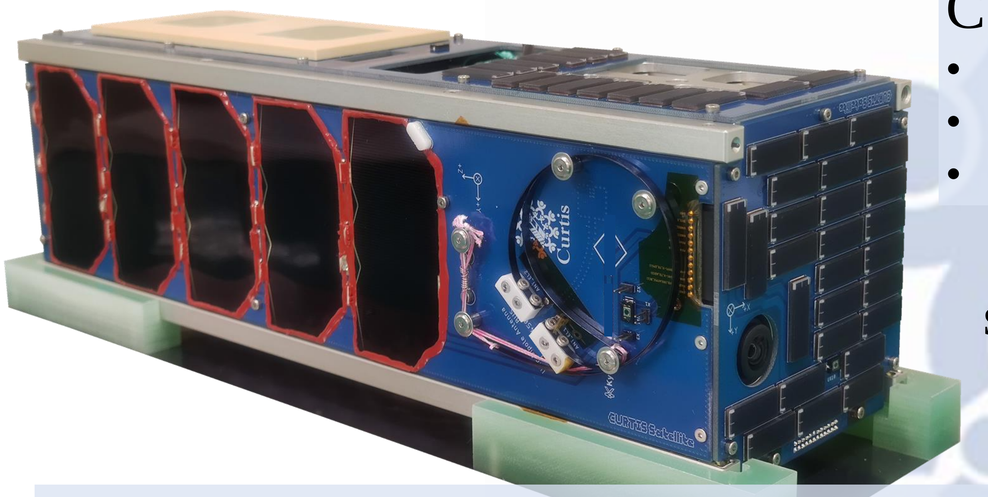
In-orbit demonstration of technology for thermal management and highly integrated electronics on a 3U CubeSat: CURTIS Satellite

Jose Rodrigo Cordova-Alarcon[1], Eyoas Ergetu Areda[1], Hari Ram Shrestha[1], Victor Hugo Schultz[1], **Necmi Cihan Orger[1]**, Hirokazu Masui[1], Mengu Cho[1], Nobuyuki Koyama[2], Izumi Tomohiro[2] Masato Mori[2]

