

A 3D cutaway rendering of the LiteBIRD satellite. The satellite has a central body with a large cylindrical instrument mounted on top. Two large, rectangular solar panel arrays are extended from the sides. The central body is shown in a semi-transparent grey, revealing internal components. The solar panels are grey with a grid pattern. A yellow, textured, rectangular component is visible on the underside of the central body.

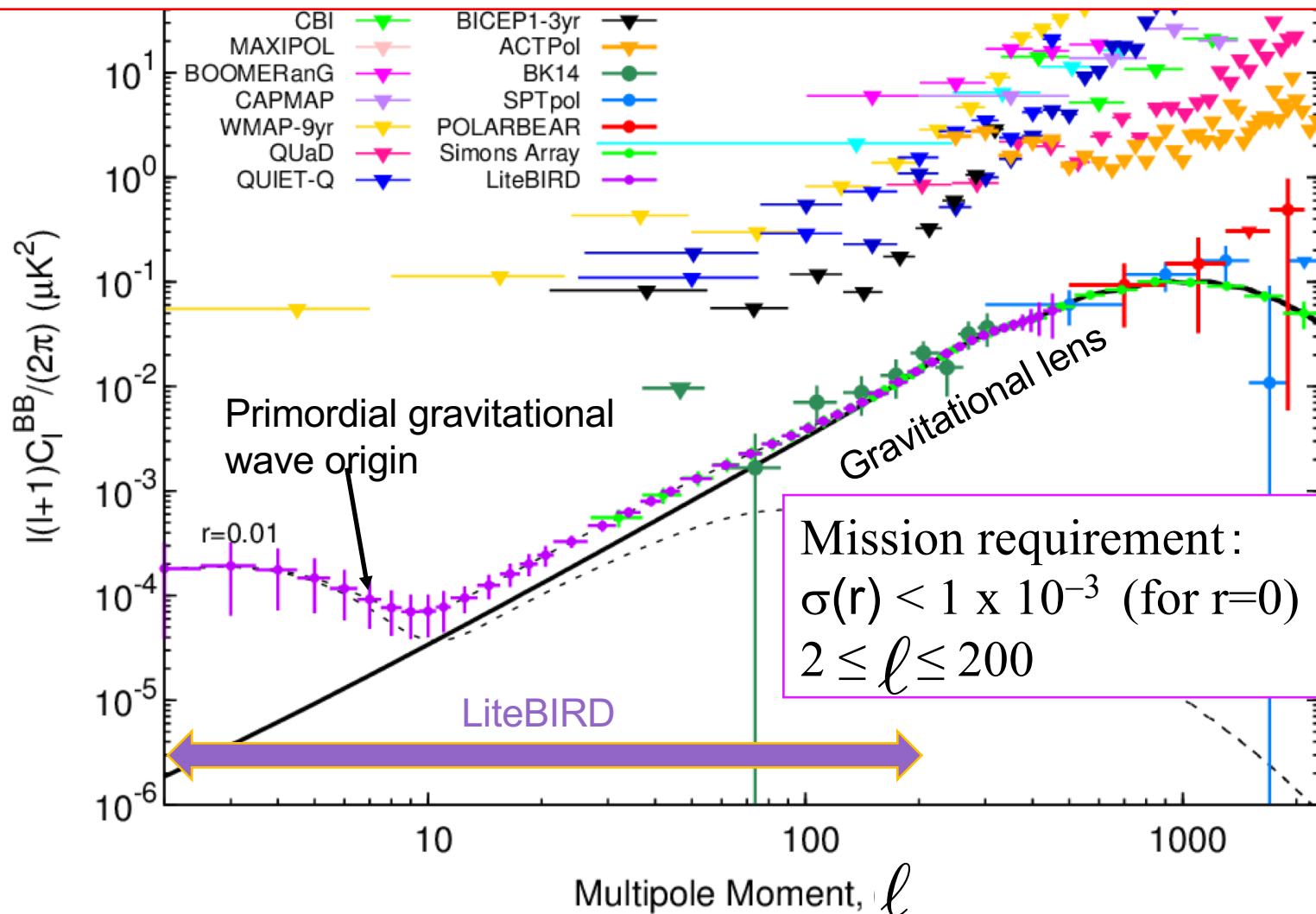
LiteBIRD Mission Overview

July 2, 2019

Tadayasu Dotani (ISAS/JAXA) and the LiteBIRD team

LiteBIRD : Science Objectives

- A definitive search for the CMB B-mode polarization from cosmic inflation.
- Either making a discovery or ruling out well-motivated large-field models.



