

Astronomical 6U CubeSat mission VERTECS

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VERTECS collaboration (Kyushu Institute of Technology, Japan Aerospace Exploration Agency, Kwansai Gakuin University, Tokyo City University, Natural Sciences' Astrobiology Center, Tokyo Institute of Technology, Kanazawa University, University of Fukui, Meisei University, SEIREN Co., Ltd., Cosina Co., Ltd.)

<Mission Overview>

Extragalactic Background Light: EBL

- Accumulated radiation of entire celestial sources from early universe to present epoch

The EBL observation is crucial to reveal star formation history of the universe.

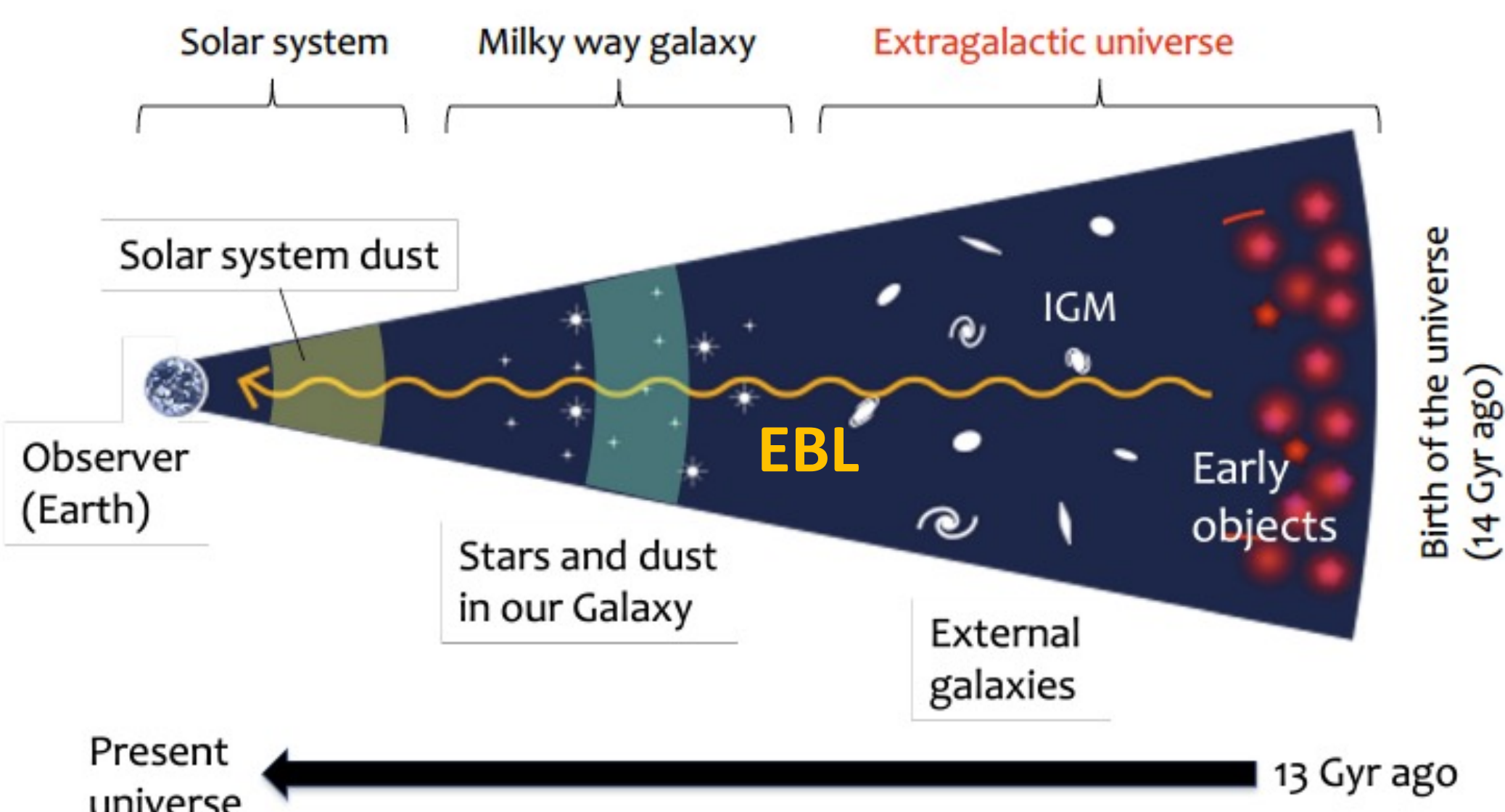


Fig. 1: Conceptual view of EBL

EBL sensitivity is determined by [Telescope aperture] × [Field of View].

