According to Bryce Space & Technology Co., among academic operators, Kyutech is No. 1 in number of small satellites launched

Members of BIRDS -1, -2, -3, -4 and -5, on 30-Oct-2020 in front of the lab building

ISSN 2433-8818

BIRDS Project Newsletter

Issue No. 73
(28 Feb 2022)

Edited by:
G. Maeda
革新的宇宙利用実証ラボラトリー
Laboratory of Lean Satellite Enterprises and In-Orbit Experiments (La SEINE)
Kyushu Institute of Technology (Kyutech)
Kitakyushu, Japan

Archive website: http://birds1.birds-project.com/newsletter.html
All back issues are archived at this website.

Acknowledgment of support: This newsletter is supported, in part, by *JSPS Core-to-Core Program, B. Asia-Africa Science Platforms.*

La SEINE

SEIC Space Engineering International Course

All back issues of this newsletter can be easily downloaded.
Go to here: http://birds1.birds-project.com/newsletter.html and scroll down to the desired issue.

Table of Sections

1. Once again BryceTech declares that Kyutech is the No.1 operator of academic small sats
2. Highlighting Japan: Snow Country
3. BIRDS Bus Open Source Webinar #3
4. Report from the Philippines
5. Kyutech and Kyushu University collaborate on space engineering education
6. During 2022 UNISEC-Global conducts UNISEC Local Chapter Empowerment Program
7. BIRDS-4: Lookback on BIRDS-4 experiences
8. BIRDS-4: Satellites Housekeeping analysis
9. BIRDS-4: Camera Mission Summary Report
10. BIRDS-4: APRS Digipeater Mission
11. BIRDS-4: Perovskite solar cell mission results
12. BIRDS-4: TMCR mission: On-orbit TID test
13. BIRDS-4: HNT mission: On-orbit demonstration of Loop Hentenna
14. BIRDS-4: Glue and NTU Missions Report
15. UNISEC-Turkey hosted the virtual UNISEC-Global meeting of 19 Feb 2022
16. Column #26 from Malaysia
17. Kyutech student Etsunaga arrives in Rome for his 4th year undergrad studies

Continued on the next page

The Guest Box

From Uganda

Explanation on the next page

Table of Sections (continued from the previous page)

18. Announcement for virtual GST workshop 2022
19. BIRDS-5: Ground station progress in Zimbabwe
20. BIRDS-5: Long duration testing
21. BIRDS-5: Flight Model power budget
22. BIRDS-5: Satellite fit check
23. BIRDS-5: PINO test
24. BIRDS-5: International Workshop on Lean Satellite
25. BIRDS-5: Weekly project meeting of 25 Feb 2022 via ZOOM
26. BIRDS ground station antenna was damaged by strong winds

Continued from the previous page ….

The CRESTED CRANE; Uganda's National Bird

The beautiful bird appears on the National Flag, National court of arms and the National football (soccer) team of Uganda is called "The Cranes".

They are a monogamous bird, meaning that once they find a partner, they will remain with that same breeding partner for life.
They form pair bonds while they are young and will remain with the bird they bond to for the rest of their lives, breeding together each year and raising their young together.
The Crested Crane is known to dance year-round with various jumping and bows. They can be seen dancing at any time of the year, and more often during their breeding periods.
This graceful and beautiful bird can live up to 22 years, whereas the average life of a songbird in the wild is merely 2 years.

By: Edgar MUJUNI

Member of BIRDS-5 Project

JSPS Reminder

When you publish a paper on a topic related to BIRDS, please include this acknowledgement in the paper:

This work was supported by JSPS Core-to-Core Program, B. Asia-Africa Science Platforms.

JSPS provides the airfare funds of <u>BIRDS International Workshops</u> and for <u>Ground Station Workshops</u>.

01. Once again BryceTech declares that Kyutech is the No.1 operator of academic small sats

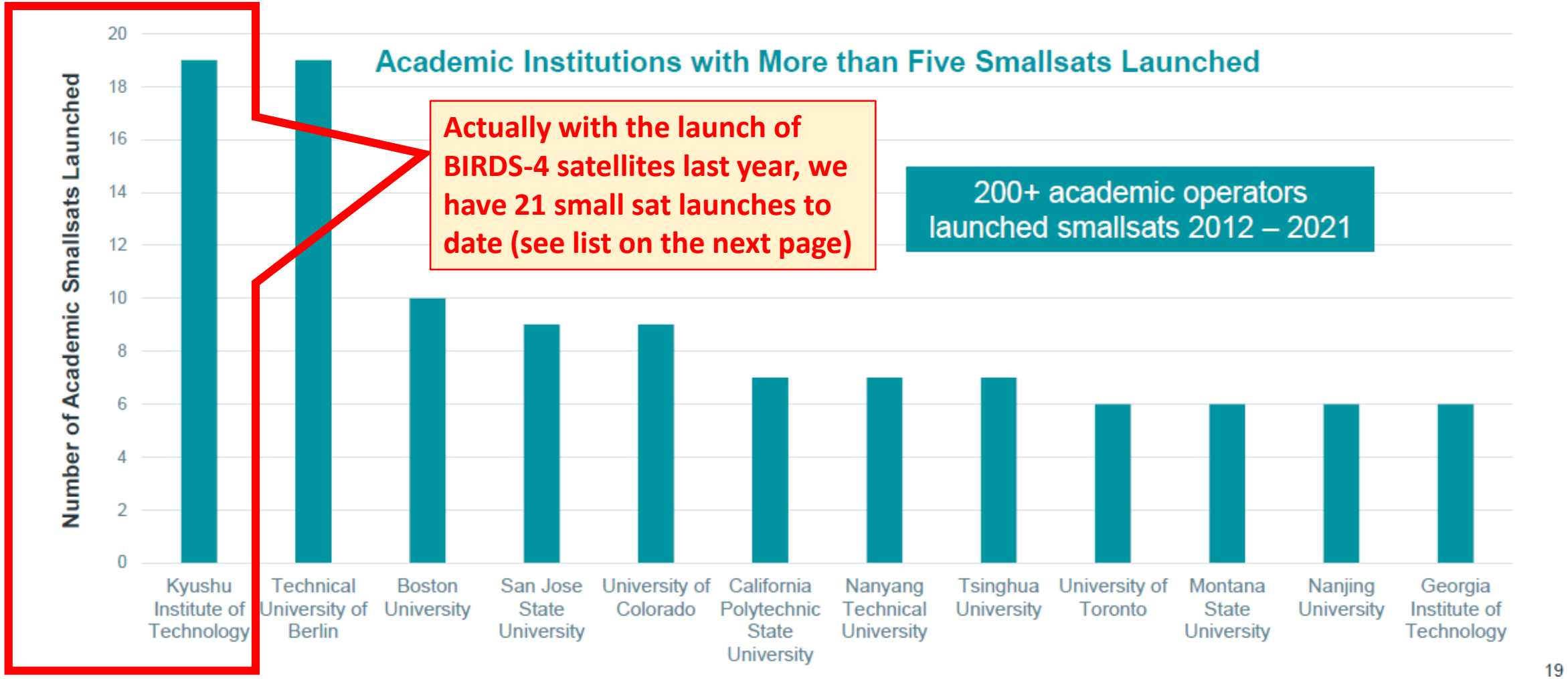
This annual report came out on 9 Feb 2022

Once again, Kyutech is the *No.1 operator* of academic small satellites

several years in a row

Number of Academic Smallsats 2012 – 2021, by Institution

Smallsats in Context and Operator/Mission Type Trends



19

No.	Satellite name	(a) Date of Launch (b) ISS deployment	Nations involved	Note
1	HORYU-II	(a) 2012/5/18	Japan	
2	Shinen-2	(a) 2014/12/03	Japan	
3	HORYU-IV	(a) 2016/02/17	Japan	
4	AOBA VELOX-III	(a) 2017/01/19	Japan and Singapore	
5	BIRDS-I : Ghana	(b) 2017/07/07	Japan and Ghana	Ghana's first satellite
6	BIRDS-I : Mongolia	(b) 2017/07/07	Japan and Mongolia	Mongolia's first satellite
7	BIRDS-I : Nigeria	(b) 2017/07/07	Japan and Nigeria	
8	BIRDS-I : Bangladesh	(b) 2017/07/07	Japan and Bangladesh	Bangladesh's first satellite
9	BIRDS-I : Japan	(b) 2017/07/07	Japan	
10	BIRDS-II : Philippines	(b) 2018/08/10	Japan and Philippines	
11	BIRDS-II : Malaysia	(b) 2018/08/10	Japan and Malaysia	
12	BIRDS-II : Bhutan	(b) 2018/08/10	Japan and Bhutan	Bhutan's first satellite
13	SPATIUM-I	(b) 2018/10/06	Japan and Singapore	
14	Ten-koh	(a) 2018/10/29	Japan	
15	AOBA VELOX-IV	(a) 2019/01/18	Japan and Singapore	
16	BIRDS-III : Nepal	(b) 2019/06/17	Japan and Nepal	Nepal's first satellite
17	BIRDS-III : Japan	(b) 2019/06/17	Japan	
18	BIRDS-III : Sri Lanka	(b) 2019/06/17	Japan and Sri Lanka	Sri Lanka's first satellite
19	BIRDS-IV : Japan	(b) 2021/03/14	Japan	
20	BIRDS-IV : Paraguay	(b) 2021/03/14	Japan and Paraguay	Paraguay's first satellite
21	BIRDS-IV : Philippines	(b) 2021/03/14	Japan and Philippines	

← These are the 21 satellites that have been launched by Kyutech – and as you can see the majority are BIRDS satellites

02. Highlighting Japan: Snow Country


CONTENTS

Features

7 The Bounties of Snow
An interview with Onodera Satoshi, a researcher at the Nishiwaga Town Snow Country Cultural Institute in Iwate Prefecture

14 The Magical Snowscape of Shirakawa-go
With its steep-roofed houses blanketed in snow, Shirakawa-go in Gifu Prefecture becomes a magical site in winter.

10 The Sapporo Snow Festival
In early February each year, Sapporo City in Hokkaido hosts the world-famous Sapporo Snow Festival.

16 Snow Monkeys
At Jigokudani Yaen-koen (Jigokudani Monkey Park) in Nagano Prefecture, the hot springs attract "snow monkeys" in winter.

12 Yokote Snow Festival
Yokote City in Akita Prefecture is home to a centuries-old kamakura (snow hut) event, now a part of the Yokote Snow Festival.

Also

4 PRIME MINISTER'S DIARY

24 POLICY-RELATED NEWS
Discover Ainu Culture

26 SCIENCE & TECHNOLOGY
Using Heat from Sewage to Melt Snow on Roadways

Download the *January 2022 issue* of this monthly publication from the Cabinet Office of Japan

https://www.gov-online.go.jp/pdf/hlj/20220101/hlj202201_all_JAPANS_SNOW_COUNTRY.pdf

Feature JAPAN'S "SNOW COUNTRY"

Shirakawa-go in winter, illuminated at night

The Magical Snowscape of Shirakawa-go

Shirakawa-go in winter becomes a magical site when its village of traditional homes built in the unique architectural style of *gassho-zukuri* is blanketed in white snow.

FUJITA MAO

SHIRAKAWA-GO in Shirakawa Village, northwest Gifu Prefecture, located in the center of Japan's main island of Honshu, is known for its thatched-roofed *gassho-zukuri*[1] houses. The gassho-zukuri architectural style is characterized by roofs with a triangular formation resembling hands joined in prayer, or *gassho* in Japanese, designed to withstand heavy snowfall. Hailed as an example of an original Japanese landscape that remains intact to this day as a blend of traditional rural culture and lifestyle, Shirakawa-go was registered as a UNESCO World Heritage Site in 1995, along with Gokayama in neighboring Toyama Prefecture. Shirakawa-go is surrounded by steep mountains, and snow falls each year from late December.

"We can get more than two meters of snow in Shirakawa-go when snowfall is heavy. In winter, daytime temperatures average -1 to 0 degrees Celsius, 2 to 3 degrees Celsius at the most. The nights are bitterly cold, with sub-zero temperatures," says Hashiwaki Kei of the Tourism Promotion Division of the Shirakawa Village Office.

From spring through fall, visitors to Shirakawa-go enjoy taking photos of the tranquil rural landscape and the "upside-down gassho-zukuri houses" reflected on the surface of the water of the rice paddies. Come winter, when the snow begins to fall, the scenery is suddenly transformed into a snow covered landscape. The gassho-zukuri houses dotted about this silvery white landscape are an iconic winter scene in Shirakawa-go.

At dusk in particular, as the snow cover gradually takes on a more intense blue hue, the lights start to come on in the houses, the *shoji*[2] paper screen windows distributing a dim light and creating a magical spectacle unique to the snow country. On certain nights only in winter, light-up events are held, turning the village into a dreamlike world. This beautiful winter landscape is unique to Shirakawa-go[3].

All photos: Courtesy of Shirakawa Village

Page 14 of 32

Feature JAPAN'S "SNOW COUNTRY"

Cooling Data Servers with Snow

For five years beginning in 2014, Bibai City in Hokkaido conducted the world's first demonstration experiment in the use of snow to cool data servers. The city is now making efforts to extend these research results to commercialization of snow-cooled servers in data centers, and it is expected that these efforts will promote the regional revitalization of Japan's snow country.

SASAKI TAKASHI

White Data Center utilizes cleared snow to cool servers

Inside the White Data Center

Page 20 of 32

A classically arranged plate of thin-sliced Shimonoseki Fuku (*fugusashi*)

Shimonoseki Fuku

Fugu hot pot (*fugunabe*) and *fugusashi*

GI JAPAN PRODUCTS

Shimonoseki Fuku

下関ふく

Shimonoseki Tiger Puffer

Shimonoseki Fuku are tiger puffer (*torafugu*) that have been caught in fishing grounds near Japan, or raised in fish farms in various parts of the country, and brought for sale to the Haedomari Regional Wholesale Market in Shimonoseki City, Yamaguchi Prefecture. The fish are kept in tanks for one to four days, then transferred to the numerous tiger puffer processing specialists in the area. Cleaning and filleting of the fish is carried out only by these licensed puffer chefs, who must pass a test to show they have the skills necessary to remove the highly toxic innards of the puffer.

Puffer food culture has been a feature of Shimonoseki since ancient times, because the fish spawn in nearby waters and migrate through the Shimonoseki Straits. Shimonoseki Fuku is prepared in a variety of ways, most famously as *fugusashi*, thin-sliced raw fuku arranged in a flower-like pattern, but also deep-fried, or alongside tofu, mushrooms and other vegetables in a hot pot known locally as *fuguabe*.

* *Fuku* is also called *fugu* in Japanese.

Yamaguchi Prefecture

Shimonoseki City

Text and images courtesy of Ministry of Agriculture, Forestry and Fisheries: https://gi-act.maff.go.jp/en/register/entry/19.html

Page 32 of 32

03. BIRDS Bus Open Source Webinar #3

During 22:00 ～ 24:00 of 12 February 2022, the BIRDS Program (PI: Prof. Mengu Cho) conducted the *3rd BIRDS Bus Open Source Webinar* via ZOOM. Unlike before, it was open to the public. Around 45 persons attended, including several persons inside of Japan. The BIRDS Bus is being open sourced to domestic developers and overseas developers of CubeSats. Below is the ZOOM recording of the webinar – but this recording will expire in a few weeks.

https://kyutech-ac-jp.zoom.us/rec/share/B4m2aQ12K8qpYeidRBe3GayHzuChVpVZLfu4DBwRPvGWO6p2jRW-SwU7VZtq5jDI.U7i0xe2f1n6UBZhD

Passcode: CrH5p1@E

If you are interested in using the BIRDS bus, please attend the next webinar:

==========

Topic:　BIRDS Bus Open Source Webinar #4
時間: 2022年3月12日 10:00 PM　JST

Zoom link
https://kyutech-ac-jp.zoom.us/j/88379129844?pwd=NktRZVlQZC9wNHNLcDZydGZRQWtXZz09

Meeting ID: 883 7912 9844
Passcode:　602342

==========

Agenda

Screenshots during this webinar

Speaker	Contents of the presentation
Prof Cho (Kyutech)	Welcome message, and Introduction
Dr Juan Jo Rojas (TEC)	Current status of Open Sourcing effort
BIRDS UiTM (Malaysia)	How we use the BIRDS Bus here
BIRDS NUM (Mongolia)	How we use the BIRDS Bus here
BIRDS Philippines	
◆ Angela (student)	BIRDS-4S Bus
◆ Derick (student)	Maya-3 & Maya-4 Bus
BIRDS ACCIMT (Sri Lanka)	How we use the BIRDS Bus here
G. Maeda (moderator)	Open discussion (open floor)

ON THE FOLLOWING PAGES ARE *ALL OF THE PRESENTATION SLIDES*

BIRDS Bus Open Source

Mengu Cho

Laboratory of Lean Satellite Enterprises and In-Orbit Experiments

Kyushu Institute of Technology

Kitakyushu, Japan

February 12, 2022

BIRDS Bus Open Source Webinar

BIRDS Program missions

- Lower the entry barrier to space sector
  1. Support capacity building efforts of non-space faring countries
  2. Make satellite building easier
- Practice a new engineering education
  3. Human resource development through international joint satellite projects
  4. Learn systems engineering and project management through satellite development and operation

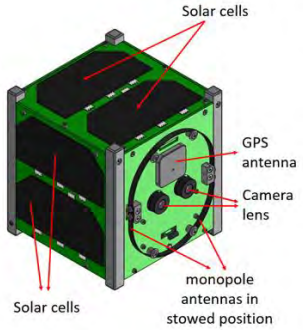
BIRDS Program

- BIRDS Program is made of the following projects
- Satellite projects
  - BIRDS-1
  - BIRDS-2
  - BIRDS-3
  - BIRDS-4
  - BIRDS-5
- BIRDS network project
- **Open-Source project**
- Standardization project

Evolution of BIRDS satellites

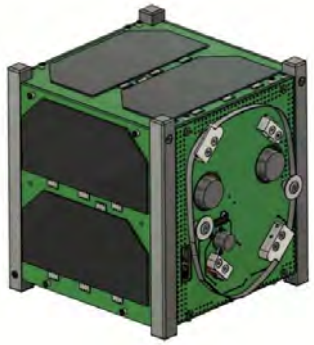
BIRDS-1

BIRDS-2



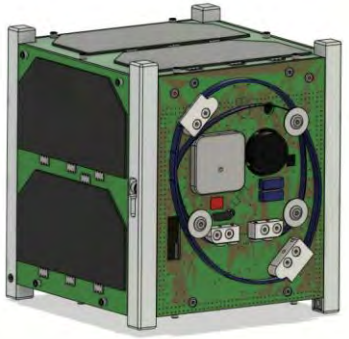
Deployable antenna
UHF uplink

BIRDS-3



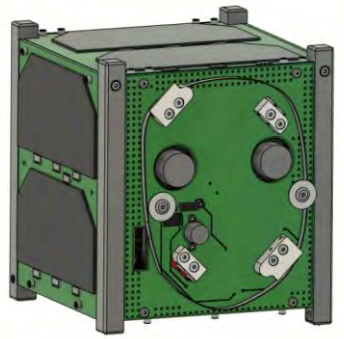
Dipole antenna
New OBC/EPS

BIRDS-4



3xDeployment switch

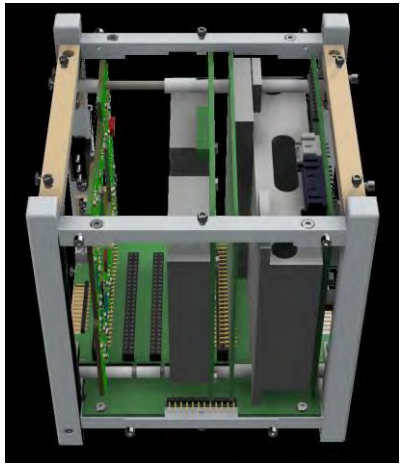
BIRDS-5

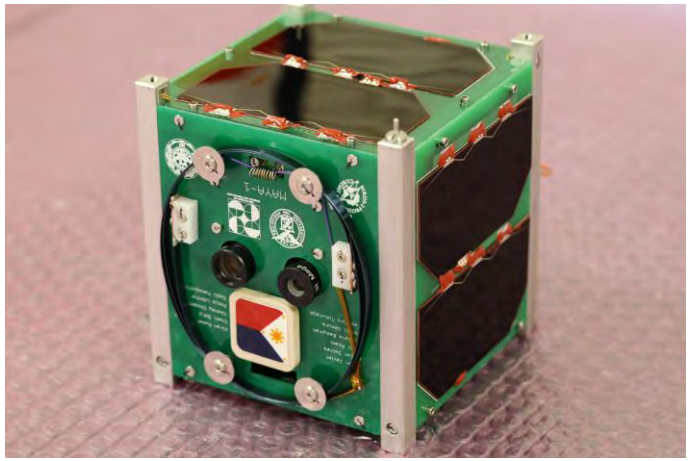


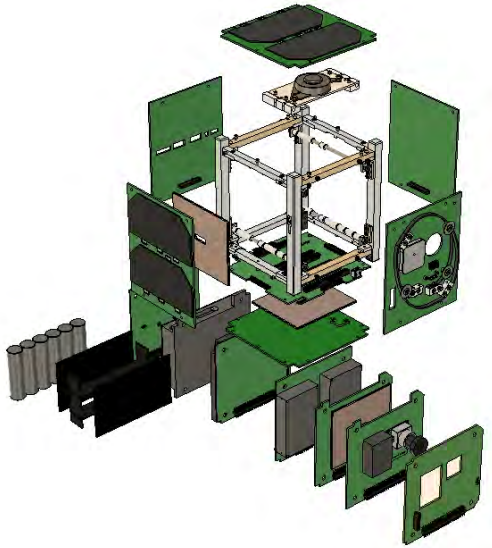
No rail switch

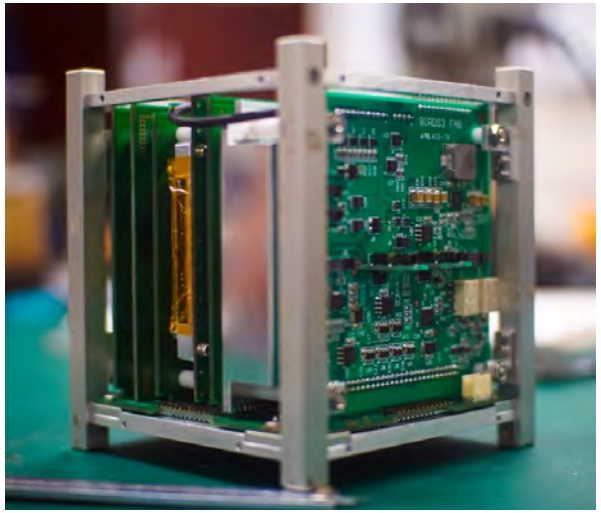
- BIRDS bus evolved by reflecting the lessons learned in the previous generations
- Minor design change since BIRDS-3
  - Mostly to adapt the changes of ISS safety requirements

BIRDS BUS (1U~2U)









Why open sourcing?

- BIRDS-5 will be the last of BIRDS satellite projects
- We will move to the next stage
  - Promote second satellites built by former BIRDS students
    - True mission success of BIRDS program
- The easiest solution for the second satellites is to duplicate or modify BIRDS satellites
- Kyutech cannot maintain the satellite bus
  - Kyutech is not a company
  - If a company commercialize the BIRDS bus (it is still OK, if you want), it will be expensive
- The most affordable way is to let users work on the satellite by themselves
- Why don’t we make others (non-BIRDS members) benefit from this initiative as well?
- The conclusion is “Open Source”

Goal

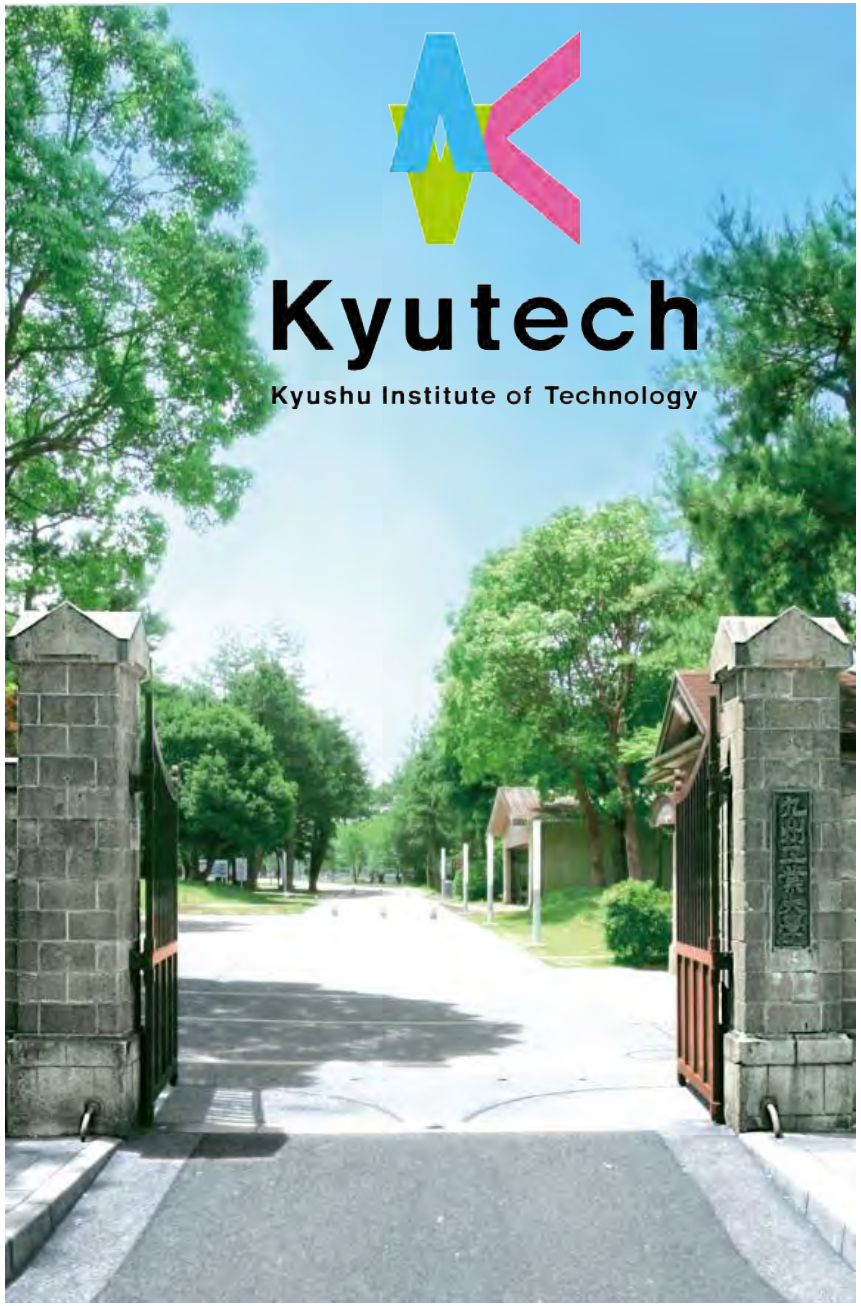
- Space programs in non-space faring countries have more solid basis in each country
- Making a satellite becomes easier, quicker and cheaper so that
  - Many new people can enter the space sector
  - Many people can benefit from the uses of outer space

END OF PRESENTATION BY PROF CHO

BIRDS Bus
Open Source Initiative

Juan J. Rojas, Costa Rica

Feb 12, 2022



What is open source?

Something people can modify and share because its design is publicly accessible

Taken from https://opensource.com/resources/what-open-source

MIT License

Copyright <YEAR> <COPYRIGHT HOLDER>

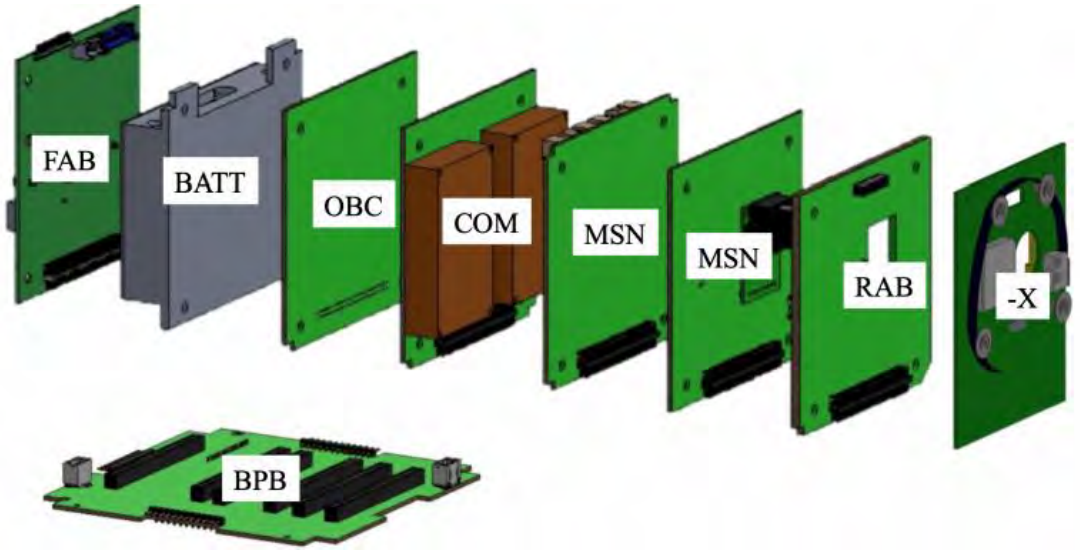
Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

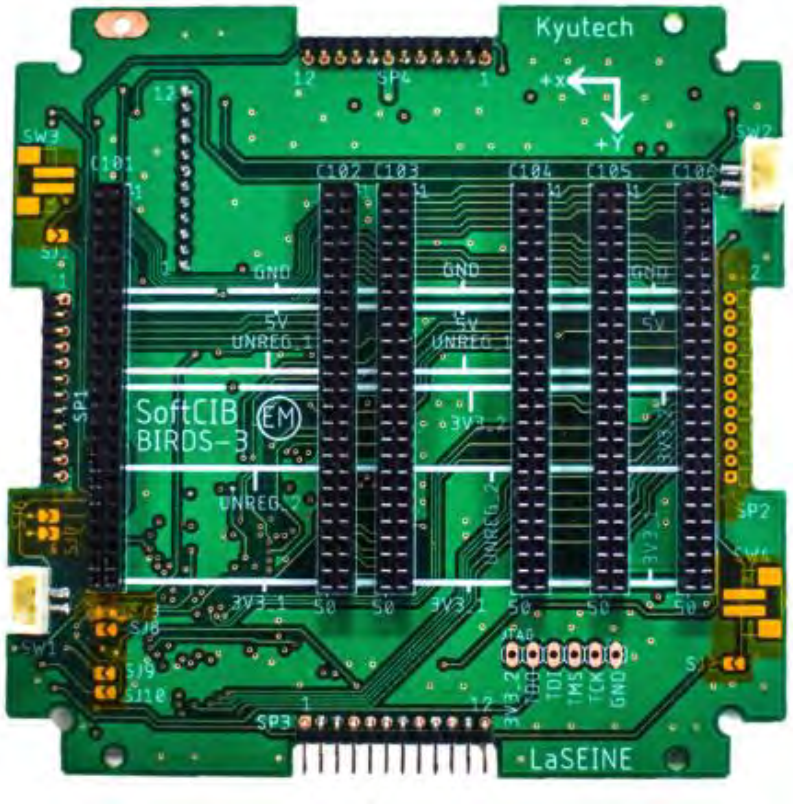
Take a deeper look here
https://opensource.org/licenses/category
https://creativecommons.org/licenses/

BIRDS Bus components and features

- Backplane (BPB)
- Front access (FAB)
- On-board computer (OBC)
- Communications (COM)
- Rear access (RAB)
- Antenna (-X)
- Solar panels

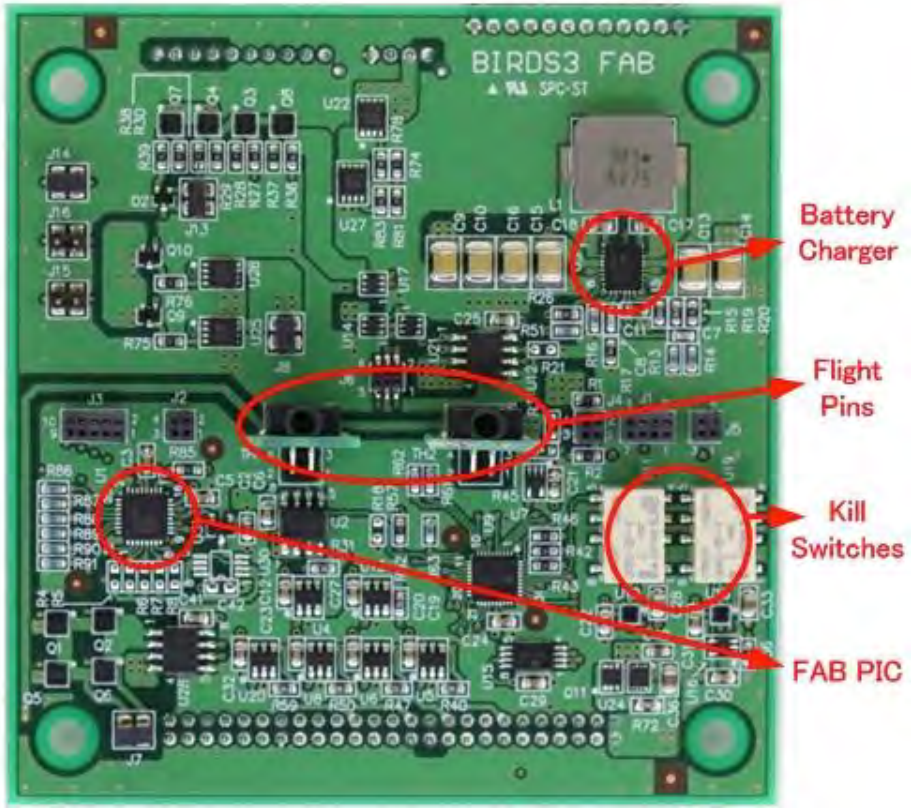


Backplane



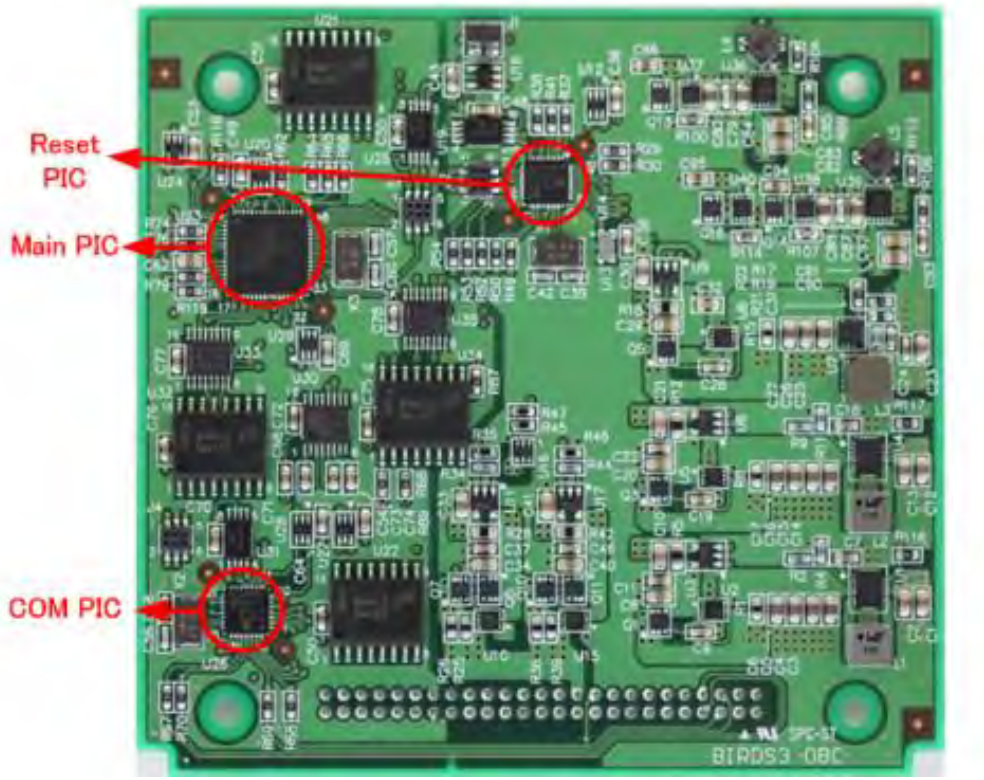
Interfaces all subsystems

Front access



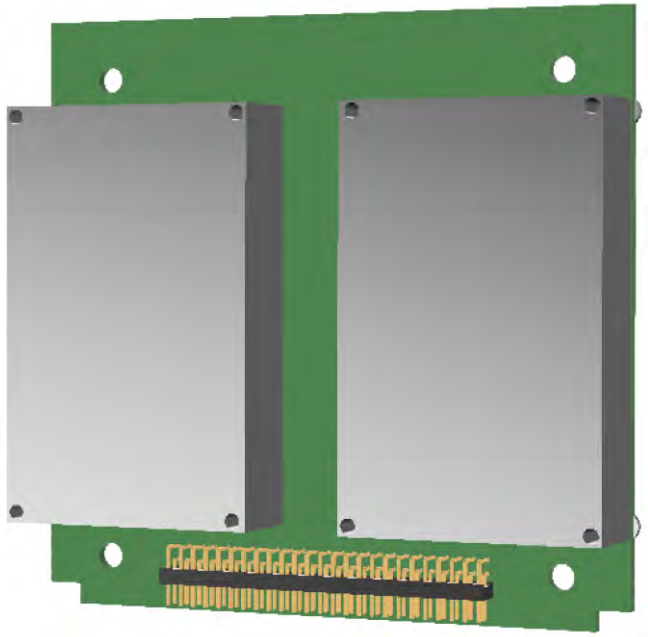
BCR, RBF, KS, sensor, interface
Sagami Tsushin

On-board computer



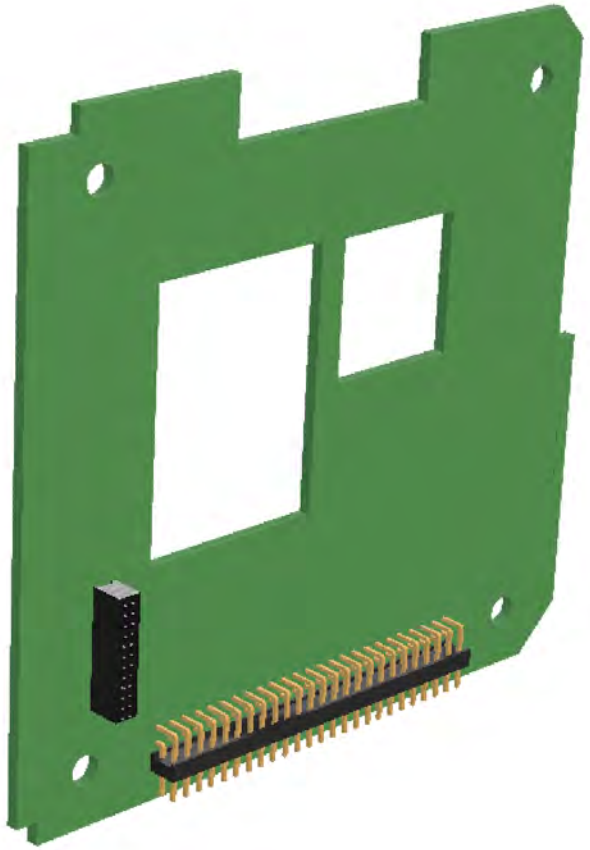
OBC, power distribution, comms management
Sagami Tsushin

Communication

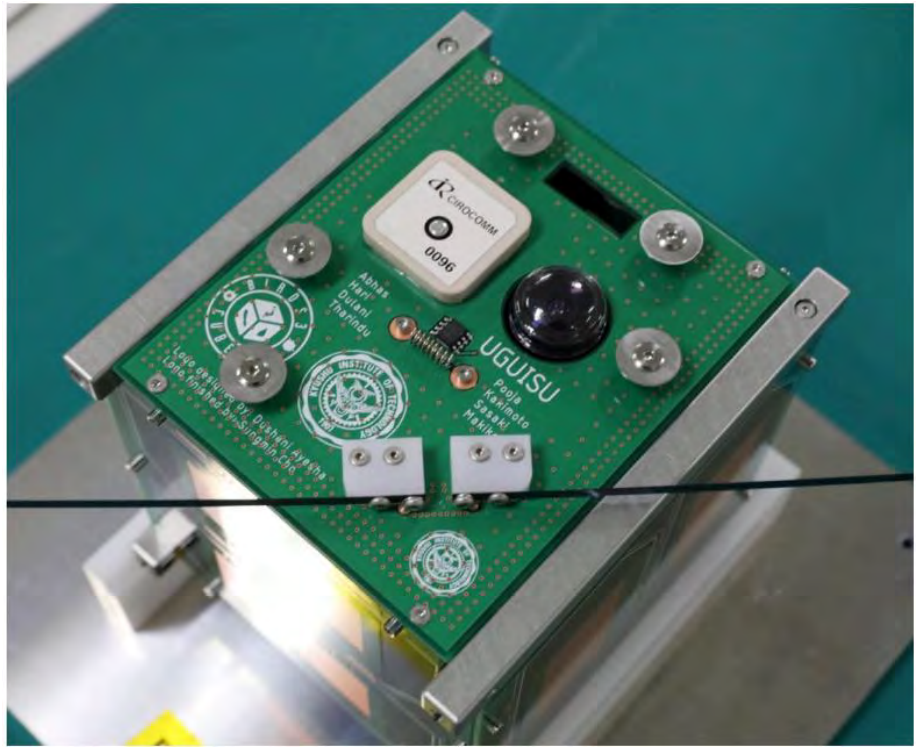


UHF Tx, Rx and beacon
Addnics

Rear access

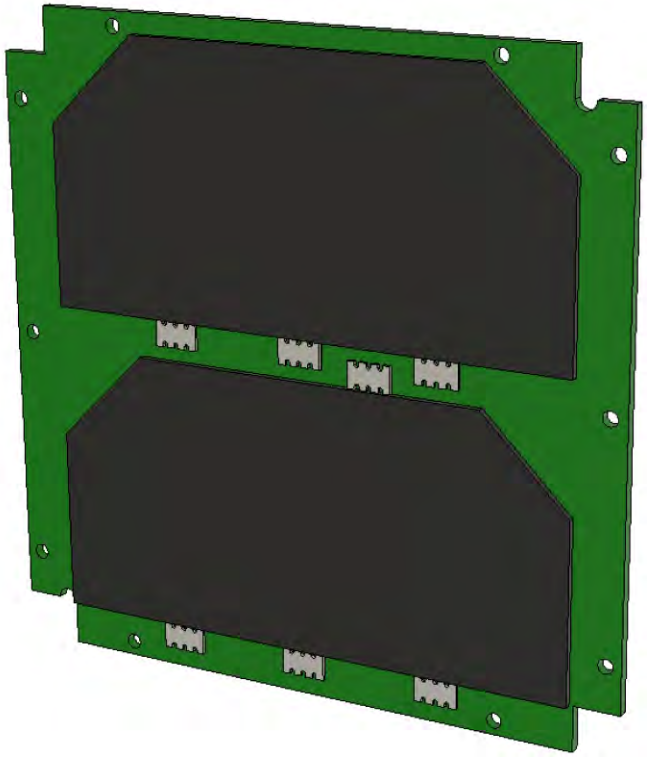


Antenna



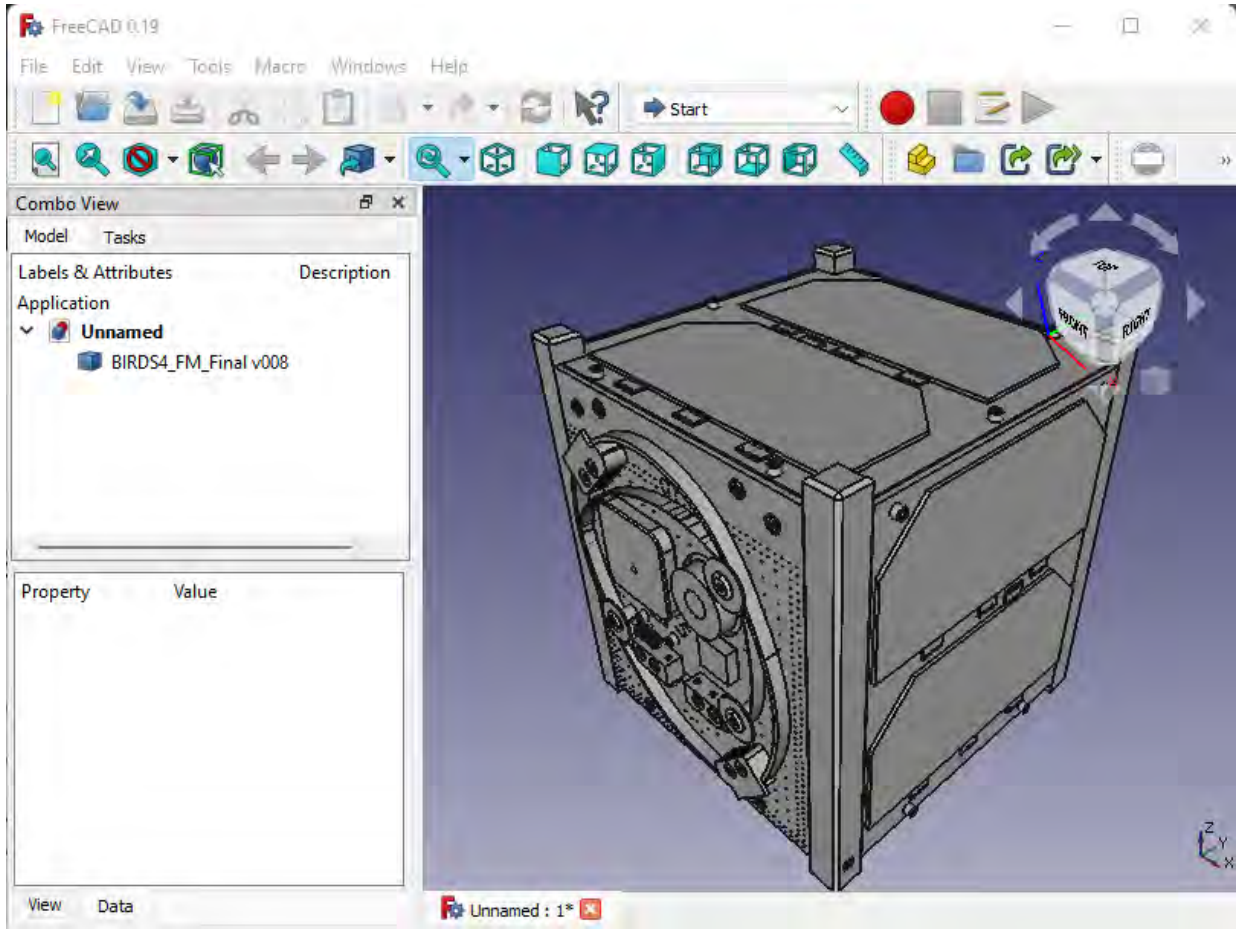
Tape antenna, GPS antenna

Solar panels



BIRDS Bus documentation

- Part list for proprietary boards
- Interface document
- Digital textbook
- Assembly and test procedures
- Test reports
- CAD model (step format)
- Ground Station Software



https://birdsopensource.github.io/

https://github.com/BIRDSOpenSource/

Birds Open Source Release

Kyushu Institute of Technology

BIRDS Project

BIRDS Project

The Joint Global Multi-Nations Birds Satellite project, or BIRDS project, was created by the Kyushu Institute of Technology (*Kyutech*) to help countries build their first satellite. So far, there have been 4 completed and one ongoing BIRDS missions:

1. BIRDS-1: Bangladesh, Japan, Mongolia, Ghana and Nigeria.
2. BIRDS-2: Bhutan, The Philipines and Malaysia.
3. BIRDS-3: Japan, Sri Lanka and Nepal
4. BIRDS-4: Japan, The Philipines, Paraguay.
5. BIRDS-5: Japan, Uganda and Zimbabwe.