LiteBIRD overview

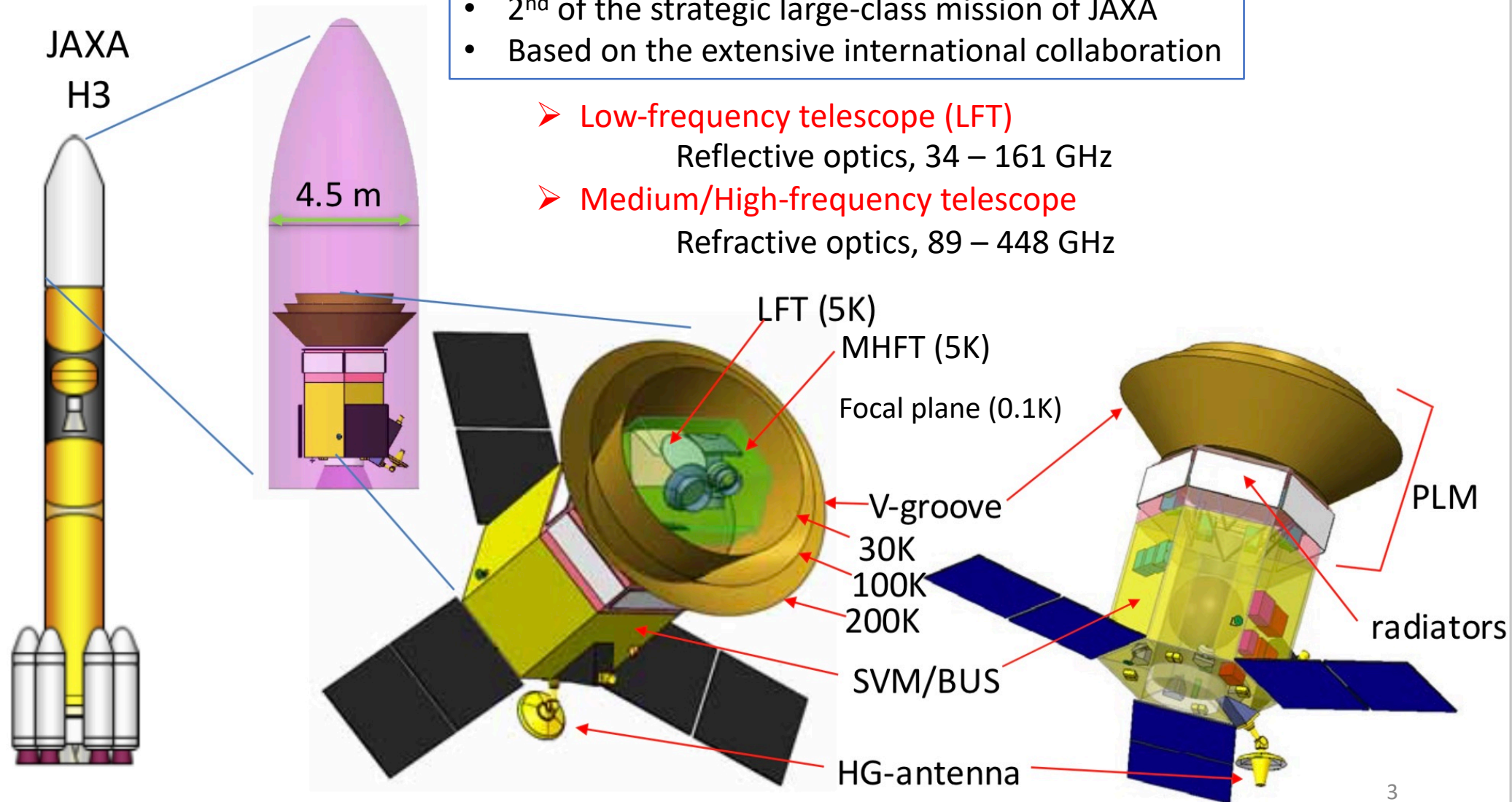
- 2nd of the strategic large-class mission of JAXA
- Based on the extensive international collaboration

