

LAPYUTA

Life-environmentology, Astronomy, and Planetary
Ultraviolet Telescope Assembly

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- Earth orbiting UV space telescope
- Selected as one of candidates for JAXA's M-class (公募型小型) mission #6 in April 2023
- Target launch year: 2032

Goal1: habitable environments in the universe

Elements for the habitable environment

Hydrogen, Oxygen, Carbon → Advantage of UV spectroscopy

(1) habitable environments in the solar system

- Current geological activity of icy moons
- Atmospheric evolution of terrestrial planets



(2) Exoplanet atmosphere

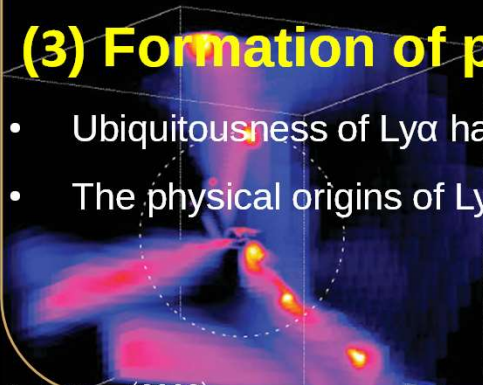
First detection of upper atmosphere of an Earth-like planet



UV astronomy

(3) Formation of present-day galaxy

- Ubiquitousness of Ly α halos
- The physical origins of Ly α halos (the Cold Streams)



Dekel et al. (2009)

(4) Origin of The heavy element

- The heavy element nucleosynthesis by neutron star mergers & Understanding of the final stage of massive star evolution



