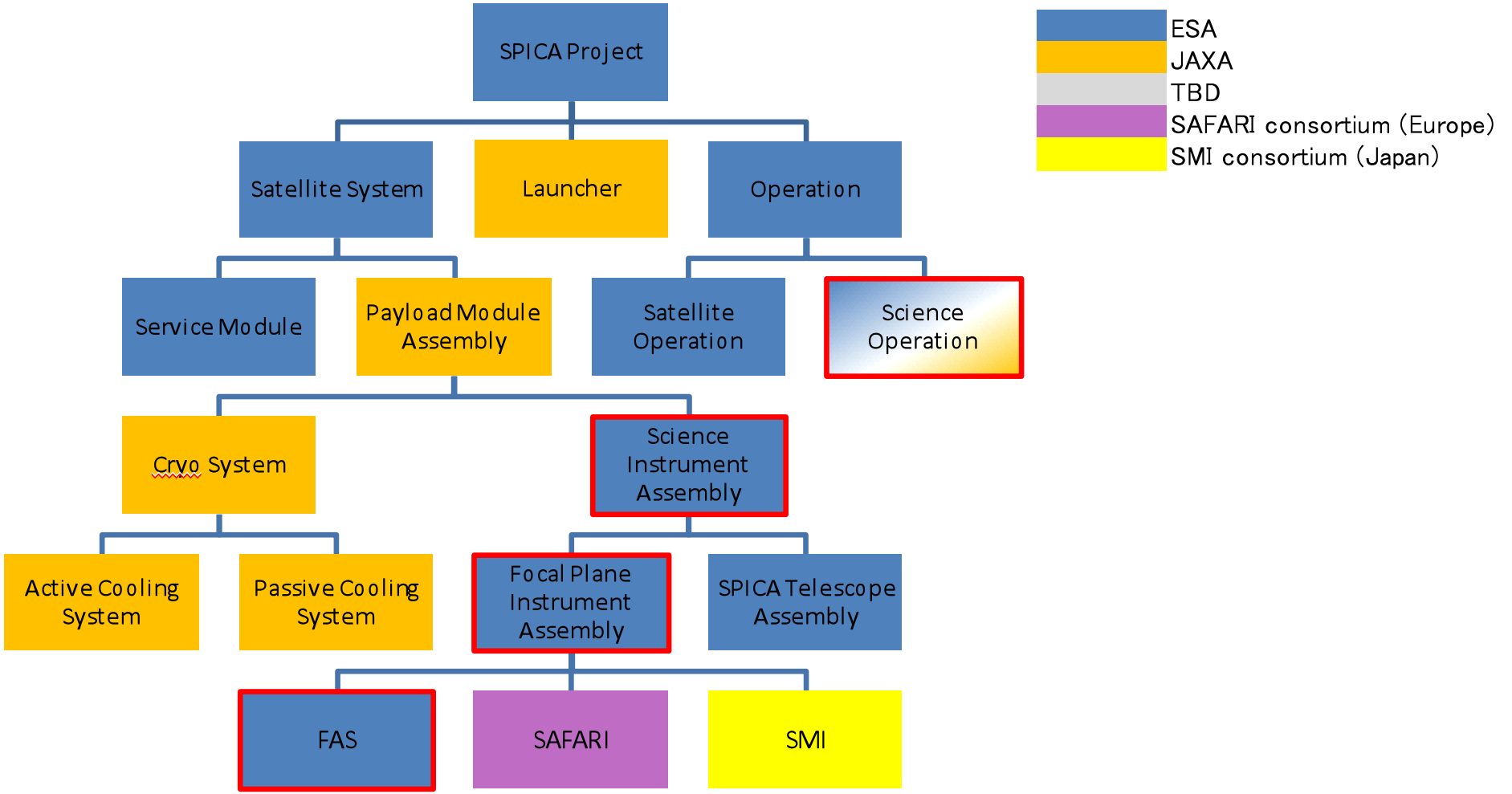
NL + European countries + Canada & US

SPICA MIR Instrument (SMI)