➤ **Low-frequency telescope (LFT)**

Reflective optics, 34 – 161 GHz

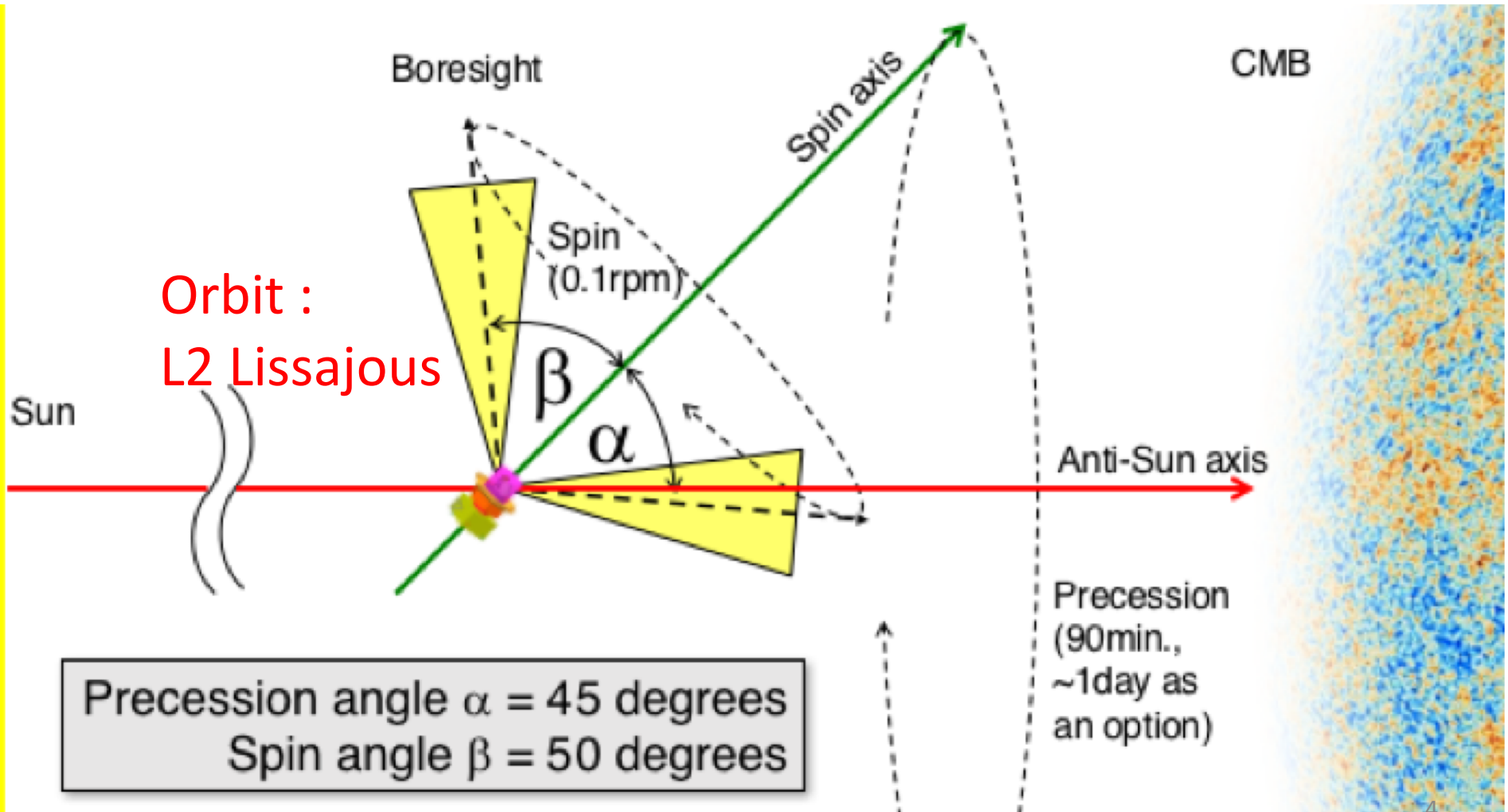
➤ **Medium/High-frequency telescope**

Refractive optics, 89 – 448 GHz



LiteBIRD : Orbit & Scan

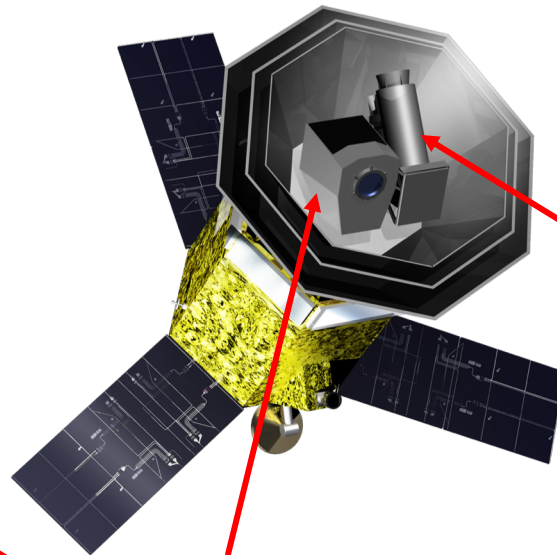
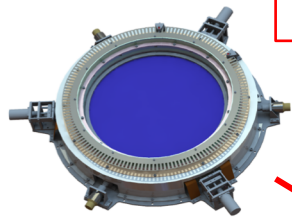
3-year observations at L2



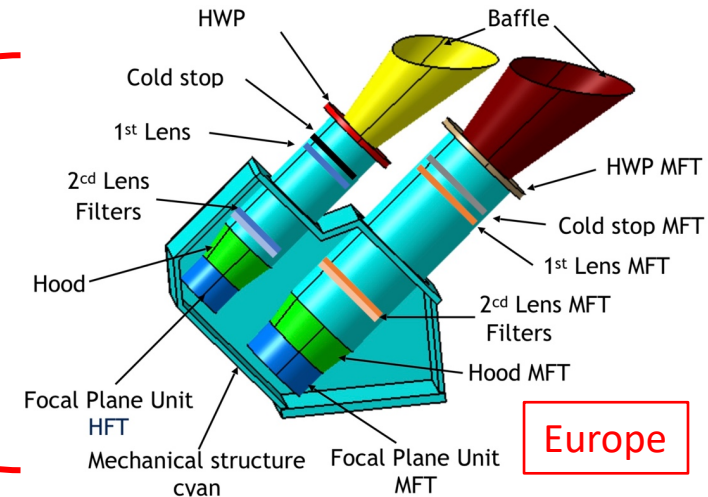
Overview of the PLM

Polarization
modulator

IPMU

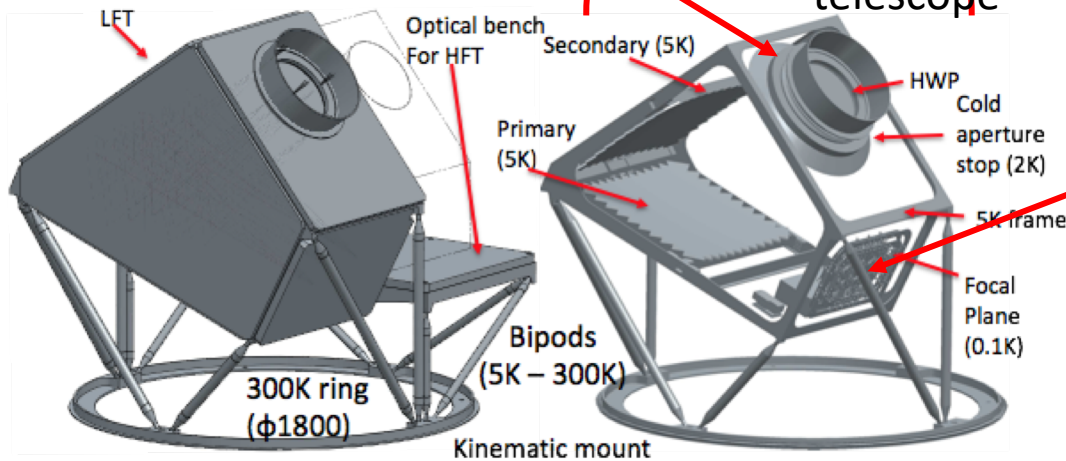


Medium/High-frequency telescope



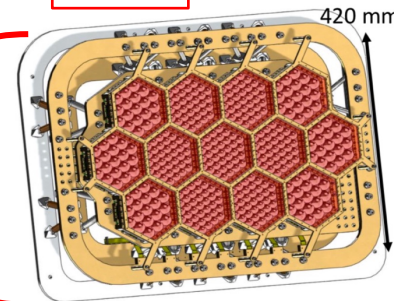
Europe

Low-frequency
telescope



With 5K enclosure

NASA



Focal plane
detectors (0.1K)