Goal2: the origin of matter and space in the universe

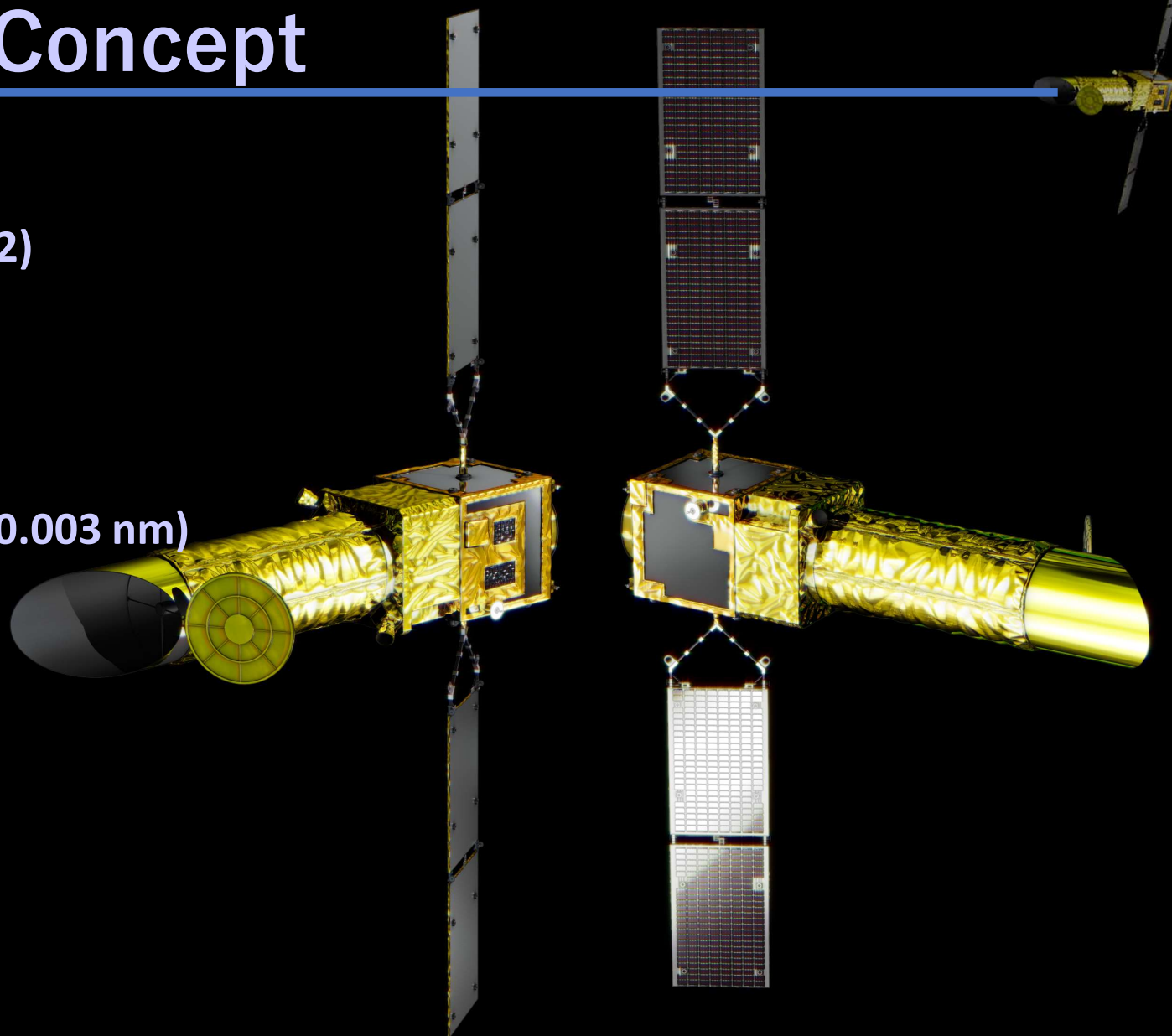
LAPYUTA : Concept

Major specifications

- Type: **Cassegrain telescope (F32)**
- Primary mirror : **60 cm**
- Effective area : **>350 cm²**
- Spatial resolution : **0.1 arcsec**
- Spectral range : **110-190 nm**
- Spectral resolution : **0.02 nm (0.003 nm)**
- FOV : **100 arcsec/180 arcsec**
- Bus system : SPRINT bus
- Orbit : ~1000 x 2000 km