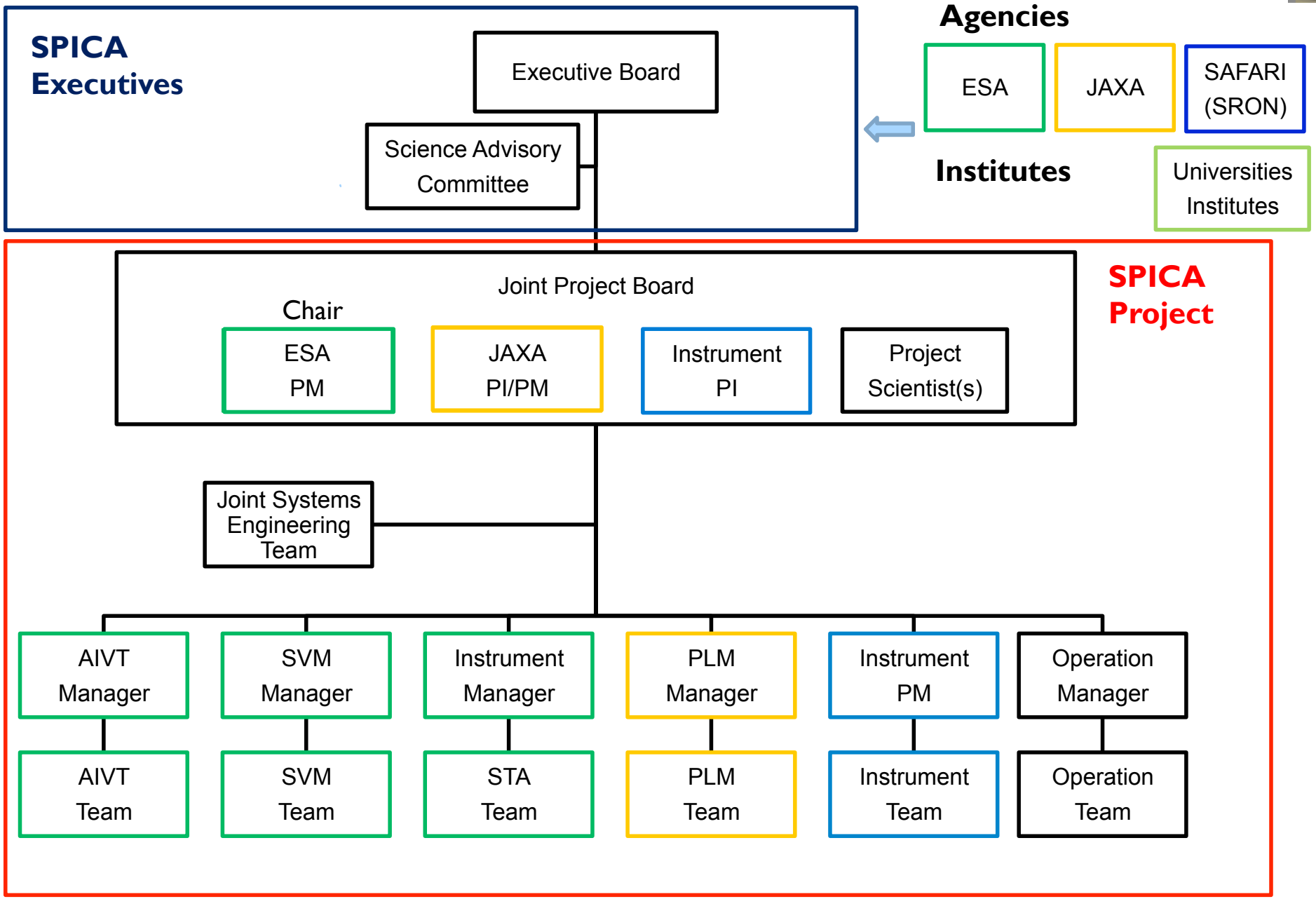
Science Community

Work Share Plan

（赤枠はCDF前提からの変更事項）



プロジェクト全体の実行体制(till Phase-D/E)



Project Master plan (tentative)