Cold readout

Warm electronics

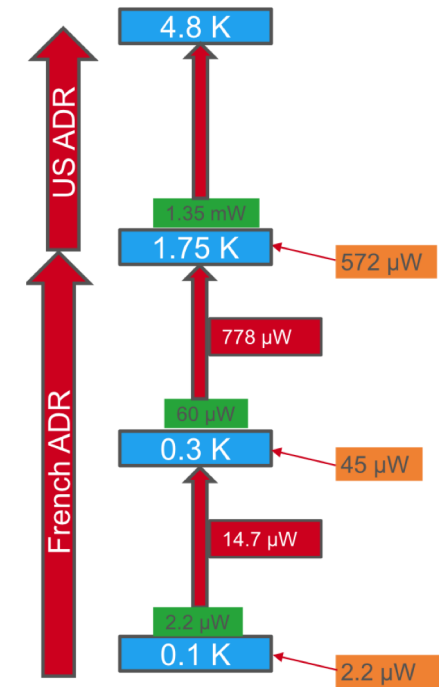
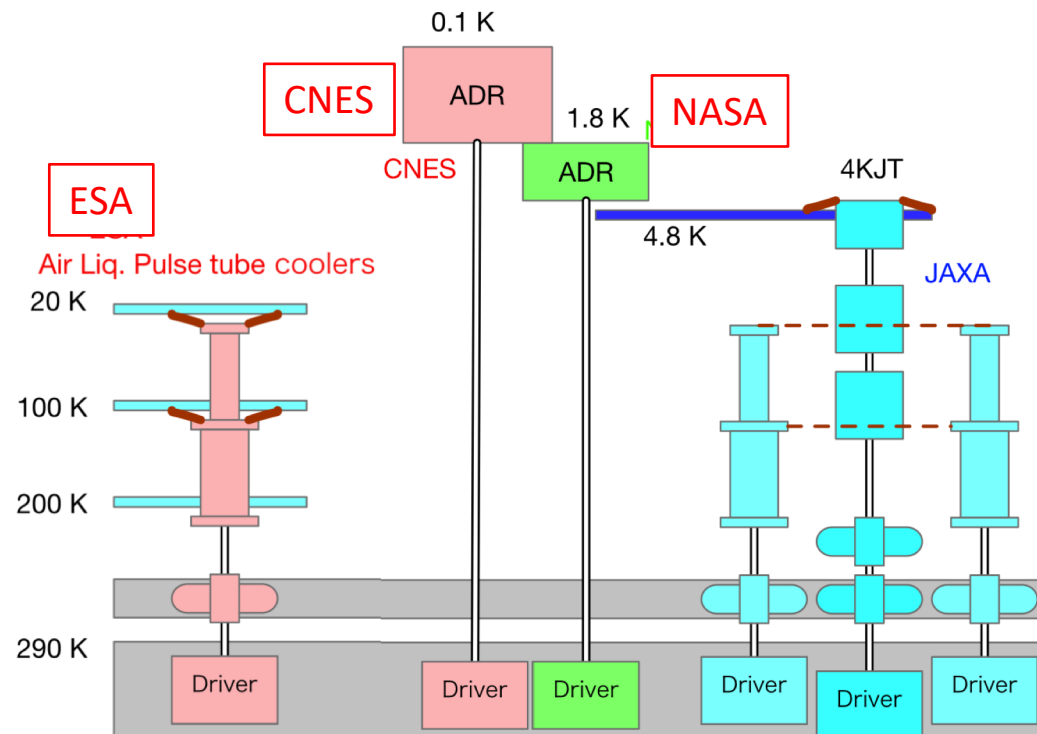
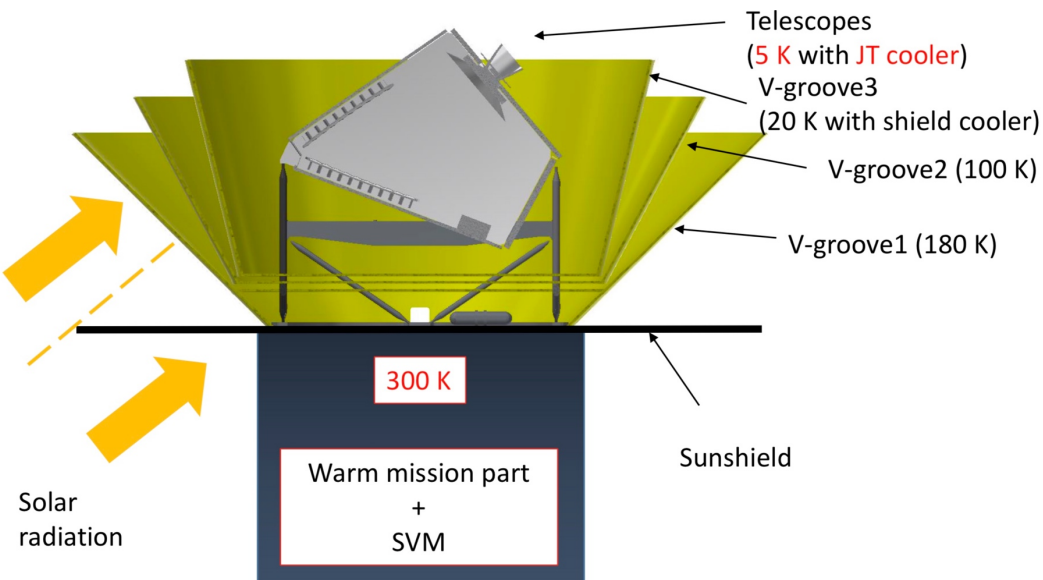
SQUID ctrl