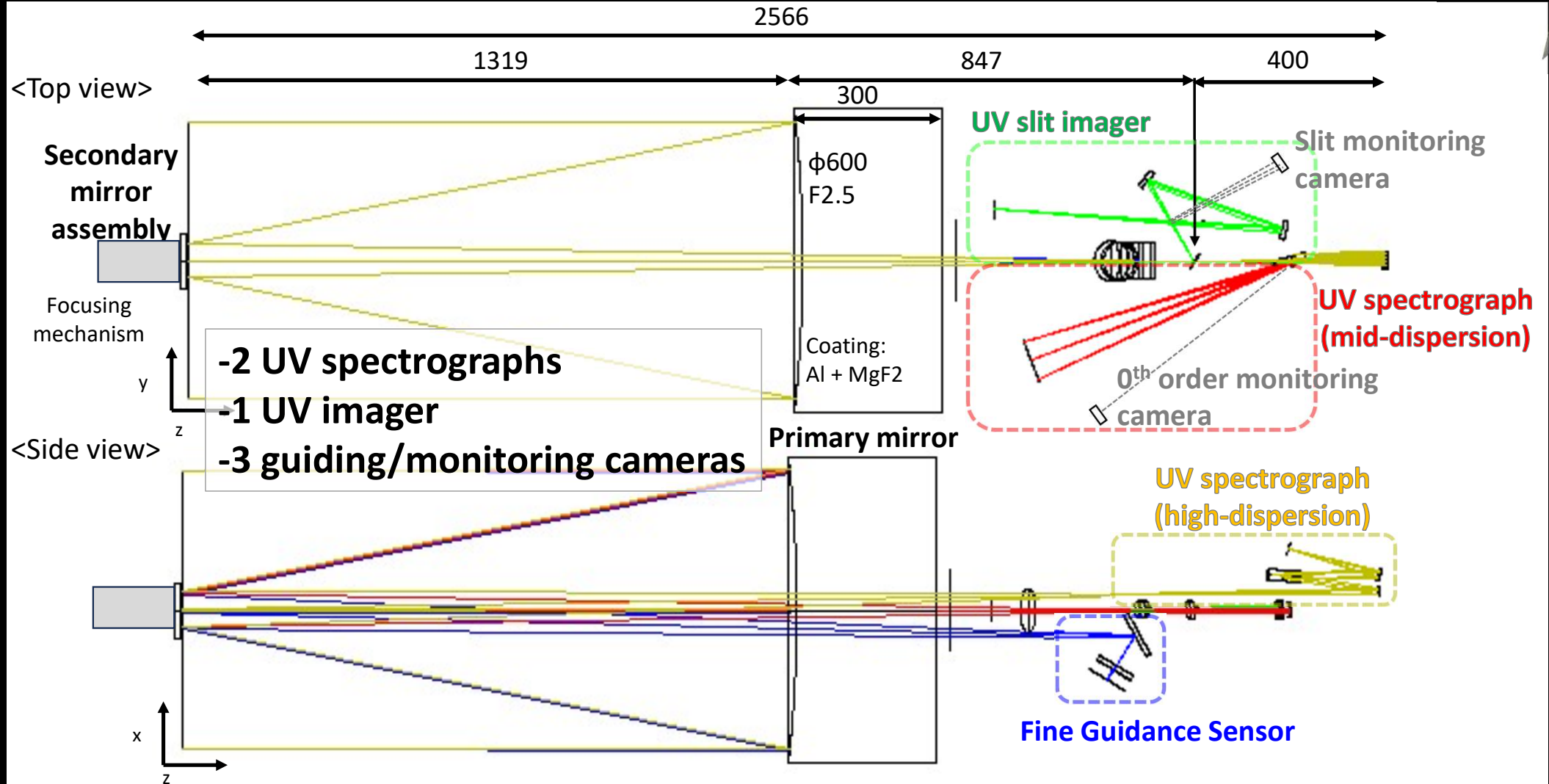
Scientific instruments

- **UV spectrograph**
(Mid/High resolution)
- **UV slit imager**



LAPYUTA : Preliminary optical design

Cassegrain telescope: $D = 60\text{ cm}$, effective $f = 1920\text{ cm}$ (F32)



Operation Plan



Primary mission period : 3 years

The mission period will be extended up to 9 years if the instruments are in good health.

Baseline

- **Solar system bodies:** optimized by solar separation angle
 - Jupiter & Mars: around oppositions
 - Venus: around maximum solar elongation angle
- **Exoplanets & Astronomical targets**
 - Unsuitable periods for the solar system bodies
- **Neutron star mergers, Supernova & stellar flares**
"Target of Opportunity"
with 24-hour operation campaign (3 months/year)
- **Public slot** (~2 months/year)

Time allocation plan



- Solar system bodies
- Exoplanet
- Astronomical object
- Public slot
- ToO

Possible collaborations with NAOJ



Science

- Science leads for exoplanet atmosphere (Ikoma) and galaxy/cosmology (Ouchi) research
- Part of Science Center (Data center, operation of public slot observation)
- Cooperation with ongoing projects in NAOJ
 - e.g.) JASMINE: exoplanet
 - Solar-C: stellar observation study
 - Ground telescope: galaxy/cosmology, multi-messenger astronomy

Technology

Japan has advantages for UV instruments

- Heritages from earth & planetary explorations (e.g. SELENE, Hisaki, Mercury mission, WSO-UV)
 - Large format UV detector & UV coating : technologies toward NASA HWO
- Developing deflection-limit 60cm class space telescopes
- Facilities & know-how for primary mirror and telescope developments
 - including high-precision measurement technology



- 2020/12 : Acceptance of WG
- FY2021: Concept study of bus system, development of key technologies, and study of science requirements
- FY2022: Concept study of telescope and development of key technologies

[illegible]