The project has two main objectives:

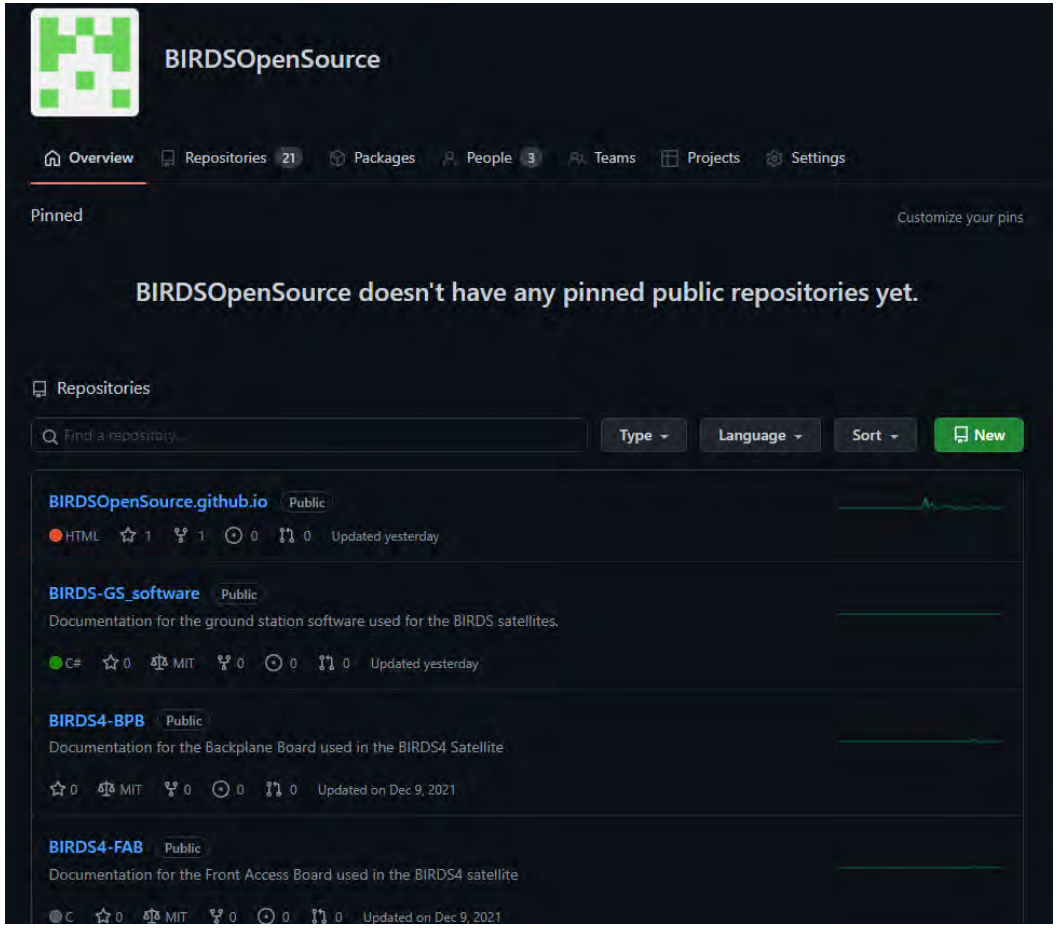
1. Experience the entire cycle of a satellite project, from mission definition to operation, in a hands-on manner.
2. Have a strategy for sustainability after the training ends.

It should be emphasized that the primary goal is not the building of a satellite, but to have a long-term and sustainable space program established in each member country.

Kyutech initiated a long-term fellowship program, DNST/PNST (Doctorate in NanoSatellite Technology/ Postgraduate study in NanoSatellite Technology), in 2011 in collaboration with the United Nations Office of Outer Space Affairs (UNOOSA) to promote the space capacity building of non-space-faring nations. It also started the Space Engineering International Course (SEIC) in 2013 as a postgraduate program.

Two or three young engineers are sent from each participating country to Kyutech as full-time graduate students to learn space engineering using 1U CubeSat development work. The BIRDS program is designed so that each generation of satellites can be finished in two years, from mission definition to operation. Including operation in two years is critical to fit the entire satellite project into a master's degree course study timeline, which is two years.

The BIRDSBus



BIRDS Bus Open Source Release on GitHub

https://birdsopensource.github.io/

BIRDS Bus Open Source Telegram Chat

https://t.me/+D3BCqCmceQ41ZGFl

END OF PRESENTATION BY JUAN JO

ASEANSAT:
AN INDIGENOUS NANOSATELLITE PROJECT INSPIRED BY BIRDS PROGRAM

ASEANSAT OVERVIEW

COLLABORATION

Collaboration with multi-nation institutions (ASEAN)

- UiTM
- KMUTNB
- UPHSD
- Ministries/Agencies
- Industries/NGOs

PROJECT DURATION

2 years

FUND FROM MINISTRY

Fund from Ministry of Science, Technology & Innovation, Malaysia

PARTICPANTS

Students from the 3 representative countries:

- Malaysia – 4 students
- Philippines – 3 students
- Thailand

FIRST ASEAN SATELLITE

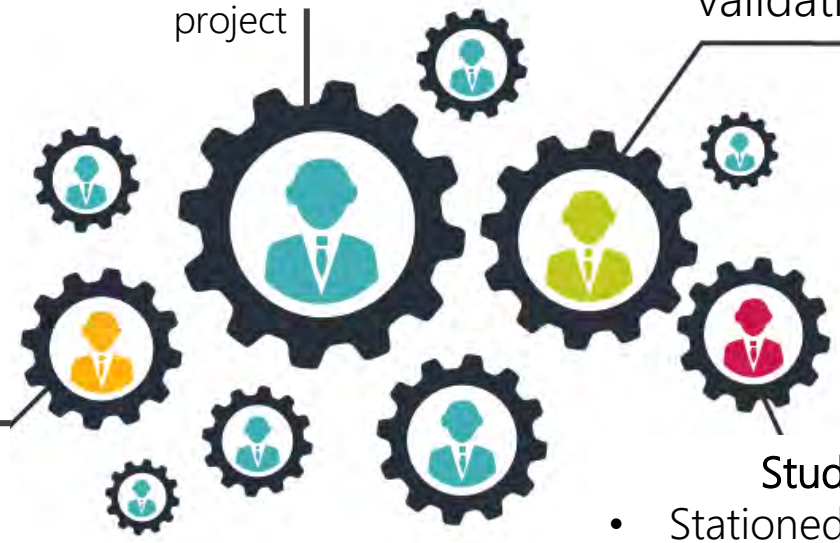
First ASEAN Collaboration (for South-East Asian Institution) Nanosatellite project

National Space Agency & Industries

- Technical support, consultancy, facilities for pre-test
- Technical management (licensing, inter-government link)

Stakeholders

- Cost & expertise
- Send student to join the project



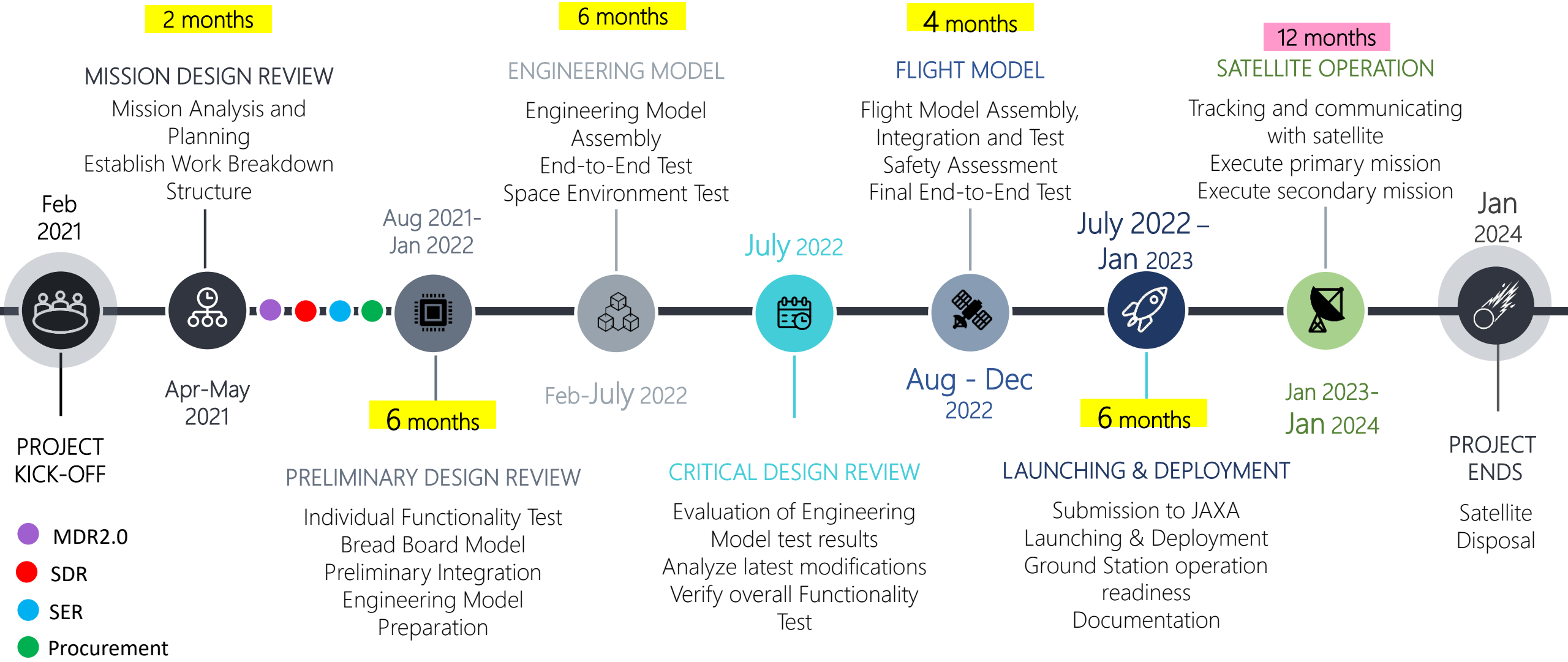
Kyutech/UPHSD/ KMUTNB

- EM & FM testing and validation

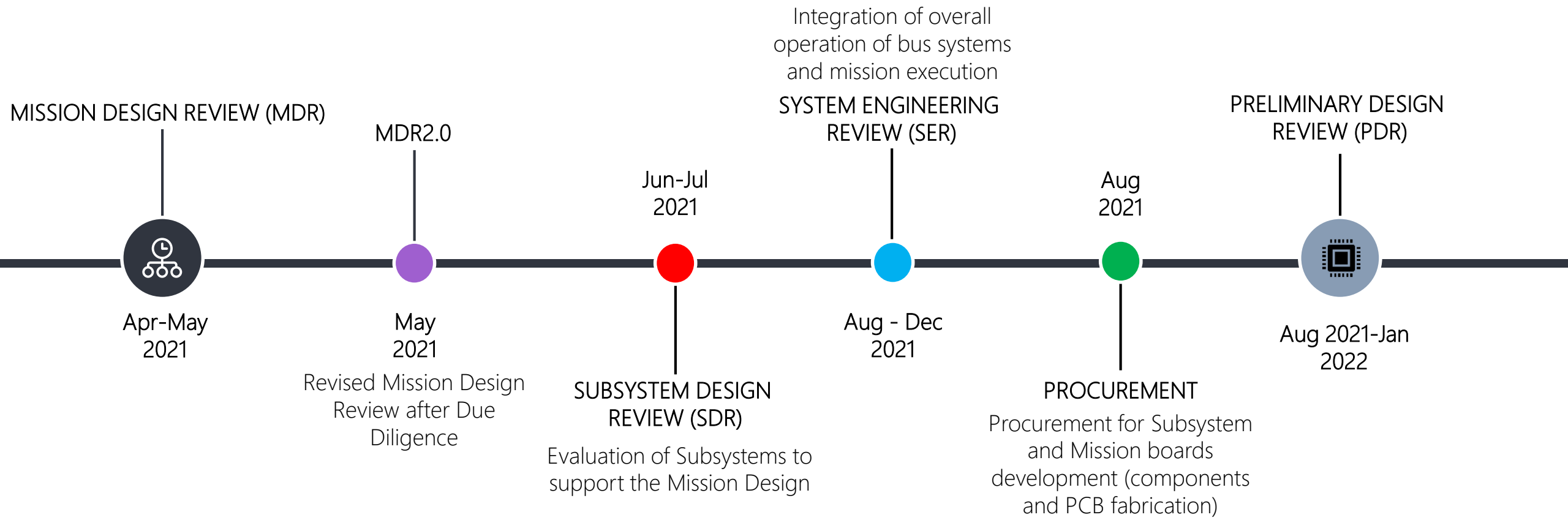
Students

- Stationed in UiTM for ASEANSAT development
- Experience hands-on training-BIRDS bus systems

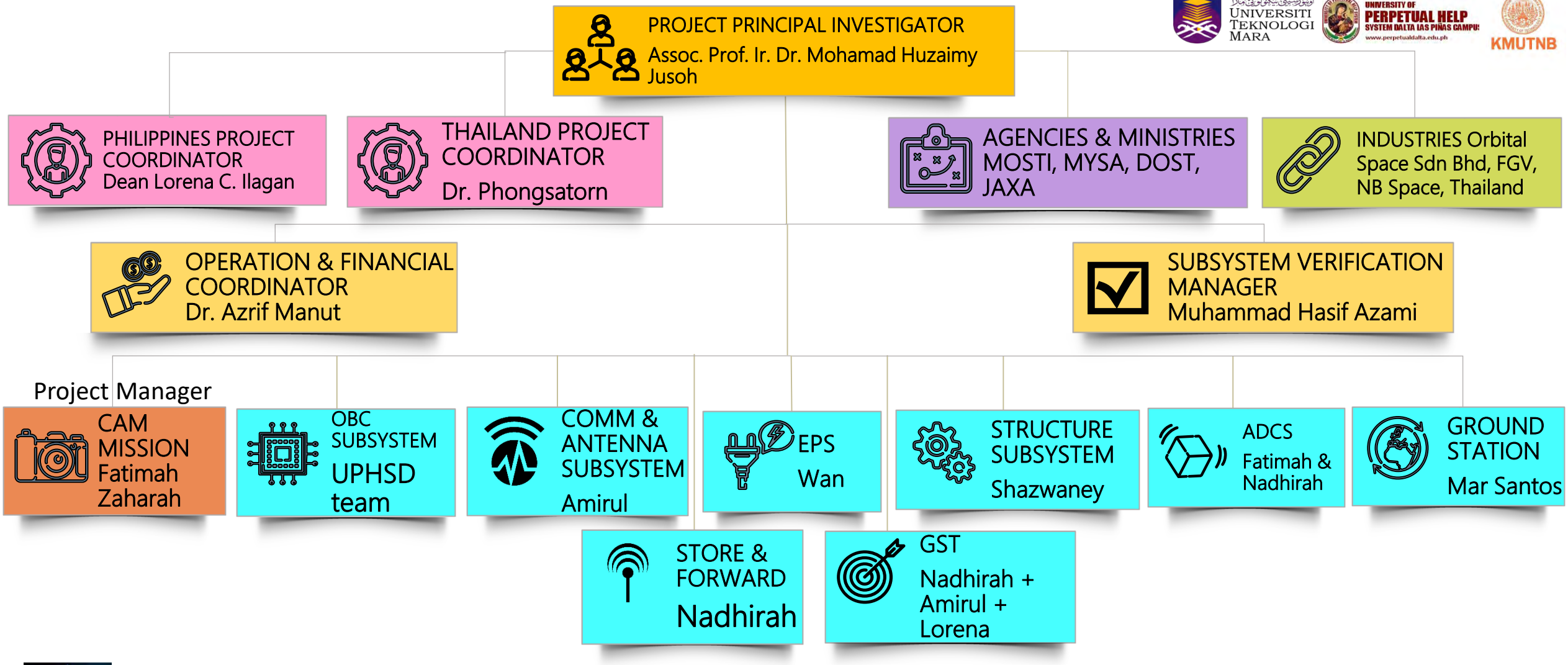
MISSION TIMELINE



MISSION TIMELINE



ASEANSAT ORGANIZATION CHART



MISSION STATEMENT

- CubeSat provides low ground resolution imageries due to limitation in selecting suitable imaging sensor. With the technology advancement in optical design, **ground resolution** can be improved.
- Additionally, in-situ monitoring by personnel at remote area requires high operational cost. By installing the **ground sensor terminal** that involves satellite data delivery services, the monitoring method can be complemented.
- As Malaysia possesses limited resources in developing a satellite where usually foreign experts were used to initialize the space program. It would be a great addition to Malaysia's satellite development where **local experts and facilities** will be utilized.

MISSION OBJECTIVE

PRIMARY OBJECTIVES:

- To capture optimal ground resolution images, store the images onboard and transmit it to ground station.
- To develop a system that utilizes ground-based sensor for data collection in remote areas with no terrestrial networks by using Store-and-Forward application.

SECONDARY OBJECTIVES:

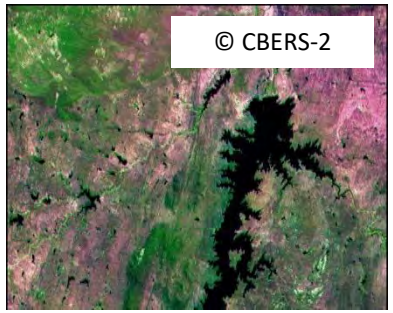
- To build and test 1U-sized Engineering Model (EM) nanosatellite by utilizing local facilities.
- Promote international collaboration project in ASEAN countries.

TECHNICAL INFORMATION

Orbital altitude	400 km
Inclination	ISS Orbit (±51.6°)
Payload	Main mission: Camera mission (< 25 meters resolution)
	Secondary mission: Store-and-forward
CMD/TLM Transmission Rate	4800 bps
Satellite Pass	4 ~ 6 times/day (6~8 minutes/pass)
Electrical Power	5V, 3.3V limited to 1A
Battery	Limited to 3.7V
Data Interface	I2C, UART, SPI
Communication Frequency	UHF mission/telemetry/CW downlink: 437 MHz
	UHF command uplink: 435 MHz
	VHF command uplink (S&F Mission): 145 MHz

ASEANSAT: MISSIONS & STRUCTURE

Main Mission:
Earth Observation Mission
High ground resolution camera payload



GSD: 20 m @ 800 km

GSD: 16 m @ 700 km

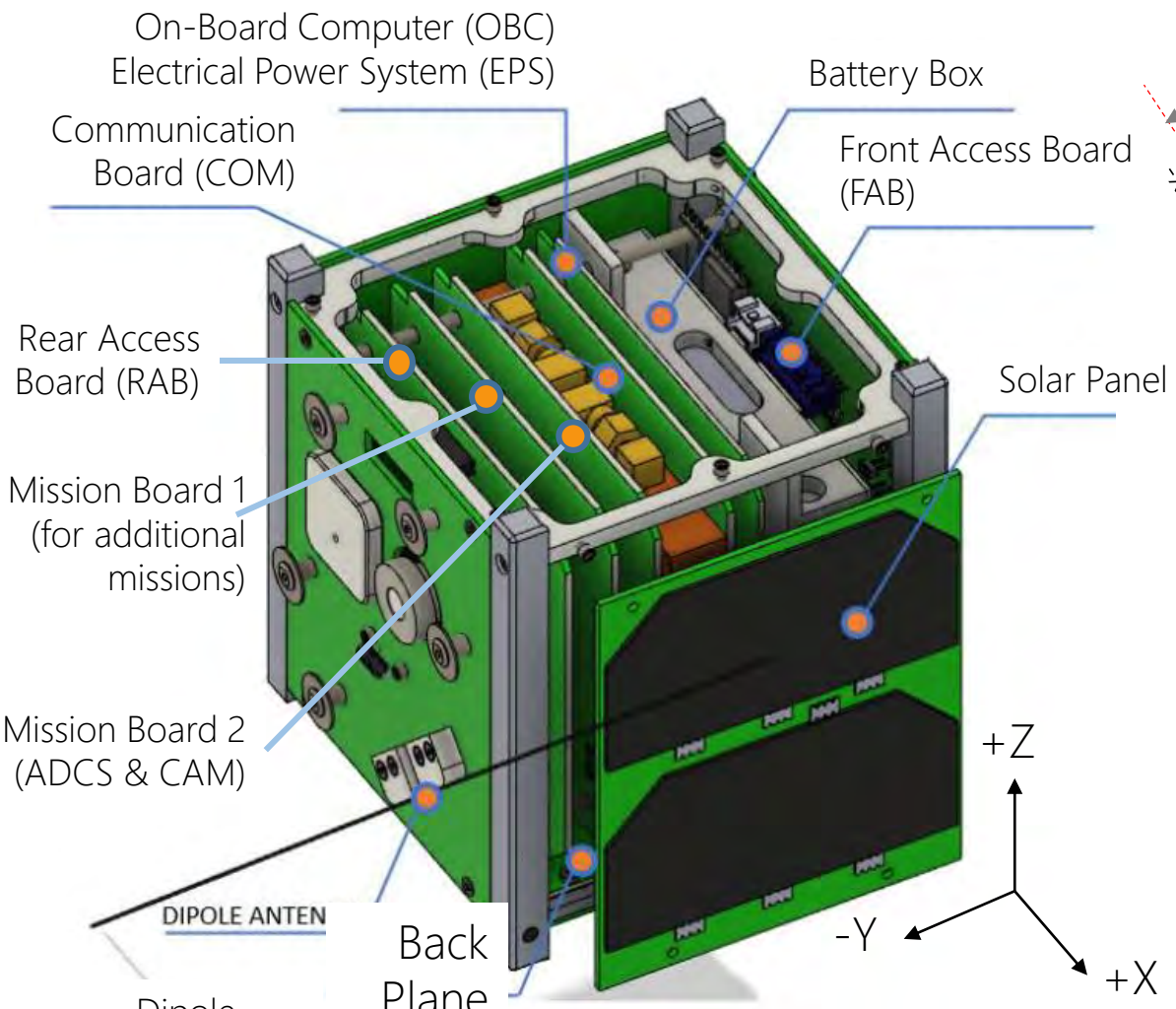
- Mass ~ 1 – 1.33 kg
- Size ~ 10 x 10 x 11.35 cm
- Power ~ 1 – 2.5 W
- UWE standard interface

UiTMSAT-2:

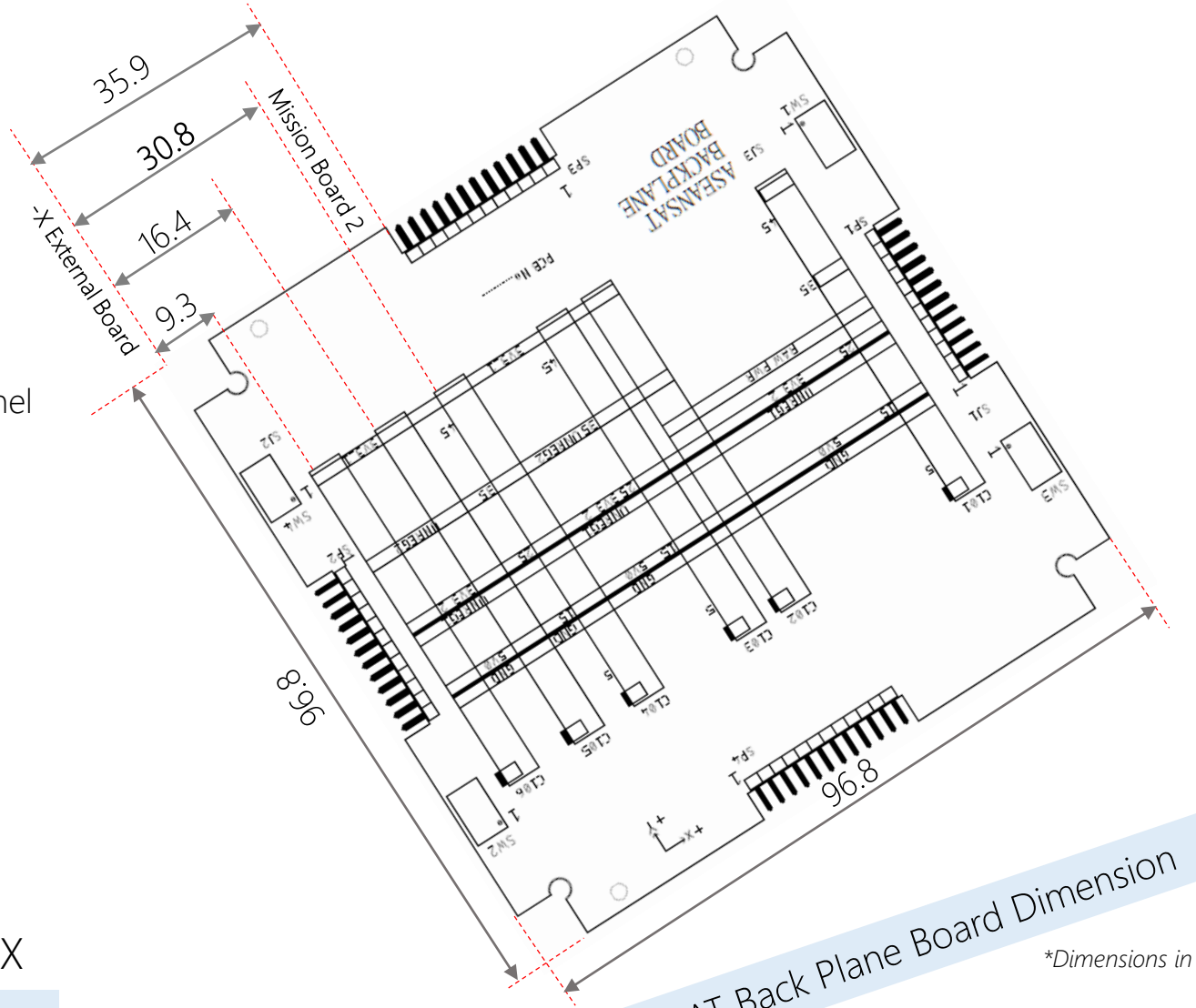
- Resolution: 2592x1944 pixels array (5 MP)
- Spatial: GSD < 25 m @ 400 km
- Spectral: RGB (λ: 0.4 – 0.7 nm)
- Radiometric: 8 – 10 bits image data
- Temporal: 4 ~ 6 times/day (6~8 minutes/pass)
- Swath: FOV ~6° (41.5 x 31 km)

Secondary Mission:
Store-and-Forward Mission
Agriculture monitoring system

ASEANSAT BUS-SYSTEMS ARRANGEMENT INSPIRED BY BIRDS3



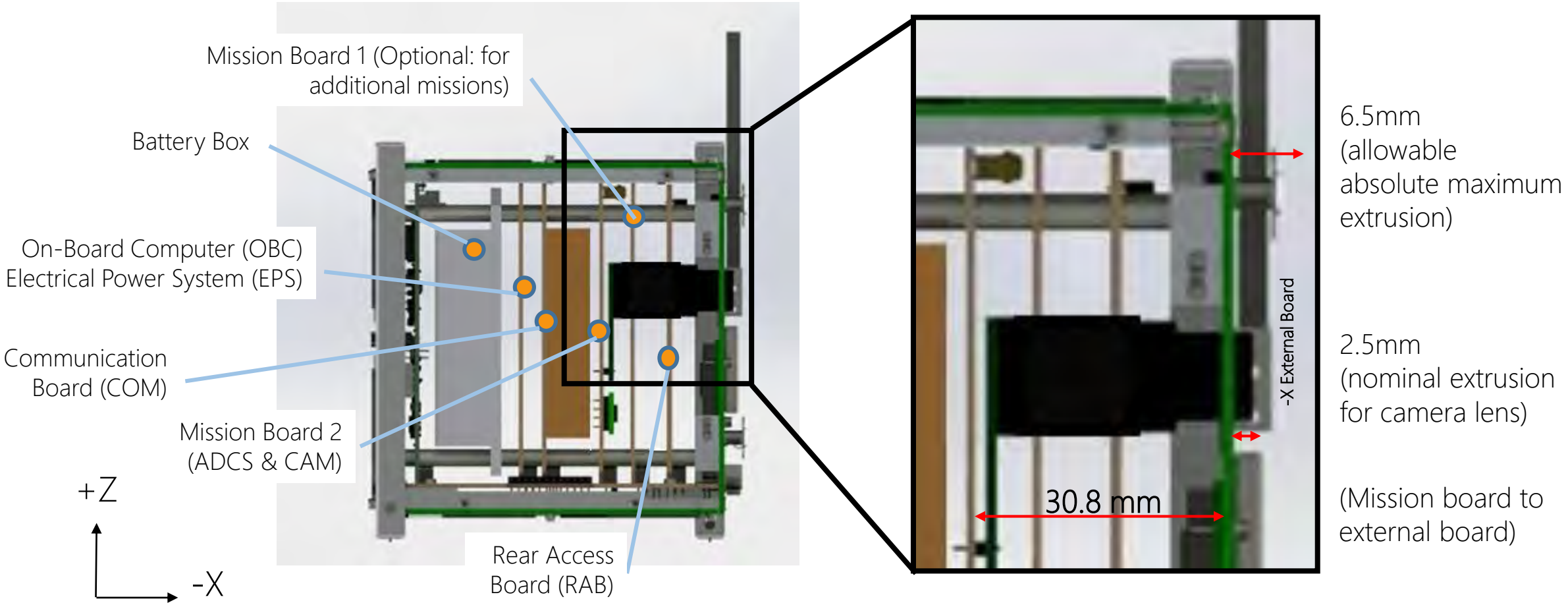
ASEANSAT Internal & External View



*Dimensions in mm

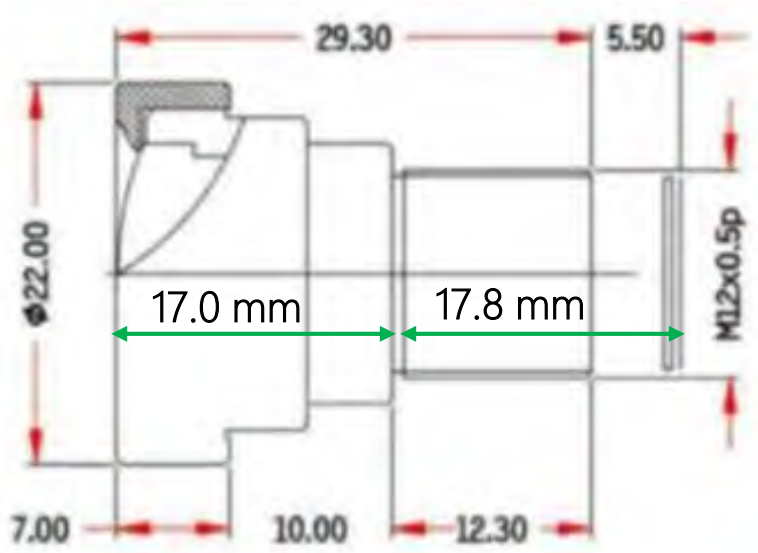
ASEANSAT Back Plane Board Dimension

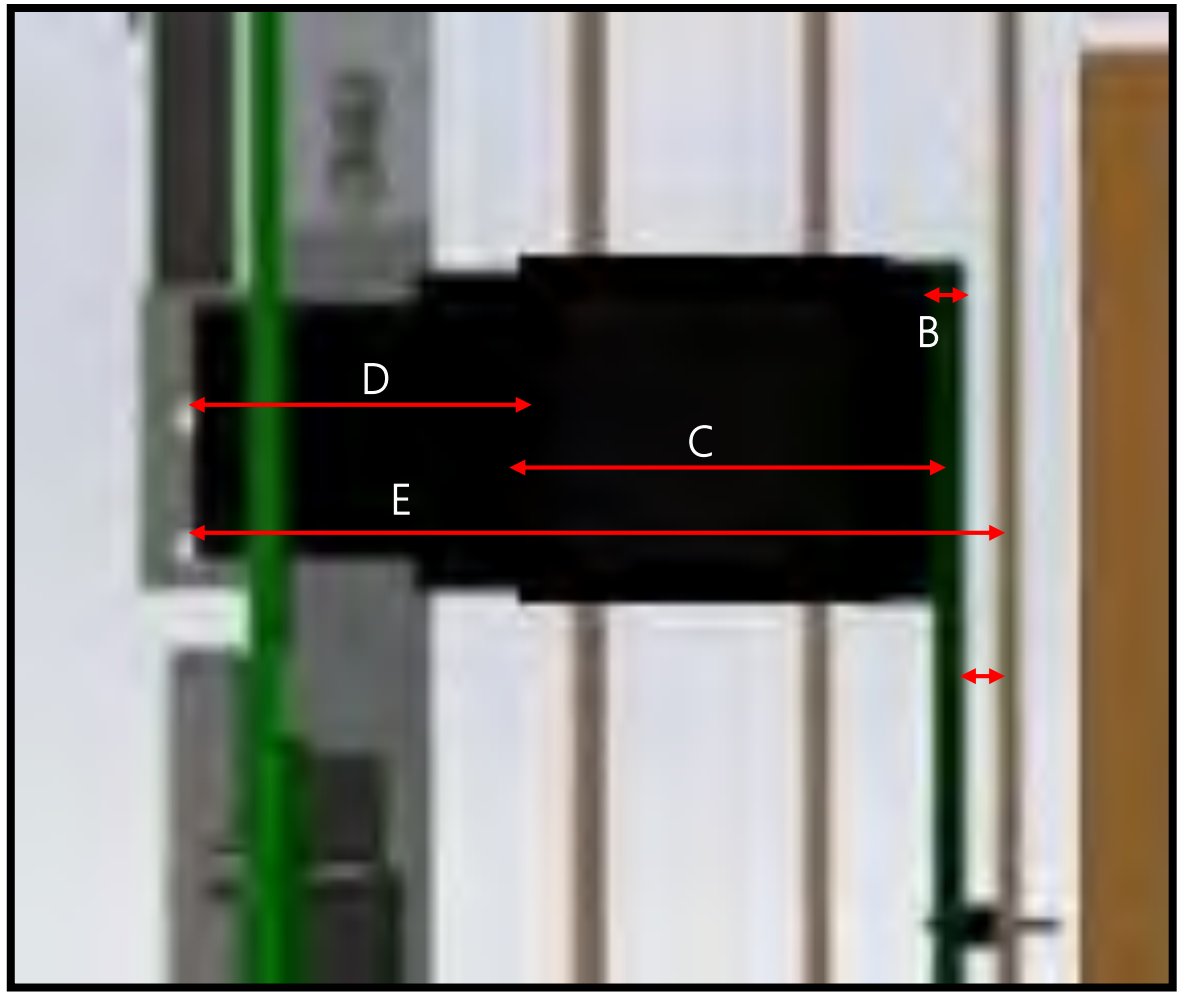
ASEANSAT BUS-SYSTEMS ARRANGEMENT INSPIRED BY BIRDS3



1. Total measurement from Mission Board 2 to the nominal extrusion camera lens = 30.8mm + 2.5mm = 33.3mm.
2. Total measurement from Mission Board 2 to the allowable absolute maximum extrusion = 30.8mm + 6.5mm = 37.3mm.
3. The chosen camera module is feasible to be used in ASEANSAT even the camera lens is extended until the maximum dimension of 35mm.
4. There is still some allowable extrusion of 2.3mm (37.3 mm – 35 mm) after the maximum extension.