Signal processing

CSA

SVM⁵

Cooling system



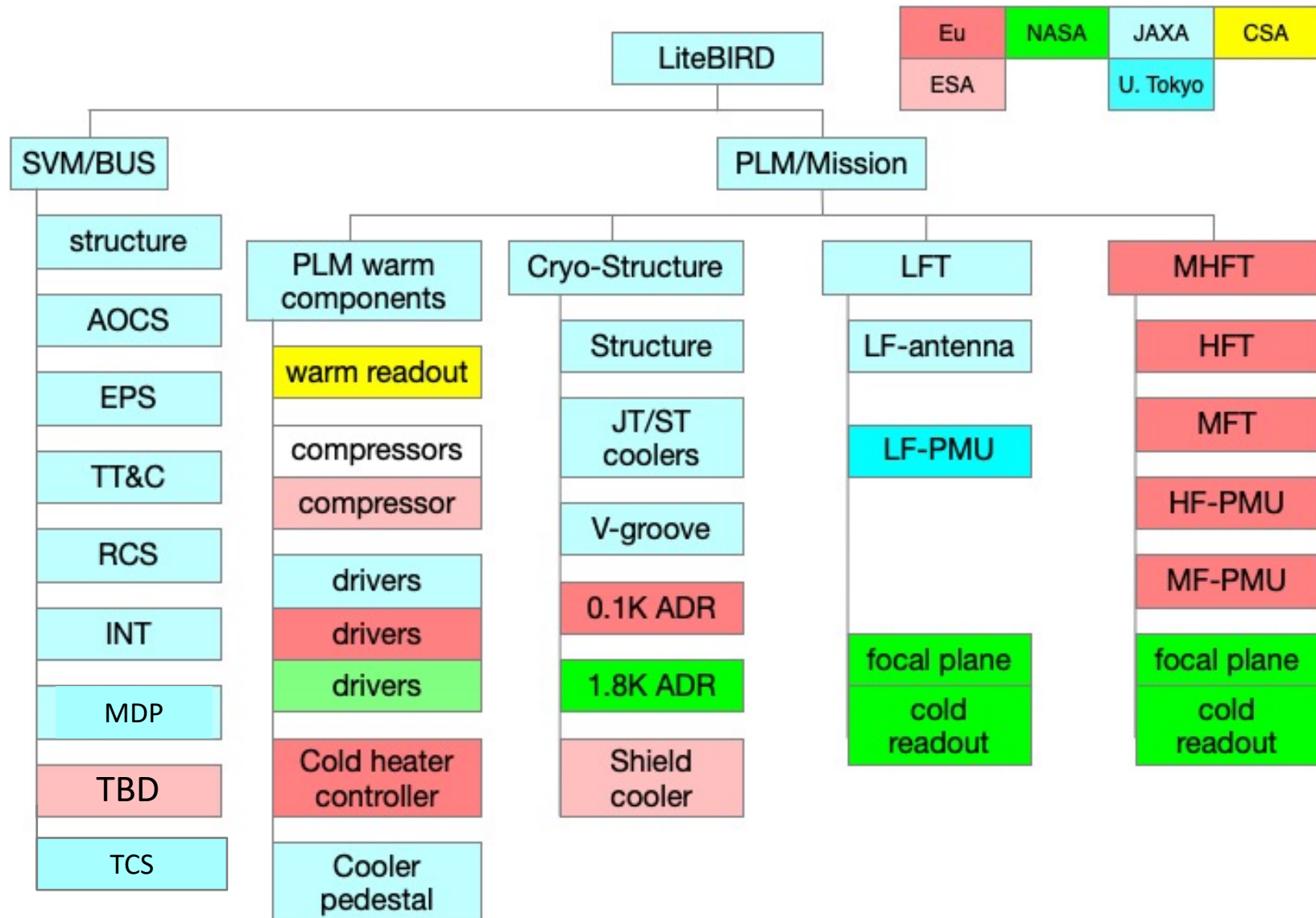
4.8 K - 1.75 K Stages

- 'Continuous' 1.8 K stage with 2 ADRs
- 2 mW at 1.8 K could be achieved
- Mass = 9 kg

1.75 K - 0.1 K Stages

- 'Continuous' 0.3 K & 0.1 K stages
- 2.2 μ W at 0.1 K could be achieved
- Mass = 10.2 kg

Product Tree



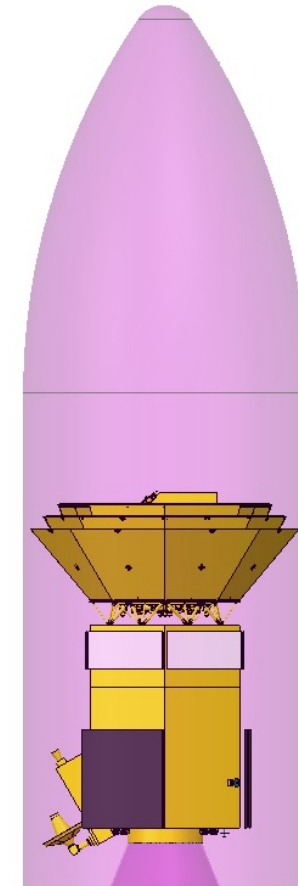
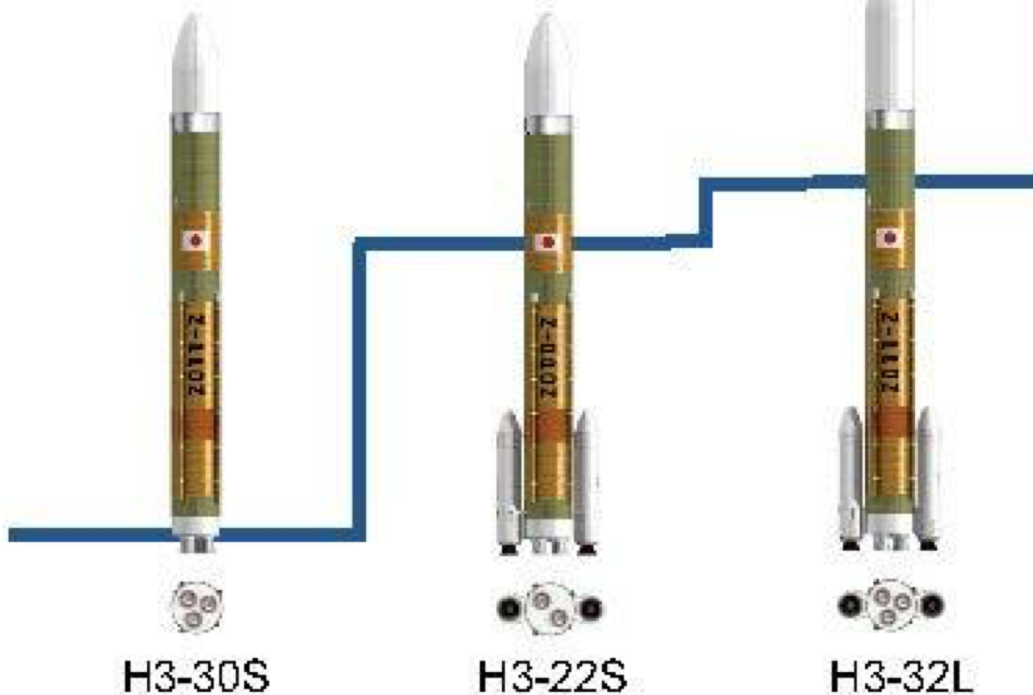
Launch vehicle

LiteBIRD will use H3-22L

H3-22L

- Two main engines.
- Two solid rocket boosters
- Long fairing

Launch capability to
GTO ($\Delta V = 1500 \text{ m/s}$)



LiteBIRD (Launch configuration) in the fairing

Service module 1/2

AOCS

Zero-momentum, 3-axis stabilization

RW (Reaction wheel)