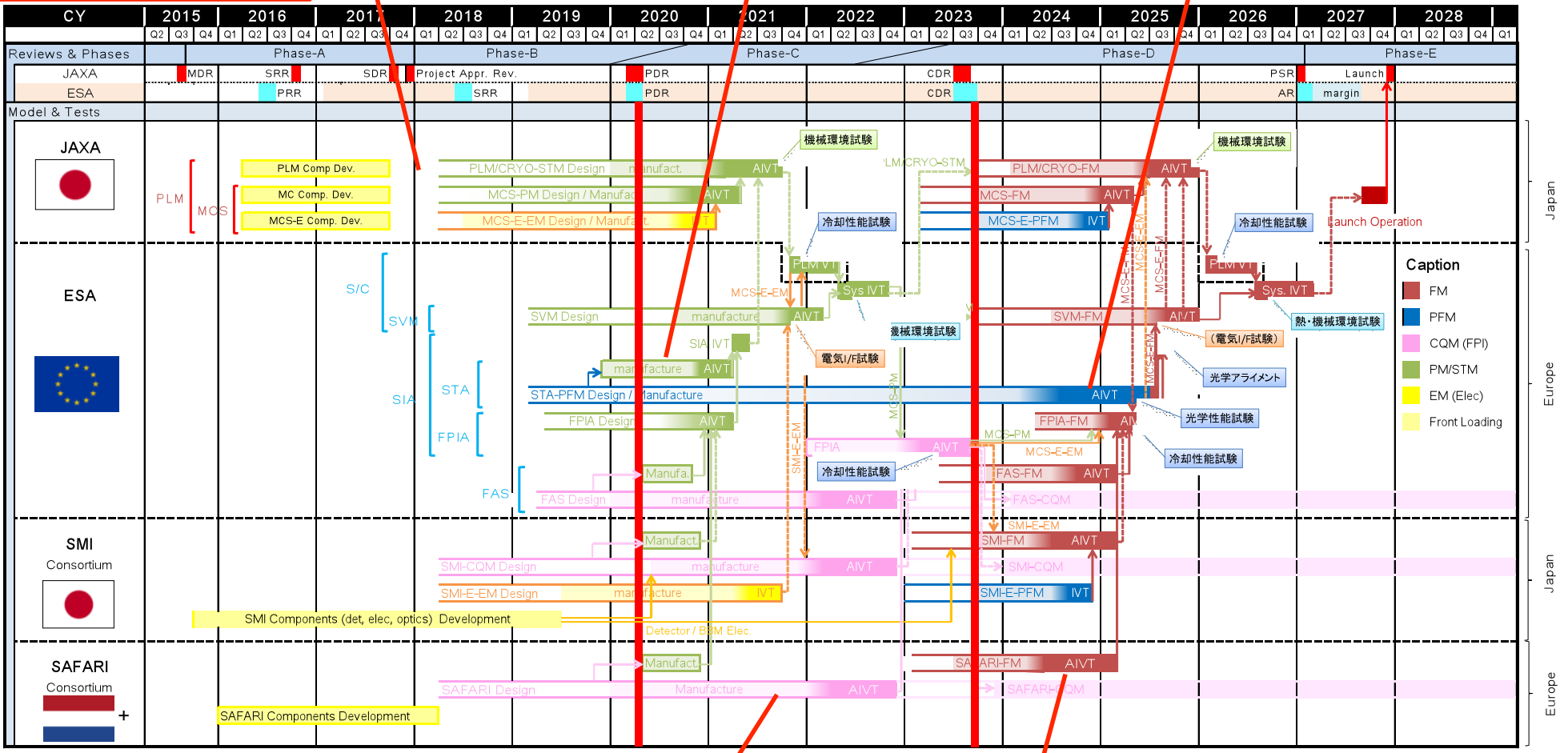
	ISAS/JAXA	ESA
Nov. 2015	Mission Definition Review (passed)	
Dec. 2015	ISAS Project Preparation Review	
July. 2016		Submit Cosmic Vision M5 Proposal
Sep. 2016		1st down selection of M5
(Dec. 2016)	System Requirement Review	・CDR ・Industry Study
(Jan. 2017)	ISAS Phase-up Review	
(Feb. 2017)	JAXA Project Preparation Review	
(May 2018)	System Definition Review	
(Jun. 2018)	ISAS Project Phase-up Review	
(Aug. 2018)	JAXA Project Phase-up Review	
Nov. 2018		Final Selection of M5 Mission
↑ Project Approval in both Japan and Europe		
2020	PDR	
2023	CDR	
2027/28	Launch	

Development Schedule (tentative)

Project Approval in both Japan & Europe

STA-STM Delivery

STA-FMの Delivery



SAFARI-CQM Delivery

SAFARI-FM Delivery

Assumption:
Project start in FY2018
Launch in FY2027