ASEANSAT BUS-SYSTEMS ARRANGEMENT





1. A = ~ 2 mm.
2. B = ~ 1 mm
3. C = ~ 15 mm
4. D = (17.80 mm – C) + 17 mm = 19.80 mm
5. E = A + B + C + D = 37.80 mm
6. There is 0.5 mm additional length

ASEANSAT SUBSYSTEMS & MISSION DESIGN

SUBSYSTEM /MISSION	BIRDS REFERENCES	ASEANSAT	Personnel
CAM	BIRDS2 – BIRDS4: • Sensor of 5MP (OV5642) • IR filter included in lens	• Focal length = 35 mm • Sensor of 5MP (OV5642), IR filter included in sensor • GSD ~ 16 m at 400km altitude	PIC: • Fatimah (ASEANSAT) Technical Input: • Izrael (BIRDS4) • Abhas (BIRDS3) • Azami (BIRDS2)
SFWARD	BIRDS4: • Downlink for acknowledgement • APRS	• No acknowledgement included (only receive data from GST) • Optional for 6 letters message transmission (APRS)	PIC: • Nadhirah (ASEANSAT) Technical Input: • Marloun (BIRDS4) • Adrian (BIRDS2)
Mission Board	• 2 mission boards (MB1 and MB2) • MB1: ADCS and other missions, MB2: CAM & SFWARD (BIRDS4)	• 1 mission board (MB) • MB: CAM, SFWARD & ADCS	PIC: • Fatimah (ASEANSAT) • Nadhirah (ASEANSAT) Technical Input • Izrael (BIRDS4) • Abhas (BIRDS3) • Azami (BIRDS2)

ASEANSAT SUBSYSTEM DESIGN

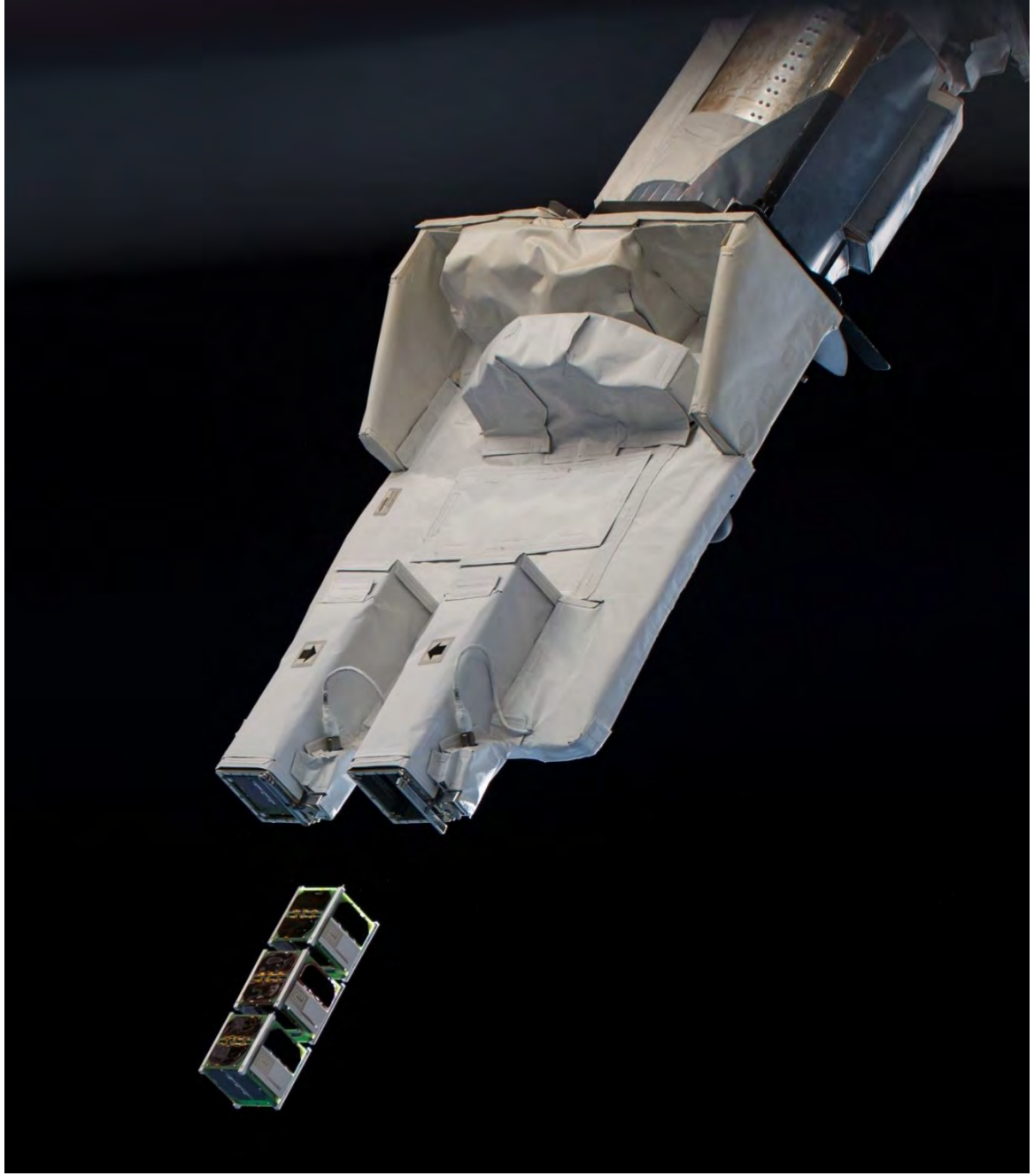
SUBSYSTEM	BIRDS REFERENCES	ASEANSAT	Personnel
ANT	BIRDS4: • Dipole antennas for both UHF and VHF • VHF uplink/downlink	• Dipole antennas for both UHF and VHF • VHF uplink only	PIC: • Amirul (ASEANSAT) Technical Input: • Azami (BIRDS2) • Syazana (BIRDS2)
COMM	• Bit rate of 4800 bps	• Bit rate 4800 bps	PIC: • Amirul (ASEANSAT) Technical Input: • Azami (BIRDS2) • Syazana (BIRDS2)
STR	BIRDS4: • 3 deployment switches (1 rail switch, 2 separation springs)	• 3 deployment switches (push buttons at rail tip) – follow updated launcher requirements (BIRDS5)	PIC: • Shazwaney (ASEANSAT) Technical Input: • Azami (BIRDS2)
OBC/EPS & FAB	BIRDS5	• Follow BIRDS5 latest design	PIC: • Wan & UPHSD team (ASEANSAT) Technical Input: • Izrael (BIRDS4) • Hari (BIRDS4)

ASEANSAT SUBSYSTEM DESIGN

SUBSYSTEM	BIRDS REFERENCES	ASEANSAT	Personnel
RAB	BIRDS4: • Other missions (TMCR, PSC, etc)	• Missions: CAM & SFWARD	PIC: • UPHSD (ASEANSAT) Technical Input: • Azami (BIRDS2)
BPB	BIRDS4	• MB will be located on MB1 of BIRDS4	PIC: • UPHSD (ASEANSAT) Technical Input: • Azami (BIRDS2)
ADCS	BIRDS2 & BIRDS4	• Passive attitude control	PIC: • Fatimah & Nadhirah (ASEANSAT) Technical Input: • Izrael (BIRDS4) • Abhas (BIRDS3) • Azami (BIRDS2)

*Several components are substituted with new models due to the issues of longer lead time, obsoletion, and out-of-stock. The new models were found based on the specification of the old components in order to avoid risk in the circuitries.

END OF PRESENTATION BY UiTM



How we use the BIRDS Bus in Mongolia

Dr. Turtogtokh Tumenjargal

ASSOC PROFESSOR

Nano-Satellite Development Laboratory

Department of Physics, School of Arts and Sciences

NATIONAL UNIVERSITY OF MONGOLIA

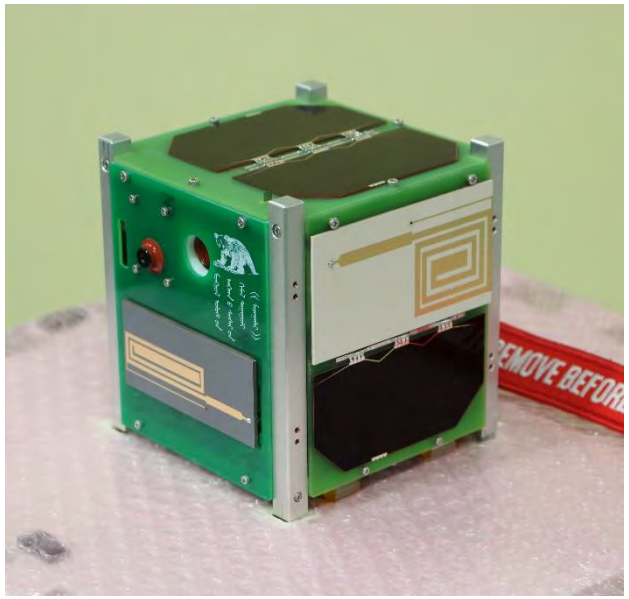
Email: turtogtokh[at]num.edu.mn

Background

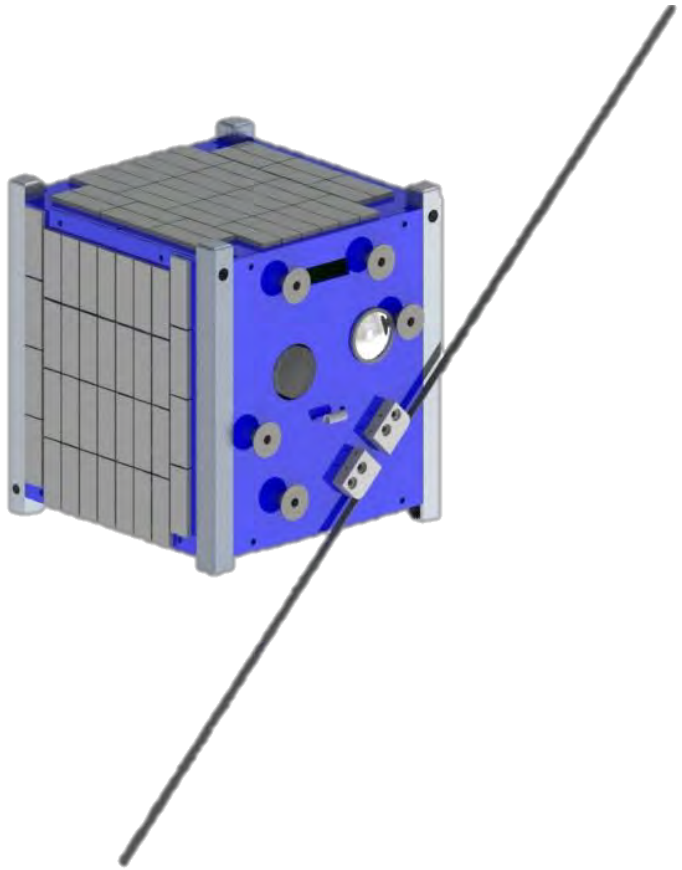
The Joint Global Multi-Nation Birds Satellite (BIRDS) Project was initiated in 2015 by the Kyushu Institute of Technology, Japan

CubeSats of the BIRDS-1 are deployed from the J-SSOD. /July 7, 2017

BIRDS-1:
Japan
Ghana
Mongolia
Nigeria
Bangladesh
Thailand (Ground station)
Taiwan (Ground station)



TEMUULEL satellite Project



Project mission

- To prepare human resources for space technology
- To own the technology bases (design, build, test, operation) of satellite engineering by conducting small satellite (1U Cubesat) project in-house

- Satellite Mission: **Educational and Technology demonstration**
  - Earth observation
  - Satellite interface
  - Remote data collection
  - Outreach: Send your dream into Space
- Team
  - Undergraduate and graduate students of National University of Mongolia (NUM)
  - Some members of Mongolian Space Technology Association (MOSTA)
- Budget
  - Less then 150,000USD including launch cost.

TEMUULEL CubeSat project

Some pictures of Temuulel PDR

Project Timeline

Oct 2018 — Kick off
Project started

MDR — Dec 2019
Mission Definition Review

PDR — Dec 2021
Preliminary Design Review. Starting Engineering Model (EM) integration

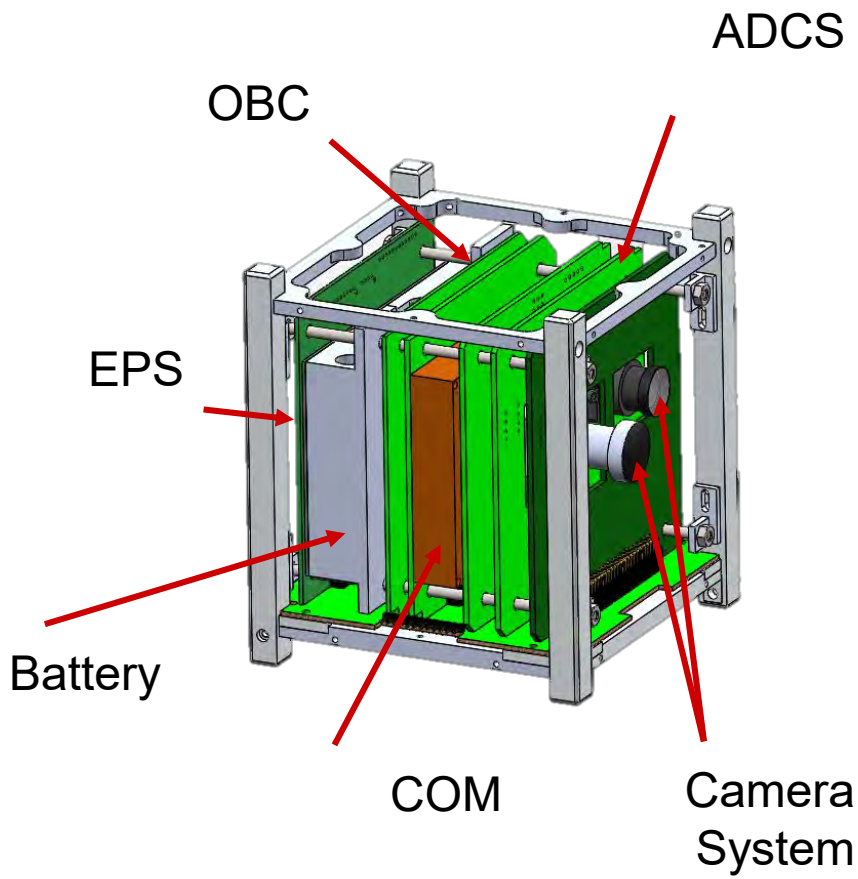
CDR — April 2022
Critical Design Review. Starting Flight Model (FM) integration

FRR — Fall 2022
Flight readiness review

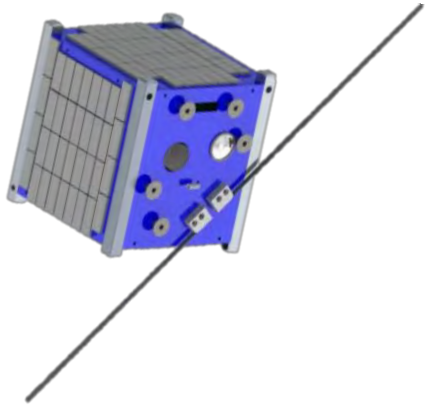
Launch — 2023
Launch, Deployment and Operation.

TEMUULEL satellite BUS

Heritage of Birds-3 bus system



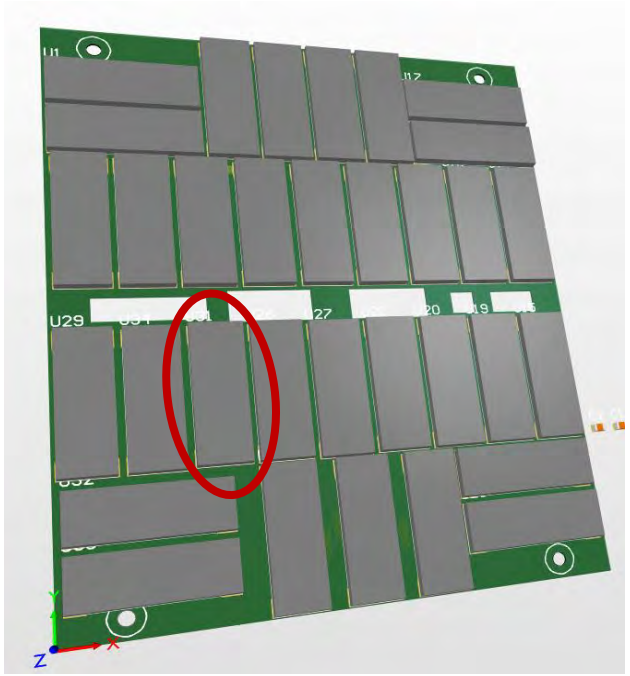
- **EPS (BIRDS BUS)**
  - 3s2p NiMH Battery
  - 5V, 3.3V, unregulated
  - *Solar panels are different*
- **Interface board - Backplane (Kyutech)**
- **Communication system**
  - FM (GMSK 9600pbs), CW
  - UHF
  - **Antenna board (BIRDS-3)**
- **On-board Computer (BIRDS bus)**
- **ADCS (*Birds-3 Heritage*)**
  - Magnetic torque
  - IMU sensor, Gyro, Magnetometer



External view of TEMUULEL satellite

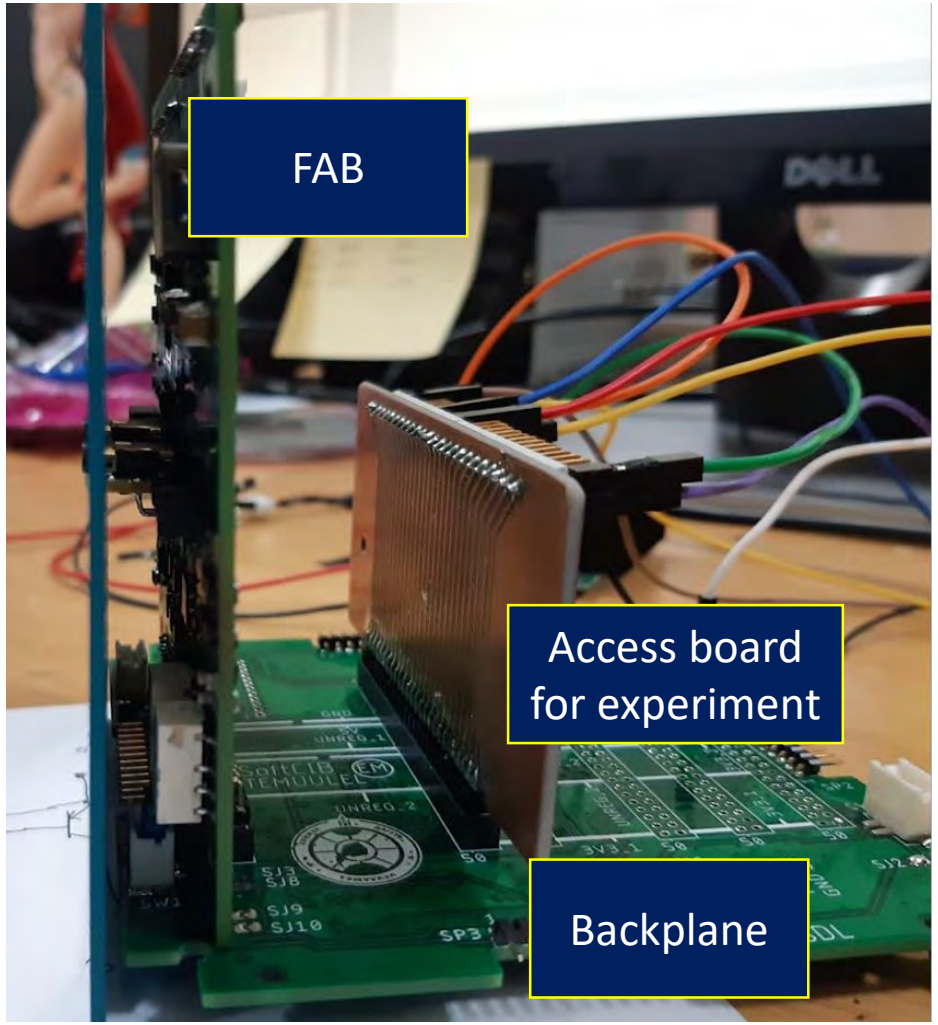
BIRDS Solar cell vs TEMUULEL solar cell

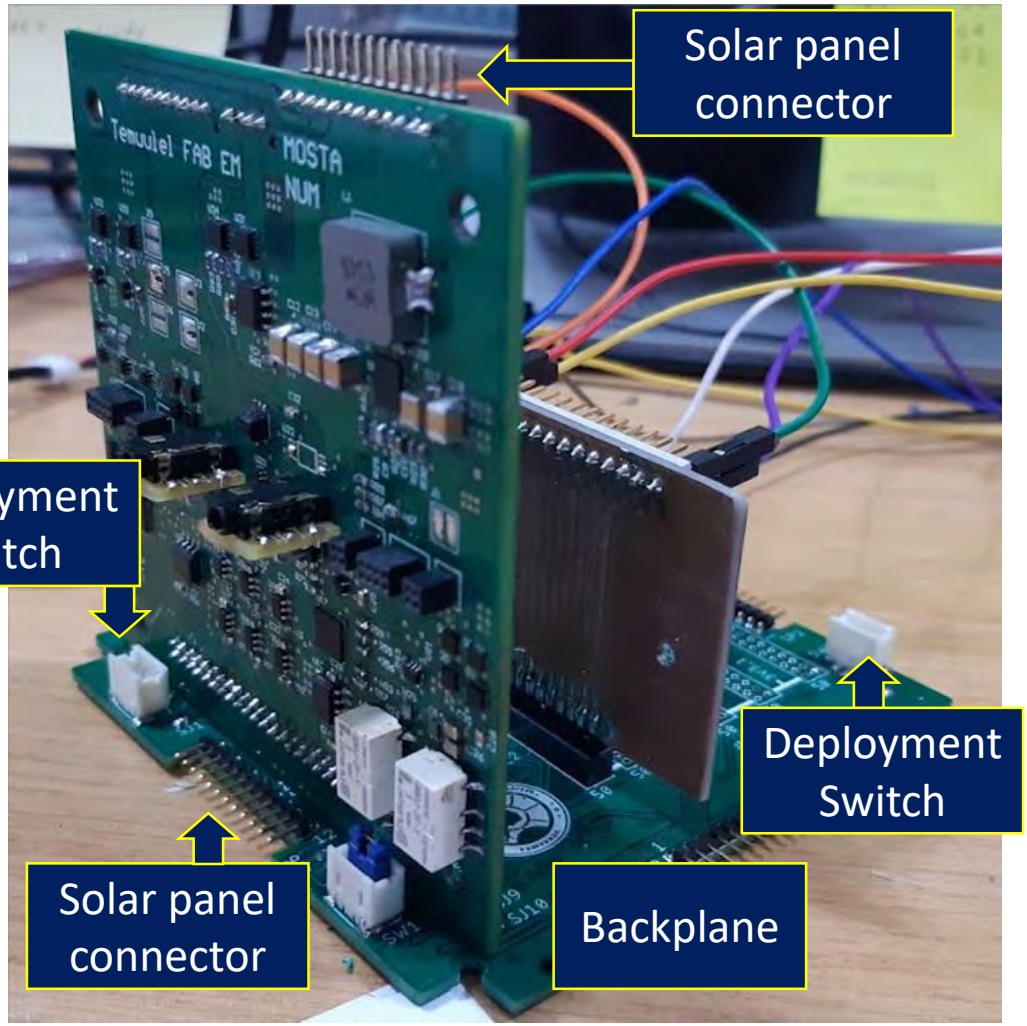
Triple Junction Solar Cell
30% Efficiency
Area: 30.18 cm^2
Vmpp : 2.4V
Impp : 504.4mA
Power: 1216mW



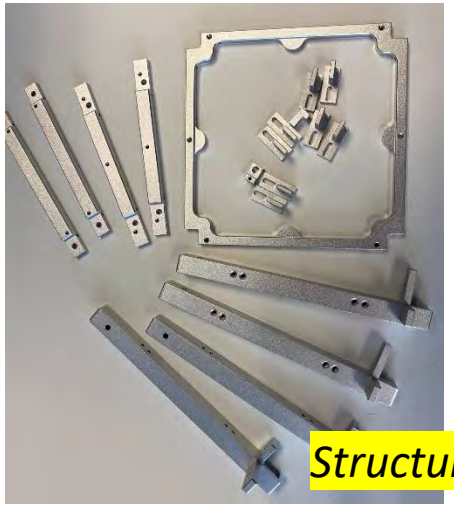
Monocrystal Solar cell
25% Efficiency
Area : 1.84 cm^2
Vmpp: 1.67V
Impp : 18.4mA
Power: 30.7mW

EPS, OBC and Backplane

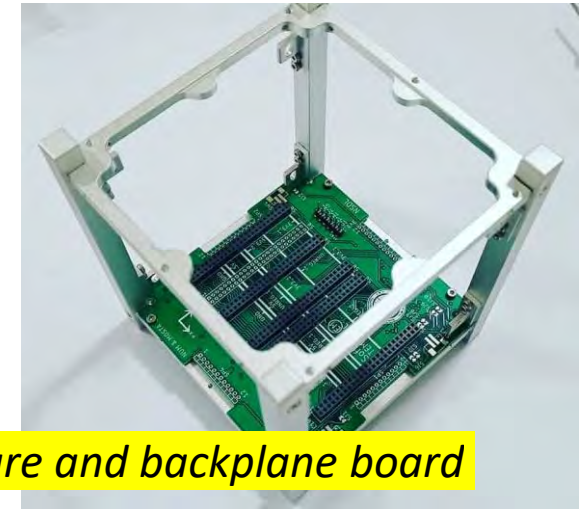


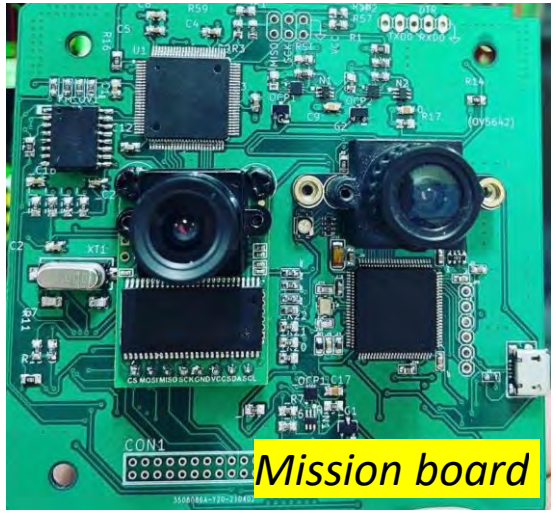


Some progresses



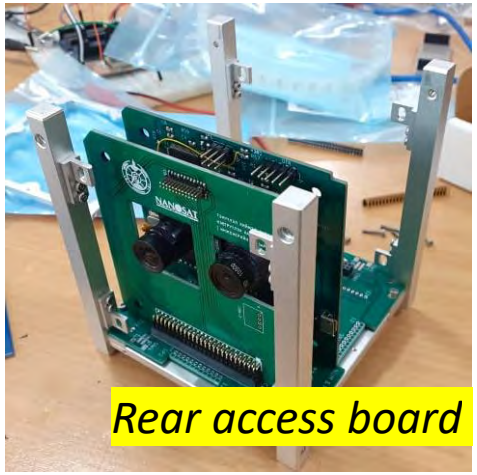
Structure and backplane board





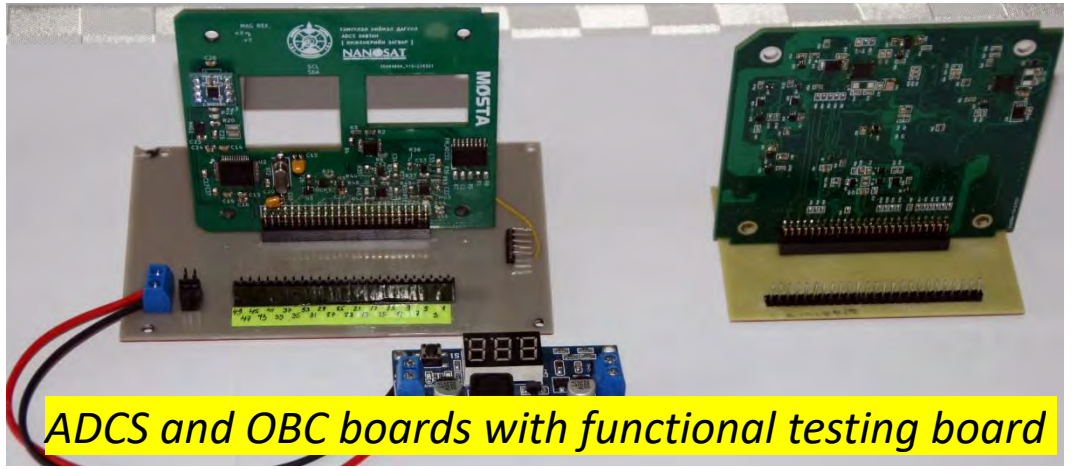
Mission board

Assembly with PCBs



Rear access board

ADCS board



ADCS and OBC boards with functional testing board

Conclusions and Discussions

- TEMUULEL CubeSat is using BIRDS bus
  - FAB, OBC, Backplane, Antenna board, Structure
- ADCS of TEMUULEL adapt BIRDS-3 heritage
- We needed good PCB designer
- Most expensive parts – Solar panels and Communication subsystem
- Many components were out of stock (few obsolete) on websites
- Changes on Requirements (may affect EPS and Backplane)
- Releasing from Rocket is another option (Seems no problem for BIRDS bus, but …)

Thank you for your attention!

END OF PRESENTATION BY NUM

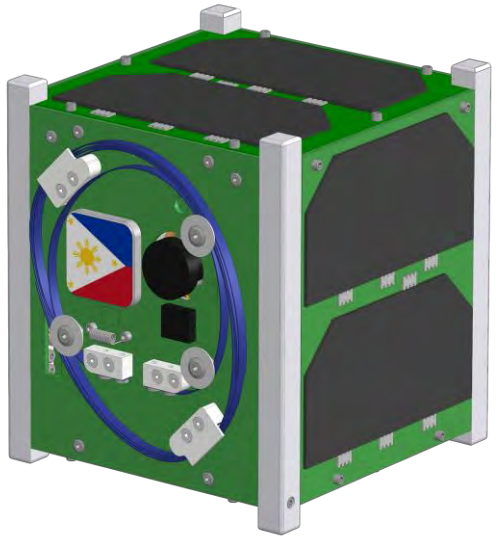
3rd BIRDS BUS Open Source Webinar

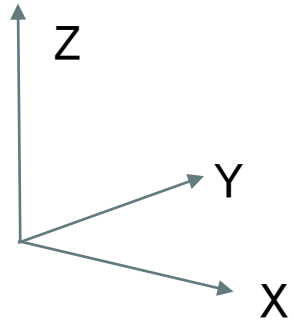
February 12, 2022

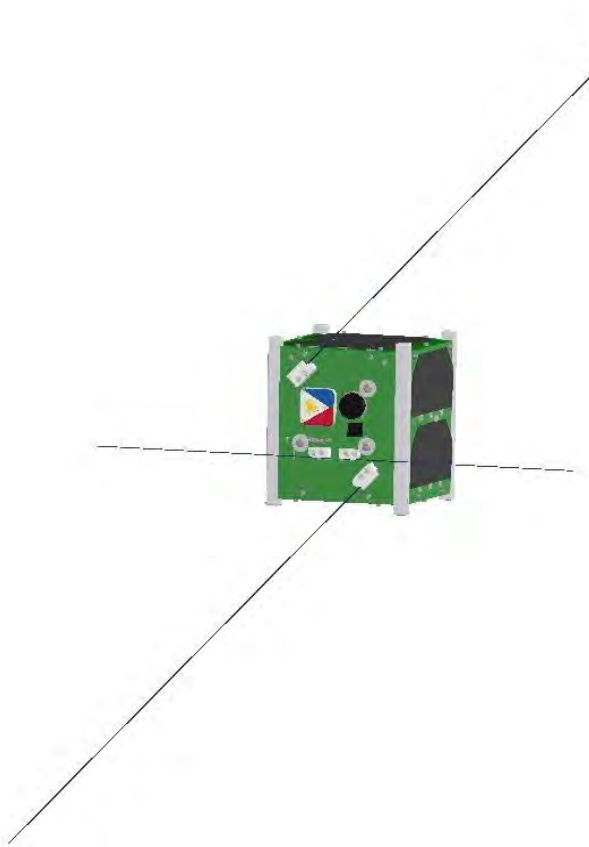
BIRDS4S BUS

By STeP-UP Batch 2 (Philippines)

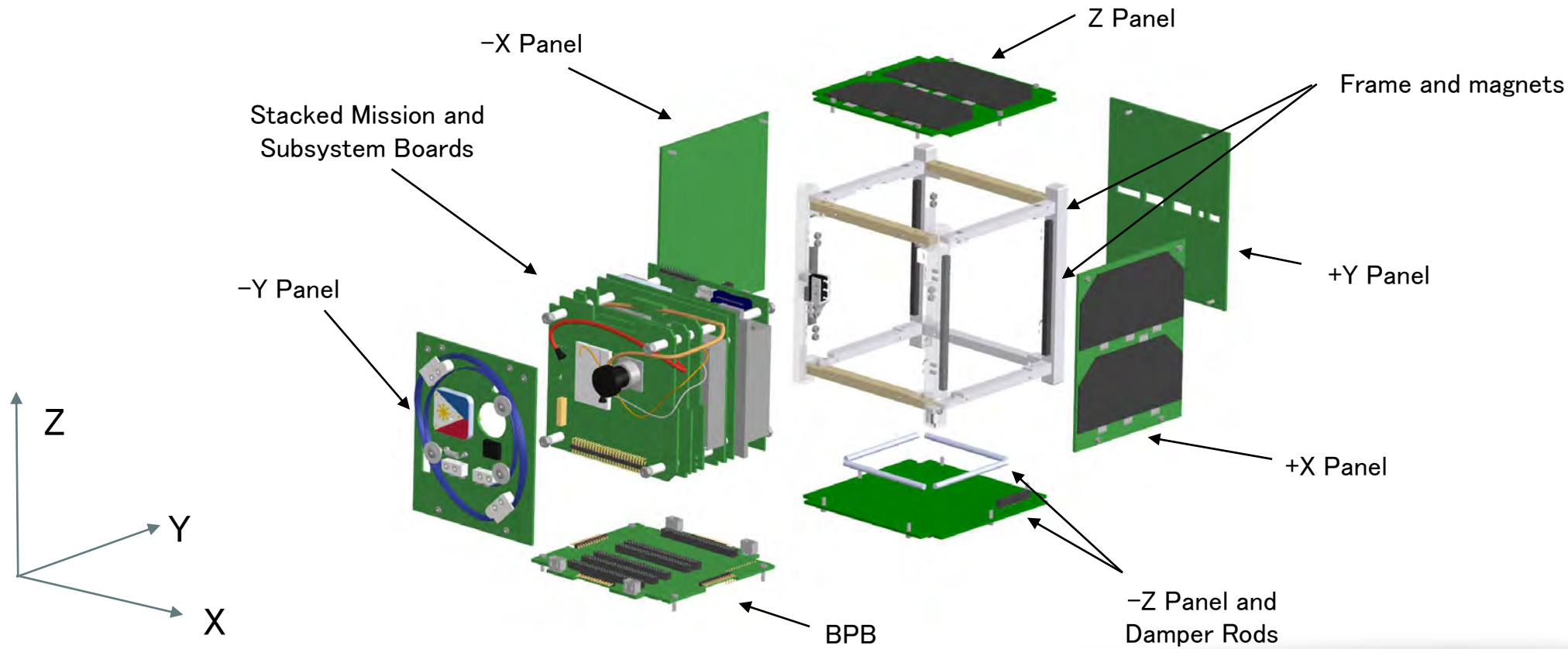
BIRDS4S (MAYA-5 & MAYA-6)







BIRDS4S (MAYA-5 & MAYA-6)



ISSUES ENCOUNTERED

COMMUNICATION SUBSYSTEM

1. The COM board, as well as some components of OBC/EPS and FAB board, generated noises that affects the received signal of the satellite.

ROOT CAUSE: Near-field Electromagnetic Interference
SOLUTION: Cover the backside of the COM board receiver and the components of OBC/EPS and FAB board that generated noise with Aluminum shield (receiver sensitivity is 8 dB better in shielded condition).

** Aluminum shield is space grade and safe from outgassing*

COM BOARD

FAB

FRONT ACCESS BOARD (FAB)

1. **J2 Port** (Serial – OBC) was damaged during series of tests

ROOT CAUSE: Due to frequent insertion of the connector during tests
SOLUTION: Soldered the pins with wires during tests
RECOMMENDATION: Apply araldite once replaced with new port

FRONT ACCESS BOARD (FAB)

2. **J4 Port** (Voltage Monitor) was damaged during series of tests

ROOT CAUSE: Due to frequent insertion of the connector during tests
SOLUTION: Manually measured the voltage directly to the board during tests
RECOMMENDATION: Apply araldite once replaced with new port

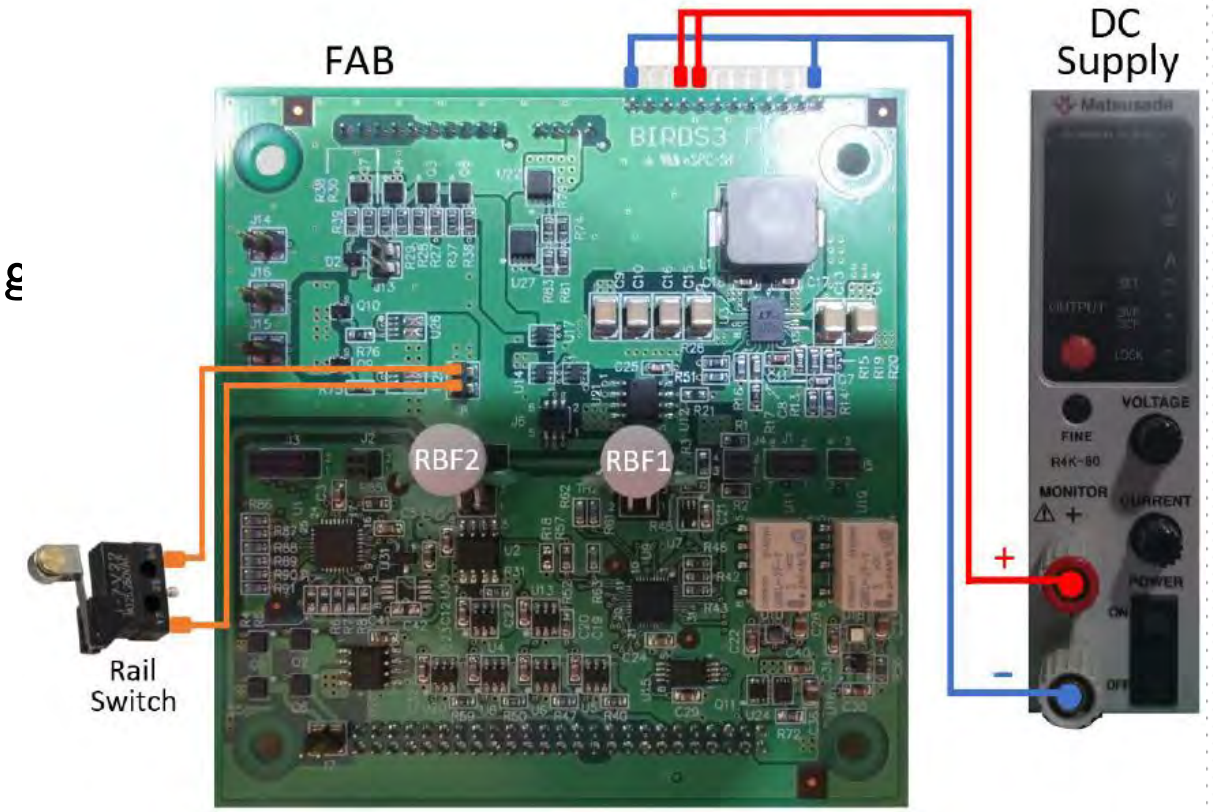
FRONT ACCESS BOARD (FAB)

3. **J5 Port** (DC Input – Battery Charging) was damaged during series of tests

ROOT CAUSE: Due to frequent insertion of the connector during tests

SOLUTION: Powered up the CubeSat via Z+ solar panel at FAB; back-up cable provided

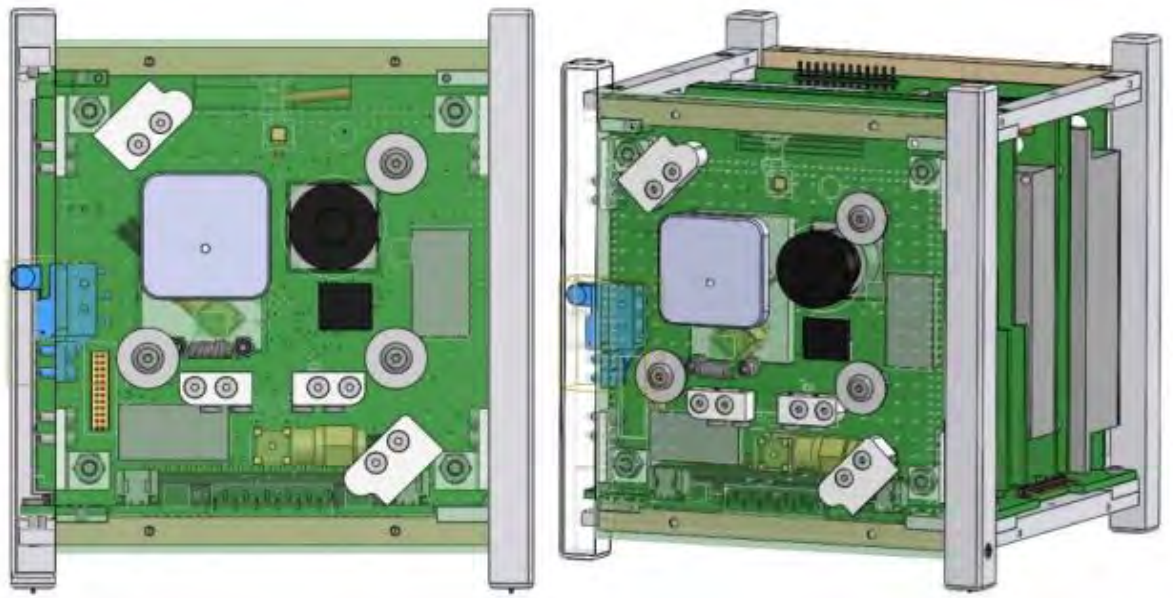
RECOMMENDATION: Apply araldite once replaced with new port



STRUCTURE

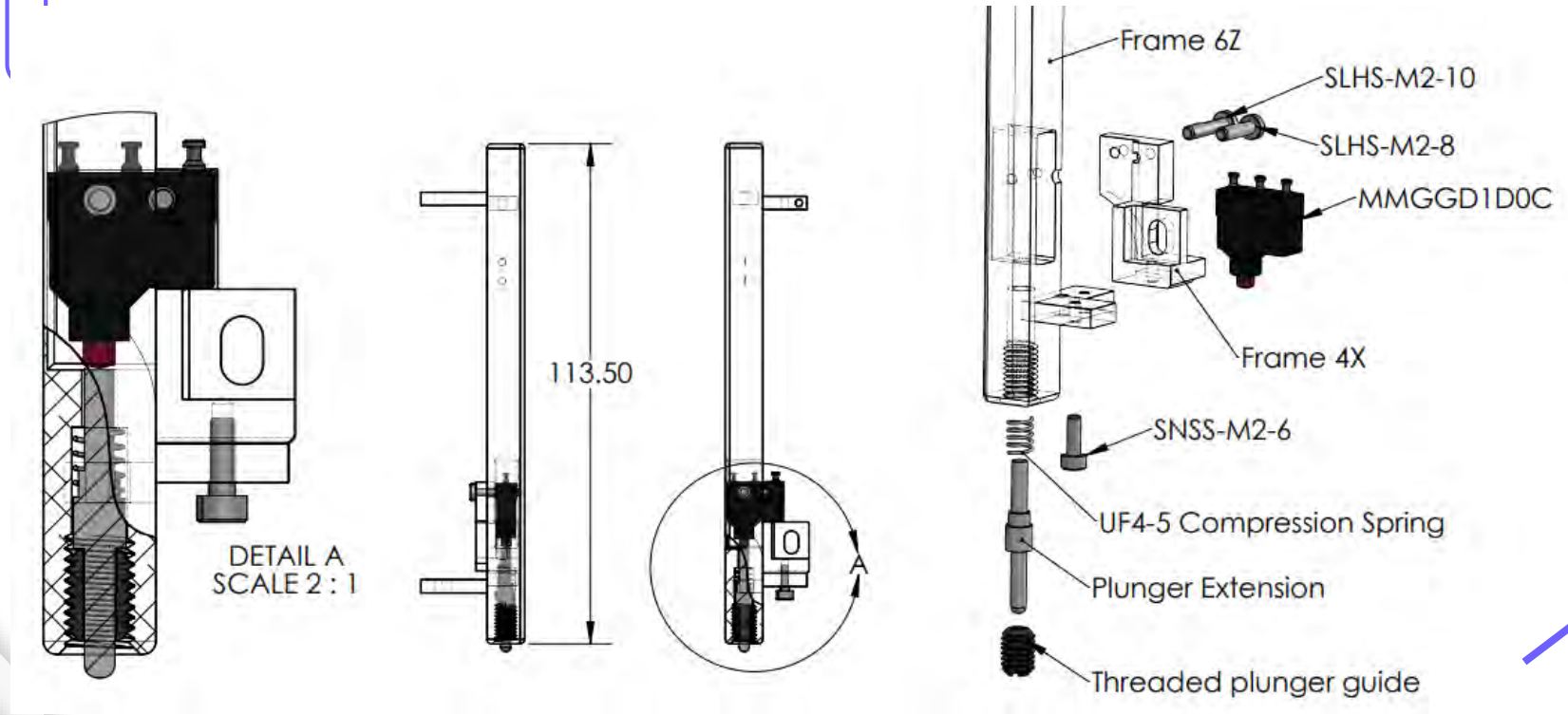
1. Conversion of side rail 7A deployment rolling switch into a rail endface switch (due to JAXA's new requirement).