- Cancel the spin angular momentum
- Produce torque for precession

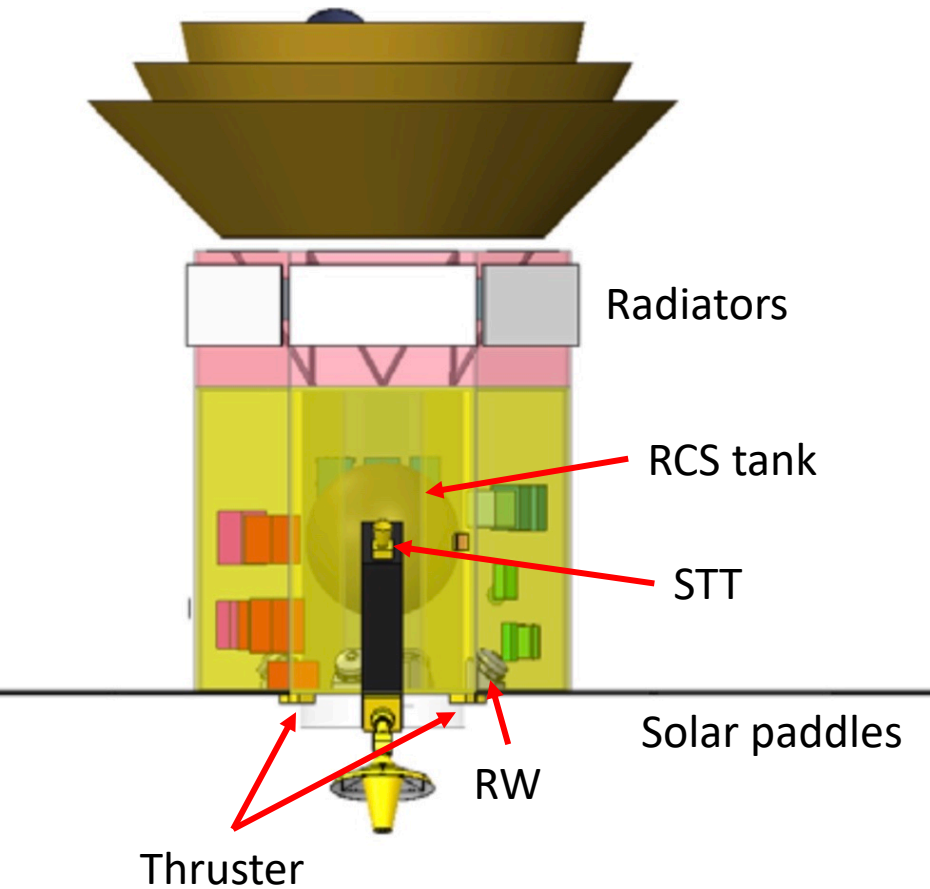
STT (Star tracker)

- High accuracy & high agility

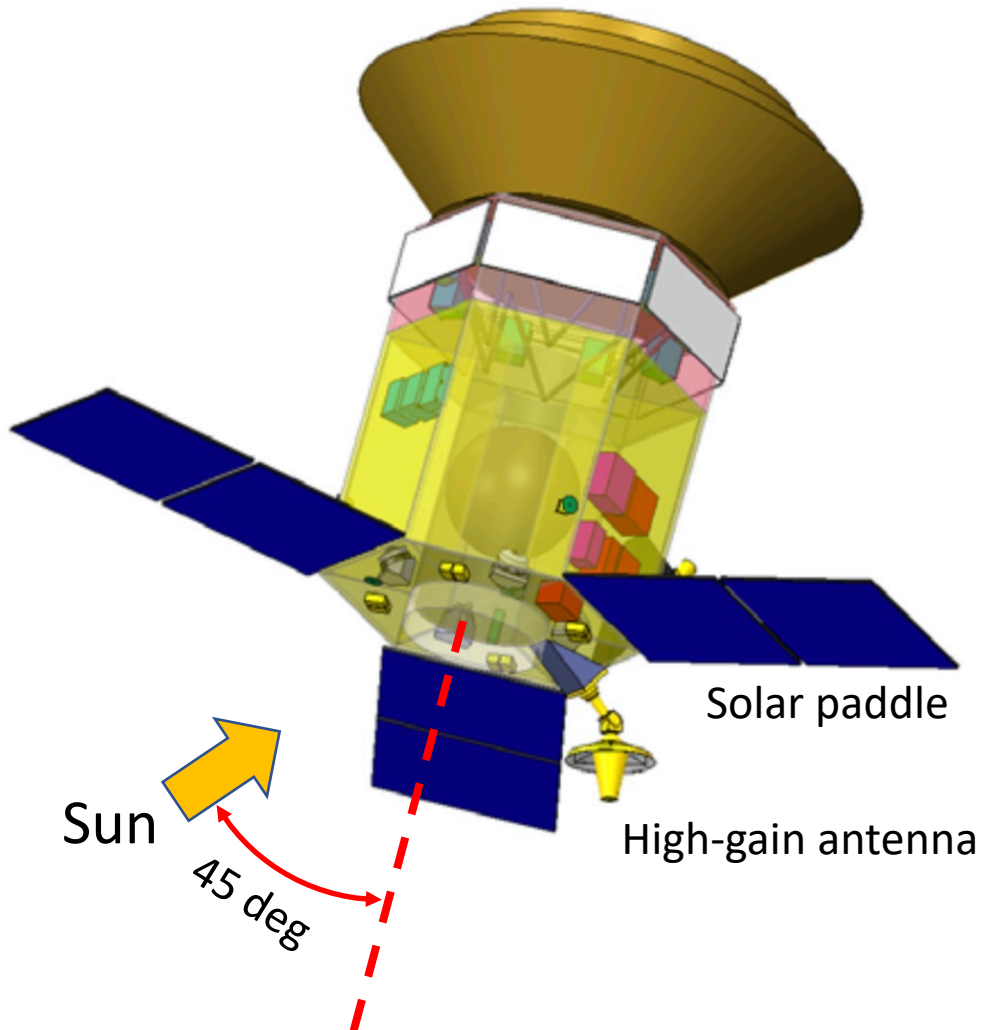
RCS

Mono-propellant (hydrazine)