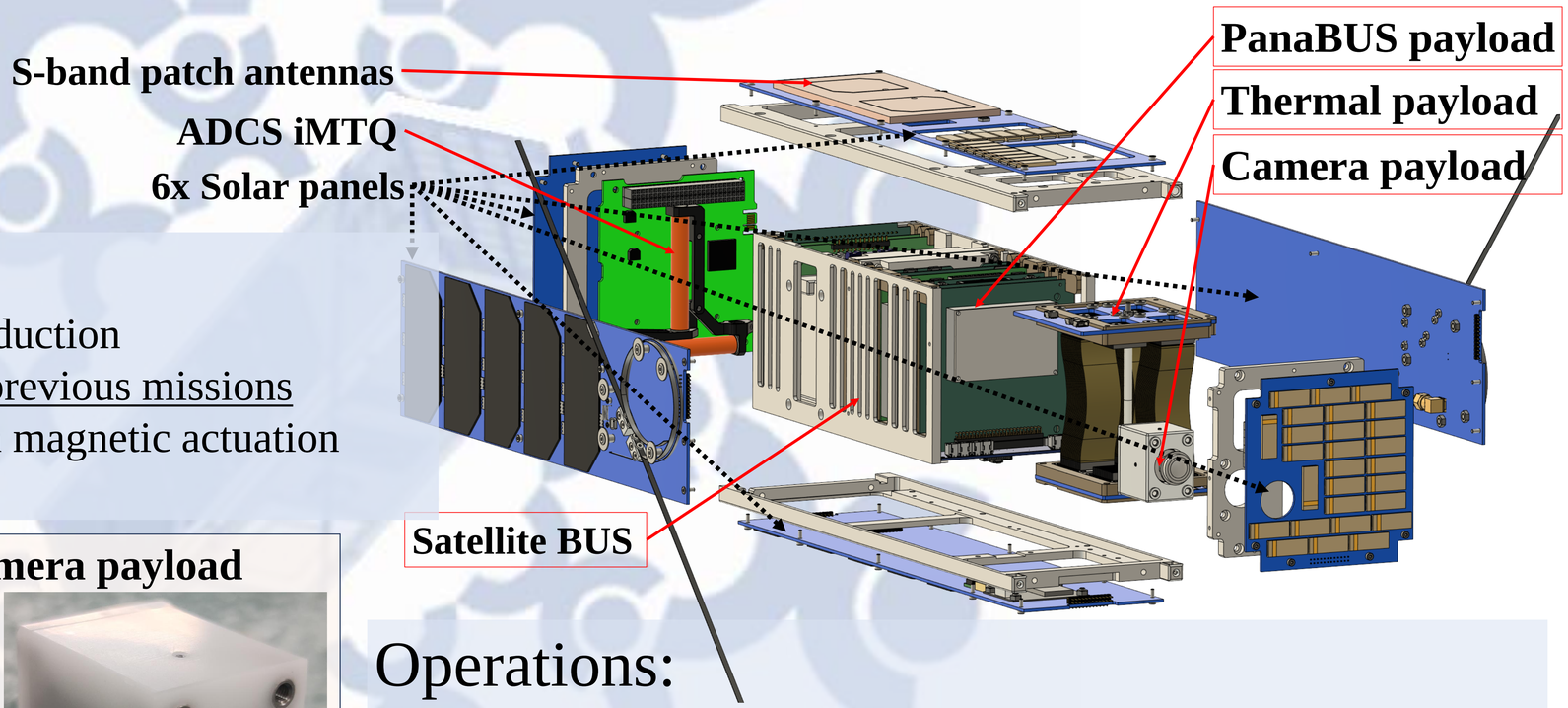
Kyutech
Kyushu Institute of Technology

[1]*Kyushu Institute of Technology, Kitakyushu City, Japan*
[2]*Panasonic Holdings Co., Ltd., Osaka, Japan*



CURTIS missions:

- **Thermal conductivity** experiments of surface-coated graphite materials
- Earth imagery using an **in-vehicle camera** module
- Demonstration of a **highly integrated OBC-EPS-UHF** transceiver made by Panasonic

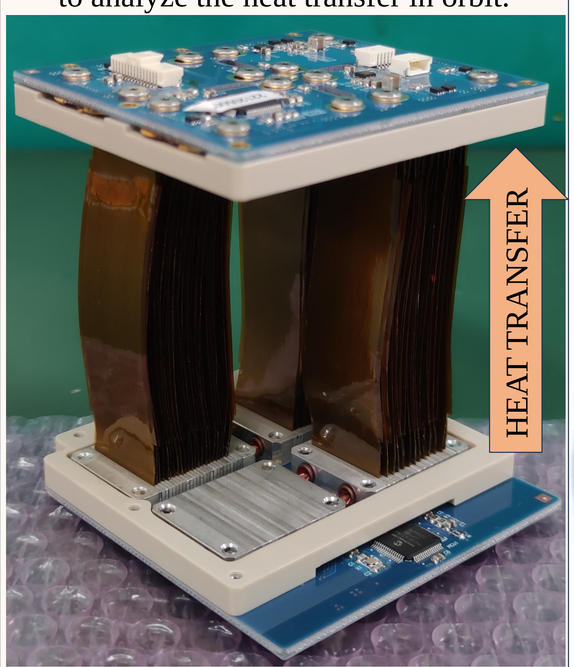


Satellite system architecture:

- **Slot-based structural design** for future mass production
- **Satellite BUS** with flight heritage from Kyutech previous missions
- **Active attitude control system** (ADCS) based on magnetic actuation
- **UHF and S-band** transceivers

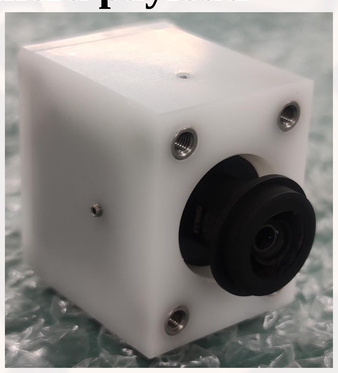
Thermal payload

It features **graphite sheets** that are surface-coated to prevent scattering of graphite dust. **Heaters** and **thermistors** are placed in the PCBs. 4 sets of heaters are installed to analyze the heat transfer in orbit.