Side rail switch: Used to disconnect the Battery Pack connection when pressed



Original switch configuration

STRUCTURE



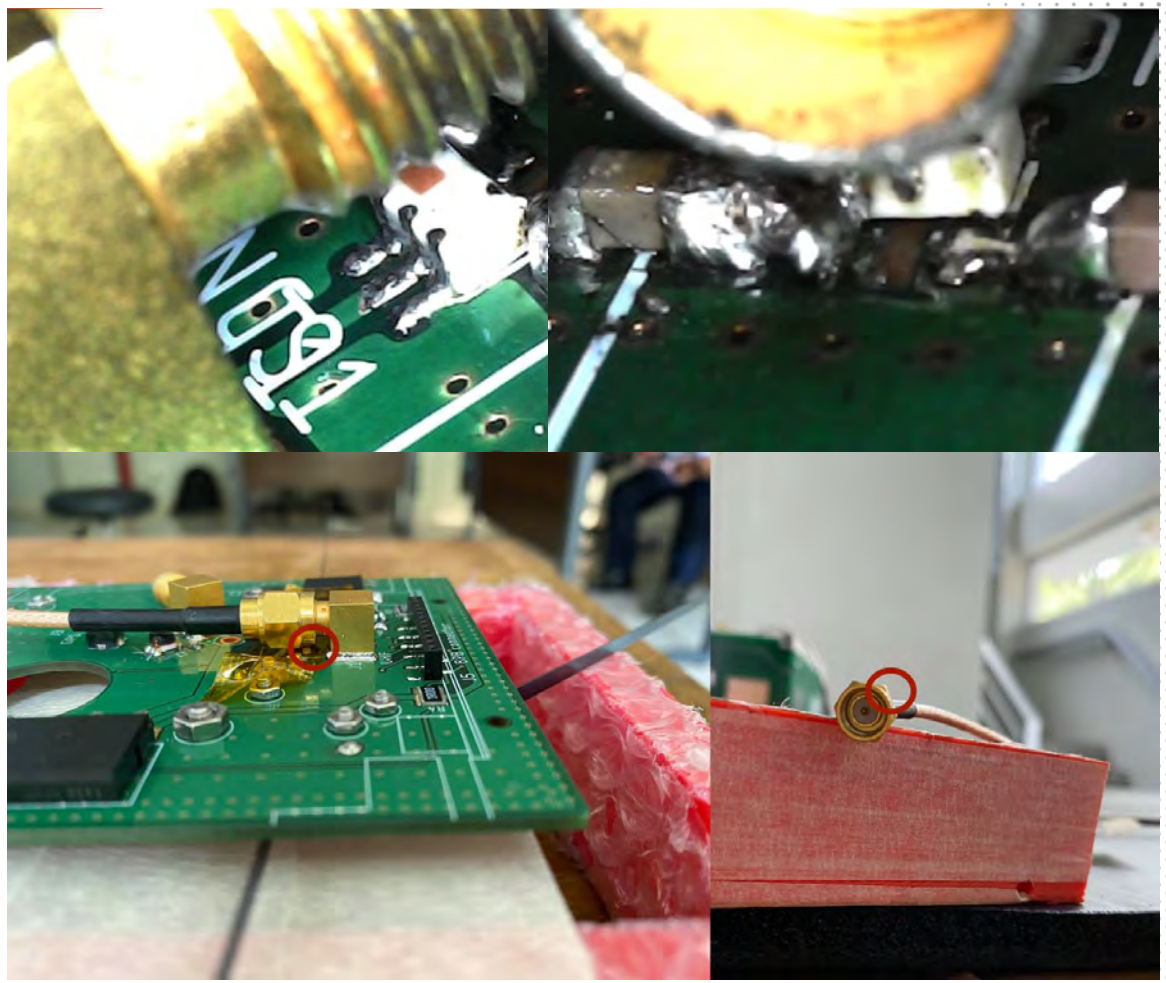
New switch configuration**

** Not yet subjected to vibration testing, therefore we cannot asses it yet.

ANTENNA PANEL

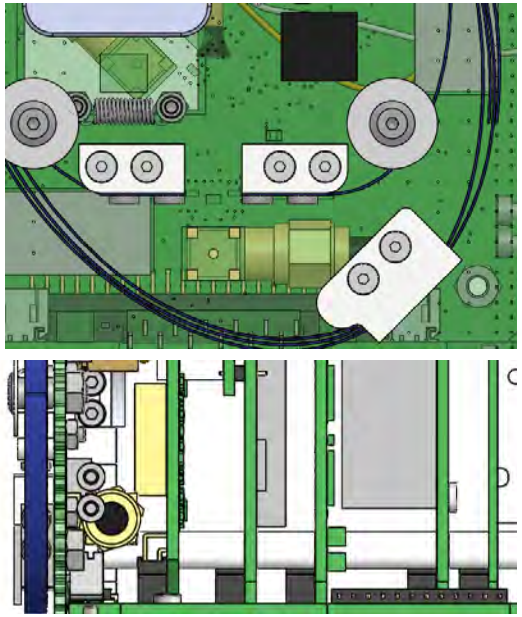
1. Persistent lifting of UHF antenna balun, needs extra care when installing SMA connector cable.

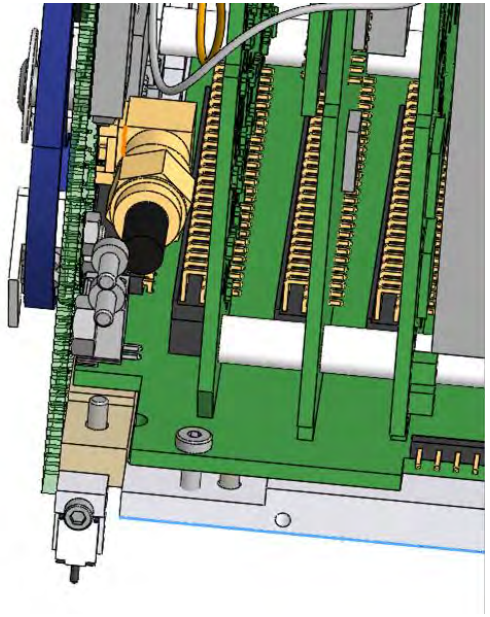
ROOT CAUSE: Due to proximity of the SMA jack and thus the SMA connector during installation.

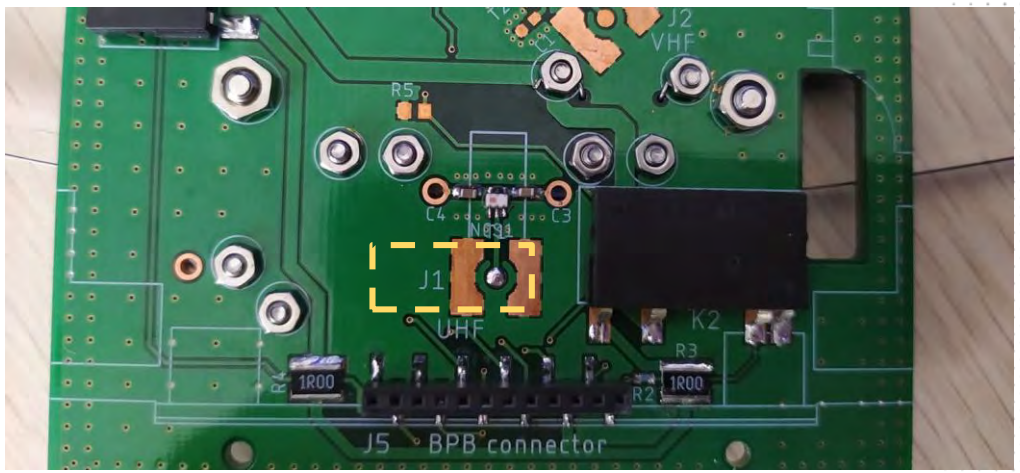


ANTENNA PANEL

SOLUTION: Rotate the SMA jack −90° to give ample clearance. This is done after modeling the fit of the new configuration.







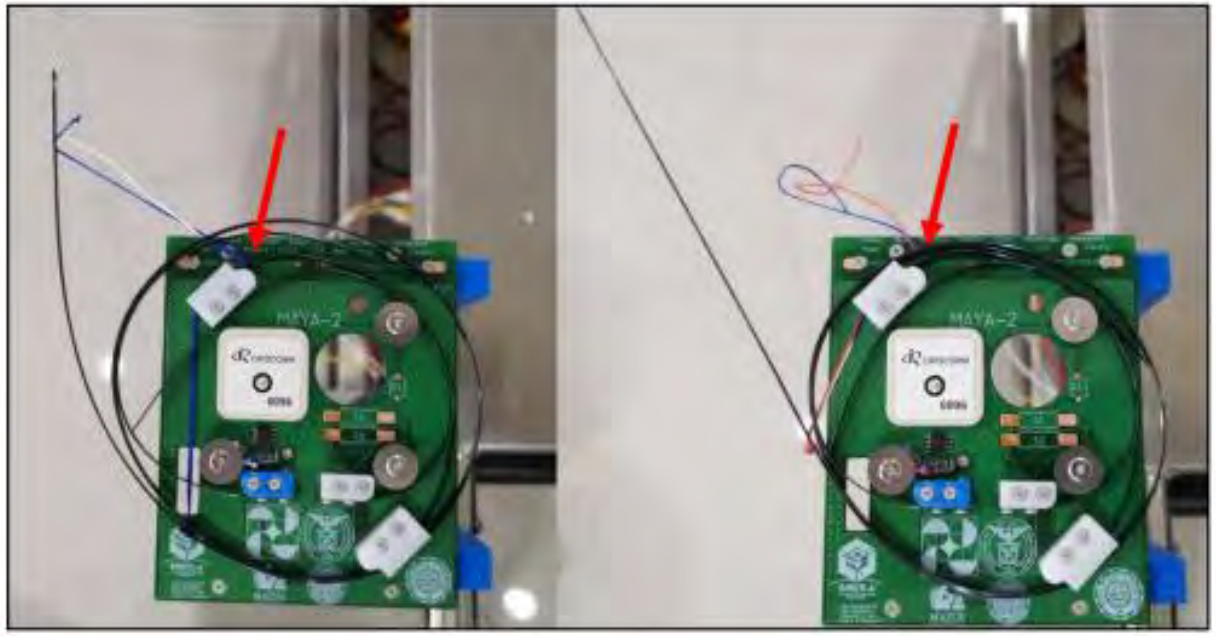
ANTENNA PANEL

NOTES: So far, there are no problems with the new configuration after TVT and antenna deployment tests.

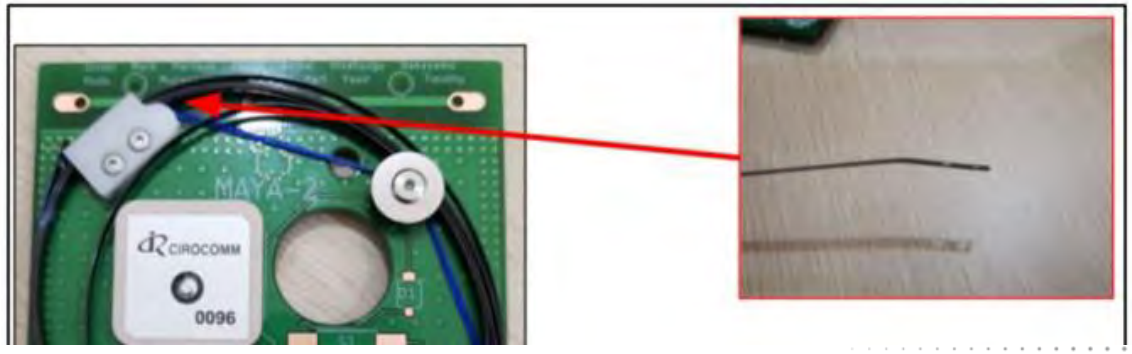
Previous (left) and new (right) configuration comparison to check for possible stress points on the SMA jack to avoid lifting

ANTENNA DEPLOYMENT

1. Polyethylene (PE) string (used for stowage of antenna) random jamming & creep bending of VHF dipoles due to long stowage.



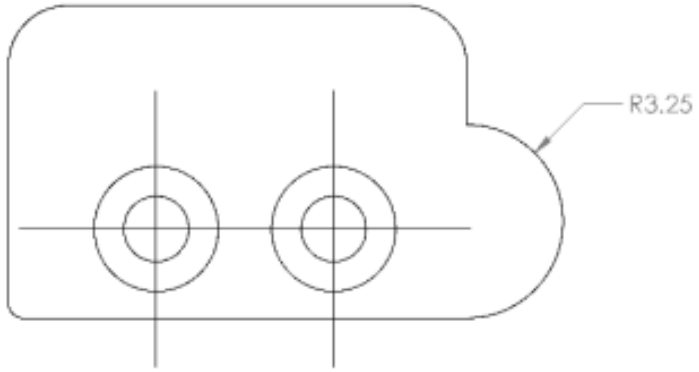
PE string random jamming



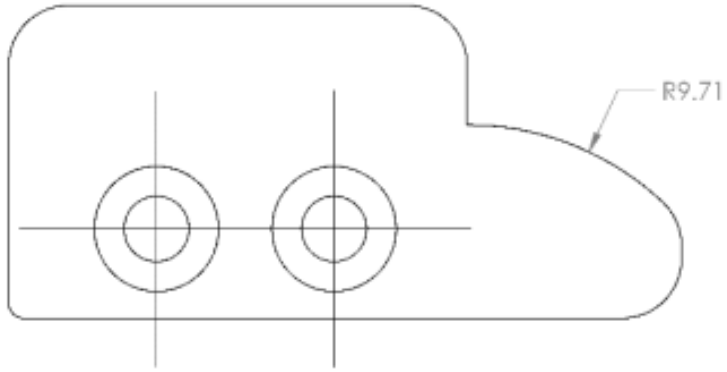
Creep bending of VHF dipoles

ANTENNA DEPLOYMENT

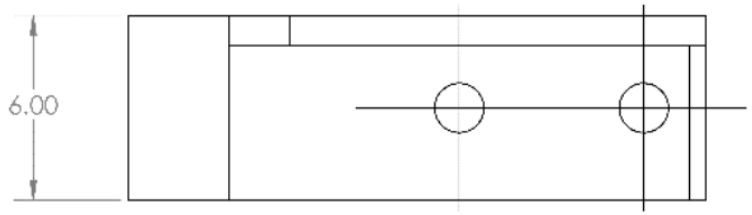
SOLUTION: VHF fixture modification based on FEA analysis



Original



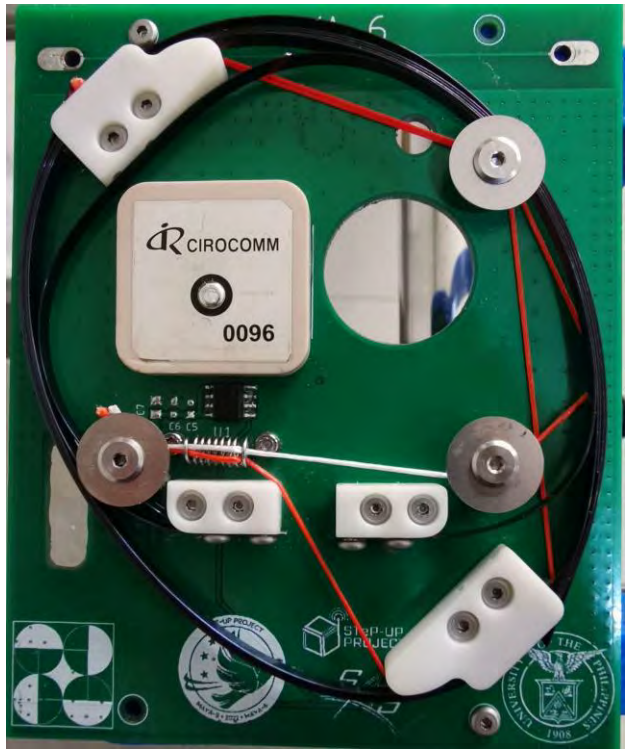
Modified

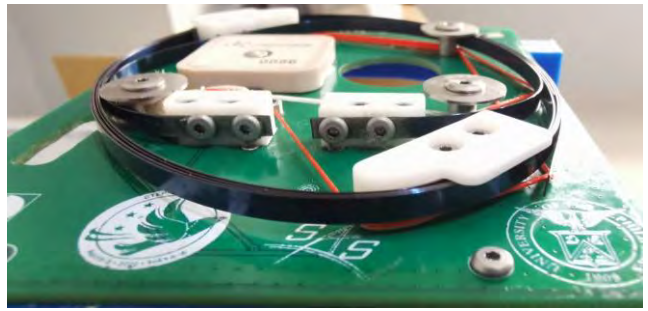


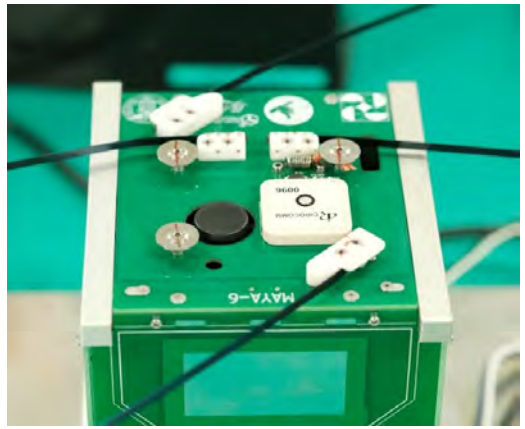
Modified Height

ANTENNA DEPLOYMENT

OBSERVATIONS: No recorded PE string jamming so far and no visual bending after a week of stowage







IMPROVEMENTS

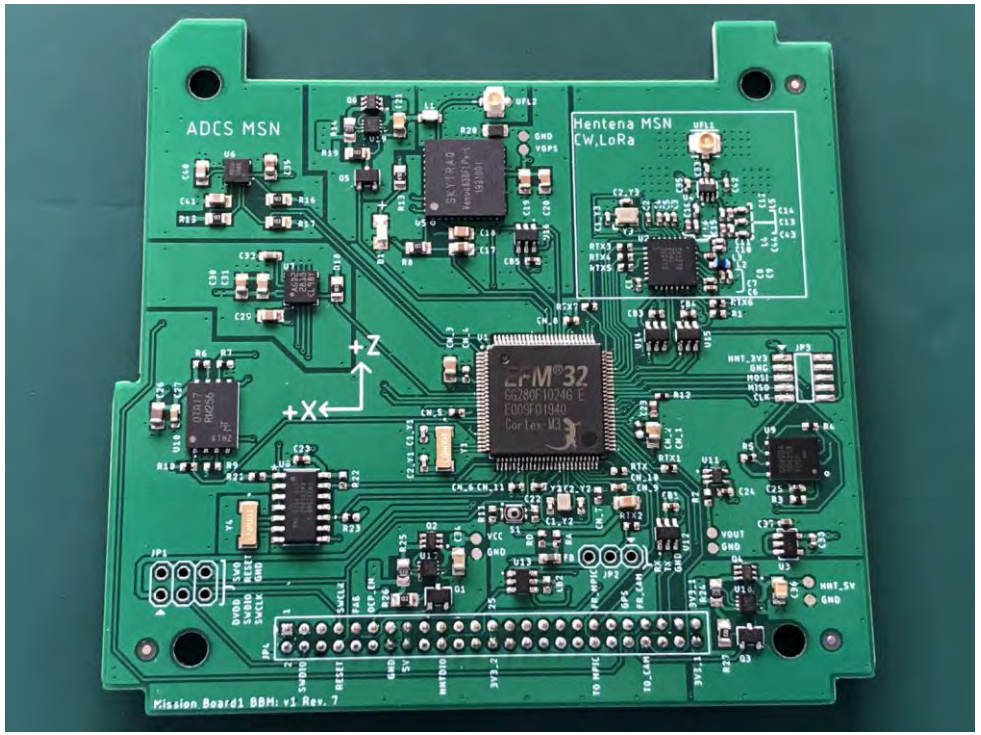
OBC-EX

- Experimental on-board computer
- New mission that aims to act as a secondary OBC and will also house the critical subsystems such as the ADCS.

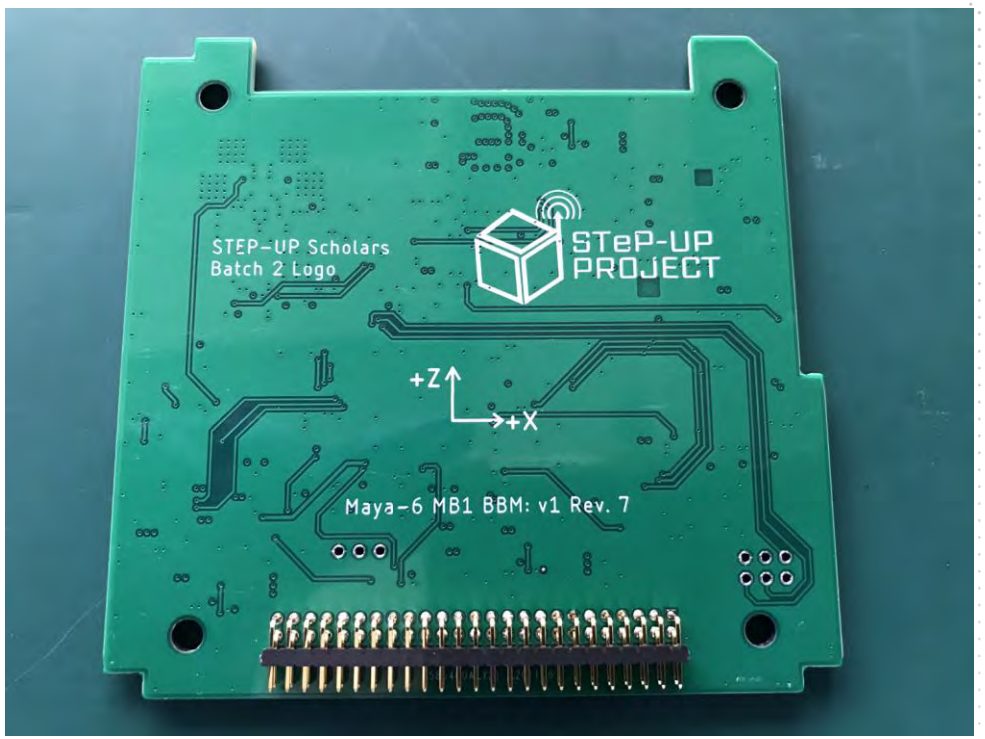
Current status:

- MAYA-6 (BIRDS4S) Mission Board 1
- Contains the ADCS and Hentenna
- Uses EFM32 (affordable yet powerful, good for beginners)
- Undergoing functionality and space environment tests

OBC-EX



Front



Back

OBC-EX

Future goals:

- Add OBC functions
- Move some Mission Boss functions to OBC-EX
- Ability to collate data for further processing (downlink or pass to other missions)
- Improve ADCS

THANK YOU

3rd BIRDS Bus Webinar

Maya-3 & Maya-4

February 12, 2022

Derick Canceran

Maya-3 and Maya-4 are the first Philippine university-built satellites designed and developed locally by the first batch of STeP-UP scholars.

Development Team

STeP-UP Scholars Batch 1

Objectives:

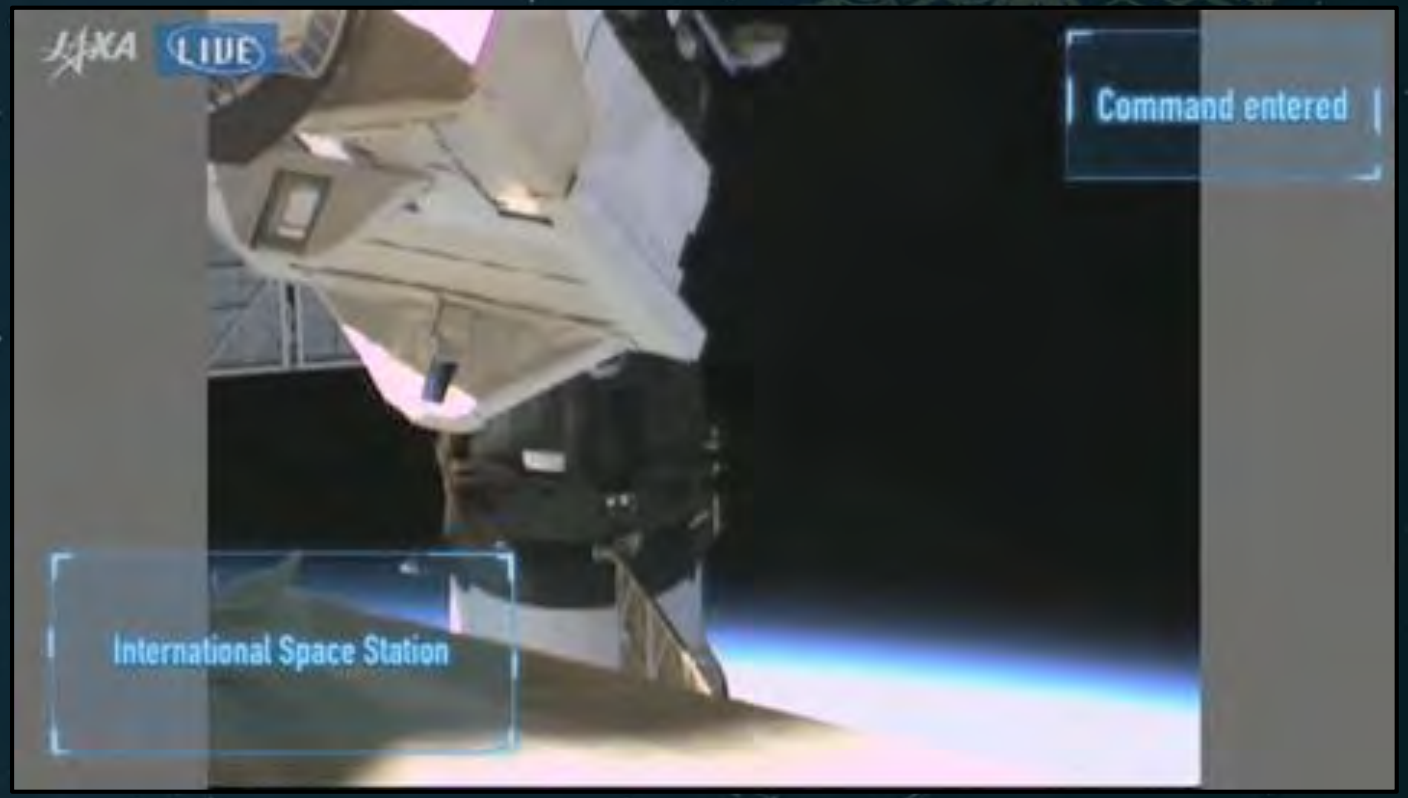
Develop the first Philippine university-built cube satellite.

- Gain knowledge about satellite development.
- Extend locally the knowledge and skills on satellite development acquired from foreign partners.
- Utilize the domestic capabilities for the satellite development.

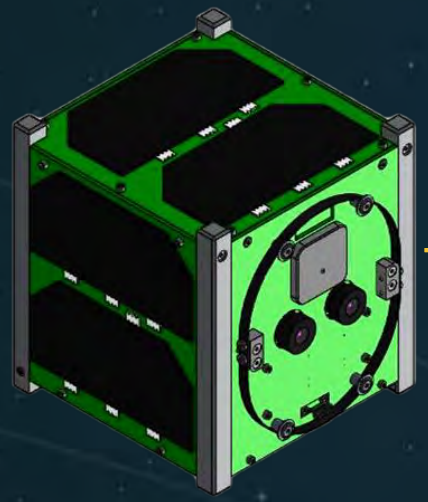
Top: STAMINA4Space Team
Bottom: STeP-UP Scholars Batch 1

Deployment from ISS Details:

October 6, 2021 at 5:20 p.m. PST
via Kibo

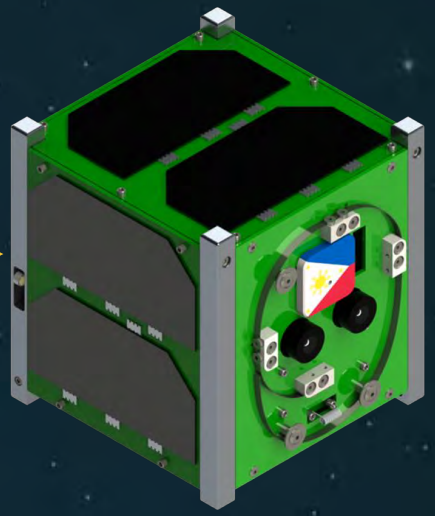


Maya-3 and Maya-4 CubeSat Deployment



Source: BIRDS-2 Project

Maya-1
BIRDS-2 Bus

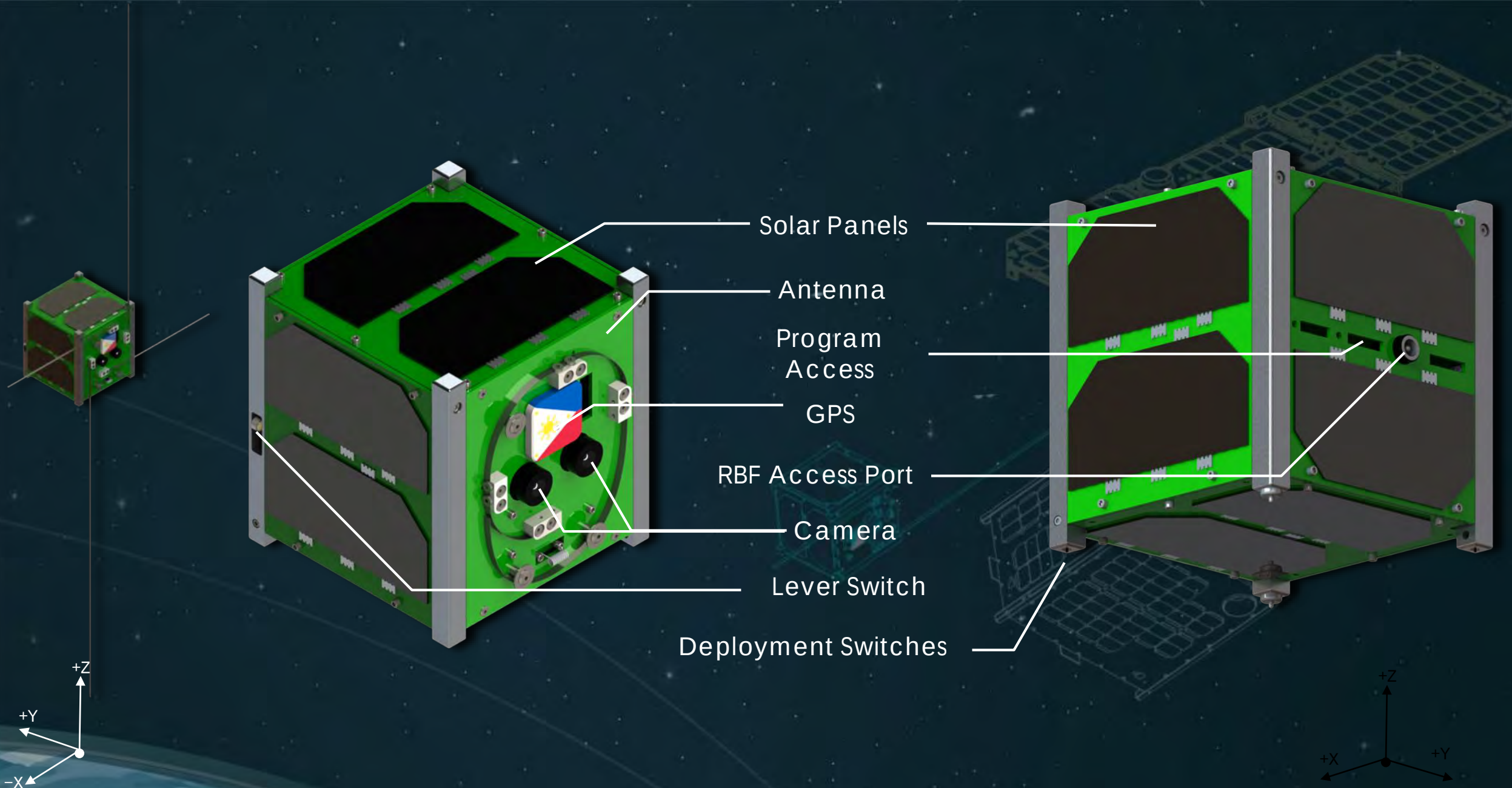


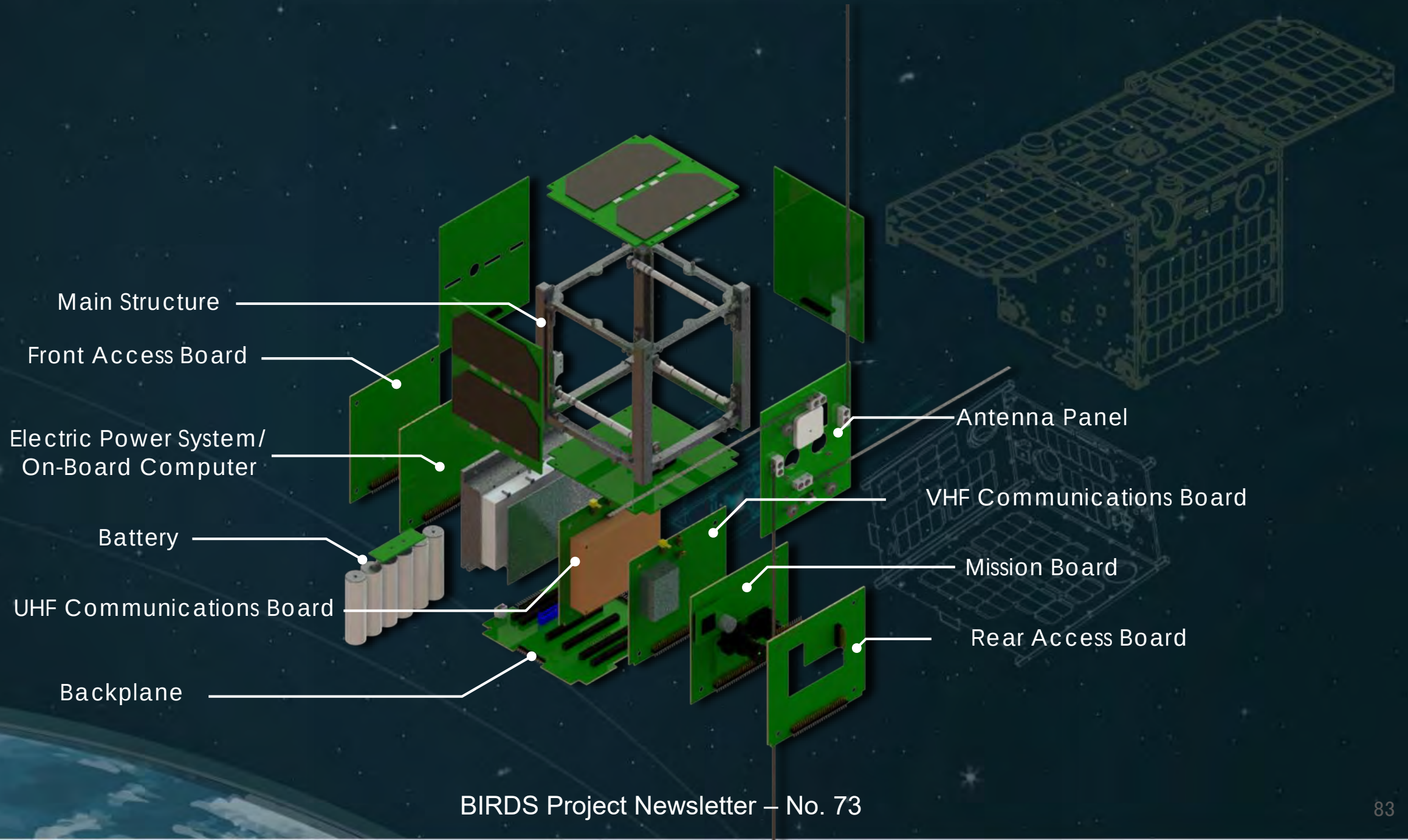
Maya-3

Maya-4

BIRDS-2S Bus

Maya-3 and Maya-4 CubeSats used the heritage bus of the Philippines' first CubeSat — Maya-1.


Solar Panels
Antenna
Program Access
GPS
RBF Access Port
Camera
Lever Switch
Deployment Switches
+Z
+Y
−X
+Z
+X
+Y


Main Structure
Front Access Board
Electric Power System/
On-Board Computer
Battery
UHF Communications Board
Backplane
Antenna Panel
VHF Communications Board
Mission Board
Rear Access Board
+Z
+Y
−X

Primary Missions

Demonstration of image and video capture of RGB camera

COTS APRS-Digipeater demonstration on CubeSat (APRS-DP)

Demonstration of a Near-Infrared (NIR) camera (Maya-4)

Demonstration of ground data acquisition using Store and Forward (S&F)

Secondary Missions

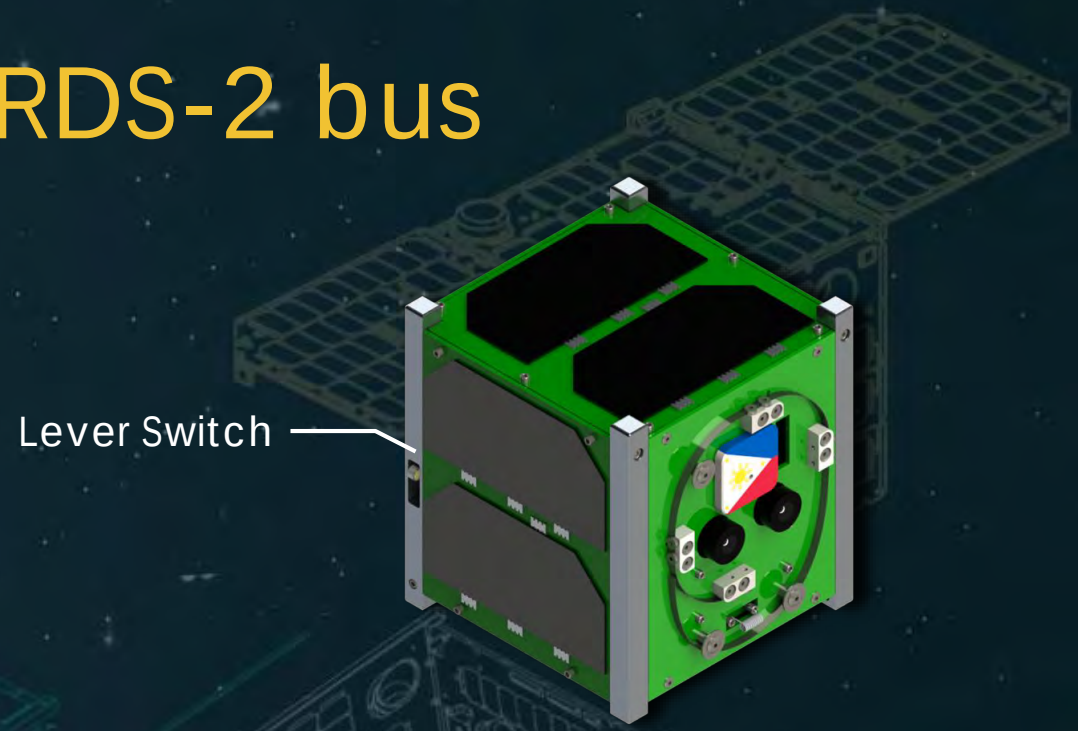
- Single Event Latch-up Detection (SEL)
- Demonstration of a COTS GPS
- Measure the magnetic field in space

Modifications made from BIRDS-2 bus

EPS: Added lever switch because of JAXA requirements. Minimal change in EPS circuitry (similar to BIRDS-3)

OBC: Implemented 3 types of beacon. Rationale: In case communication with the satellite cannot be established, we can still harvest a substantial amount of data from the satellite.