- Insertion to L2
- Maneuver to keep the Lissajous orbit
- Unloading the RW



Service module 2/2



Communication system

X-band

- Command & telemetry
- Down-link of mission data

Down-link rate

High-gain antenna
-> 10 Mbps for the mission data

Data handling system

Network : SpaceWire

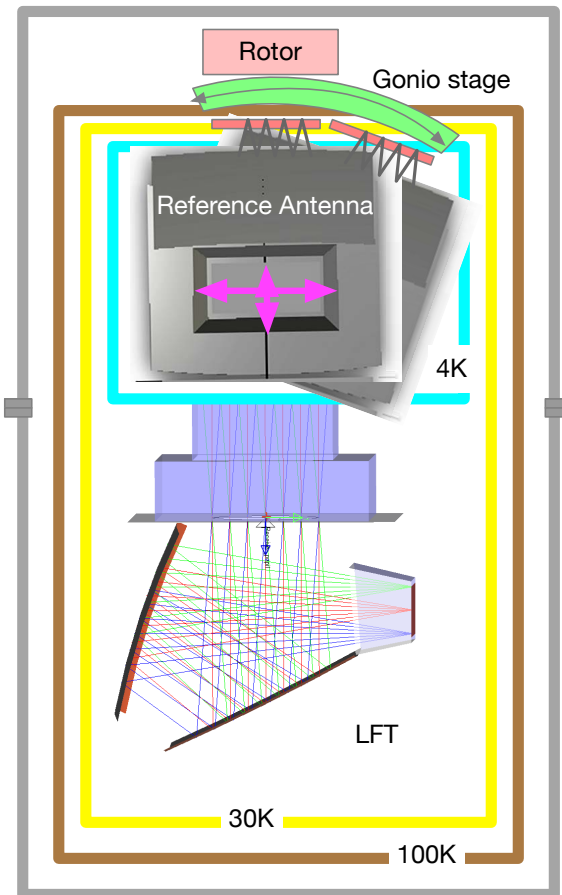
Power system

- 50V unstabilized power
- Fixed solar paddles + Li-ion battery

Ground test & calibration

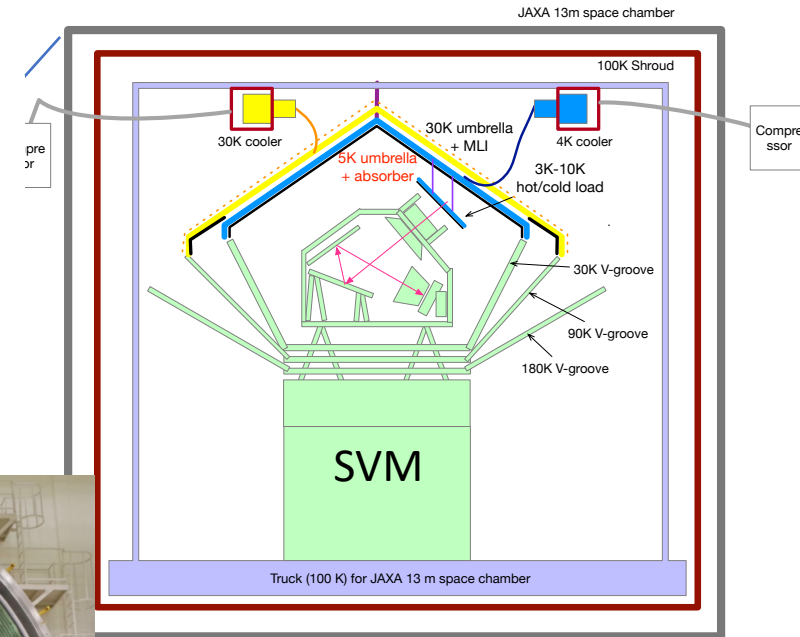
LFT

Dedicated 4K chamber will be prepared at KEK to test and calibrate the LFT.



PLM+SVM

Performance of PLM will be tested in final configuration using the cold umbrella.



JAXA 13m ϕ chamber

Ground stations

Daily operation

- Telemetry, command, ranging
- Down-link of the mission data
~3 hr/day

Either Uchinoura 34m or GRREAT 54m will be used.