→ **Small wide-field telescope for CubeSat can detect the EBL.**

Near-infrared EBL brightness is reportedly several times brighter than integrated light of known galaxies.

→ Presence of unknown extragalactic sources, such as Intrahalo Light or First Stars

VERTECS mission

- Spectral observation in visible wavelength $0.4\mu\text{m}-0.8\mu\text{m}$ to reveal origin of the EBL

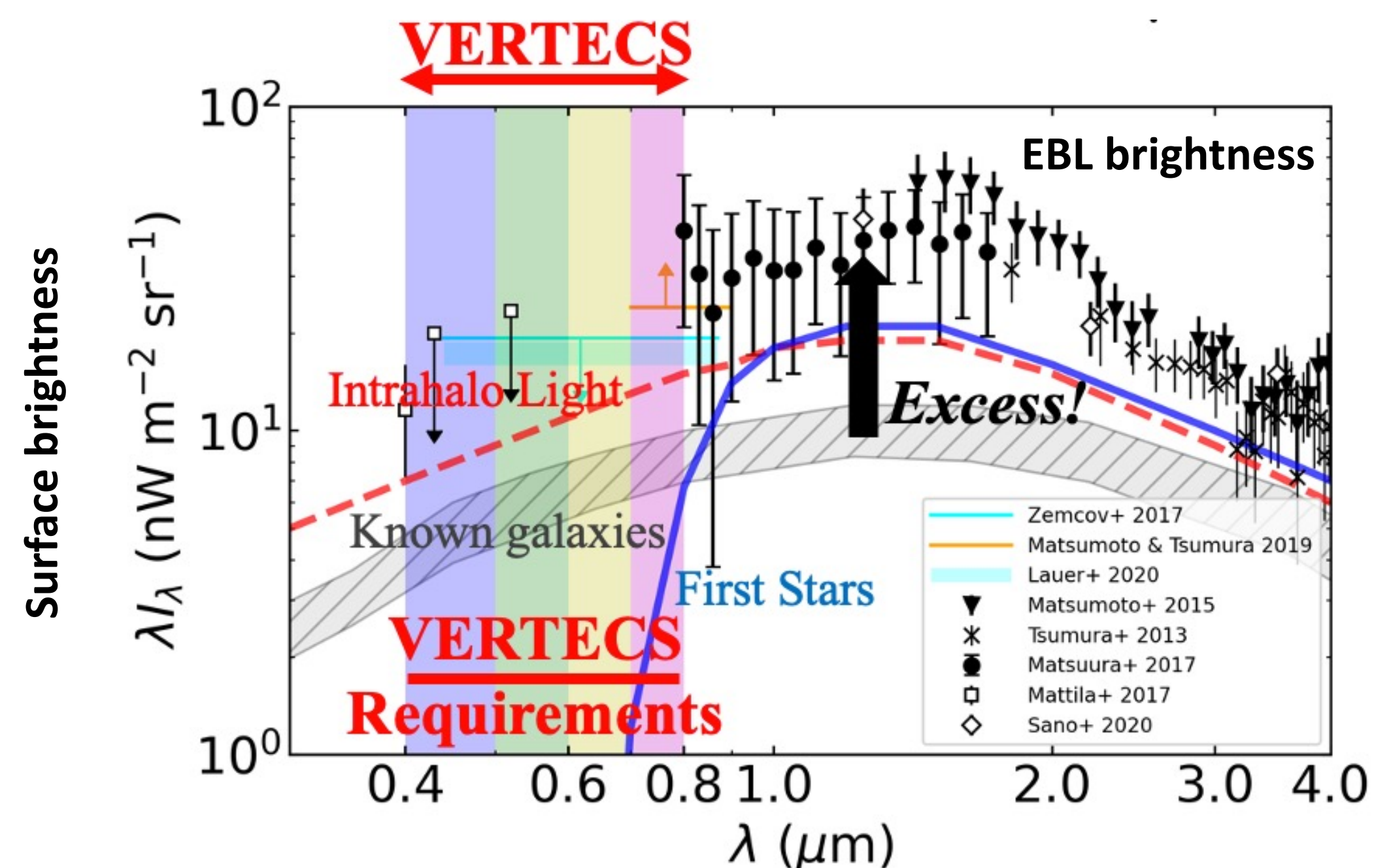


Fig. 2: Previous EBL measurements and observation range of VERTECS