OBC: Modified execution sequence of reserved missions. In case of uplink failure, OBC will still activate the satellite missions.



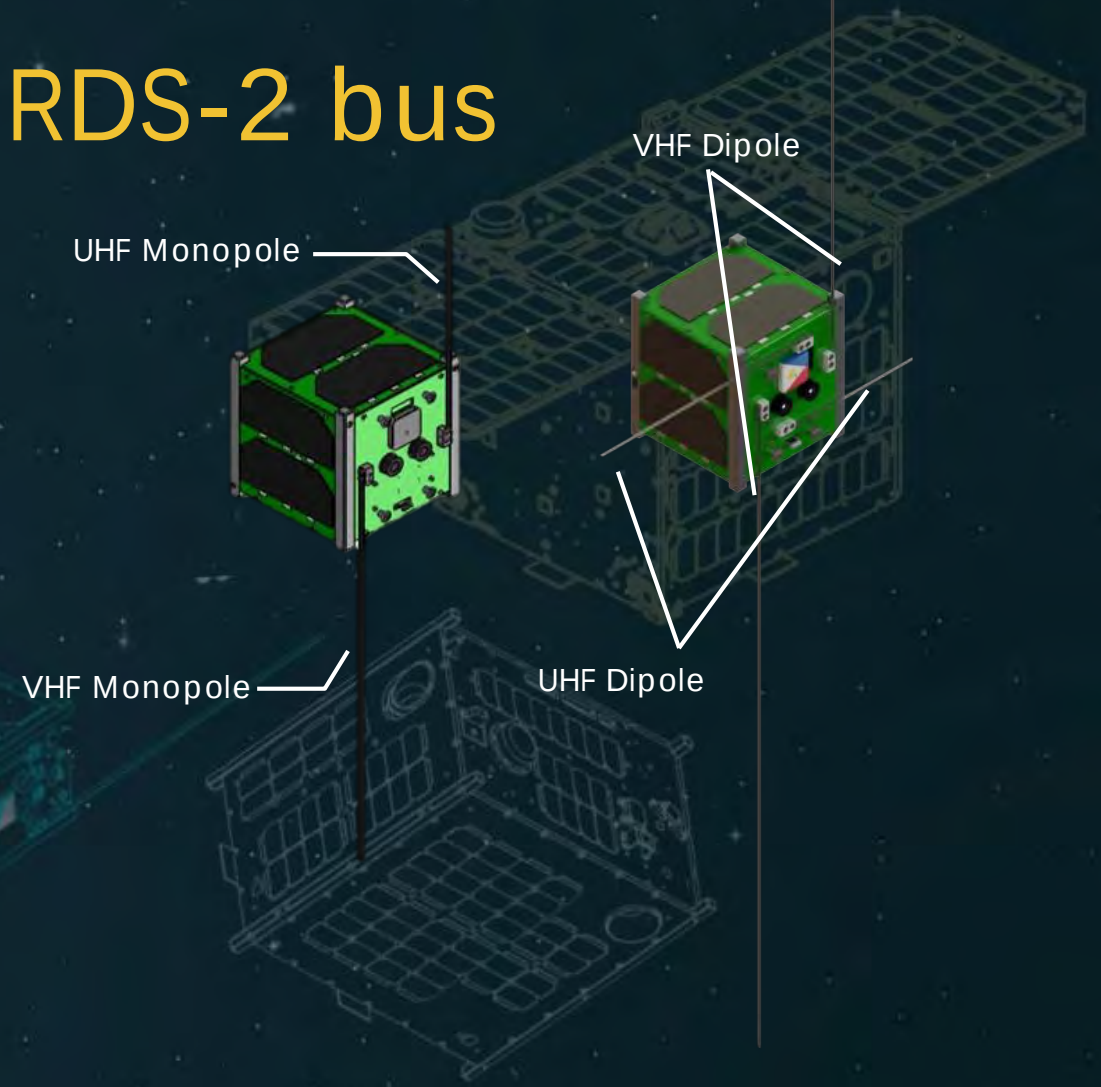
Maya-3 and Maya-4: Three types of CW beacon	
Type 1	Critical satellite information (battery voltage and current, system temperature, and operation indicators)
Type 2	Battery voltage and current, coarse rotation, and field measurements
Type 3	Solar cell and GPS information

Modifications made from BIRDS-2 bus

COMMS: Communication data rate adjusted from 9600 to 4800

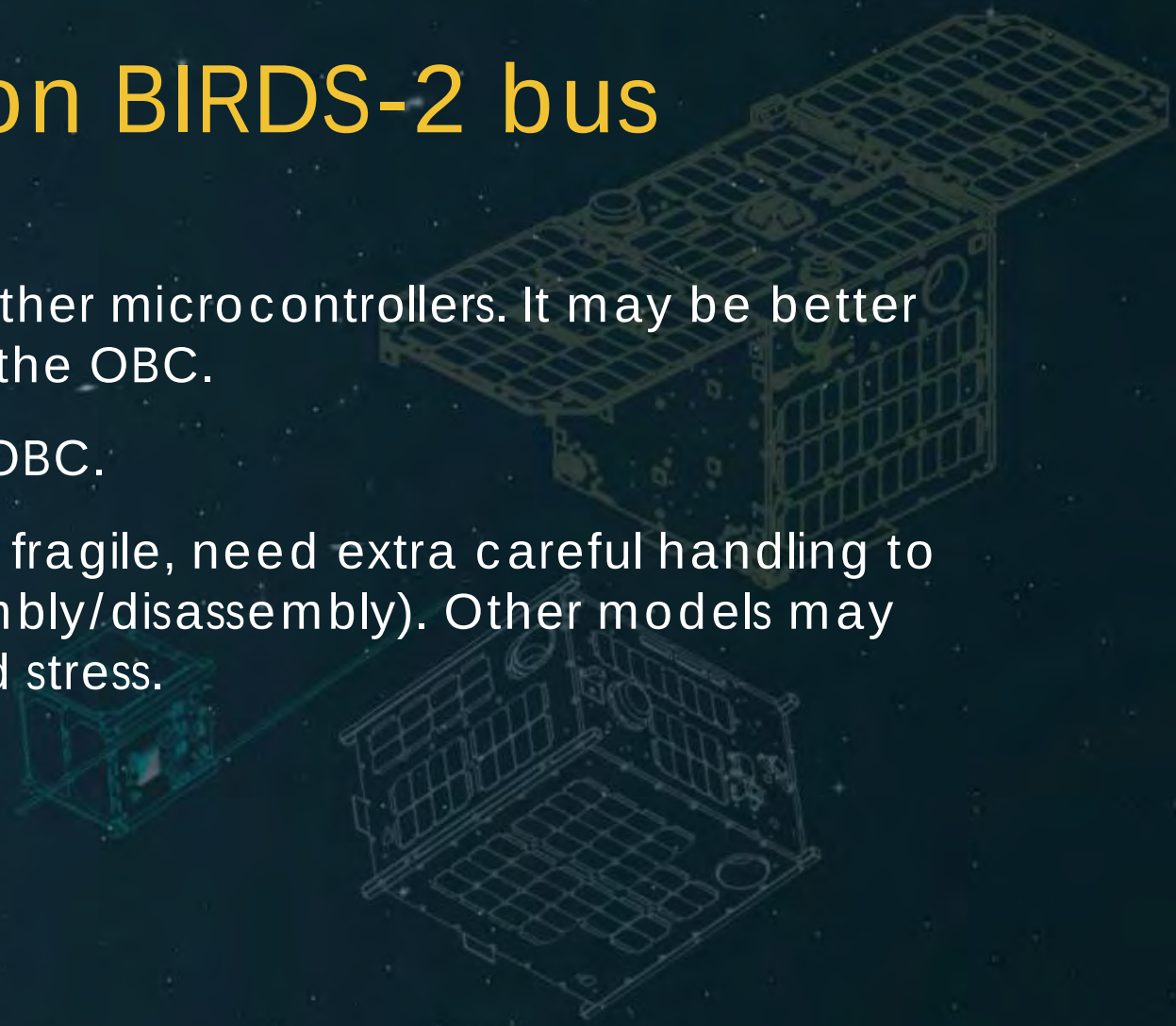
COMMS: UHF and VHF monopole antennas replaced by dipoles for better electromagnetic characteristics

Payload selection: Camera modules considered have the same interface with pre-existing data busses (SPI and I2C) in the satellite.



Possible improvements on BIRDS-2 bus

- RESET PIC has no communication with other microcontrollers. It may be better if the RESET PIC can communicate with the OBC.
- Time data from GPS might be useful to OBC.
- Deployment switches and fine wires are fragile, need extra careful handling to avoid damage (especially during assembly/disassembly). Other models may be explored which can better withstand stress.



Thank you!

Connect with us!

STAMINA4Space

STAMINA4Space
Diwata2PH (Diwata-2 ARU updates)

stamina4space

info@stamina4space.upd.edu.ph
maya3maya4_ops@eee.upd.edu.ph

stamina4space.upd.edu.ph

END OF PRESENTATIONS FROM THE PHILIPPINES

Arthur C. Clarke Institute for Modern Technologies
Sri Lanka

BIRDS Bus Experiences

By: Tharindu Dayarathna
(Research Engineer, ACCIMT, Sri Lanka)
12-FEB-2022

Content

- ACCIMT CubeSat Projects
- Engineering Model - 1
- BIRDS Bus Experiences

ACCIMT CubeSat Projects

EM – 1 Project

- Improved version of RAAVANA-1 (copy of Raavana-1)
- 1U Standards
- Only functional tests will be performed
  (no environmental testing)

FM Project

- EM-1 project bus system will be used.
- Size is not decided yet
- Missions are not decided yet
- Functional tests and environmental tests will be performed

Project Members

Project Adviser
Eng. Sanath Panawennage
Director Genaral (ACCIMT)

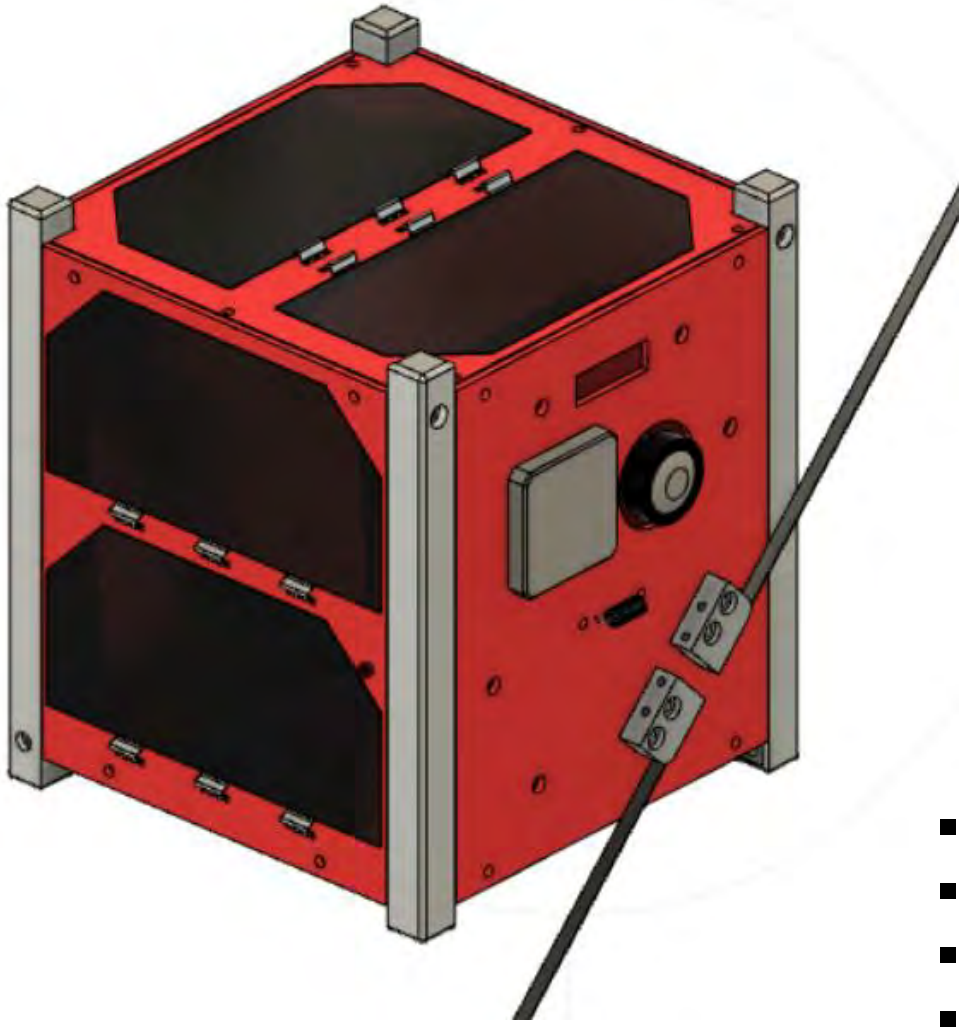
Project Manager
Eng. Kavindra Jayawardena
Director (Communication Engineering)

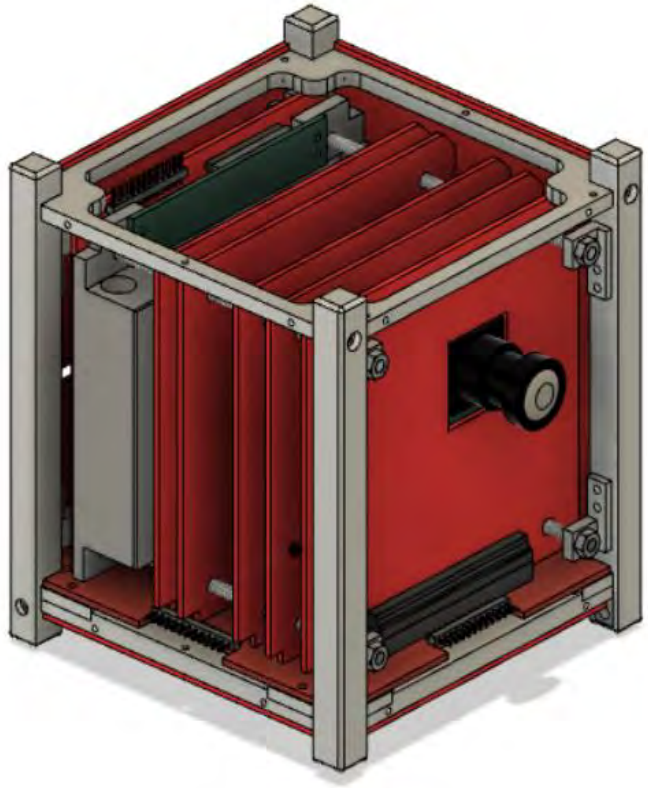
Eng. Tharindu Dayarathna
(Research Engineer)
OBC, EPS, COM,
Backplane, Antenna, Structure

Eng. Kaveendra Sampath
(Electronics Engineer)
ADCS, EPS,
Antenna, Ground Station

Thilina Rajitha
(Research Scientist)
Camera Mission, Mission - 2

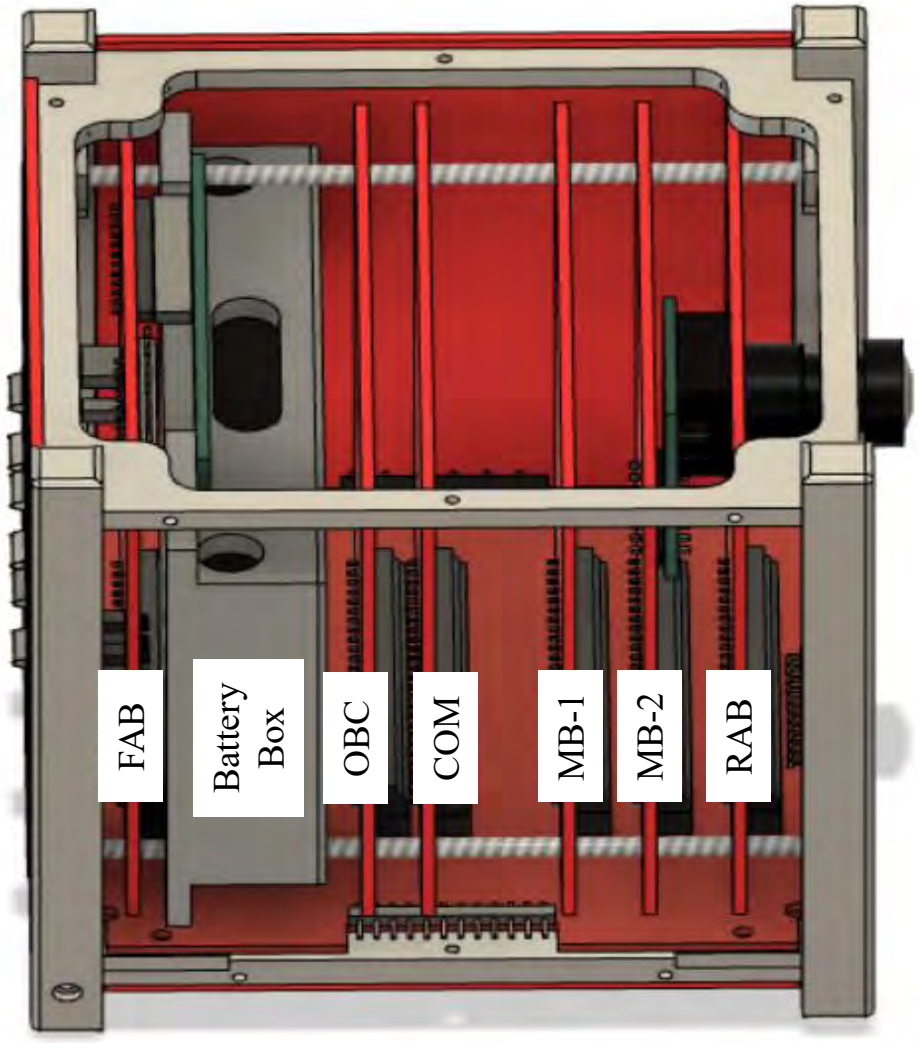
Engineering Model - 1



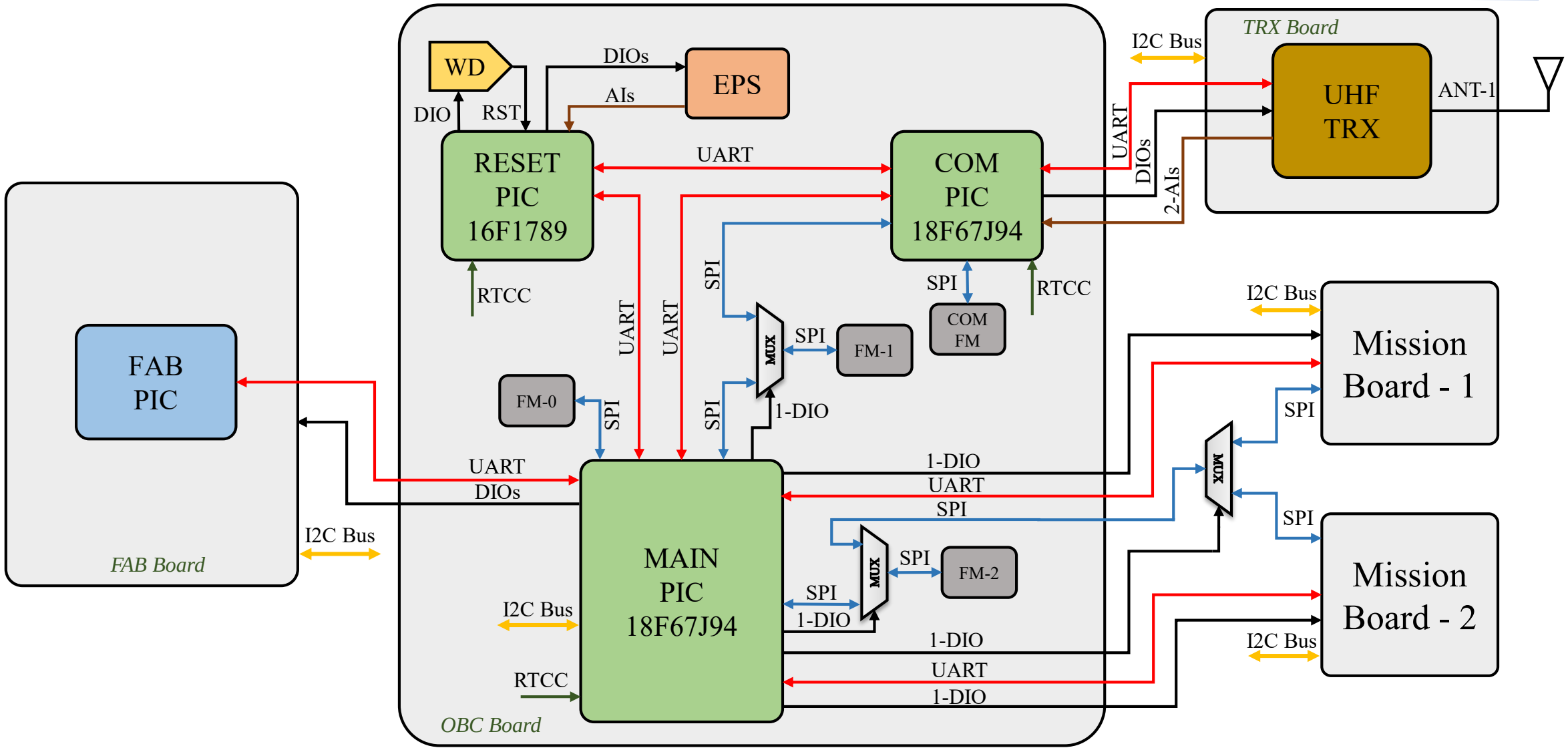


- Improved version of RAAVANA-1 satellite (BIRDS BUS)
- 1U Standards
- Two main missions
- Amateur radio frequency band

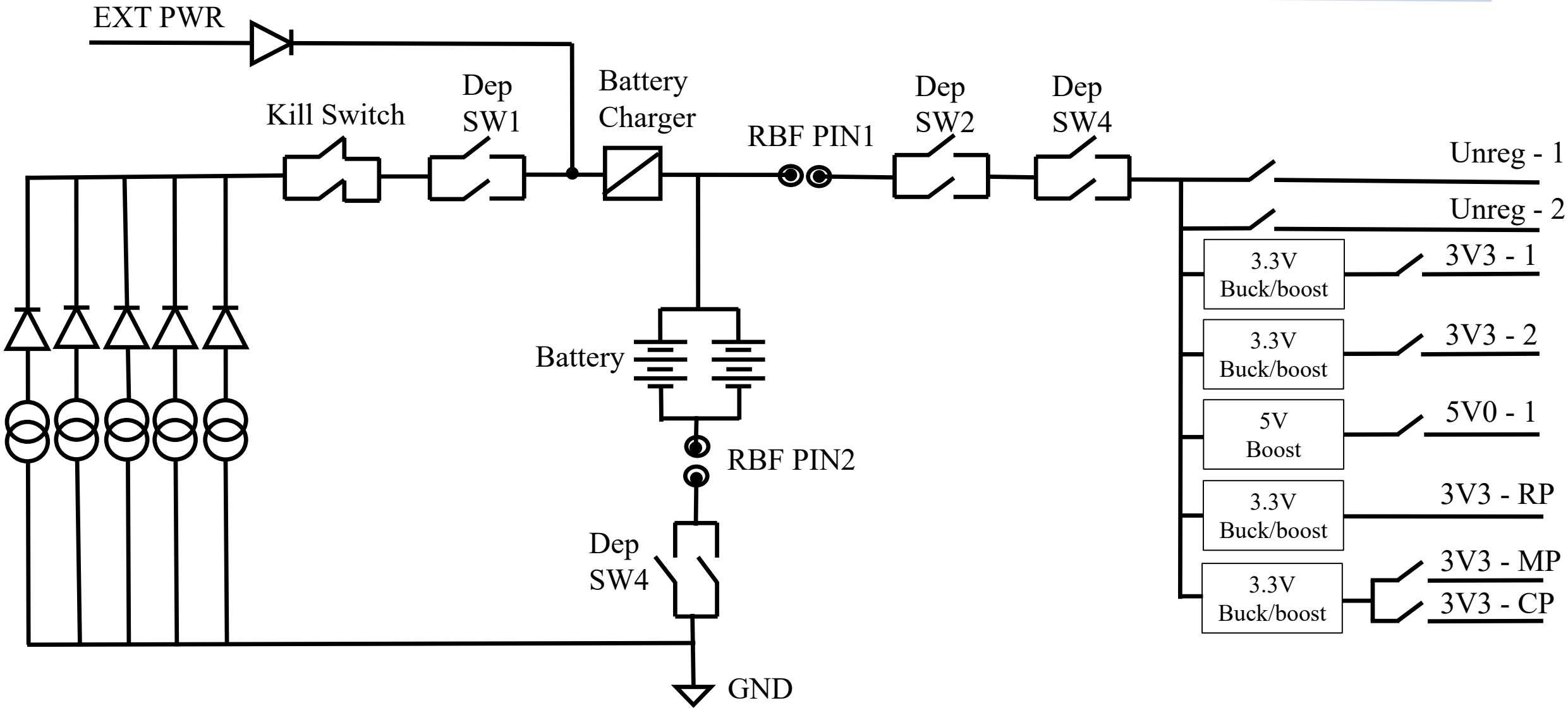
EM – 1 Subsystems



ACCIMT SAT EM-1 OBC Block Diagram



ACCIMT SAT EM-1 EPS Block Diagram



Changes of ACCIMT SAT EM-1 Bus

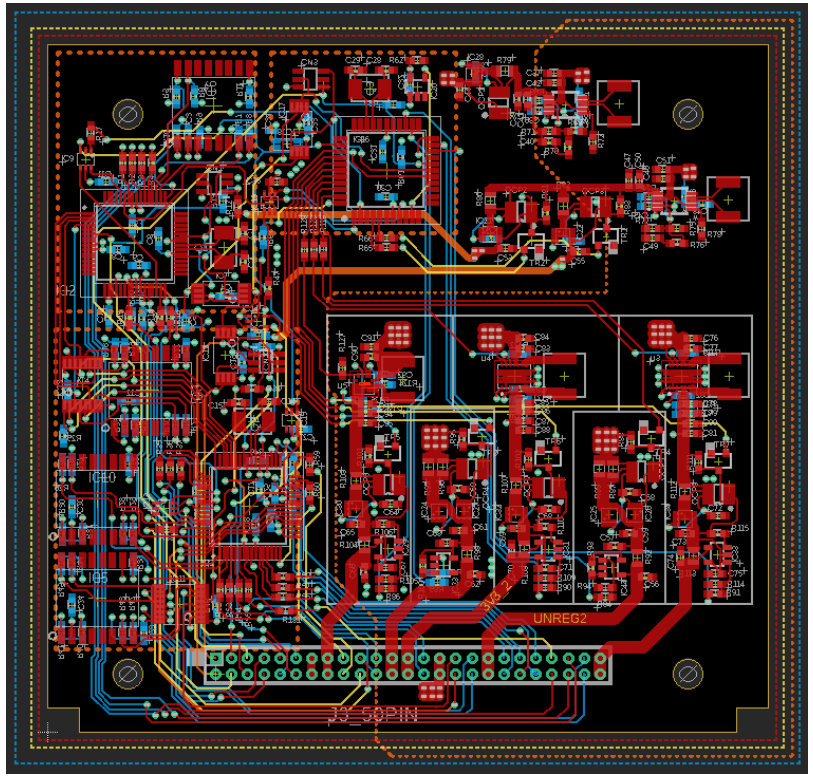
- FM-2 can be accessed by both mission boards
- An I2C bus was added
- COM PIC was changed to PIC18F67J94 from PIC16F1789
- All the buck, boost, buck/boost conveters are updated with new components (some old components were out of stock or obsolete)
- Less number of Cable harness
- UHF Transceiver is also designed by us
- 50 pin connector was changed (old component were out of stock)
- Deployment switch - 4 circuit was updated
- Kill switch driver circuit was changed

Why We Selected BIRDS BUS

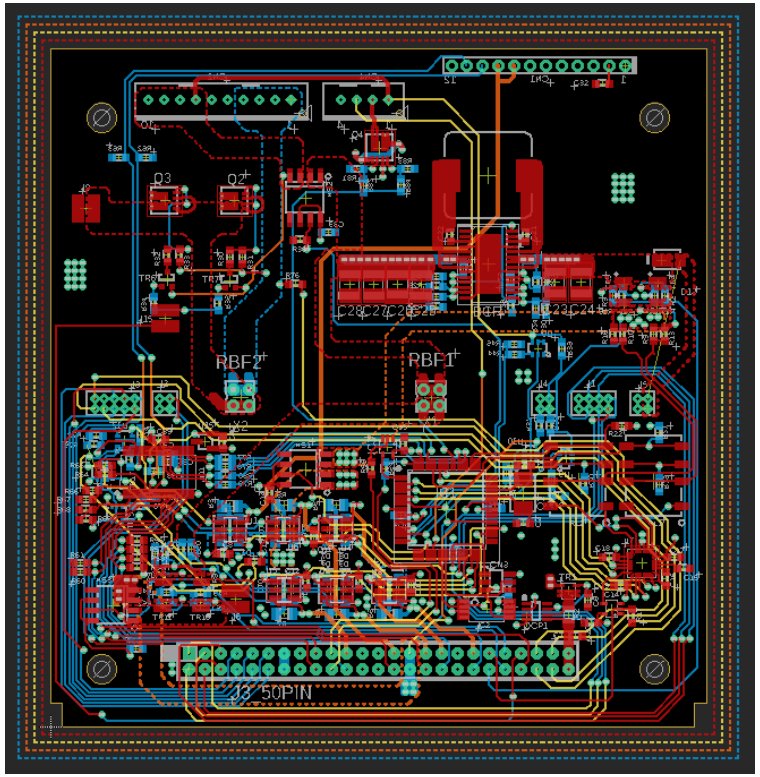
- We were part of BIRDS-3 Project (Raavana-1)
- Space tested design
- Easy to update
- Easy to start for a beginner
  - Simpler programing language (for OBC and EPS)
  - Less complex MCUs (PIC Microcontrollers)
- Distributed task architecture (Easy to divide tasks among project members)
- Easy to test and debug
- Back plane method

Thank You

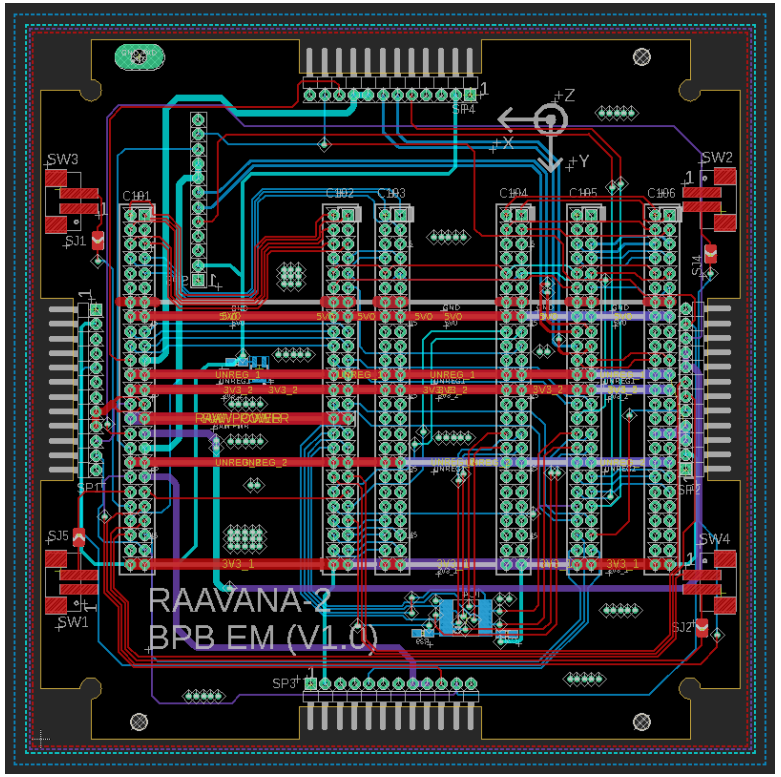
Appendix



OBC PCB Design



FAB PCB Design



BPB PCB Design

Appendix

Project Objectives

- Capacity Development of ACCIMT engineers to build and test complicated satellite in future
- Developing stable and reliable bus system for ACCIMT future CubeSat (Ex. OBC, EPS, COM, Backplane, ADCS developed in this project can be used in future CubeSat projects in ACCIMT)
- Exposure for project management and team working experience
- Exposure for system engineering knowledge
- Commercializing subsystems to Nano satellite industry (Ex, Power system, On board computer, communication board)
- Introducing cube satellite design and development courses to educational institutes in Sri Lanka (ex: new subjects in universities) based on gained knowledge.

END OF PRESENTATION FROM ACCIMT

UPDATES FROM THE PHILIPPINES

Philippine Space Agency

PREPARED BY:

Public Relations and Information Division
Philippine Space Agency

Philippine Space Agency (PhilSA) and OneWeb to test low Earth orbit satellite internet service

The Philippine Space Agency (PhilSA) has accepted the proposal of OneWeb to test their satellite Internet services in select remote and rural areas across the country under the INCENTIVISE Project. Through INCENTIVISE, which stands for "Introducing Non-Geostationary Satellite Constellations Test Deployments to Improve Internet Service," OneWeb is provided an opportunity to test and demonstrate, on a temporary and non-commercial basis, the high throughput and low latency capability of their satellite broadband constellation.

Read more:
https://philsa.gov.ph/news/philippine-space-agency-philsa-and-oneweb-to-test-low-earth-orbit-satellite-internet-service/

Philippine Space Agency
STAMINA4Space Program
STeP-UP Scholars Batch 1
STeP-UP Scholars Batch 2

Philippines to boost maritime security through space-enabled technologies

Philippine Space Agency Director General Dr. Joel Joseph S. Marciano, Jr. signed a Memorandum of Understanding with National Coast Watch (NCW) Center Director CG RADM Roy A. Echeverria in a virtual ceremony held Wednesday, 19 January 2022, to establish a formal partnership on information exchange and capacity building on the use of space science and technology applications (SSTA) in maritime response, maritime security, and maritime domain awareness.

The NCW is an inter-agency maritime surveillance and coordinated response center led by the Philippine Coast Guard. PhilSA Deputy Director General for Space Science and Technology Dr. Gay Jane P. Perez and NCW Deputy Director CG CDR Mark Larsen Mariano witnessed the signing ceremony.

Read more:
https://philsa.gov.ph/news/ph-to-boost-maritime-security-through-space-enabled-technologies/

National Arts Month

In celebration of the Philippines' National Arts Month, we invited everyone to draw their own Philippine satellite character inspired by the Diwata (Diwata-1 and Diwata-2), Maya (Maya-1, -2, -3, -4) satellites.

Chosen artists will receive STAMINA4Space merchandise and will be featured in all of our social media platforms. This is open to anyone residing in the Philippines.

**

Shown on the photo on the right is an illustration from Mr. Julius Sempio, one of the researchers of STAMINA4Space, as part of his informative blog for PHL-Microsat entitled "Remote Sensing 101, Part 1: Feeling Without Touching":

STAMINA4Space

PREPARED BY:

Mae Ericka Jean C. Picar
Information Officer, STeP-UP Project
STAMINA4Space
Overall Graphics/Layout Artist and Contributing Writer

Nicole V. Ignacio
Information Officer, ASP Project
STAMINA4Space
Contributing Writer/ Overall Editor

Katrina Mina
Information Officer,GRASPED Project
STAMINA4Space
Contributing Writer/ Overall Editor

F. Mara Mendoza
Project Manager, STeP-UP Project
STAMINA4Space
Contributing Writer/ Overall Editor

UNISEC Philippines participates in UNISEC-Global's local chapter empowerment program

The University Space Engineering Consortium (UNISEC) Philippines has been invited two two events this month as part of UNISEC-Global's Local Chapter Empowerment Program:

- UNISEC Congruent Systems Seminar Customized for UNISEC Philippines - 02 February 2022
- UNISEC Local Chapter Empowerment Seminar -09 February 2022

The seminar series was organized by the Association for Overseas Technical Cooperation and Sustainable Partnerships (AOTS).

Track our satellites!

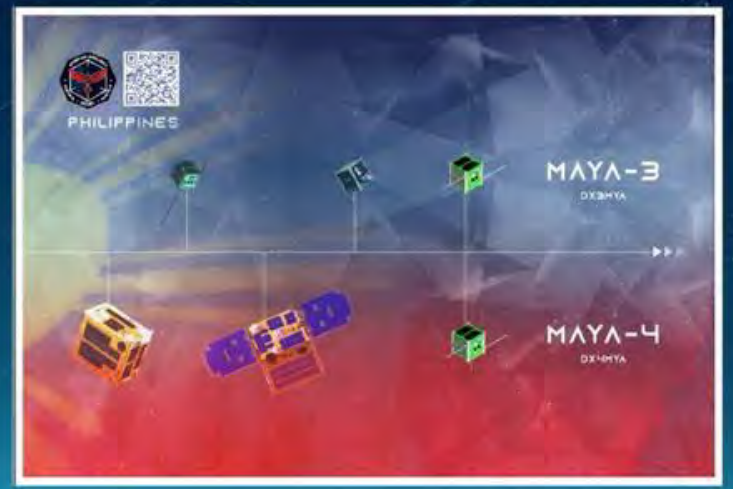
To receive a QSL card, all Amateur Radio Community members are encouraged to track our microsatellites and nanosatellites in space.

Track Diwata-2

1. Track the Diwata-2 (PO-101) microsatellite and send the data here: https://bit.ly/3HBpE85

2. Guide and information on usage can be accessed here: https://blog.phl-microsat.upd.edu.ph/amateur-radio-unit

Track Maya-3 & Maya-4



1. Track the Maya-3 (DX3MYA) and Maya-4 (DX4MYA) CubeSats - both will transmit Morse Coded CW beacon at 437.375 MHz and APRS beacon at 145.825 MHz. TLE data: Maya-3 NORAD ID 49273, Maya-4 NORAD ID 49274

2. With the received CW beacon, know its status using the CW Beacon Decoder Software: https://tinyurl.com/yjjzk94m

3. Submit your decoded data to: https://tinyurl.com/anzzyzv6

Philippine Space Agency

STAMINA4Space Program

STeP-UP Scholars Batch 1

STeP-UP Scholars Batch 2

National Astronomy Week

The third week of February is the Philippines' National Astronomy Week, by virtue of Presidential Proclamation No. 130, s. 1993, and will be observed and celebrated on February 20-26, 2022. Each year, the national meteorological and hydrological services agency of the Philippines, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), gives the official theme and hosts activities for the celebration.

PAGASA is mandated to spearhead the annual celebration of the National Astronomy Week (NAW). This year's theme is *"Ma(g)laya(g) Tayo Sa Mga Tala"* — the word for freedom, *"Malaya"* could be read as *"Maglayag"* (to set sai) in ancient Baybayin script, depending on the context in which it is used.

This year, we have partnered with different organizations for the event. Researchers and staff will be part of different events, groups, and activities. Updates will be provided in the next issue.

FRAZIL: A Talk about a Recent Innovation in Science and Technology in the Philippines

STeP-UP PROJECT

The development of Maya-3 and Maya-4 was featured in a talk organized by the University of the Philippines Academic League of Chemical Engineering Students Inc. (UP ALCHEMES). In the presentation, Maya-3 and Maya-4 Project Manager Renzo Wee shared the story of the CubeSats, from kick-off to deployment, highlighting critical development activities. Renzo also talked about some of the applications of space technology in the Philippine context.

The talk can be viewed here: https://fb.watch/b23nAipMYj/

PREPARED BY:

Gladys A. Bajaro
Derick B. Canceran
Bryan R. Custodio
Lorilyn P. Daquioag
Marielle M. Gregorio
Christy A. Raterta
Judiel L. Reyes
Renzo S. Wee

STeP-UP Scholars Batch 1, Maya-3 and Maya-4 Engineers

Philippine Space Agency
STAMINA4Space Program
STeP-UP Scholars Batch 1
STeP-UP Scholars Batch 2

Seeding in the Southern Part of the Philippines!

Lorilyn Daquioag presented the initial draft of the proposal for a Ground Station planned to be established in the University of Southern Mindanao, Kabacan, North Cotabato, Philippines. The meeting was attended by the Vice President for Research and Extension Dr. Edward Barlaan, DOST Region XII Provincial Director Michael Ty Mayo, and the staff of the said offices, which was done last January 31, 2022.