Uchinoura 34m antenna



GREAT 54m antenna



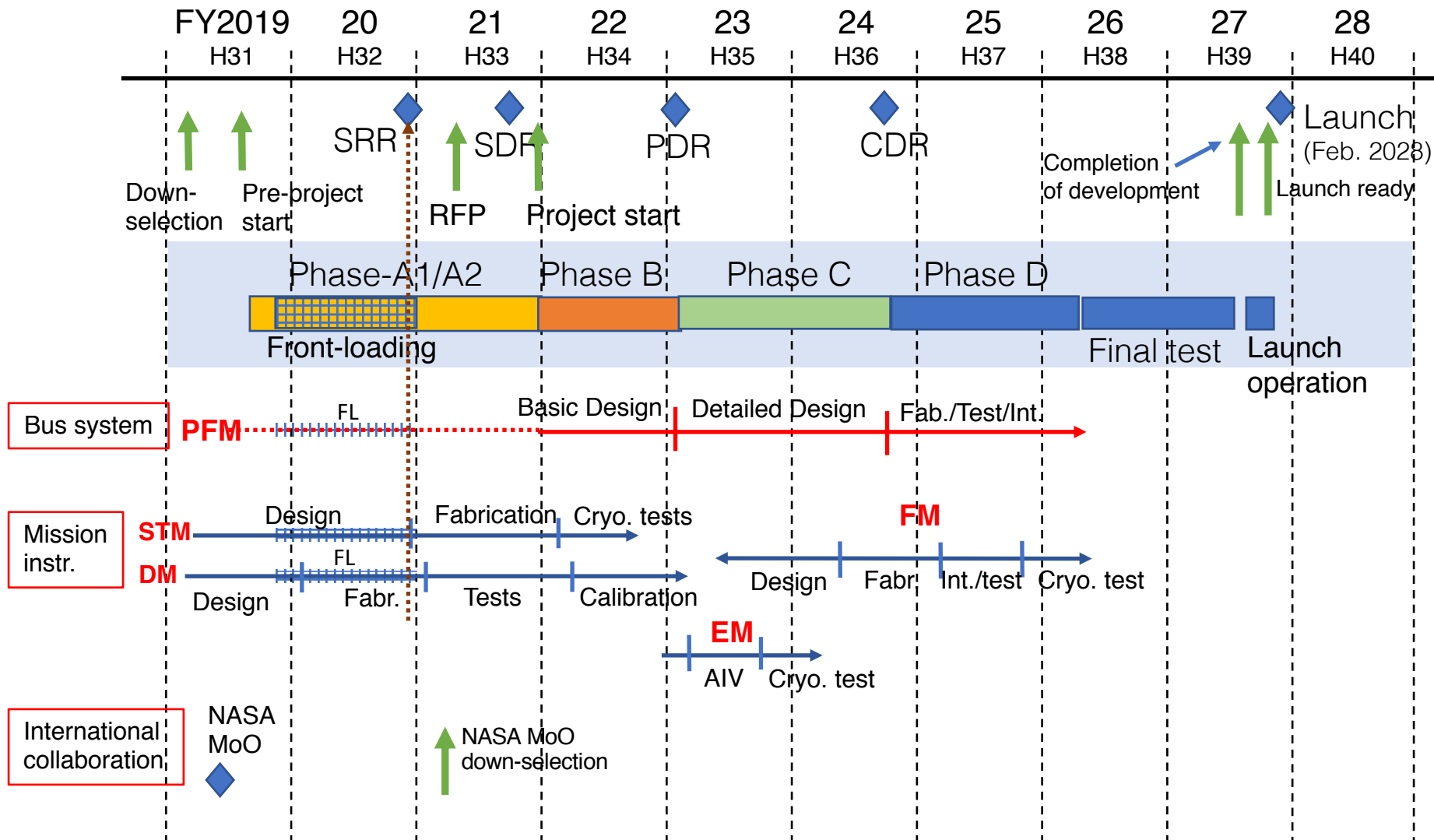
Find offices / facilities on the map



Global Schedule

Preliminary version, subject to change

Japanese fiscal year (JFY, April 1 – Mar 31)

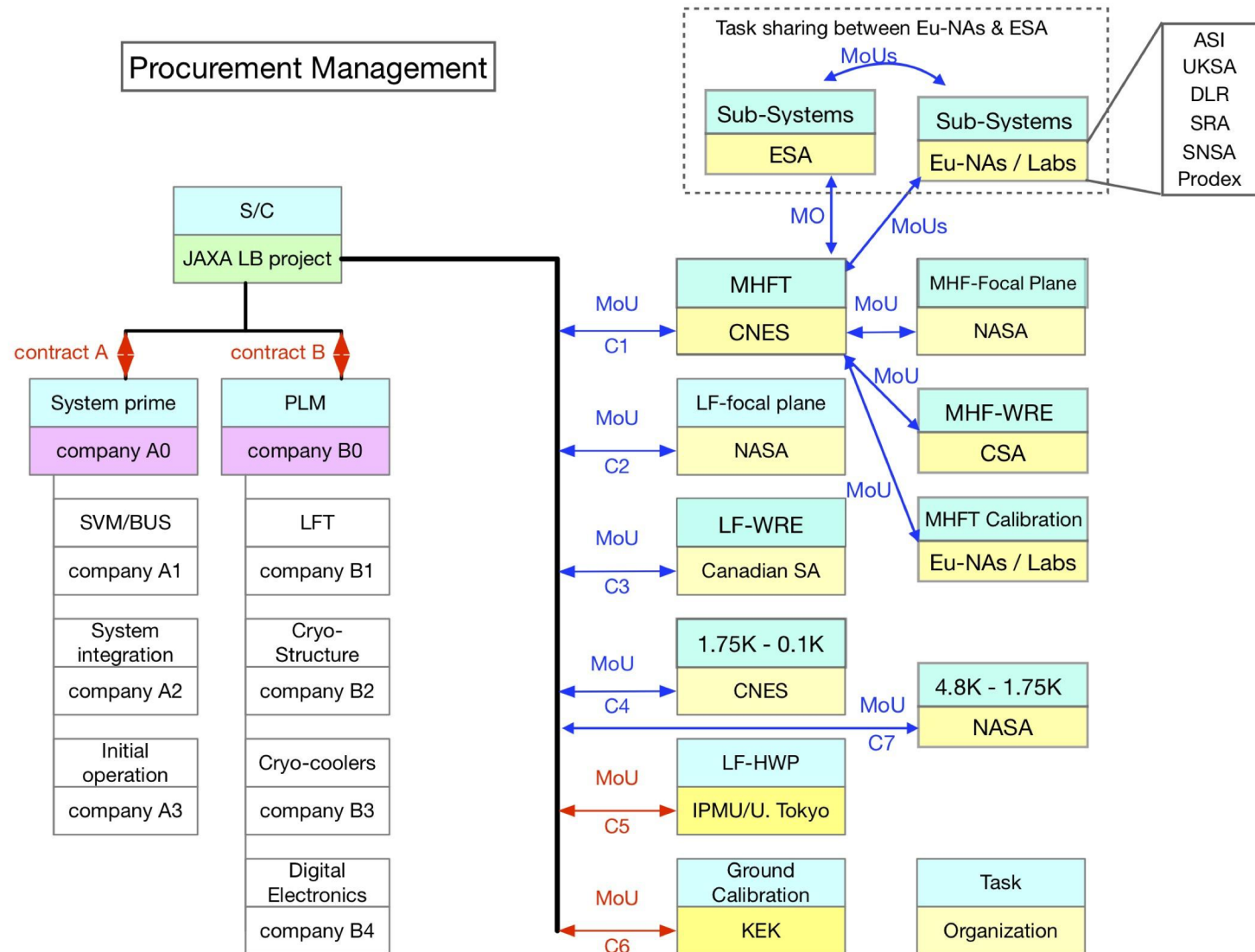


Summary

- LiteBIRD is the 2nd of the strategic large-class mission of JAXA.
- It is based on the extensive international collaboration with NASA, European countries, ESA and CNES.
- LiteBIRD uses LFT and MHFT to cover 34 - 448 GHz in 15 bands.
- Low temperature of the PLM is achieved with the mechanical coolers and radiative cooling.
- LiteBIRD makes all sky survey at L2 with 0.1 rpm spin combined with precession.
- Launch vehicle will be H3-22L.
- Two ground stations, Uchinoura 34m antenna and GREAT 54m antenna, will be used for the daily operation.

Backup slides

Procurement management plan



Procurement management plan inside Europe