<System Overview>

Table: Major system specifications

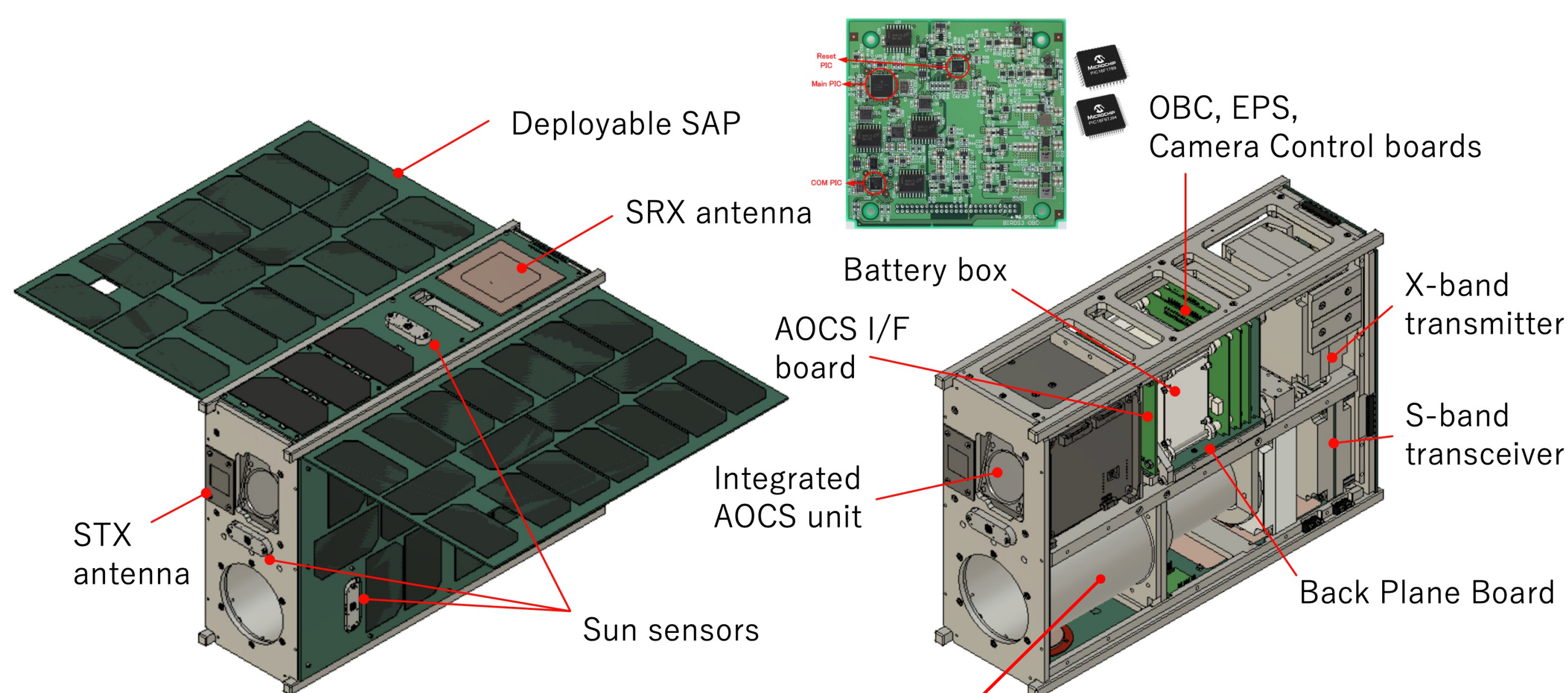
Parameter	Value
Mission Payload	- Optics D = 35 mm, FoV = 4.2 deg × 4.2 deg - Detector (SONY IMX533) Low-noise detector, 3k × 3k format
Pointing Stability	10" (1σ) / 1 min (TBC)
Communication	1 kbps (Up)/32 kbps (Down) S-band 5 Mbps X-band (Mission data Down)
Orbit	500 km Solar Synchronous Orbit (TBC)
Launch	2025 (TBC)

Main bus (OBC, EPS)

- Based on CubeSat heritage at Kyutech (BIRDS, KITSUNE, etc.)