The post can be viewed thru this link: https://www.facebook.com/dost12cotabatoprovince/posts/2391343550726 86

SCHOLARS AT THE BIRDS WEBINAR

PREPARED BY:

Khazmir Camille Valerie Macaraeg
Layout Editor & Contributing Writer

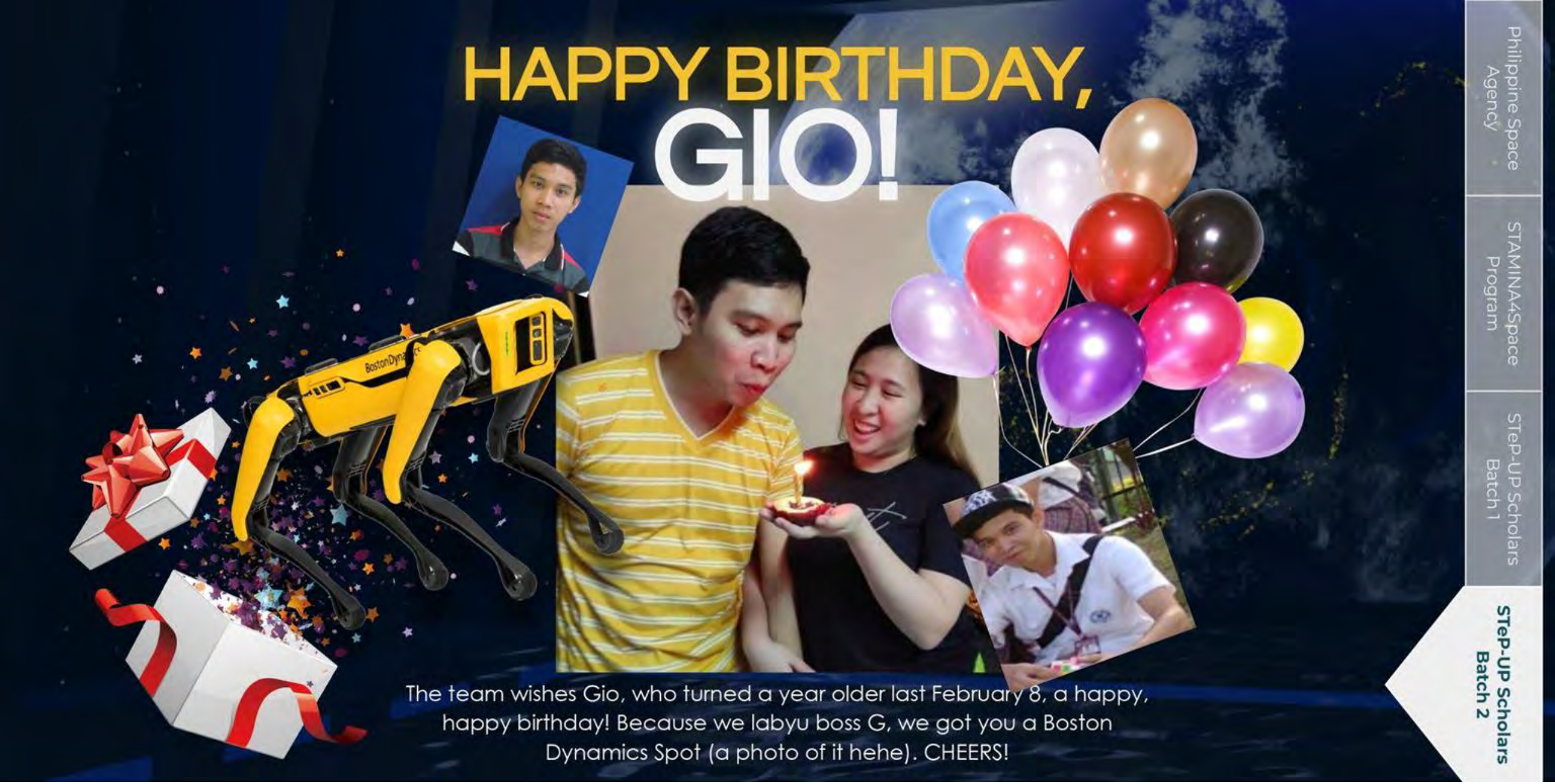
Angela Clarisse Chua
Graphic Artist & Contributing Writer

Joseph Jonathan Co
Anna Ruth Alvarez
Gio Asher Tagabi
Genesis Remocaldo
Chandler Timm Doloriel
Ronald Collamar
Contributing Writers

Last February 12, STeP-UP Batch 2's Angela Chua shared the team's experiences in developing Maya-5 and Maya-6 with the rest of the BIRDS community. This included some of the challenges we faced and the improvements we made on the cube satellites.

Derick Canceran of Batch 1 also presented their experiences, highlighting the operations of Maya-3 and Maya-4, at the 3rd BIRDS Bus Open Source Webinar.

Philippine Space Agency | STAMINA4Space Program | STeP-UP Scholars Batch 1 | **STeP-UP Scholars Batch 2**


HAPPY BIRTHDAY,
GIO!
The team wishes Gio, who turned a year older last February 8, a happy, happy birthday! Because we labyu boss G, we got you a Boston Dynamics Spot (a photo of it hehe). CHEERS!
Philippine Space Agency
STAMINA4Space Program
STeP-UP Scholars Batch 1
STeP-UP Scholars Batch 2


Happy lunar new year! May the start of the year bring us prosperity in our healths, careers and relationships.
Philippine Space Agency
STAMINA4Space Program
STeP-UP Scholars Batch 1
STeP-UP Scholars Batch 2

05. Kyutech and Kyushu University collaborate on space engineering education

As a press release, this news was simul-taneously released on 14 Feb 2022 by Kyutech and Kyushu University. The story ran in several newspapers in Japan (e.g., Yomiuri).

国立大学法人
九州工業大学

Google 提供 Language

文字サイズの変更 標準 大

入学希望の方へ | 在学生の方へ | 卒業生の方へ | 企業の方へ | 地域・一般の方へ

大学案内 | 学部・大学院等 | 図書館・センター等 | 教育・学生生活 | 就職・進路 | 研究・産学連携 | 国際・地域交流 | 入試

九州工業大学 > TOPICS > プレスリリース > 九州工業大学と九州大学が衛...

学長室より
工学部
情報工学部
生命体工学研究科
教養教育院
MSSC（海外拠点）

九州工業大学と九州大学が衛星教育に関する共同プログラムを開始― 革新的宇宙理工学ミッションの中核人材の育成 ―

更新日:2022.02.14

九州工業大学と九州大学が衛星教育に関する共同プログラムを開始

― 革新的宇宙理工学ミッションの中核人材の育成 ―

国立大学法人九州工業大学(以下「九工大」という。)と国立大学法人九州大学(以下「九大」という。)は、革新的な宇宙ミッションを企画・実行できる素養を持つ人材を育成するべく、両大学共同での教育プログラム「大学間連携による理学工学融合実践的宇宙ミッション早期教育プログラム」をスタートしました。同プログラムは、九工大が主管実施機関、九大を共同参画機関として文部科学省の令和3年度宇宙航空科学技術推進委託費(プログラム名:宇宙航空人材育成プログラム)に採択されているもので、両大学の強みやこれまでの実績を活かした取組になっています。既にテレビ会議を通じて両大学の学生約50名が定期的な交流を行うなど2022年1月から本格的に活動を開始しており、3月には衛星開発の第一歩としてミッション定義審査(MDR)*1を実施

Read the full article:

https://www.kyutech.ac.jp/whats-new/press/entry-8848.html?fbclid=IwAR0rRV_WCSisXUTugvO87GtuQrGVa6XhdORtmmKuZuekbCUF06bSFIyoxwA

06. During 2022 UNISEC-Global conducts UNISEC Local Chapter Empowerment Program

Subject: [mic_coordinator:520] Today (Feb 14) is UNISEC's birthday!
From: Rei Kawashima, Secretary General of UNISEC
Date: 2022/02/15
To: all MIC coordinators

Dear UNISEC-Global Community,

The original UNISEC obtained legal status in Japan on Feb 14, 2003. Thus, we call it our birthday. The day is known as “Valentine's Day" as well. We chose this day because UNISEC activities require love and compassion.

During 2022, we will conduct *the UNISEC local chapter empowerment program*. As a part of our efforts, we organized the UNISEC Local Chapter Empowerment Seminar with the support of AOTS on Feb 9, 2022. The video recording is available until Mar 30, 2022. (21:59, JST). Please watch it if you wish. (The image quality is not very good. Sorry.)

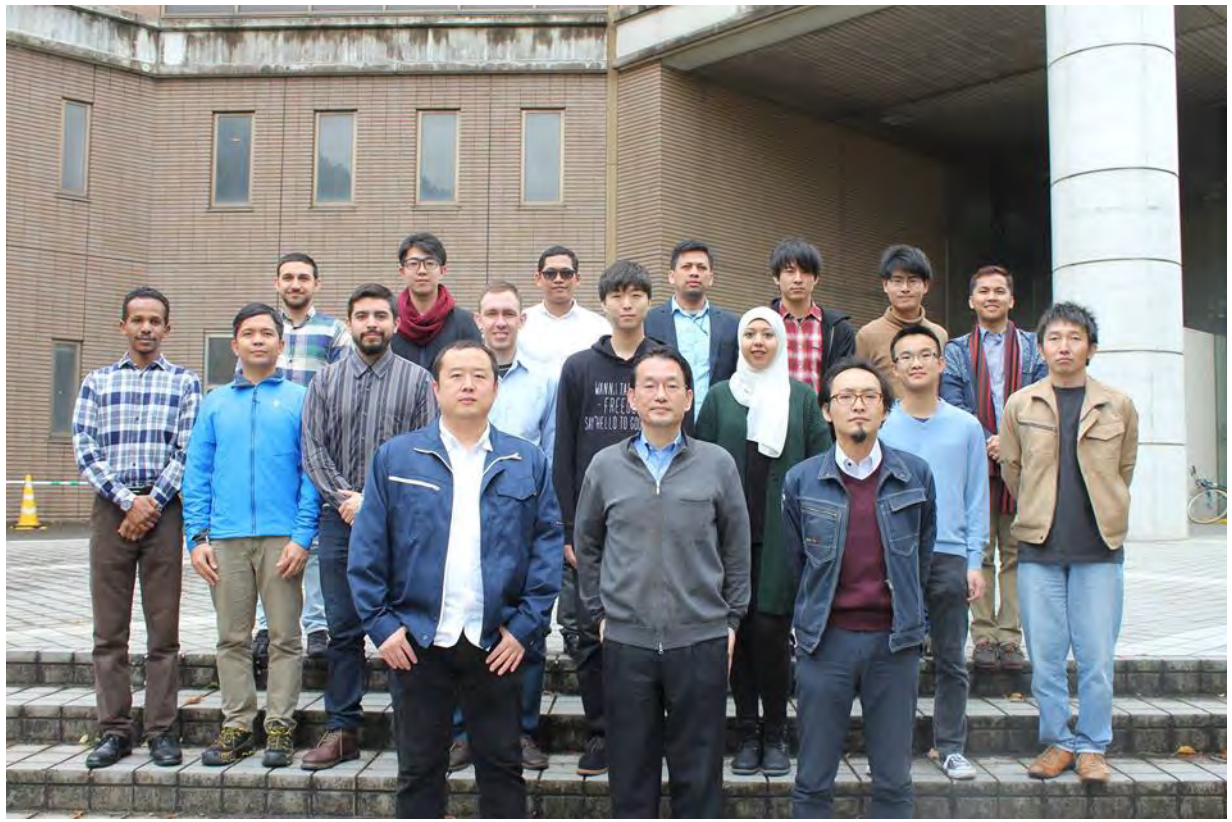
https://vimeo.com/676532373
Passcode: UNISEC@0209

With warm regards,
Rei Kawashima

The following sections are the BIRDS-4 articles for February 2022

(compiled by Adolfo of Paraguay)

07. BIRDS-4: Lookback on BIRDS-4 experiences

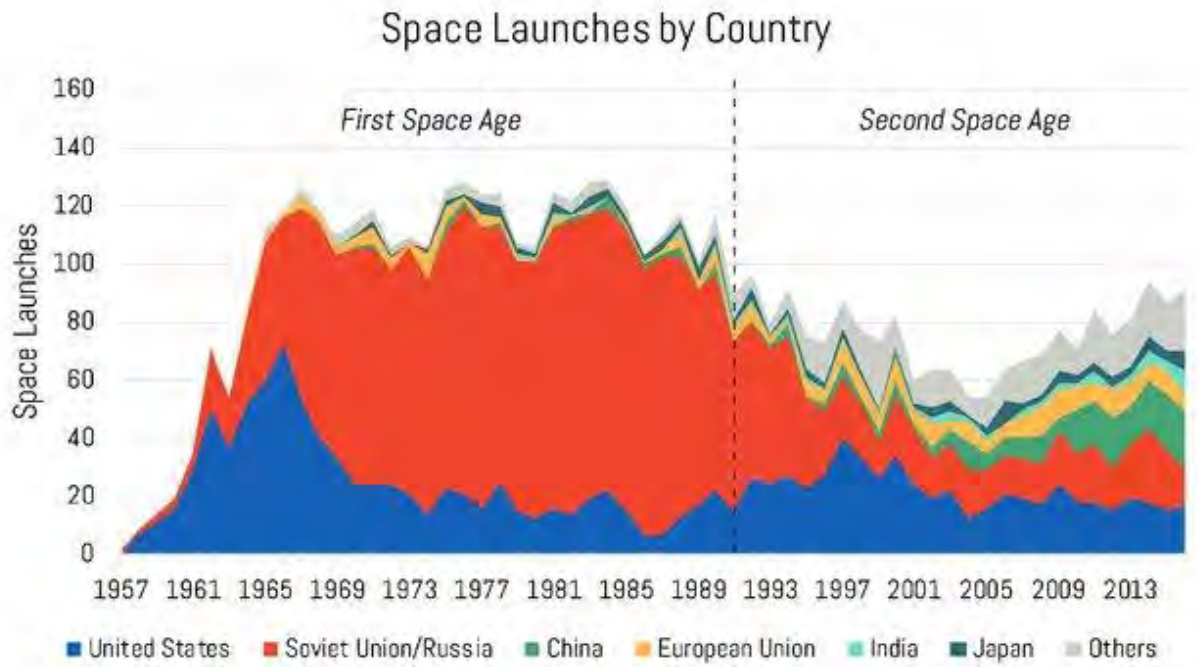


This article was submitted to this newsletter on 20 Feb 2022 by Dr Izrael Zenar BAUTISTA
-- who was the original project manager of BIRDS-4. He now works for the Philippines Space Agency.

A lookback on BIRDS-4 experiences

Building and operating a satellite never crossed my mind as something that I will be doing in my career as an engineer. For one, satellite technology has long been an exclusive field for "first world" countries with extra budget to spend over something that may or may not be beneficial to its people, but is done in the conquest of knowledge and exploration.

With the advent of smaller satellite form factor, such as CubeSats, building and operating satellites has become an attainable feat even for nations with lower GDP.



Space has been a "premium" industry for rich countries until the emergence of low-cost satellite platforms such as CubeSats

Figure reference: Kaitlyn Johnson, 10.13140/RG.2.2.15240.11525

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

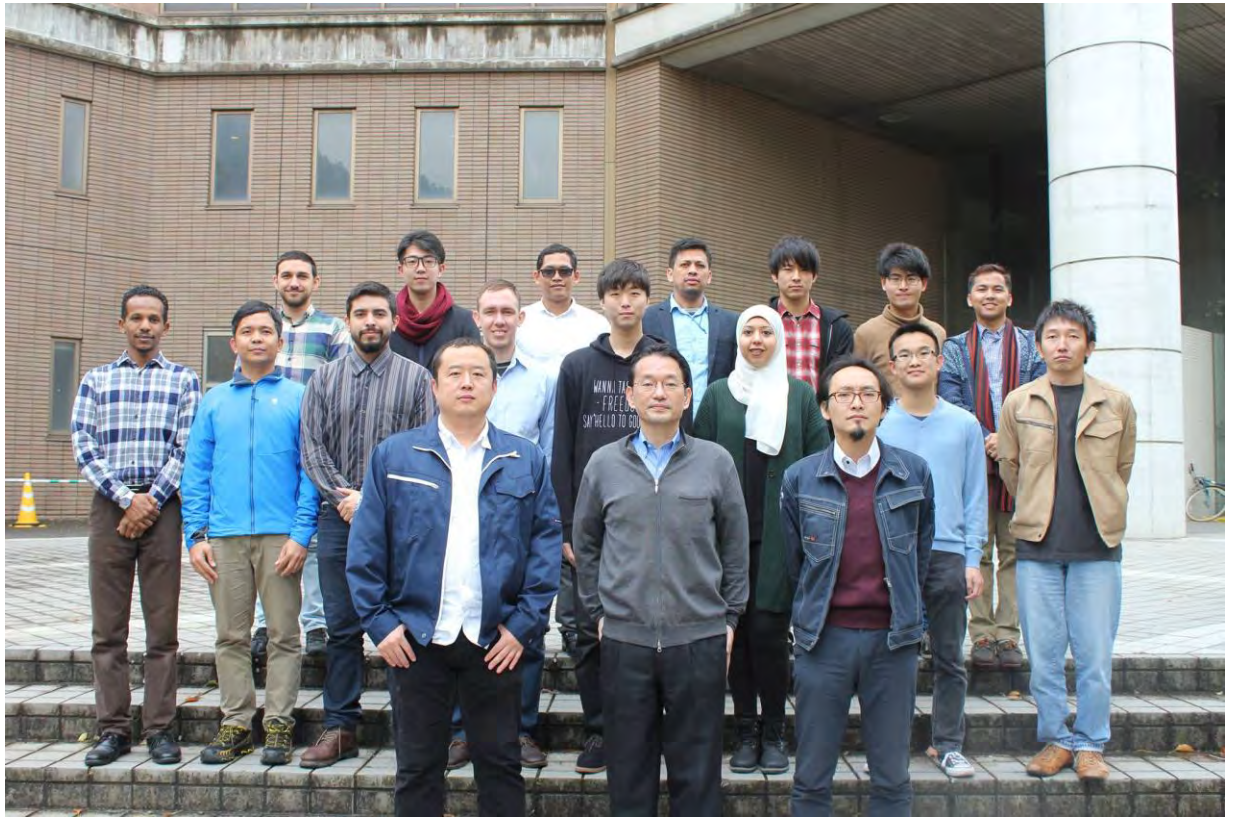
Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

Kyushu Institute of Technology's Joint Global Multination Birds program, led by Professor Mengu Cho, aimed to allow more non-space faring countries to launch and operate their first satellites. The fourth Birds project made it possible for Paraguay to launch their first satellite and allowed me to learn the whole cycle of satellite development and managing a team of engineers from various nations.

A year after successfully launching and deploying our satellites into orbit, BIRDS-4 members had a lookback on our experiences while building and operating our satellites.



BIRDS-4 team with our advisors

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

One of the major challenges according to the Birds-4 members is that all of us have no experience in building satellites. Some members, like myself, may have some idea already but none of us have actually gone through the whole process of mission planning, design, testing and operation. There are other things to learn such as frequency coordination, circuit design, structure design, programming microcontrollers and writing flight software and ground station software.

BIRDS-4 members during satellite development and testing of the flight model

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

As all of us are also students while we were working on the satellite development, time management has always been a crucial part as we have deadlines for our subjects/coursework, research and for the satellite. I guess this is one of the things that Birds-4 really trained us. At times during development we have minimal hours of sleep due to very tight deadlines.

Having a multi-cultural team makes communication complex. Open communication and empathy allows the team to work well together.

We might come from different nations and cultures, but open communication allows us to work fluidly together

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

A lot of concepts are new to the Birds members so there are a lot of lessons and skills learned throughout the satellite development. Radio regulations, data processing are just some of the technical skills learned.

The team member's "soft skills" such as communication, presentation skills, critical thinking, resourcefulness, creativity, positive thinking, conflict resolution and discipline were all improved throughout the project.

This room has been our "second home" for almost two years where a lot of our technical and "soft skills" were developed

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

In satellite development, quality should always come first because once the satellite is launched to space, there's no turning back. If substandard work was done during development, the satellite might not work. Careful planning and being proactive is key to prevent cramming and problems during testing.

Another thing learned because of the cross cultural exchange, are new languages. We had a whiteboard where we write a word in 7 different languages!

Knowing new things from the countries of each member is a very enriching experience which expands your view of the world

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

More than the hard times, we remember more the good times. We hold parties and dinner frequently, prior to the pandemic. This keeps the team morale high and improves our teamwork. We had a tradition of surprising members with a cake on their birthdays.

Being the makers of a country's satellite is big news to any nation and we experienced being interviewed in regional and national television for our project!

The team does regular parties and birthday celebrations to strengthen our bond and enhance our teamwork

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

I would say the happiest experience the team had was the first time we heard beacon and receive acknowledgement from our uplink to the satellite, signifying that our satellites are working. Being able to download and process data coming from our satellite, like images and mission data, tells us our efforts weren't in vain. Operating wasn't easy because we sometimes have to come during early hours of the day, but it's worth it whenever we are able to hear our satellite and download data.

The team was very anxious during the first pass of the satellite over Kyutech, as well as during the first uplink we've sent to the satellite

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

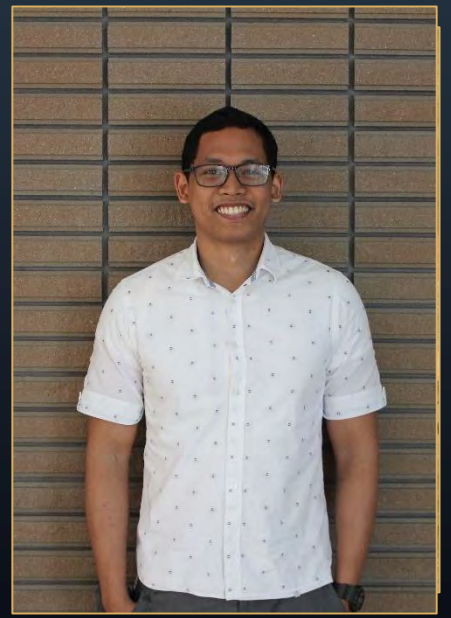
From the Philippines

Mark Angelo Purio
Camera mission

Marloun Sejera
Communication subsystem

Article by:

Izrael Zenar BAUTISTA



A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

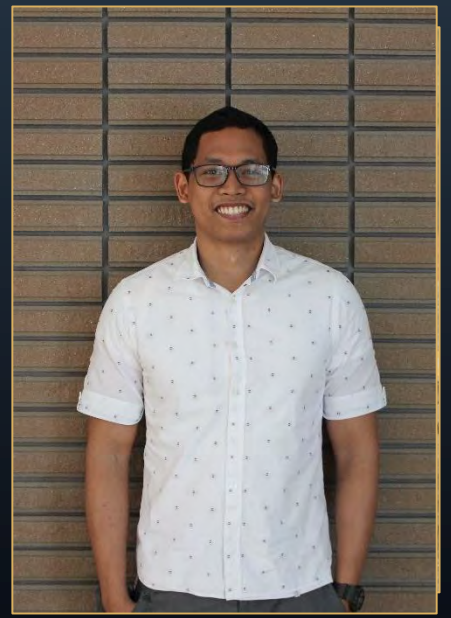
From Paraguay

Adolfo Jara
Onboard computer

Anibal Mendoza
Thermal subsystem

Article by:

Izrael Zenar BAUTISTA



A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

From Paraguay

Ariel Manabe
Operations

Esteban Fretes
Operations

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

From Japan

Daisuke Nakayama
Hentenna Mission/
Ground station

Hiroki Hisatsugu
Attitude Control and
Determination
system

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

From Japan

Tomoaki Murase
Total ionization dose mission of COTS parts

Nozaki Yuma
Antenna deployment

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

From Turkey
Yigit Cay
Structure

From Nepal
Hari Ram Shrestha
Electrical Power system

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

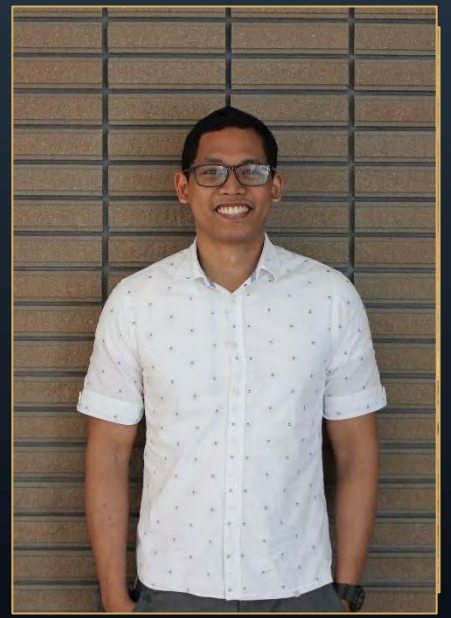
To end this article, I would like to mention and thank all the BIRDS-4 members:

From Sudan
Yasir Abbas
Store-and-Forward mission

From France
Timothy Leong
Image classification mission

Article by:

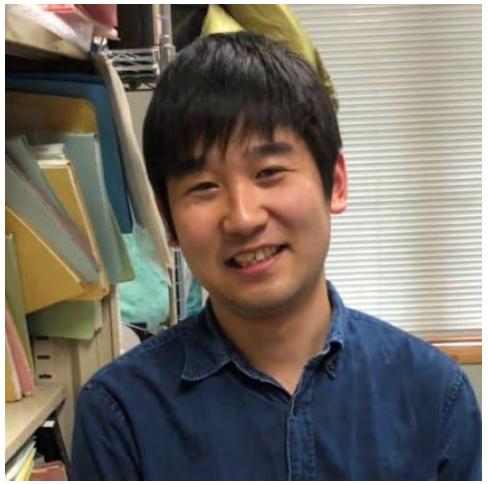
Izrael Zenar BAUTISTA



A lookback on BIRDS-4 experiences

To end this article, I would like to mention and thank all the BIRDS-4 members:

From Egypt
Hoda Awny
Ground station terminal for S&F mission



Honorary BIRDS4 members from Japan

Koutaro Hiraka &
Akihiro Oboshi

Article by:

Izrael Zenar BAUTISTA

A lookback on BIRDS-4 experiences

All of them toiled through all the challenges, proving that despite differences in culture and character, we can unite to a common goal that is greater than the sum of its parts.

To all our “senpais” and mentors/advisors. Thank you for the guidance that led to this success. Hoping to see all of you again soon!

End of Lookback article

#birds4

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Izrael Zenar BAUTISTA

08. BIRDS-4: Satellites Housekeeping analysis

The Satellite telemetry data is the main reference to judge the working status and the health status of in-orbit satellites

The BIRDS-4 team operators periodically execute the High Sampling Sensors data Collection mission (HSSC) to verify the satellite health condition. It includes records of temperature, current and voltage from the satellite panels. BIRDS-4 satellites use the sensors described in Table 1.

Subsequently, the team downloads the housekeeping data to the ground station. It is essential to understand how the satellite orbit and attitude affect the panel's voltage, current, and temperature.

Table 1. Description of solar panels sensors.

Sensor	Variable	Unit	Data size
LMP8640	Current	mA	8 bits
AD7490	Voltage	mV	12 bits
LMT84	Temperature	°C	12 bits

The BIRDS-4 satellite constellation was deployed into orbit from the ISS (altitude 400[km], inclination: 51.6[°], duration: 92.6[min]). Since no attitude control is applied yet, the satellites are in free rotation at approximately 3[deg/s] on each axis.

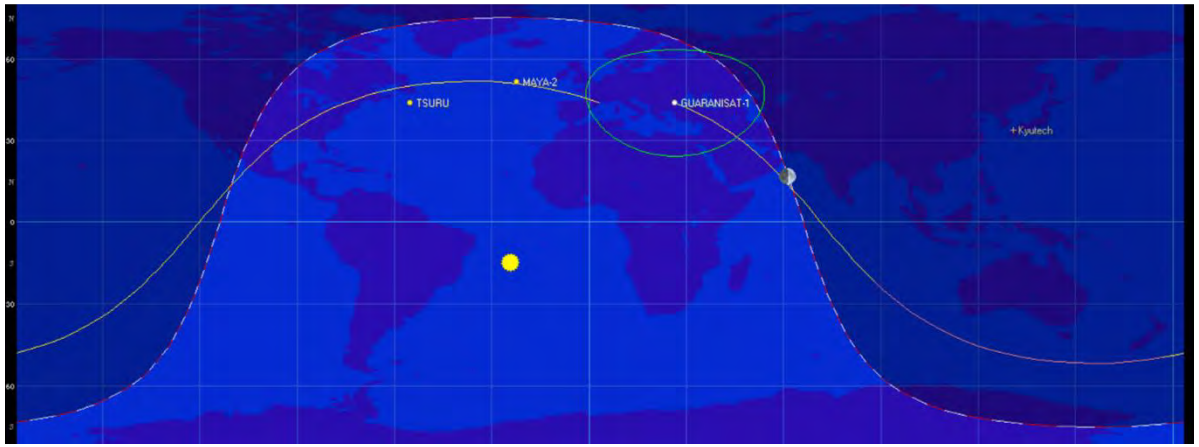


Fig. 1. BIRDS-4 satellites orbit

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Adolfo Jara

BIRDS-4 satellites Housekeeping analysis

Therefore, the panel condition is affected by two factors: the orbital periods (eclipse and sunlight) and the attitude perturbation of the satellite.

Figure 2 shows the power generation during one orbit, the samples were taken during low beta angle, when the satellites experience the longest eclipse time.

Figure 3 shows one orbit of +X and -X panels temperature. We can observe significant temperature changes (~48[°C] for +X) due to the orbit of the satellite and the slight temperature variance (~4[°C]) due to the satellite's rotation on its axes.

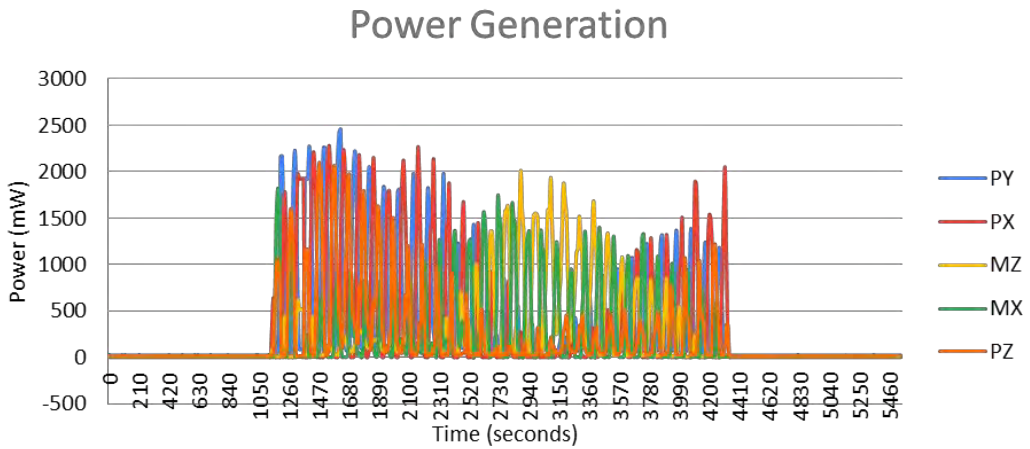


Fig. 2. One orbit all panels power generation during low beta angle

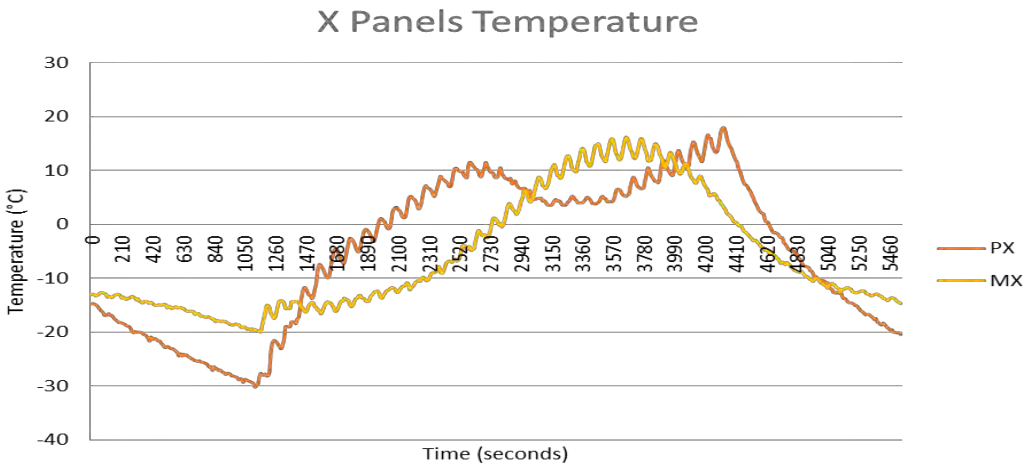


Fig. 3. One orbit +X and -X panels temperature during low beta angle

Article by:

Adolfo Jara

BIRDS-4 satellites Housekeeping analysis

Figure 4 shows the power generation during one orbit, in this case the samples were taken during high beta angle, during this period the satellites do not experience eclipse as we can see in the power generation graph.

Figure 5 shows one orbit of +X and -X panels temperature, we can observe an average temperature of ~25[°C] for +X while for -X the average temperature is around 0[°C], this difference is due to the satellite attitude during the specific orbit.

Reminder: The beta angle determines the percentage of time that a satellite in low Earth orbit spends in direct sunlight, absorbing solar energy.

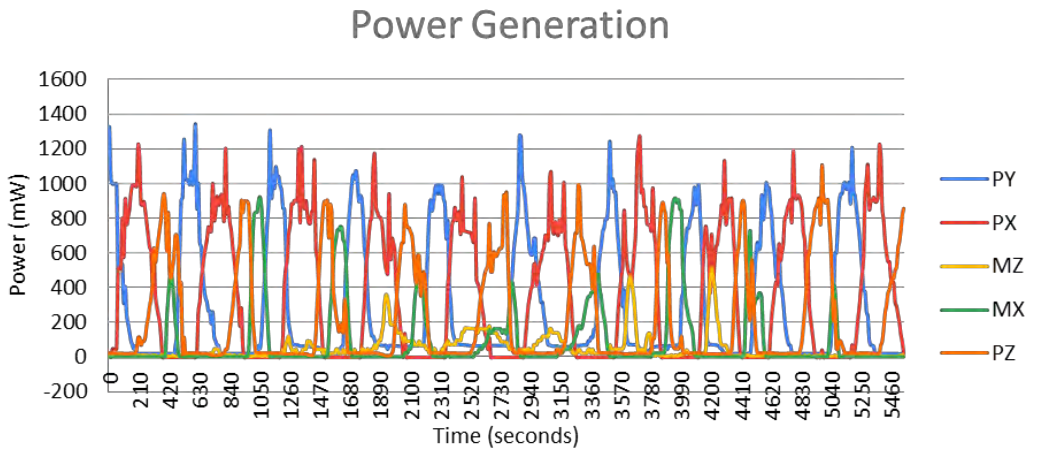


Fig. 4. One orbit all panels power generation during high beta angle

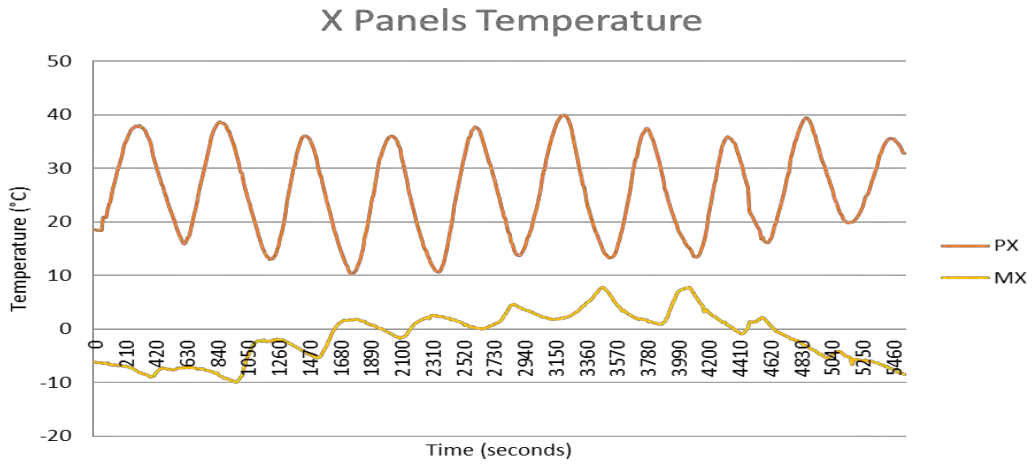
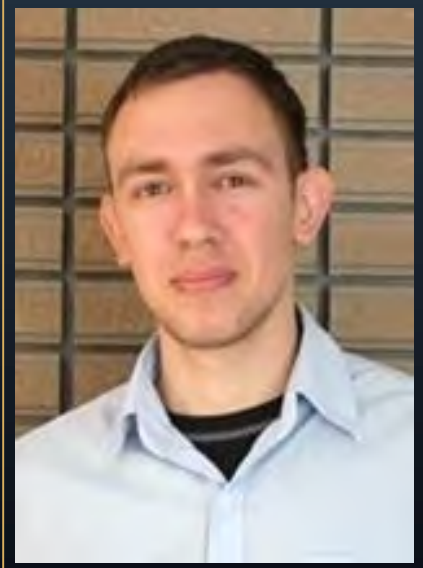


Fig. 5. One orbit +X and -X panels temperature during high beta angle

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Adolfo Jara



BIRDS-4 satellites Housekeeping analysis

We can also find a high correlation among the solar panel's parameters by analyzing the telemetry data. Figure 6 shows the correlation between the current and the temperature of the + Y panel when it faces the sun. A small delay is observed in the temperature graph compared to the current graph. This delay exists due to the photovoltaic characteristic of the solar cell, the current readings are more sensitive to the change in light intensity than the temperature reading to the radiated heat.

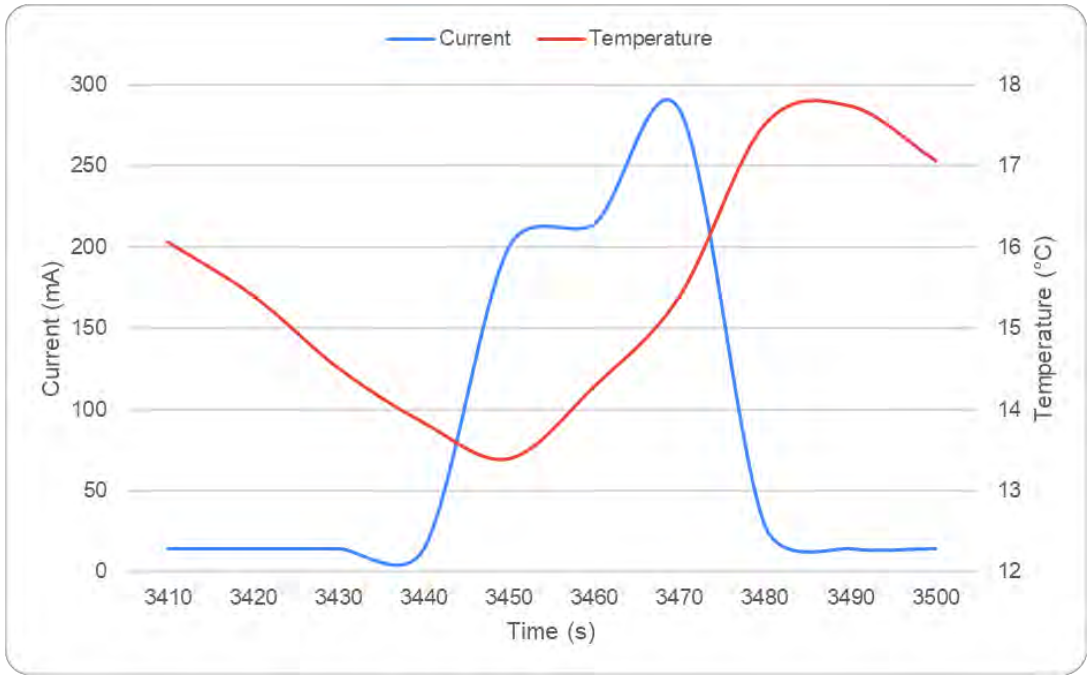
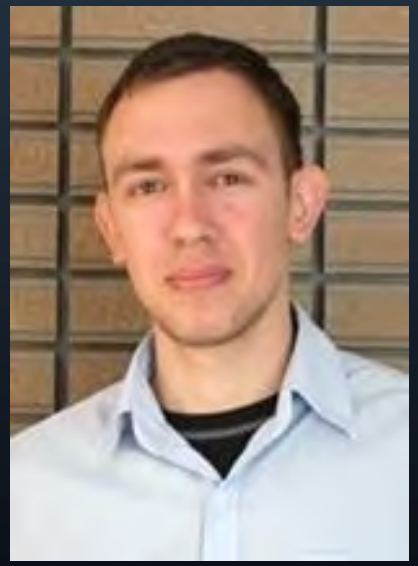


Fig. 6. +Y panel voltage and temperature recorded on November 27th, 2021

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Adolfo Jara



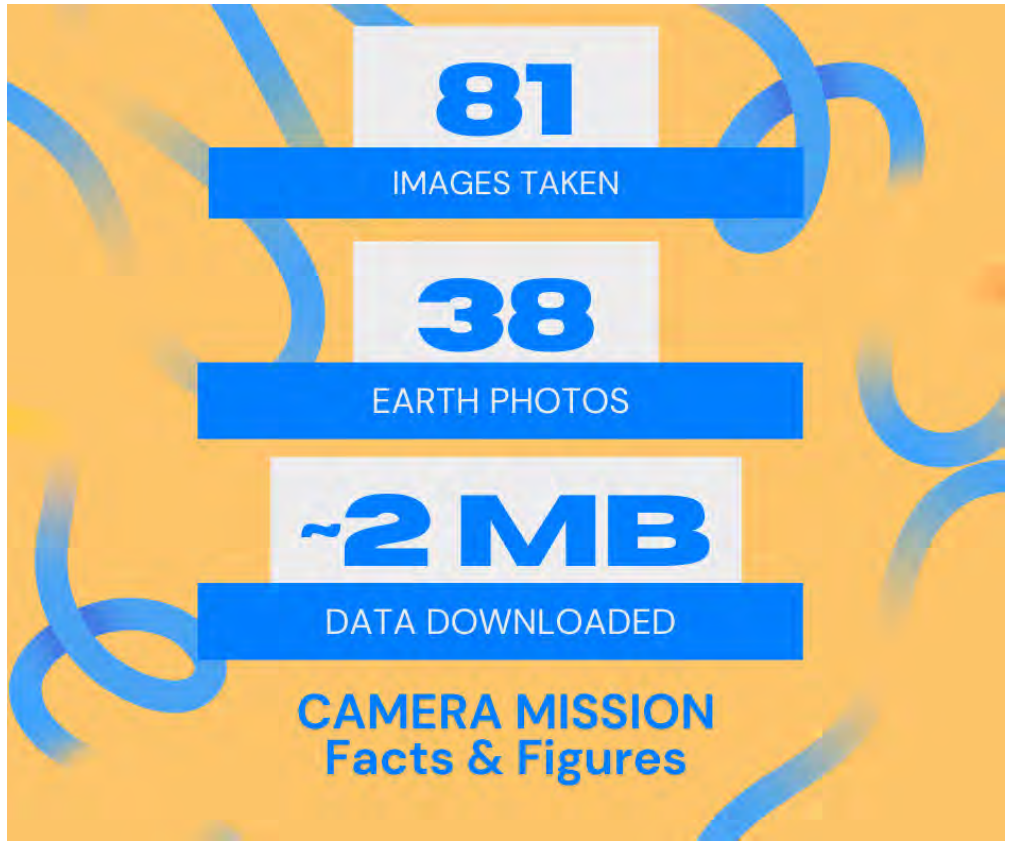
09. BIRDS-4: Camera Mission Summary Report

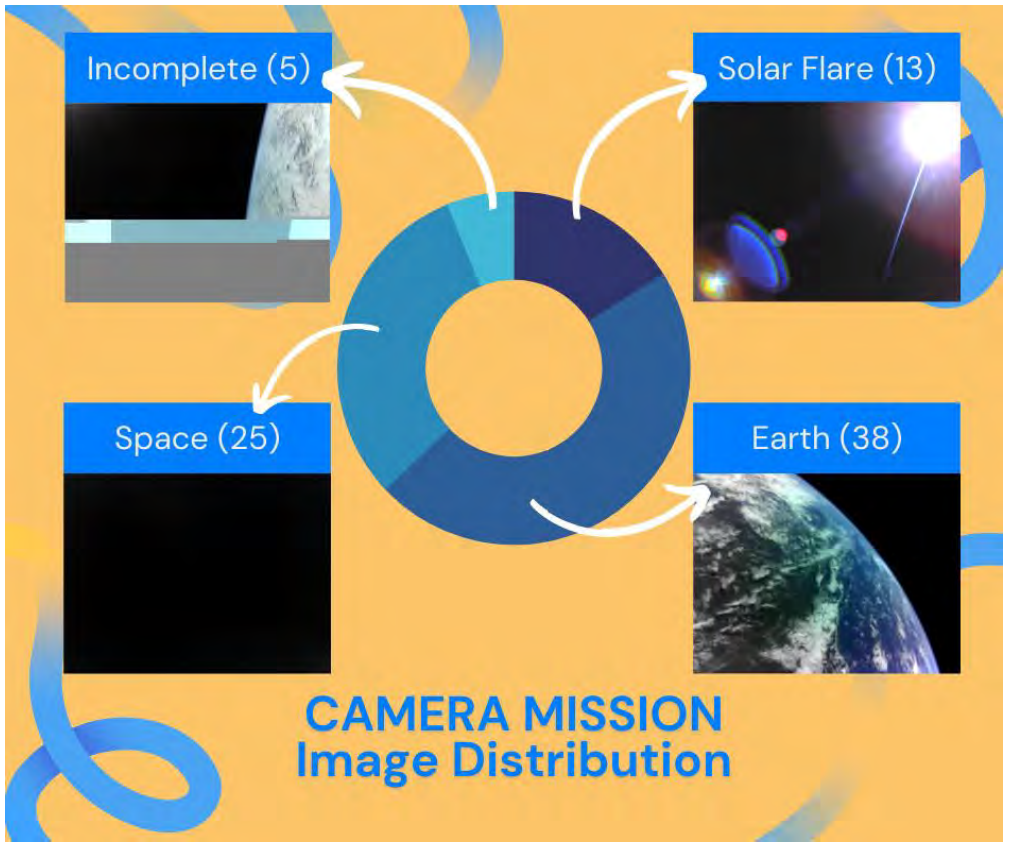
BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Mark Angelo PURIO

BIRDS-4 Camera Mission Summary Report





BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Mark Angelo PURIO

BIRDS-4 Camera Mission Summary Report

BIRDS-4
Joint Global Multi-Nation Birds Satellite Project

Article by:

Mark Angelo PURIO

BIRDS-4 Camera Mission Summary Report

BIRDS-4
Joint Global Multi-Nation Birds Satellite Project

Article by:

Mark Angelo PURIO

BIRDS-4 Camera Mission Summary Report

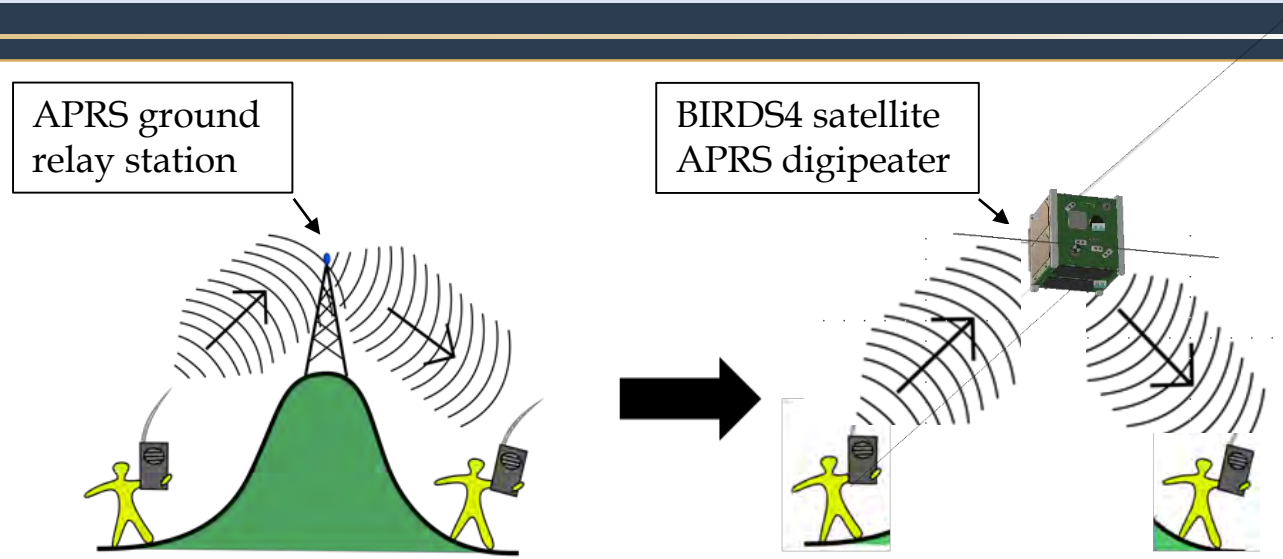
BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Mark Angelo PURIO

10. BIRDS-4: APRS Digipeater Mission

Automatic Packet Reporting System (APRS) is a real-time data communications protocol used in exchanging information among multiple amateur radios within a local area. BIRDS-4 APRS mission allows the satellites to act as relay or a digipeater in the sky. Using commercial of-the-shelf (COTS) components, the payload receives APRS messages and digipeats the messages over the satellite's footprint. This further increases the coverage area and the people who can receive the message. The mission uses a dipole antenna and operates at 145.825 MHz amateur band.