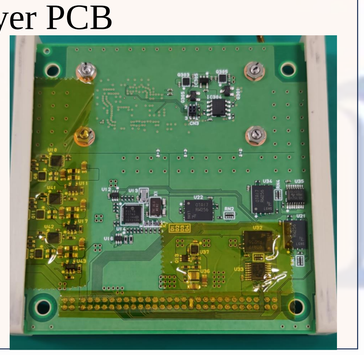
In-vehicle camera payload

CMOS sensor with a resolution of **2.6Mpix** and camera lens field of view angle of **62.5deg.** The in-vehicle camera will be tested for future Earth observation missions



Highly integrated satellite BUS

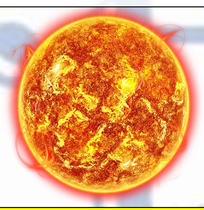
Its electrical design is based on Kyutech satellite BUS (**OBC,EPS,UHF**) comprised in a 6-layer PCB



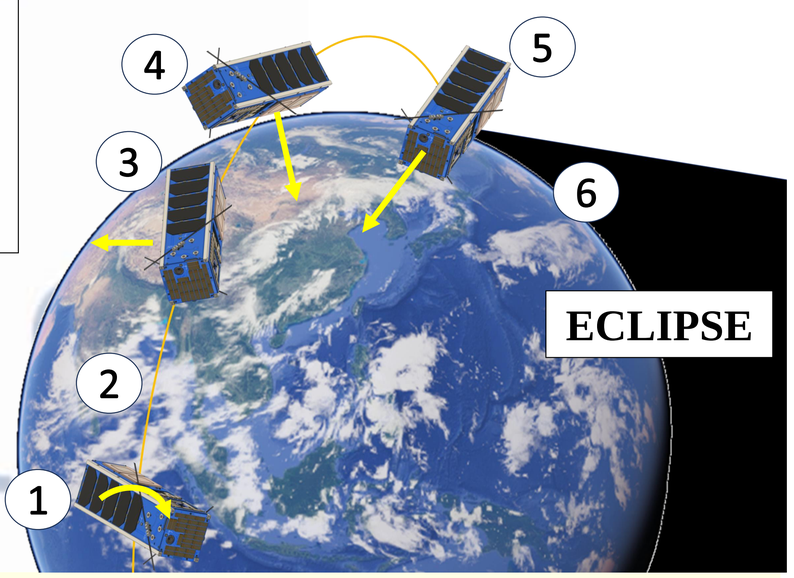
Operations:

- **To be deployed in ISS orbit in ~March 2024**
- **UHF ground station** located in Kyutech and **S-band ground station network** powered by Infostellar

1. **Tumbling**
2. **Detumbling**
3. **Sun tracking**
4. **Nadir – S-band**
5. **Nadir - Camera**
6. **Thermal (eclipse)**



SUN PHASE



Acknowlegdements:

This project is subsidized by the ***Ministry of Economy, Trade and Industry*** (***METI***), Japan (SERVIS Project). We would also like to show our gratitude to the following team members from Kyutech who made a valuable contribution to this project: Reynel Josue Galindo-Rosales, Joseph Ampadu Ofosu (Thermal and testing), Kudakwashe Jeje, Ratatamanun Subsinchai, Mazaru Ariel Manabe Safi, Rafael Esteban Fretes-Ruiz-Diaz (ADCS), Kaito Shinozaki, Sackdavong Mangkhaseum, Holy bagas Bramandika Pangestu (Communications team), Leticia Santos Lula Barros (EPS).