AOCS

- 1U unit developed through technological front-loading at JAXA



Telescope

- 2U size wide-field optics and baffle structure

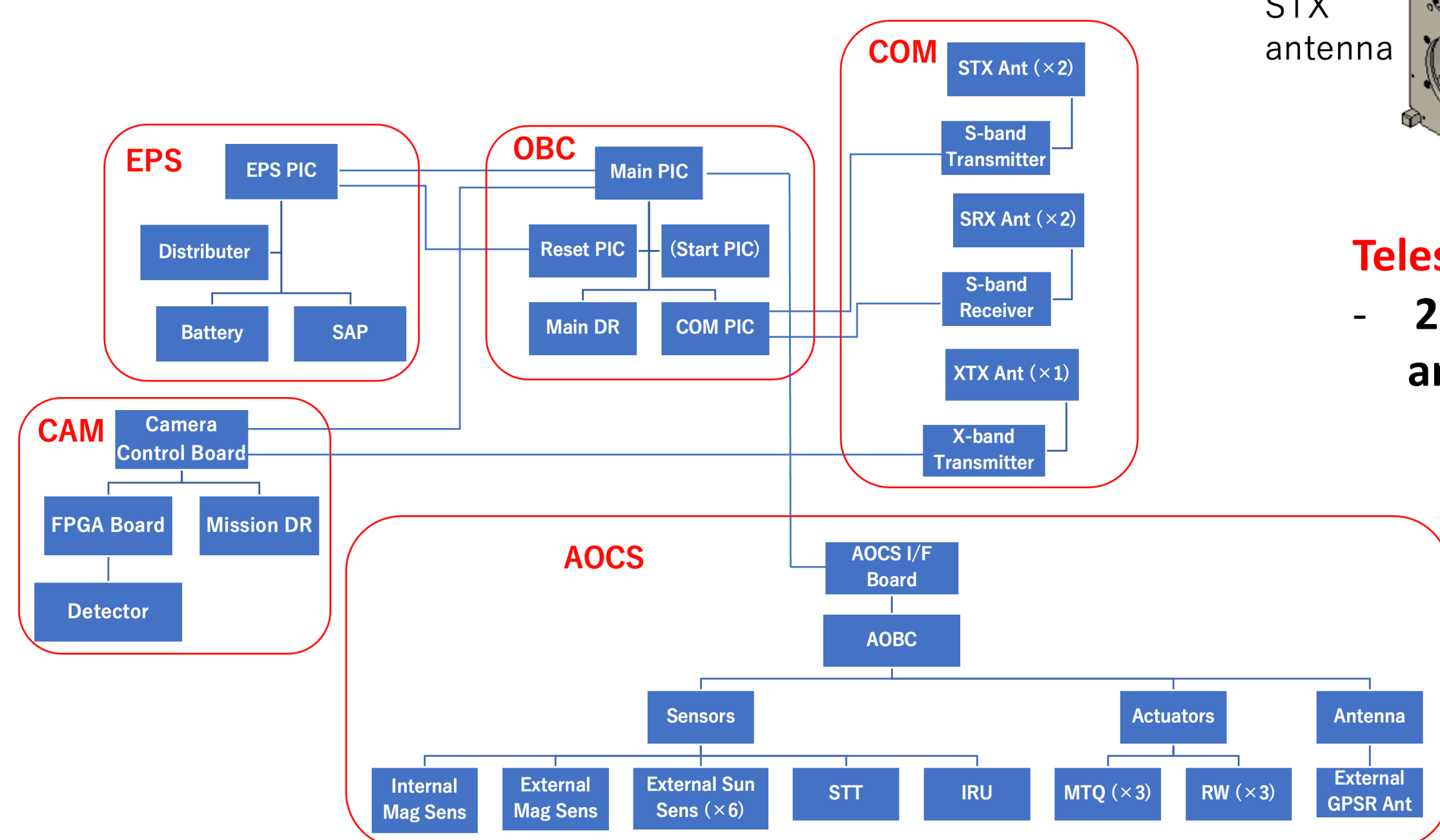
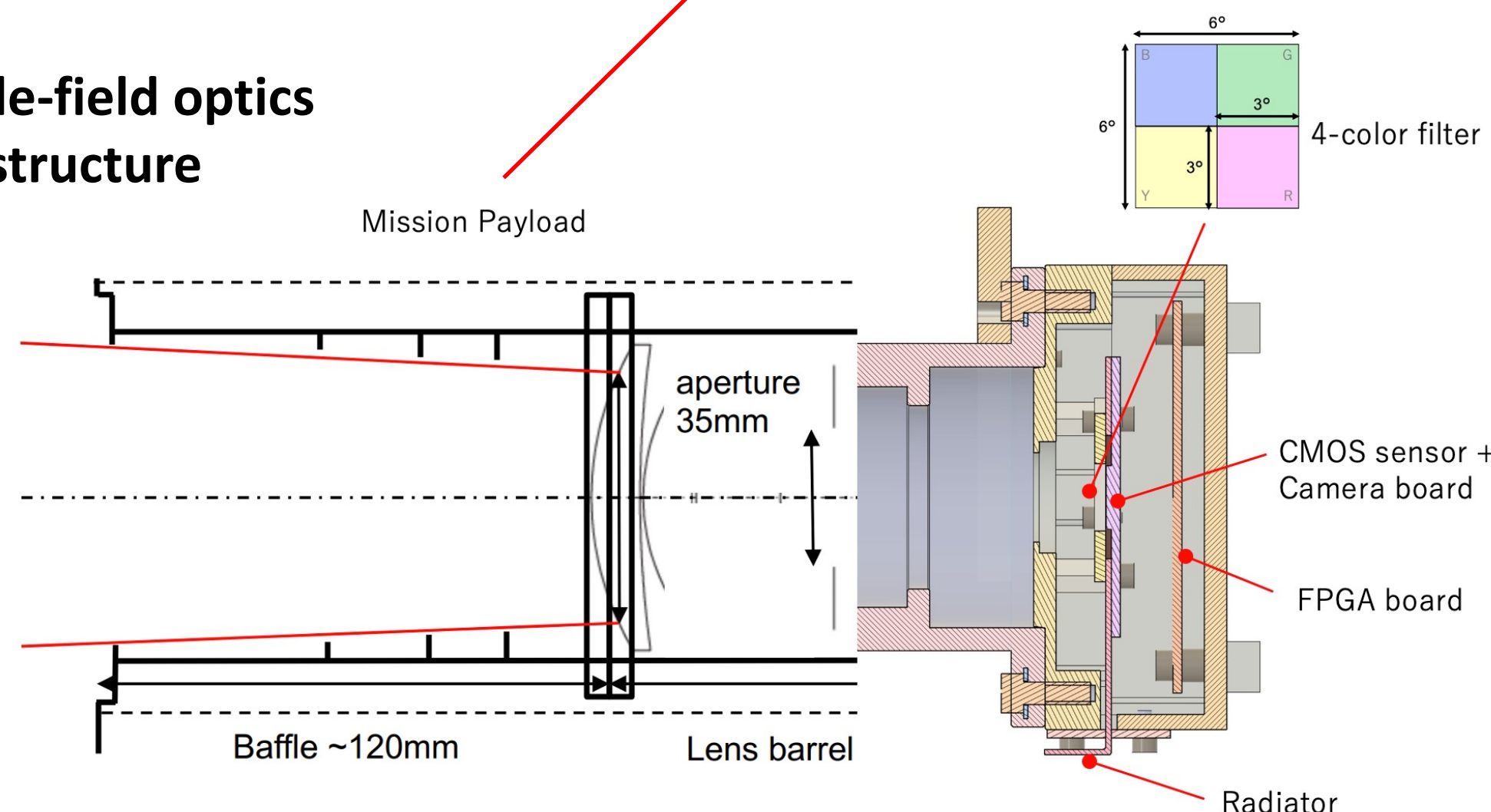


Fig. 3: System block diagram

- VERTECS is expected to establish a versatile system served for various astronomical observations.

<Framework of VERTECS>

VERTECS is funded by JAXA-SMASH (JAXA-Small Satellite Rush) program.

The program started from December 2022 and requires satellite development in 2 years.

JAXA-SMASH Program is a research and development program that encourages universities, private companies and JAXA to collaborate to realize small satellite missions utilizing commercial small launch opportunities, and to diversify transportation services in Japan.