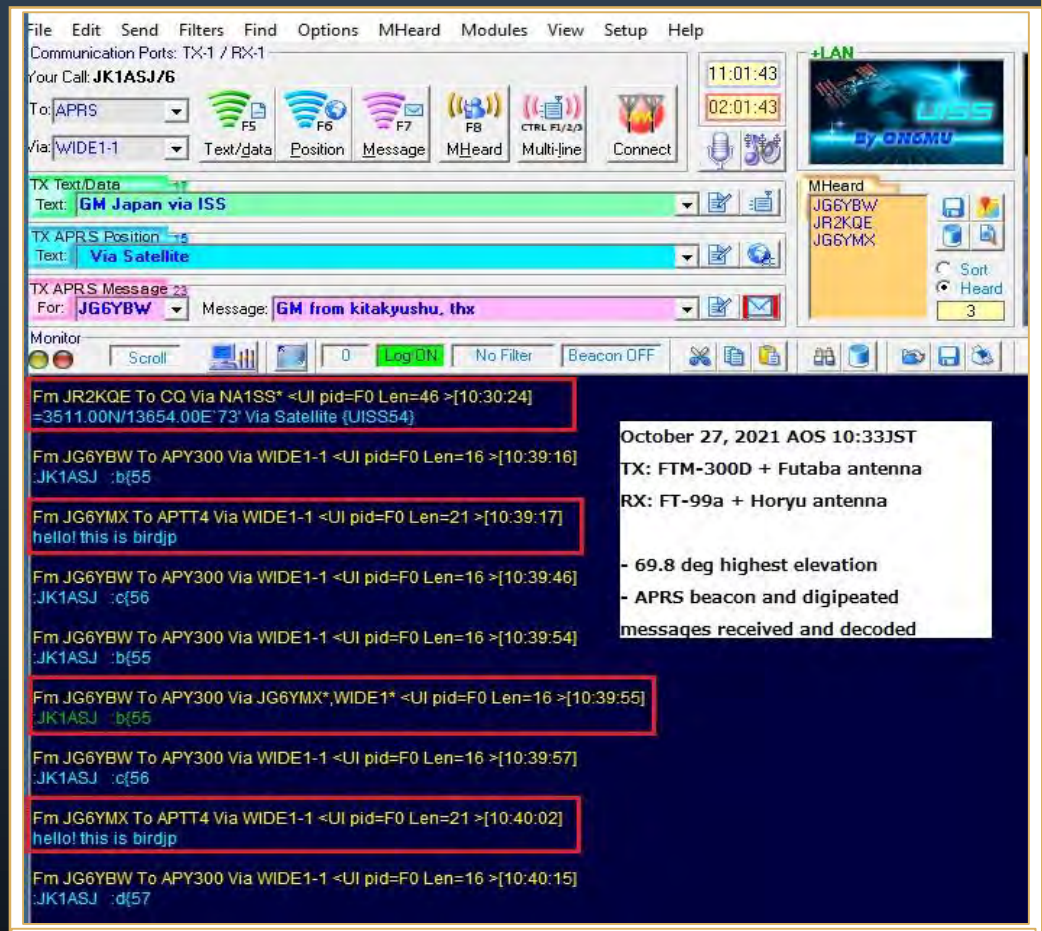
The APRS digipeating mission was successfully demonstrated. A hand-held radio with 50 W amplifier and a 7 dBi commercial antenna could uplink APRS messages to the satellite. The digipeated messages could be received at Kyutech Ground Station VHF setup comprising of 16 dBi VHF antenna, radio and UISS software. The payload also sends APRS beacon every 40 seconds. The mission is activated for 15 minutes whenever satellite pass over Kyutech GS has elevation of 50 degrees or more. This ensures successful digipeating of the satellite.

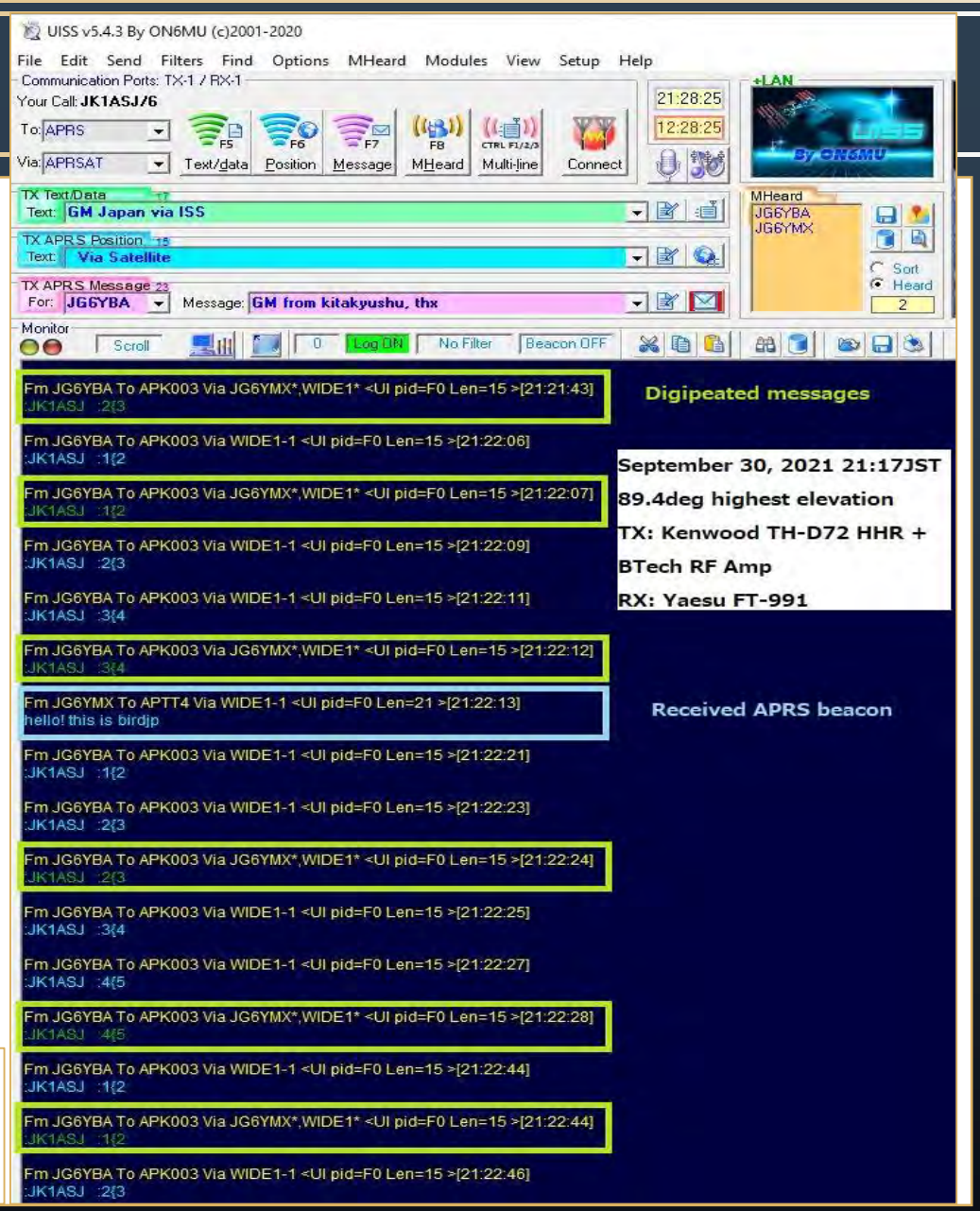
BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Marloun Sejera

APRS Digipeater Mission





The figures show the received digipeated messages and APRS beacon in the Kyutech GS.

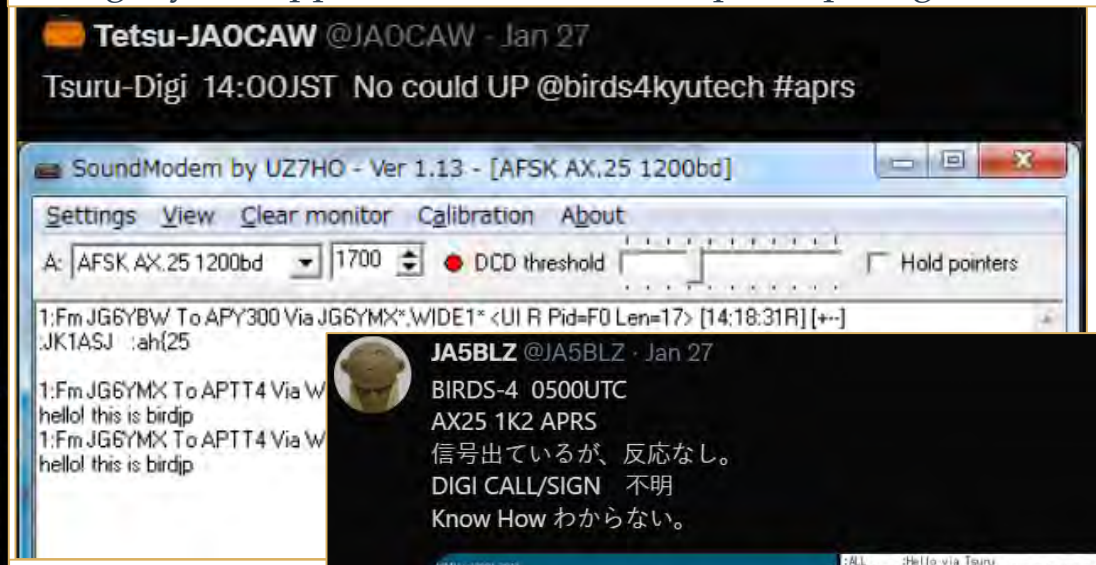
BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

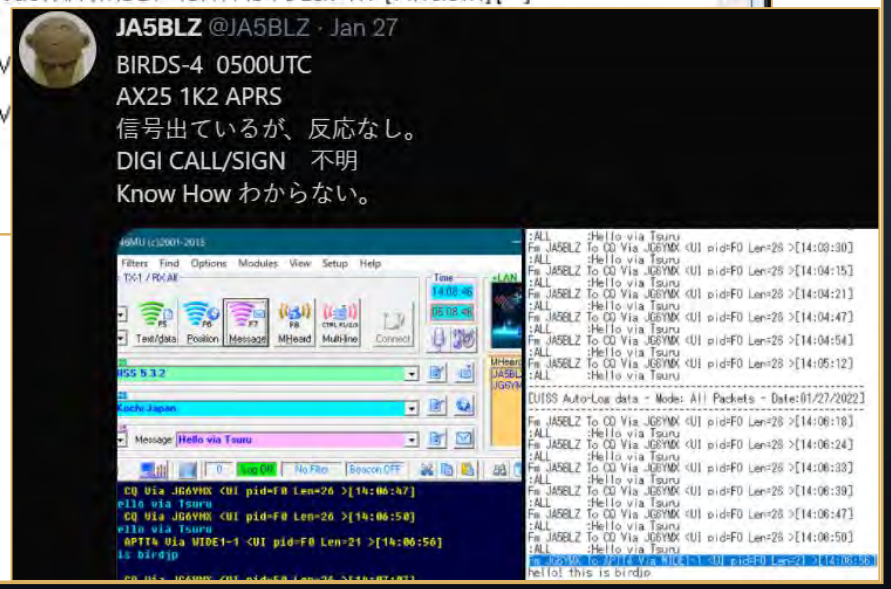
Article by:

Marloun Sejera

APRS Digipeater Mission

After receiving the license to operate, the team began to announce the schedule of APRS activation over Japan for amateurs to utilize the service. Next step is to activate the mission over Paraguay, Philippines and other BIRDS participating countries.





Left: APRS activation schedule posted over Tweeter

Right: Responses from amateurs over Tweeter

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Marloun Sejera

11. BIRDS-4: Perovskite solar cell mission results

For this mission, each satellite was attached with two samples of perovskite solar cell. In the Rear access board (RAB) of the satellite, a solar cell circuit measures the current and voltage characteristics of the PSCs as well as the temperature and irradiance from the sun.

In Figure 2, the PSC Average normalized efficiency shows a change of -0.15% over time. A slower degradation rate was observed compared to when the samples were tested on the ground. The analysis conclusion is that this type of PSC is not yet ready for space but significant improvement in encapsulation and material could allow future PSC missions to perform better in space.

Fig 1. Perovskite solar cells attached to BIRDS-4 satellites.

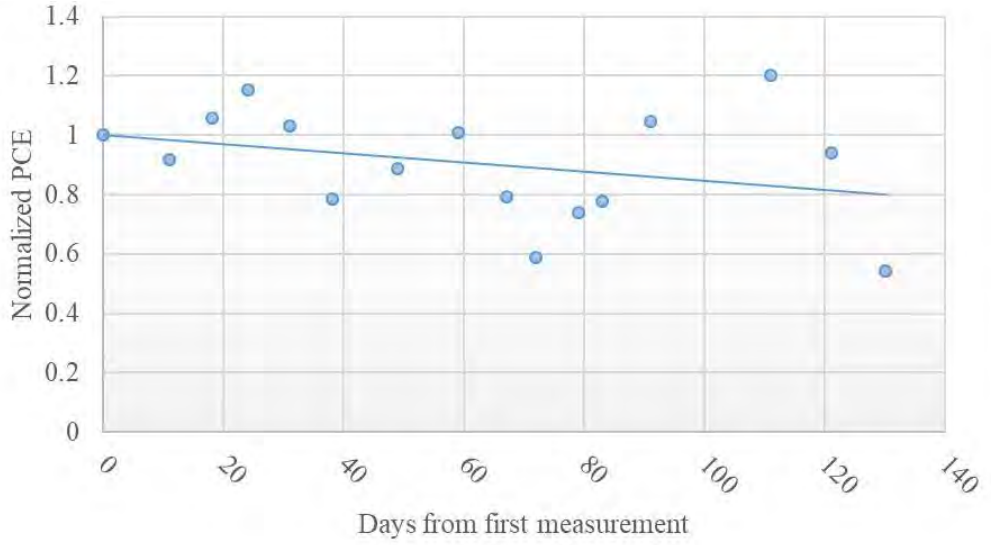


Fig. 2. Normalized Average Efficiency over time

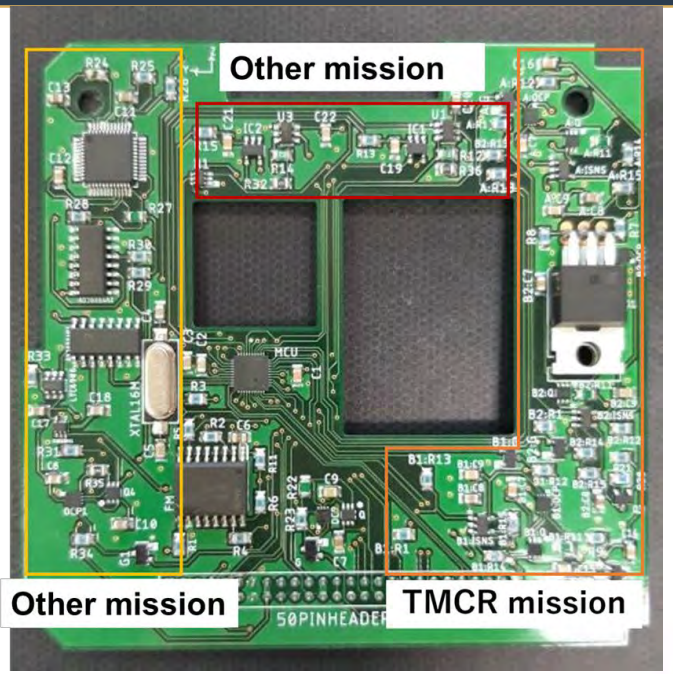
BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Adolfo Jara &
Izrael Bautista

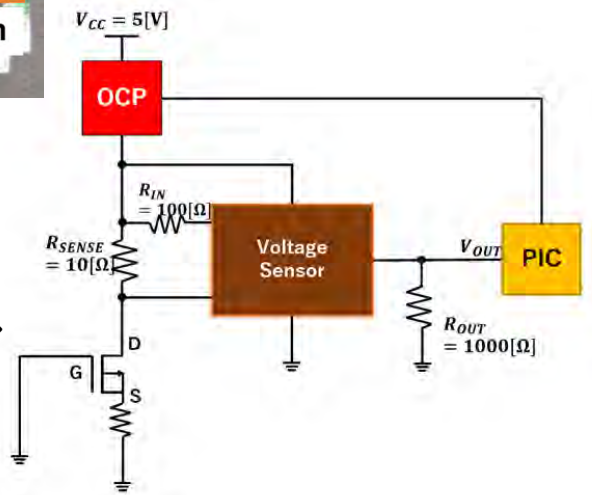
12. BIRDS-4: TMCR mission: On-orbit TID test

TMCR mission has two objectives. First is to confirm the accuracy of the TID (Total Ionized Dose Effect) tests that have been conducted on the ground. Second, to verify a system that predicts the number of doses from the change of Drain current. If the accuracy of the TID test on the ground is confirmed by the on-orbit experiment, the radiation dose on--orbit can be predicted by observing the change of Drain current of MOSFETs, and it may be used as a simple dosimeter.



←Location of the TMCR mission on the board

System of TMCR mission→



BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Akihiro Oboshi

TMCR mission: On-orbit TID test

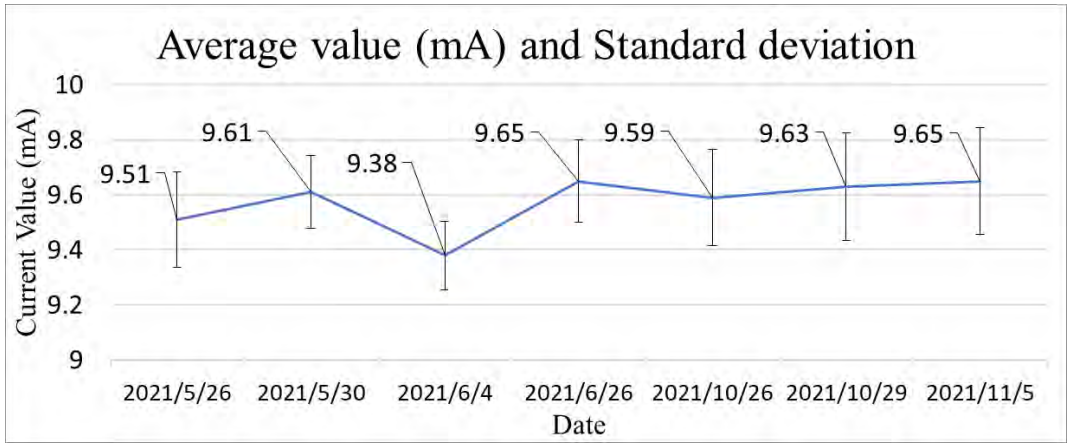
The semiconductors should show more degradation than in the ground tests, but the results of the on-orbit experiments showed no clear signs of degradation even after 237 days.

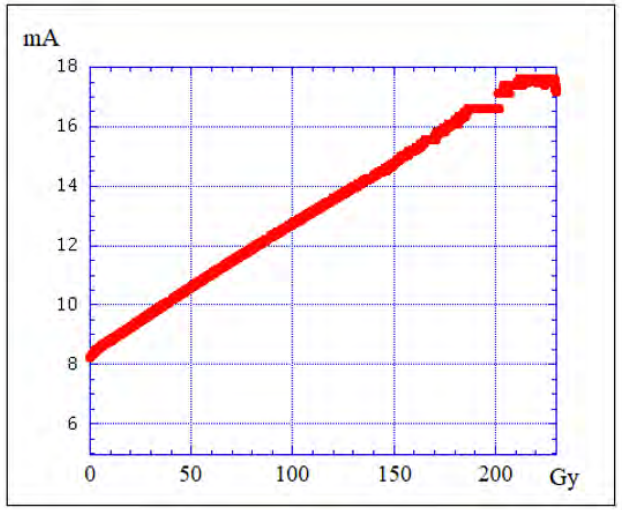
There are two reasons for this:

(1) the cumulative radiation dose is low, and

(2) the voltage is not always applied to the semiconductors for experiments due to power consumption issues.

We will continue our observations to determine the cause.





↑On-orbit results. estimated to be 13.7 Gy total radiation dose as of 2021/11/5

←TID test results on the ground

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

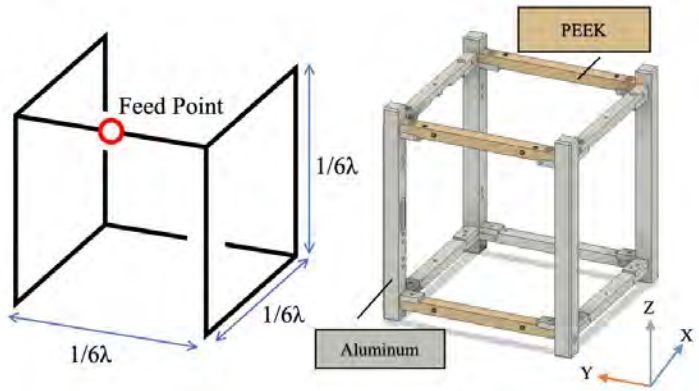
Article by:

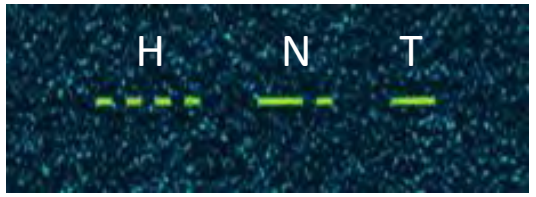
Akihiro Oboshi

13. BIRDS-4: HNT mission: On-orbit demonstration of Loop Hentenna

HNT mission is one of the nine missions of BIRDS-4. We executed HNT mission on December 15, 2021. CW beacons were sent alternately from the Loop Hentenna and the Dipole Antenna. We are so happy to confirm that the Loop Hentenna worked. The receiver used was RTL-SDR and we recorded the IQ signal as a wav file. I am analyzing the received signal. The analysis results will be published in a journal paper.

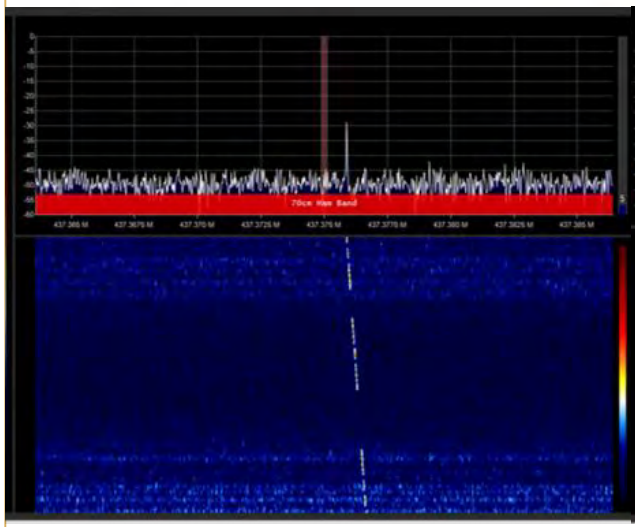
The HNT mission will continue, so why not try to receive it when you get a chance? It is powerful enough to be received with an omni-directional QFH antenna.



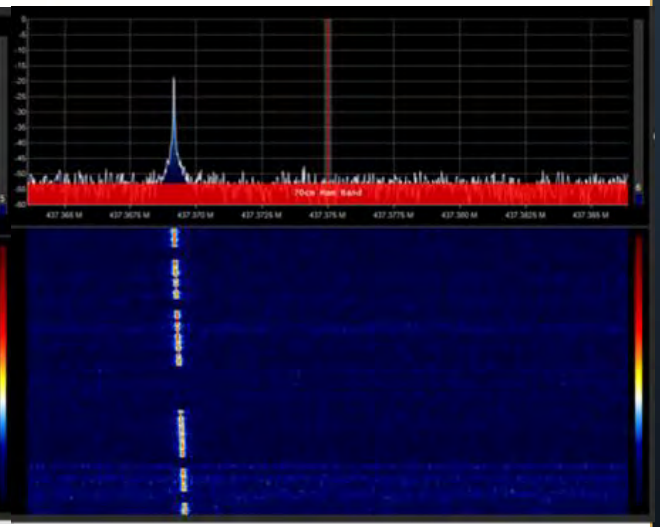


↑ "HNT" signal
from HNT mission

←Loop Hentenna structure
of BIRDS-4 HNT mission



HNT CW beacon
from Loop Hentenna



Bus system beacon
from dipole antenna

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Daisuke Nakayama

14. BIRDS-4: Glue and NTU Missions Report

The Glue mission uses commercially available glue (EP007 model) as an alternative to RTV-S 691 space-qualified adhesive to reduce costs and ease of purchase. The glue was applied to one of Japanese satellite's solar panel.

The mission has the following success level criteria:

Minimum - get comparison data on the amount of power generated by solar cells attached using RTV* and cheaper glue during the operation.

Medium - power generation efficiency with cheaper glue is at least 90% to that of RTV

Full - the same amount of power generation as the solar cells pasted with RTV

Figure 1 shows the system diagram was applied to the Tsuru satellite`s +X panel board. The +X solar panels are sent the voltage,

*RTV-S (Room Temperature Vulcanizing – Silicone)

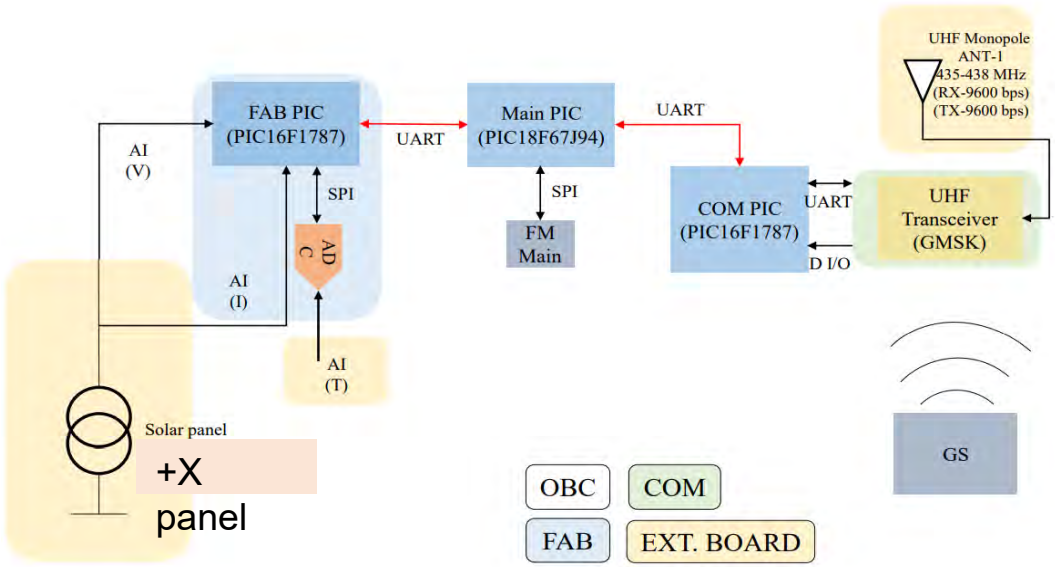


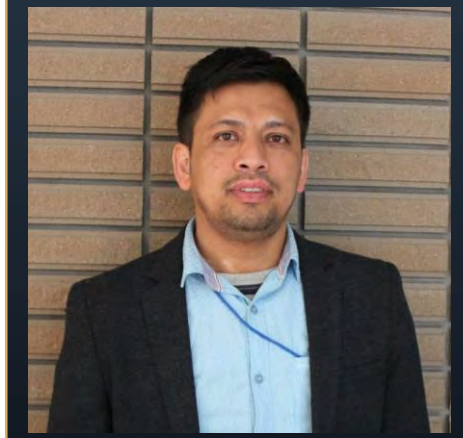
Fig. 1. System diagram of glue mission

temperature and current to the FAB PIC. After receiving the command from the main PIC, the data is collected every 90 seconds for normal sampling data and every 10 seconds for high sampling data. In addition, the Main PIC and the COM have a bidirectional relationship for communication with each other, which allows data to be transmitted from satellite.

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Hari Ram SHRESTHA



Glue and NTU Missions Report

Figure 2 shows the power generation results of two different solar panels during one orbit. The red curve is from the solar panel (+X) with the commercial glue, while the curve in green is from the solar panel (-X) with RTV. The maximum power output occurs during the beginning phase of the sunlight due to power consumption by the battery until the battery is fully charged. Power generation is higher when there is direct sunlight, and it is lower when there is no direct sunlight. The +X solar panel generates 411 mWh per orbit, according to high sampling data. The maximum sampling time is 10 seconds.

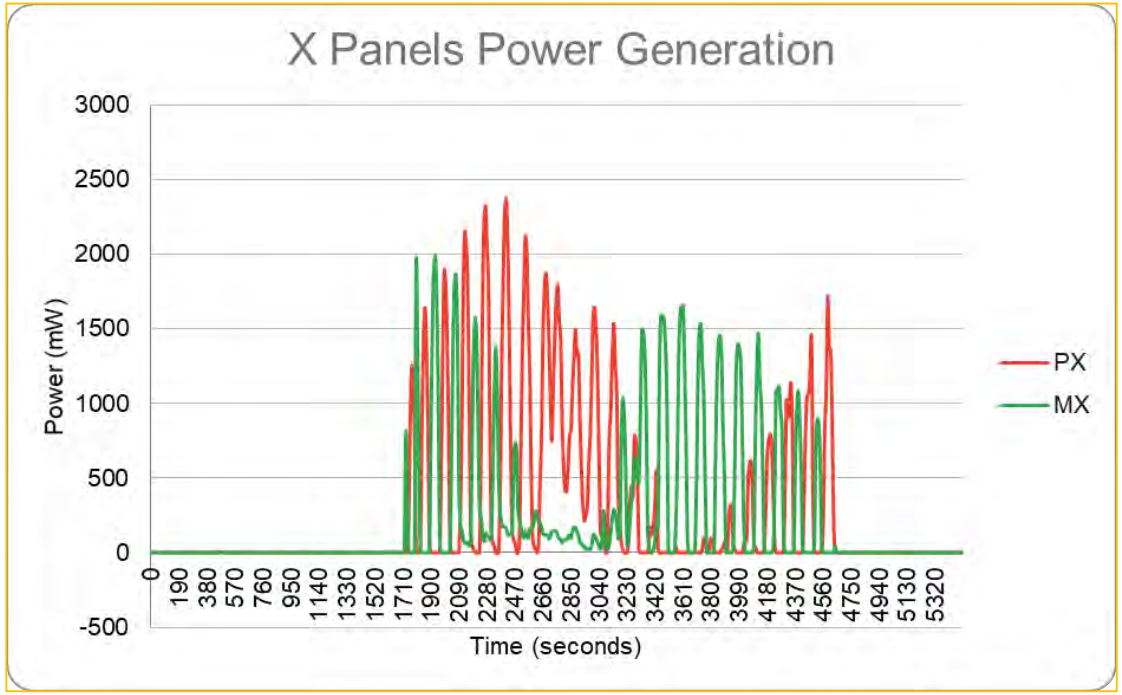


Fig. 2. Power generation by +/- X panels

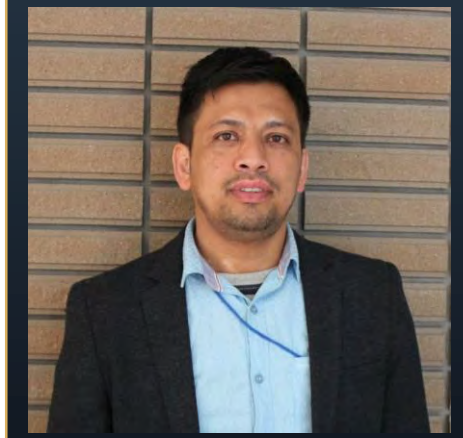
Sample Time (s)	Total py (mWh)	Total px (mWh)	Total mz (mWh)	Total mx (mWh)	Total pz (mWh)	Total (mWh)
10	403.0425365	411.1782527	327.8563864	328.328226	282.2613355	1752.666737

Table 1: Power generation status by each solar panel

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

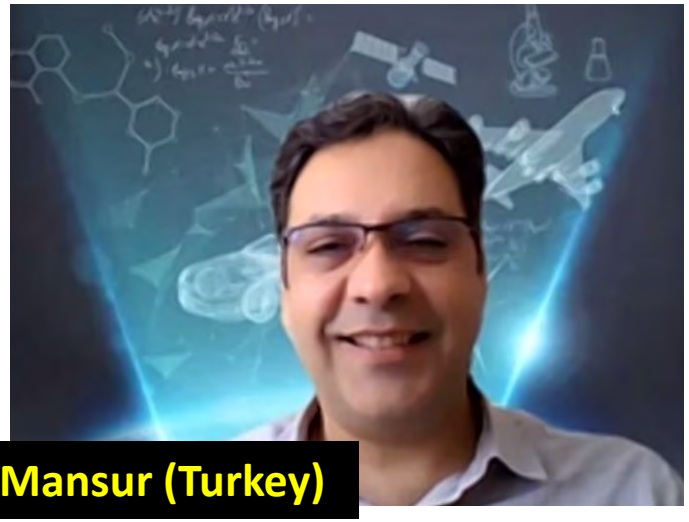
Article by:

Hari Ram SHRESTHA

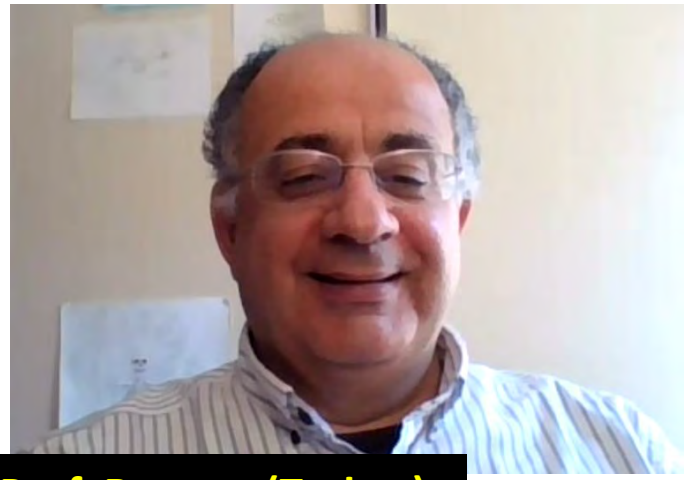


End of BIRDS-4 reports

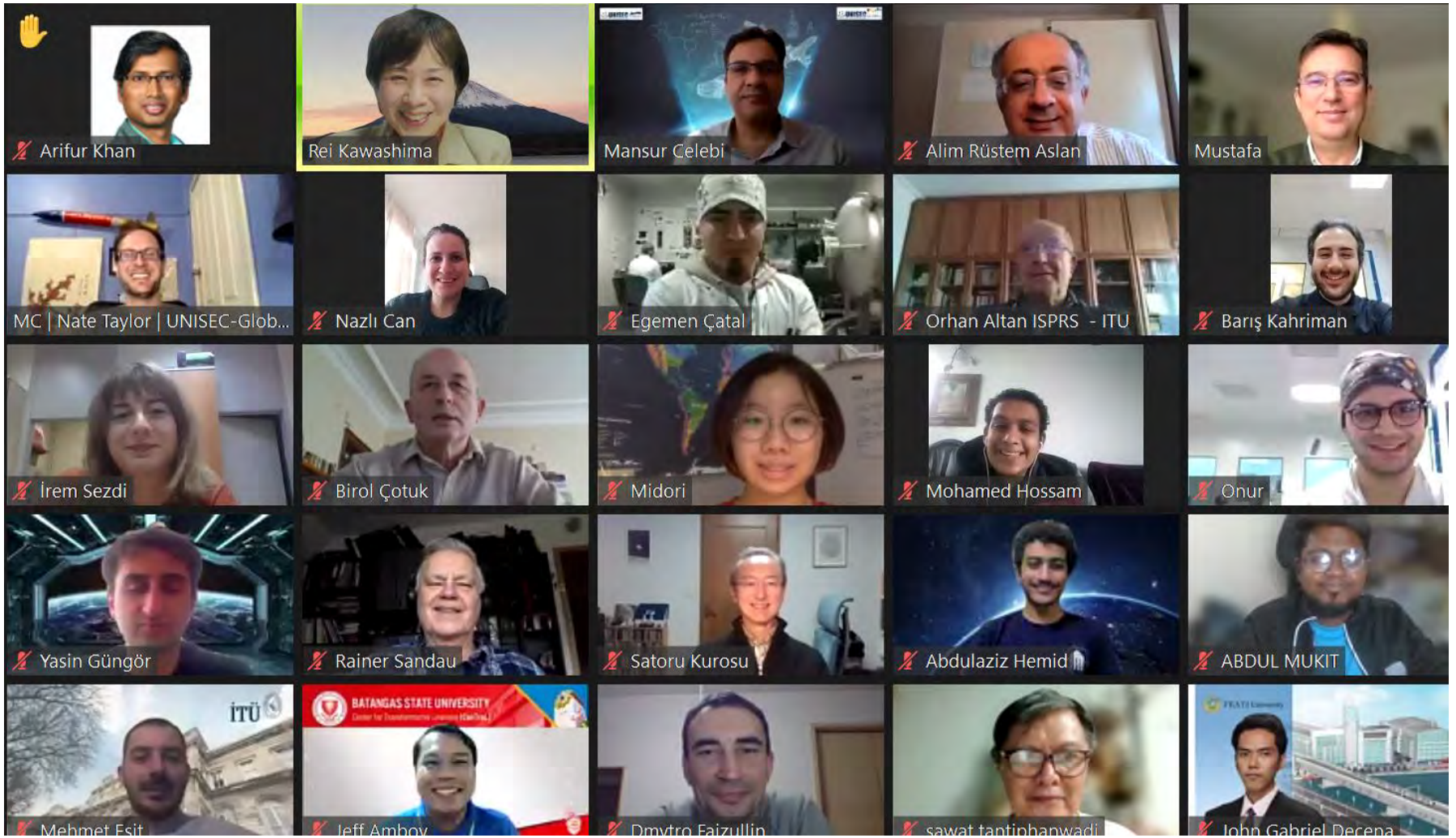
015. UNISEC-Turkey hosted the virtual UNISEC-Global meeting of 19 Feb 2022



Mansur (Turkey)



Prof. Rustem (Turkey)



UNISEC-Turkey provided two really outstanding speakers for this meeting !

UiTMSAT COLUMN

Column No. 26

Editor: FATIMAH ZAHARAH BINTI ALI (*ali.fatimahzaharah@gmail.com*)
PhD CANDIDATE, LABORATORY OF SPACE WEATHER AND SATELLITE SYSTEM
SCHOOL OF ELECTRICAL ENGINEERING, COLLEGE OF ENGINEERING
UNIVERSITI TEKNOLOGI MARA (UiTM), SELANGOR, MALAYSIA

UNIVERSITI TEKNOLOGI MARA

UiTM Sentiasa Di Hatiku
"UiTM Always in My Heart"

HIGH GROUND RESOLUTION IMAGERY FOR ASEANSAT 1U CUBESAT

IN January 2022, ASEANSAT team has conducted a Preliminary Design Review (PDR) to review the developed breadboard model (BBM) and the testing that have been performed for Camera Mission and subsystems such as antenna subsystem (ANT), communication subsystem (COMM), and structure (STR). Three (3) panels had been invited for the review.

In this issue of UiTMSAT Column, CAM will be briefly elucidated based on the functionality tests performed on the sensor used in the ASEANSAT project. For the record, ASEANSAT will be having CAM that offers ground resolution higher than the common imaging sensor of 1U would provide.

To achieve the objective, ASEANSAT is using a lens that has long focal length. The longer focal length lens that suits to be mounted on the applied imaging sensor is 35 mm. The images obtained from the lens with 35 mm focal length were compared with the images obtained from a sensor that used a default lens (4.9 mm). This was the initial functionality tests performed for the imaging sensor in order to see the results of the captured images.

Image obtained from sensor with 4.9 mm EFL default lens.

Image obtained from sensor with 35 mm EFL lens.

Fig. 1: Comparison between images.

From Fig. 1, it is clear that the sensor with 35 mm focal length lens can capture a closed image compared to the image captured by a sensor with default lens. Longer focal length lens can provide higher ground resolution than a shorter focal length lens could offer. Higher ground resolution of an image can include item greater than the size of the imagery pixel. If we can refer to Fig. 1 again, the word “Dell” on the computer’s monitor cannot be seen in image that used default lens, but it is clearly spotted in image of 35 mm focal length lens. This is one of the proof that the longer focal length can provide high ground resolution or small pixel size that leads to the closed-up imagery.

However, the drawback of having longer focal length lens is it is difficult for the engineer to include Infra-Red (IR) Filter in it. The features or physical condition of the lens aggravate the process of mounting the IR filter on the lens. Thus, the imaging sensor that uses the longer focal length cannot be provided with the shielding from the harmful IR ray. The IR ray will enter the sensor through the lens and destroy the fragile and vulnerable sensor. The image with damaged sensor will have black dotted or spotted and is considered and ruined imagery.

Fig. 2: The imaging sensor with 35 mm focal length lens.

Thus, to avoid such damage to happen, the IR Filter was mounted on the imaging sensor, instead. See Fig. 3. There are additional board attached on the imaging sensor board as shown in Fig. 3. The additional board is the IR filter board that consists of two (2) different glasses. The first glass is a normal glass that will allow IR ray to enter the sensor. The image without IR filter is shown in Fig. 4. The second glass is an IR filter that can be switched from normal glass by supplying an enough power supply to the IR Filter connector.

Fig. 4: Image without IR filter.

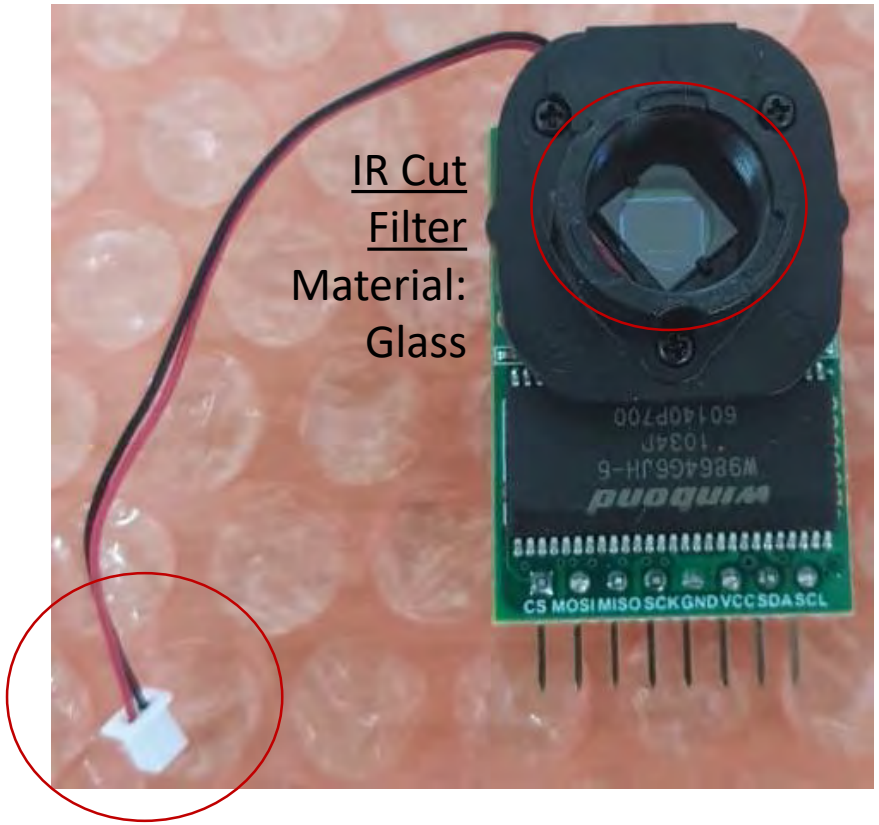


Fig. 3: IR filter board on imaging sensor board

End of Malaysia's Column

017. Kyutech student Etsunaga arrives in Rome for his 4th year undergrad studies

Email from Rome, Italy, on 4 March 2022

Dear Prof. Maeda, Dear Prof. Cho,

Very good news from Italy: Etsunaga-san has arrived in Rome and we were super happy to give him our welcome to our University, we took a welcome picture at the entrance of our faculty.

First visit to the lab and to the (very old) faculty done, Etsunaga-san was quite surprised we are so close to the Coliseum and enjoyed some pasta with us.

With us in the picture, Giulio Mattei, the student that will come for the MSc thesis we hope as soon as possible, that was his tutor for today.

Prof. Maeda, Yudai already told me he will do a huge photo report for the newsletter, but I thought you could enjoy this small "prologue".

All the best from Rome,

Paolo Marzioli, PhD
Research Associate
Department of Mechanical and Aerospace Engineering (DIMA)
Sapienza University of Rome, Italy

Announcement

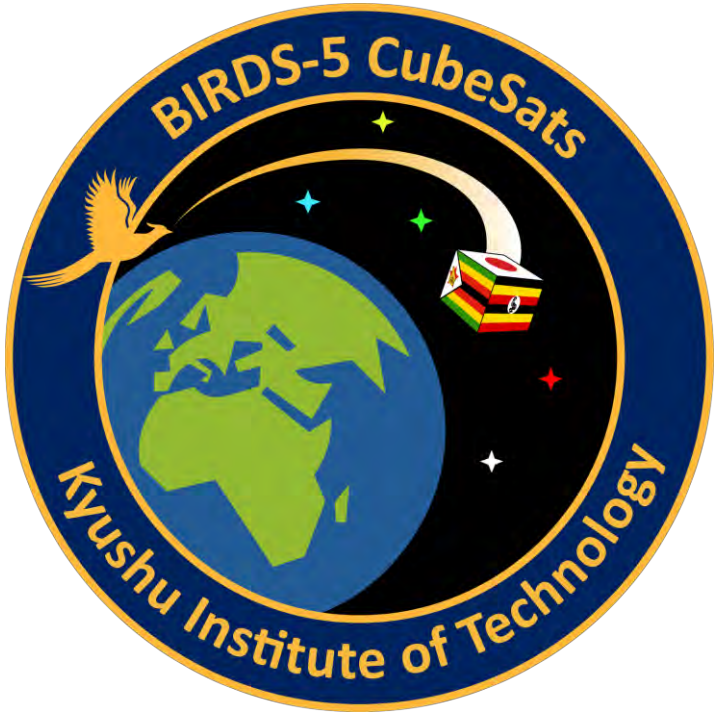
Virtual GST Workshop 2022

10th March, 2022

21:00 (JST) ~

Agenda: GST development progress

If you wish to attend, please contact Pooja at this email address: lepcha.pooja586[at]mail.kyutech.jp



The following sections are the BIRDS-5 articles for February 2022

(compiled by Timothy of Zimbabwe)

ZIMBABWE NATIONAL GEOSPATIAL AND SPACE AGENCY

GROUND STATION PROGRESS BRIEF

By : Tatenda G. S. Marimo

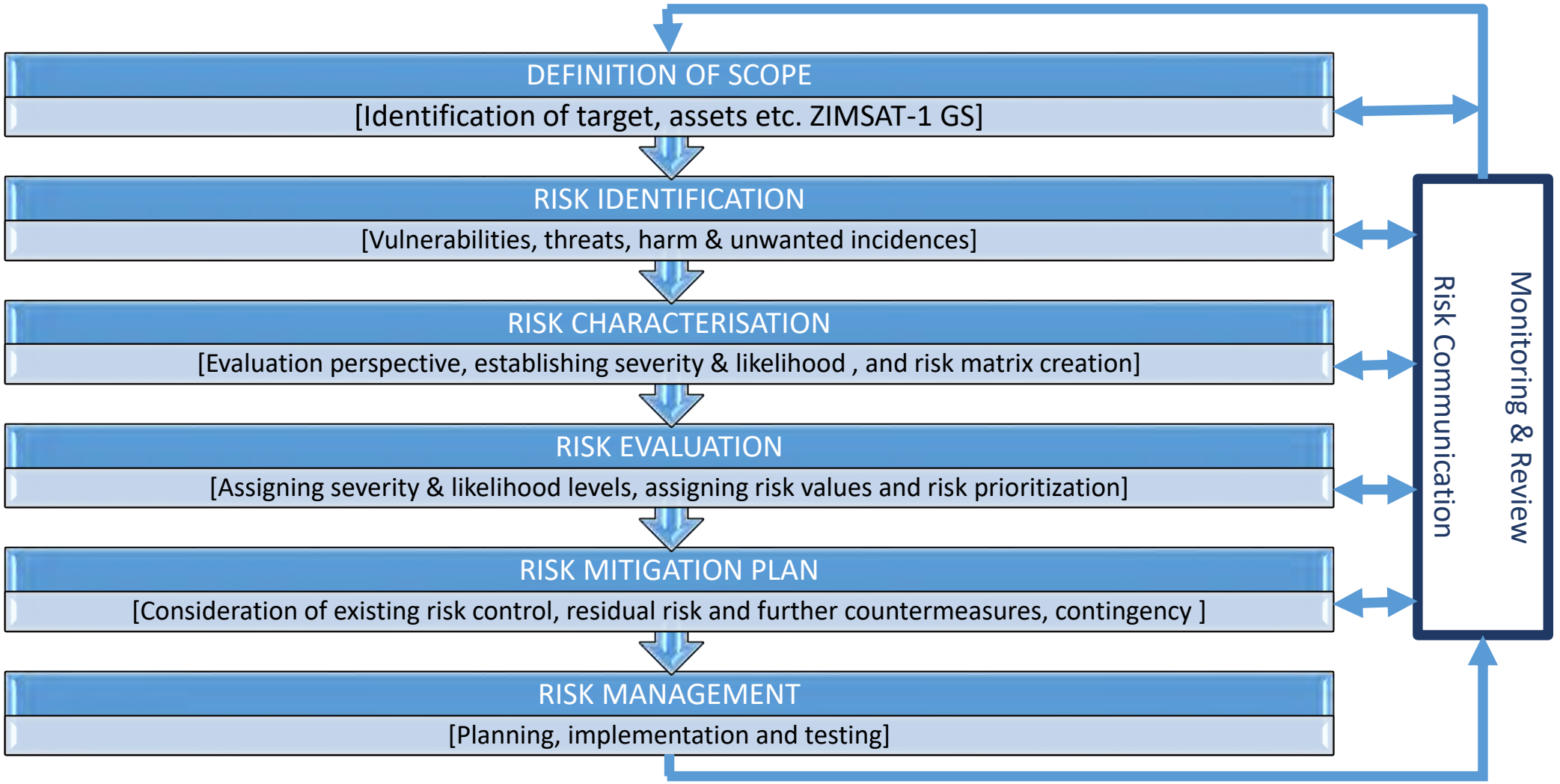
Acting Outreach Officer

14/02/2022

Ground Station Equipment

- The procurement of Ground Station Equipment is now complete (100%).
- Equipment assembly and pre-installation tests completed.
- Operational and Installation Risk Assessment completed.

Risk Assessment for G S installation

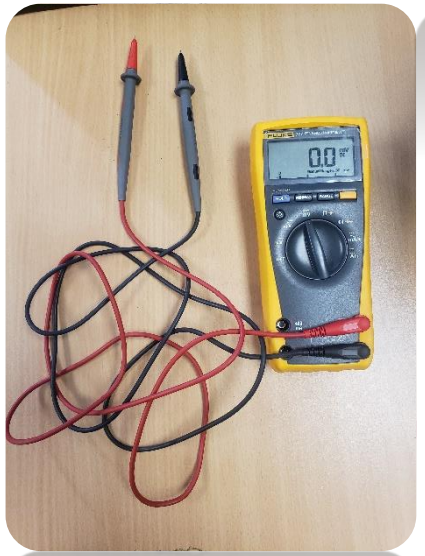


Tools & Equipment

- Some of the tools and equipment which were used during the termination, assembling and testing of Ground Station equipment.
- Physical, parameter and functional tests were successfully carried out.

SWR & Power meter

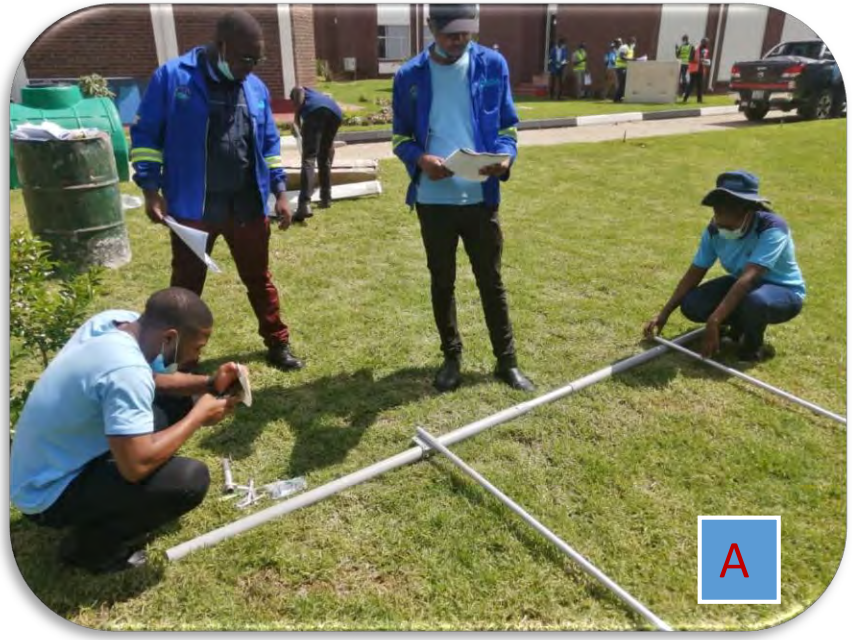
Antenna Analyzer

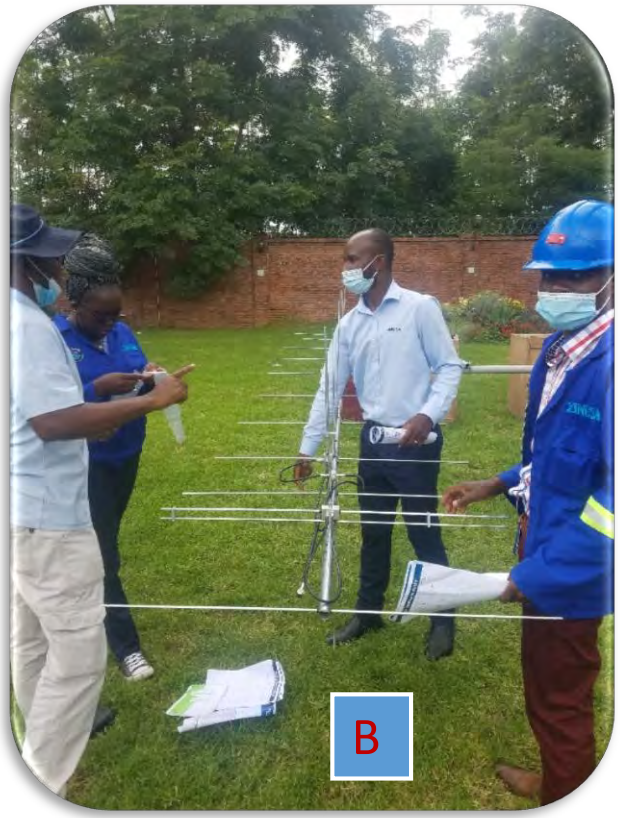

Multi-meter

Coaxial cable installation kit

Hot-air station

Assembling and Pre-installation test of G S Antenna





Engineers assemble the G S Antenna (Figure A & B) ,Figure C: tests on the complete UHF and VHF Yagi antenna in preparation for installation works at ZINGSA Head Quarters.

Victoria Falls Resort in Zimbabwe

A.Victoria Falls: An epitome of African beauty! B. Wildlife viewing around Victoria Falls.

www.discoverafrica.com/safaris/zimbabwe/victoria-falls-in-Zimbabwe, Zimbabwe A World of Wonders (zimbabwetourism.net)

END OF ARTICLE

- THANK YOU

TATENDA

SIYABONGA

ありがとうございました

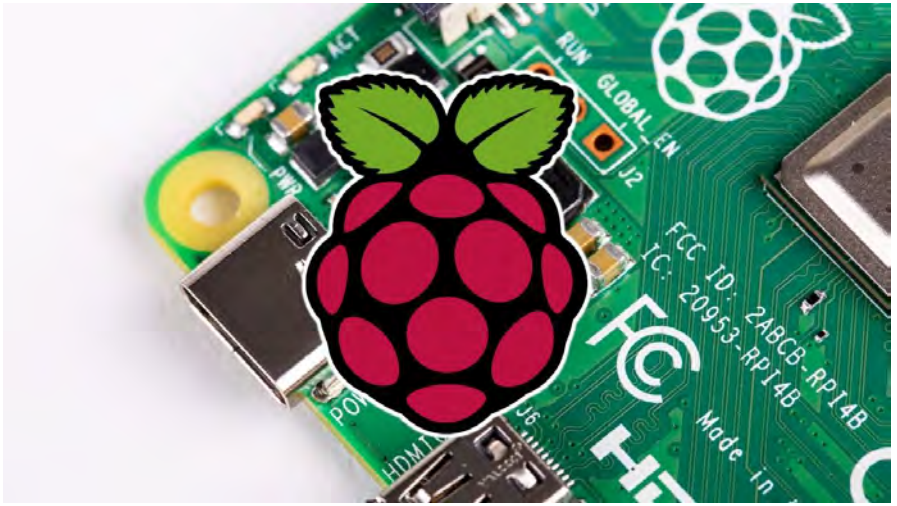
Long Duration Testing

By: Keenan Chatar

18/01/21

Introduction

- The Raspberry Pi is a small, affordable and versatile computer-on-a-board



- The Pi can be used for a variety of applications such as:
  1. Robotics
  2. Education tool
  3. Weather Monitoring
  4. Security

Long Duration Testing

- Scheduled from 24/02/2022 at 6pm to 02/03/2022 at 6pm (7-day duration)
  - Simulate Normal Operation (4 passes per day, 4 operations)

- Simulate Satellite in-orbit conditions:
  - Charge/Discharge Cycle (every three hours, we will charge satellite
  - Periodic Reset Cycle (Expect three satellite resets (1 per 24hrs))
  - Use only GS software
  - Testing antenna deploy (after 31mins), COMM will turn on after 32mins

- Testing 1U BIRDS-5S Satellite:

Satellite Log

- Satellite Log is 11 bytes long:

0xDA	0xDA	Sec	Min	Hr	Day_h	Day_l	data1	data2	data3	0xEF

- Data bytes record the code for what was logged

- SATLOG is recorded after events with specific codes:
  1) Satellite RESET – 0x25, 0x25, 0x25
  2) Burner Circuit Activation – 0xBB, 0x30, 0x30
  3) Kill SAT Command – 0xEE, 0x04, Kill Count
  4) Mission Command Uplink to Main – 0xCC, CMD0, CMD2
  5) Reservation Command – 0xDD, CMD0, RSV Time
  6) Data Erase – 0xE0, D1, D2
  7) Data Transfer - 0xAB, D1, D2
  8) Mission Time Elapse - 0x99,0x99,0x99

Satellite Log

- Satellite Log is 11 bytes long:

0xDA	0xDA	Sec	Min	Hr	Day_h	Day_l	data1	data2	data3	0xEF

1st log – SAT RESET

2nd log – Antenna Deploy 30mins after

Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00000000	DA	DA	00	00	00	FF	FF	25	25	25	EF	DA	DA	3B	1F	00
00000010	FF	FF	BB	30	30	EF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

CW Beacon

- CW Beacon shows critical status data in concise format:
  - 5 bytes long
  - Two Types: Type 1 and Type 2
  - Saved to SCF, MF, SMF from address: 0260 0000

Type1			Type2		
Cell Number	Data	bit	Cell Number	Data	bit
1	Battery Voltage (mV)	8bit	1	Gyro X axis (deg/s)	8bit
2	Battery Current (mA)	8bit	2	Gyro Y axis (deg/s)	8bit
3	Battery Temperature (℃)	8bit	3	Gyro Z axis (deg/s)	8bit
4	Format identifier “0” (Data Type 1)	1bit	4	Format identifier “1” (data type 2)	1bit
	Operation Modes --> 11: Normal	2bit		HSSC Automatical Trial ----> 1: done 0: not done	1bit
	Kill Switch Main -----> Nomal:0 Kill:1	1bit		COM to MAIN Flag----> 1: comm 0: no comm	1bit
	Kill Switch FAB -----> Nomal:0 Kill:1	1bit		RESET to MAIN Flag ----> 1: comm 0: no comm	1bit
	Antenna deploy status------> Success:1 Unsuccess:0	1bit		FAB to MAIN Flag ----> 1: comm 0: no comm	1bit
	Solar cell +Y----------> Sunshine:1 Shadow:0	1bit		Battery Heater -------> ON:1 OFF:0	1bit
	Solar cell +X----------> Sunshine:1 Shadow:0	1bit		Reservation command ----> Reserve:1 Nothing:0	1bit
5	Solar cell -Z----------> Sunshine:1 Shadow:0	1bit		Uplink Success ----> Success:1 Not Success:0	1bit
	Solar cell -X----------> Sunshine:1 Shadow:0	1bit	5	Mission status (ON/OFF)	4bit
	Solar cell +Z----------> Sunshine:1 Shadow:0	1bit			
	Time after last reset (number of hours)	5bit		Mission Operating Status (Operating/Not Operating)	4bit

CW Beacon

- CW Beacon shows critical status data in concise format:

Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00000000	9C	7A	88	61	40	00	00	00	B8	00	9C	7A	87	61	40	00
00000010	00	00	B8	00	9C	7A	87	61	40	00	00	00	B8	00	9B	7B
00000020	87	61	40	00	00	00	B8	00	9B	7A	87	61	40	00	00	00

CW Beacon Type 1

CW Beacon Type 2

CW Analyzer:

CW Decode	9c7a886140	9c	7a	88	61	40
			7a0			400

CW Type1		CW Type2	
Bat Vol [V]	3.96825	Gyro X [deg/sec]	-100
Bat Cur [mA]	200.1	Gyro Y [deg/sec]	122
Bat Temp	23.1075	Gyro Z [deg/sec]	-120
Format (0)	0	Format (1)	0
OP Mode	nominal	Auto HSSC	1
Kill Main	0	COM to MAIN	1
Kill FAB	0	RESET to MAIN	0
ANT Dep	0	FAB to MAIN	0
Solar Cell -X	0	Bat Heater	0
Solar Cell +Y	1	RSV_CHECK	0
Solar Cell -Z	0	UPLINK Success	1
Solar Cell -Y	1	Mission Status	0
Solar Cell +Z	0	Mission Operating	0
Operation Time (hours)	0		

Housekeeping Data

- Housekeeping Data shows critical satellite status information:
  - Time Data
  - Voltage Data (Panel, Battery, etc.)
  - Current Data (Panel, Battery, etc.)
  - Temperature Data (Panel, Battery, BPB)
  - ADCS Data (Gyro and Magnetometer)

from	to	size(byte)	HK DATA	
0	1	2	header(0x33)	OBC
2	2	1	sec	RESET
3	3	1	min	RESET
4	4	1	hour	RESET
5	6	2	day_H&L	RESET
7	9	3	for confirmation(0xAA)	OBC
10	11	2	+Y_Temp_HIGH&LOW	FAB
12	13	2	+X_Temp_H&L	FAB
14	15	2	-Z_Temp_H&L	FAB
16	17	2	-X_Temp_H&L	FAB
18	19	2	-Y_Temp_H&L	FAB
20	21	2	+Z Temp_H&L	FAB
22	23	2	+Y Voltage_H&L	FAB
24	25	2	-Y Voltage_H&L	FAB
26	27	2	-Z Voltage_H&L	FAB
28	29	2	-X Voltage_H&L	FAB
30	31	2	+Z Voltage_H&L	FAB
32	33	2	-X Current_H&L	FAB
34	35	2	+Y Current_H&L	FAB
36	37	2	-Z Current_H&L	FAB
38	39	2	-Y Current_H&L	FAB
40	41	2	+Z Current_H&L	FAB
42	43	2	Raw Current_H&L	FAB
44	44	1	SRC Voltage	FAB
45	45	1	RAW Voltage	FAB
46	47	2	SRC Current_H&L	FAB
48	48	1	Battery Voltage	FAB
49	50	2	Battery Current_H&L	FAB
51	51	1	Battery Temp	FAB
52	52	1	Heater FLAG	FAB
53	53	1	Kill Status	FAB
54	56	3	for confirmation(0xBB)	OBC
57	58	2	Magnetometer_X	ADCS
59	60	2	Magnetometer_Y	ADCS
61	62	2	Magnetometer_Z	ADCS
63	64	2	GYRO_X	ADCS
65	66	2	GYRO_Y	ADCS
67	68	2	GYRO_Z	ADCS
69	71	3	for confirmation(0xCC)	OBC
72	72	1	Voltage_RAW	RESET
73	73	1	CURRENT_3V3#1	RESET
74	74	1	CURRENT_3V3#2	RESET
75	75	1	CURRENT_5V	RESET
76	76	1	CURRENT_UNREG#1	RESET
77	77	1	Time since last reset (hrs)	RESET
78	79	2	footer(0x44)	OBC

Housekeeping Data

- Housekeeping Data shows critical satellite status information:

Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00000000	33	33	03	00	00	FF	FF	AA	AA	AA	05	DB	04	6A	05	D4
00000010	05	D5	05	D7	05	D8	03	FE	04	24	03	66	04	00	07	13
00000020	00	0E	00	18	00	10	00	23	00	0D	02	43	AC	9A	01	D1
00000030	9B	08	D2	82	00	00	BB	BB	BB	00	00	00	00	00	00	00
00000040	00	00	00	00	00	CC	CC	CC	97	07	01	00	00	00	44	44
00000050	33	33	20	01	00	FF	FF	AA	AA	AA	05	DB	04	84	05	D4
00000060	05	D5	05	DA	05	D6	03	F3	04	29	03	68	04	02	07	16
00000070	00	0F	00	17	00	10	00	24	00	0C	02	4B	AC	9B	01	D4
00000080	9C	08	D6	81	00	00	BB	BB	BB	00	00	00	00	00	00	00
00000090	00	00	00	00	00	CC	CC	CC	98	06	01	01	00	00	44	44

1st HK collection

2nd HK collection

BIRDS-5 HSSC and HK Analyzer																		
Start byte		5	7	9	11	21	25	29	33	37	41	45	49	53	57	61		
Number of bytes long		2	2	2	4	4	4	4	4	4	4	4	4	4	4	4		
Type of Data		Time Data				Solar Panel Temperatures						Solar Panel Voltages						
Insert HSSC/HK Data:	33 33 03 00 00 FF FF AA AA AA 05 DE	03	00	00	FFFF	05DB	046A	05D4	05D5	05D7	05D8	03FE	0424	0366	0400	0713	00	
		sec	min	hour	day	Tpy (°C)	Tpx (°C)	Tmz (°C)	Tmx (°C)	Tmy (°C)	Tpz (°C)	Vpy (mV)	Vmy (mV)	Vmz (mV)	Vmx (mV)	Vpz (mV)	Imx	
1	3333030000FFFFAAAAAA05DB046A05D	3	0	0	0	21.83	62.78	22.61	22.5	22.28	22.17	1,559.83	1,617.83	1,327.84	1,562.88	2,764.04		

Primary Checklist

1. Checking the consistency of the satellite behavior (such as periodic reset, initial mode after satellite deployment, recovery after the power reset, etc.)

2. Checking the consistence of the satellite housekeeping data (readings of voltage, current, temperature, other sensors)

3. Checking the responses to the commands and verify mission operation

Consistent Satellite Behavior

SR 1.0 - Verify Consistent Satellite Behavior				
ID	**Design Requirements**	**ID**	**Verification Requirements**	**Verification Method**
DR 1.1	Periodic reset after 24hrs	**VR 1.1**	SATLOG	• After every reset, in the satellite log there should be an indicator of the reset (0x25, 0x25, 0x25)
DR 1.2	Initial Mode after turning on	**VR 1.2**	SATLOG, CW, HK, Flag Data, Address Data	• Downlink all of these data and check if it is what is expected at first deploy
DR 1.3	Satellite Recovery - retrieve flag and address data from memory after power reset	**VR 1.3**	CW, Flag Data, Address Data	• Downlink these data and confirm expected locations and data

Consistent Housekeeping Data

SR 2.0 - Verify Consistent Housekeeping Data				
ID	**Design Requirements**	**ID**	**Verification Requirements**	**Verification Method**
DR 1.1	Confirm valid voltage readings of sensors	**VR 1.1**	HK and HSSC data	• Downlink HK, CW and HSSC data and use excel sheet to convert the HEX to confirm accurate expected data readings for voltages, currents, temperature time and ADCS readings
DR 1.2	Confirm valid current reading of sensors	**VR 1.2**		
DR 1.3	Confirm valid temperature reading of sensors	**VR 1.3**		
DR 1.4	Confirm accurate time information from RESET	**VR 1.4**		
DR 1.5	Confirm accurate ADCS information	**VR 1.5**		

Mission Command Response

SR 2.0 - Verify Mission Command Responses				
ID	**Design Requirements**	**ID**	**Verification Requirements**	**Verification Method**
DR 1.1	Confirm critical command responses (RESET command, Downlink command, data transfer commands)	**VR 1.1**	GS Log, SATLOG, CW Data	• Downlink these data and confirm Uplink Success from GS side and Satellite side
DR 1.2	Confirm mission command responses (MULTSPEC, IMGCLS, HSSC, SFWD)	**VR 1.2**	GS Log, SATLOG, CW Data, Mission Data	• Downlink all of these data and check if confirmed mission execution and mission data present
DR 1.3	Confirm non-priority commands (data erases, redundant commands, etc.)	**VR 1.3**	GS Log, SATLOG, CW Data	• Downlink these data and confirm Uplink Success from GS side and Satellite side

END

BIRDS-5 FM Power Budget

By : Derrick TEBUSWEKE

Date: 22nd February, 2022

BIRDS-5 EM Power Budget Estimate

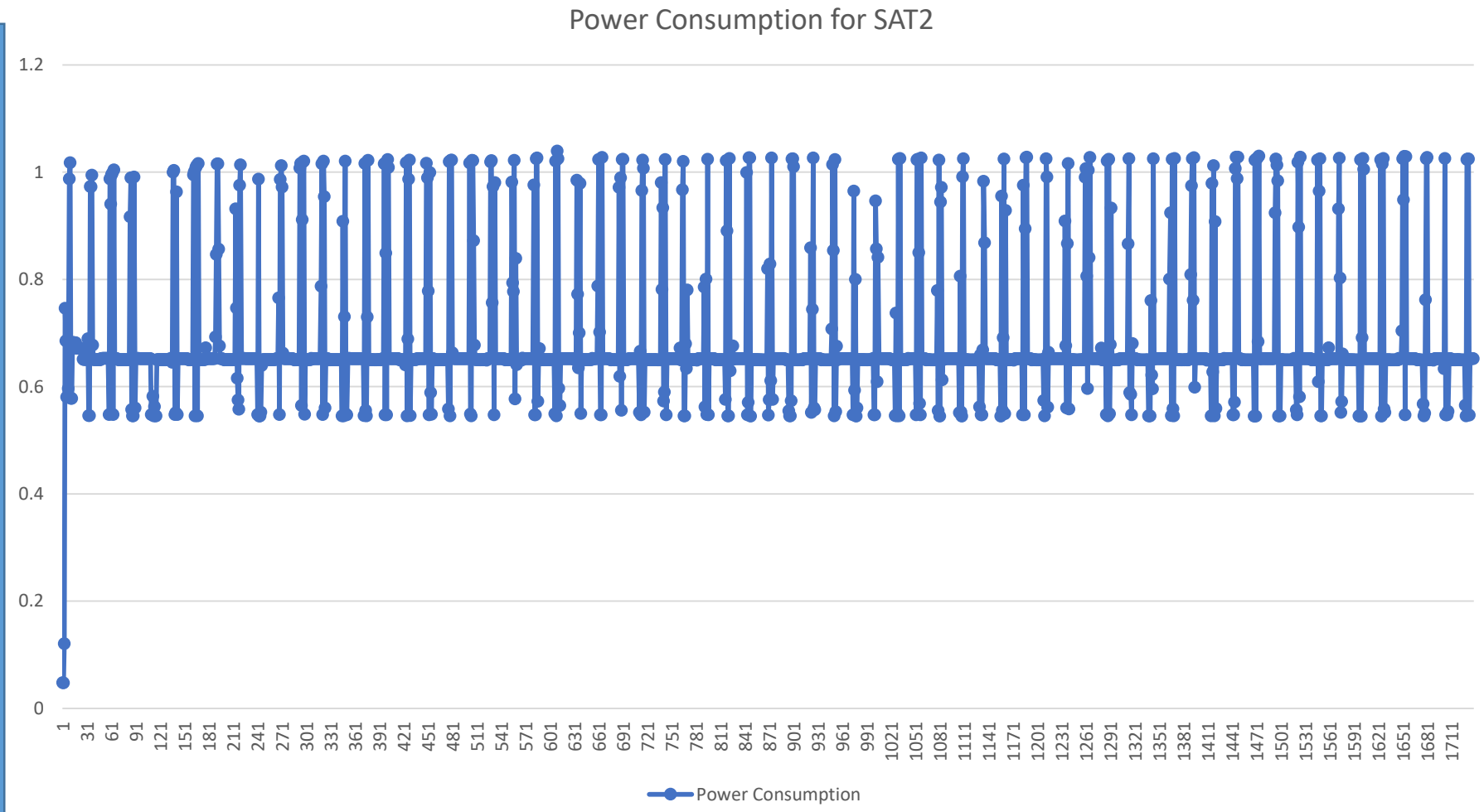
- In Nominal Mode, the satellite should generate more power than it uses, so that the battery gets charged.
- No mission is run in nominal power mode.
- If satellite uses more power than can be generated, then no mission can even be run.
- Hence satellite failure.

	COMPONENTS	OBC-EPS-FAB-COM UHF (RX)	OBC-EPS-FAB-COM UHF (TX-CW)	OBC-EPS and FAB	COM UHF (TX-Telemetry)	APRS-DP SF-WARD (RX)	APRS-DP SF-WARD (TX)	MultiSpec CAM Mission	ICU Mission (With RGB Cam)	ADCS (Determination MCU and sensors ON)	Mission Boss & CPLD	(Antenna Deployment) Burner Circuit	TOTAL ENERGY CONSUMPTION per Mission (mWh)
	Maximum power allocated (mW)	604.8	987	410	4054.6	280	1710	3200	1321.1	480	123.5	12600 (one time)	
	Duration per orbit/Duty cycle (h)	1.115	0.418	1.53	0.117	0.25	0.11	0.1	0.1	0.25	0.25	2.78×10^{-4}	
	Energy per Orbit (mWh)	674.35	412.57	627.3	474.3882	70	188.1	320	132.1	120.0	30.875	3.5	
Power Consumption (mWh) and Operational Status per Orbit	Command Uplink and Beacon	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1086.92
	Image and Sensor Data Downlink	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	1592.18
	MultiSpec CAM Mission	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	OFF	1557.8
	ADCS Determination	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	1237.8
	APRS-DP and SF-WARD Mission	ON	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	1375.89
	ICU (With RGB Cam) Mission	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	1369.9
	Antenna Deployment(30 mins)	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	630.8

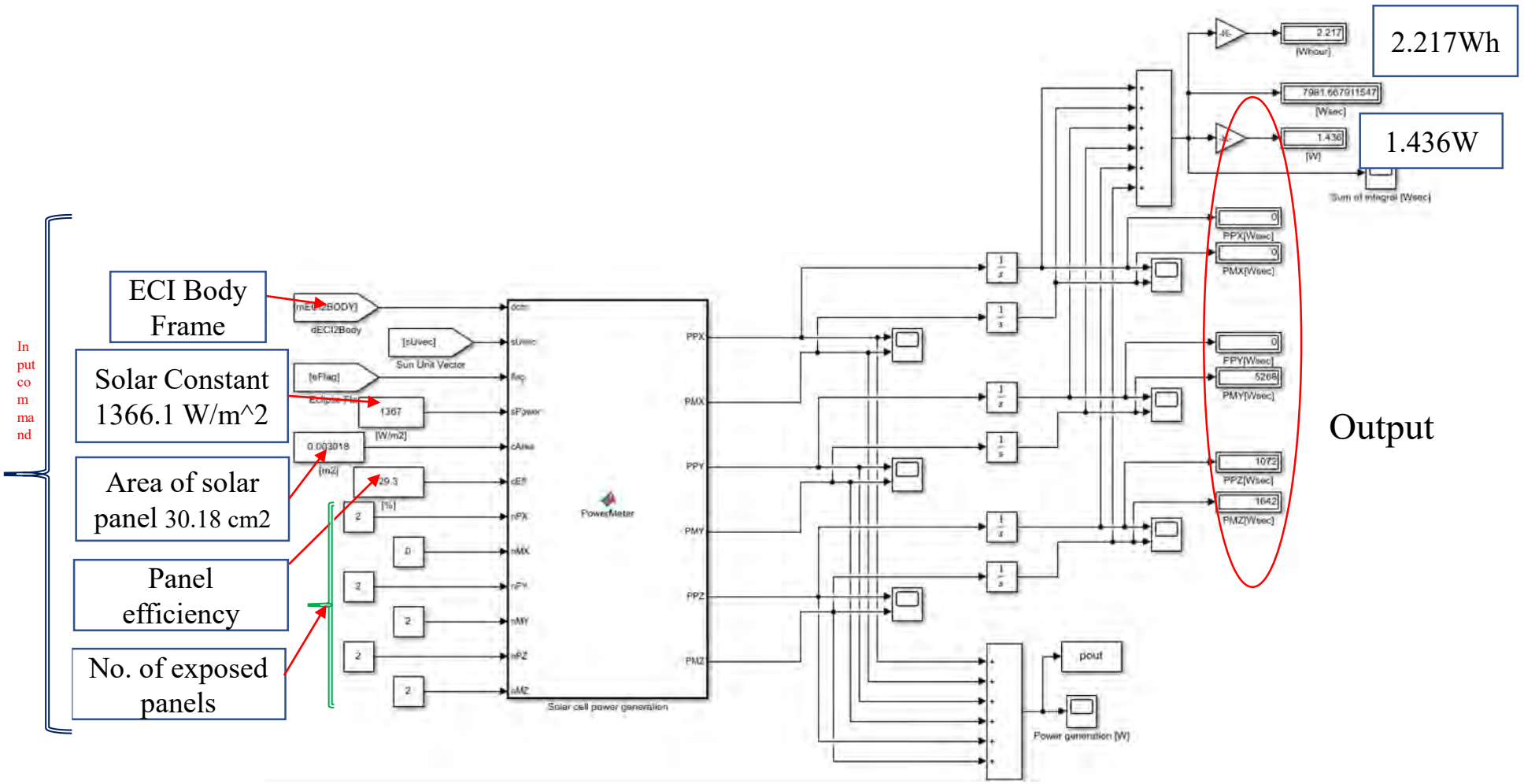
Satellite Nominal Power Budget = 1086.92 mWh

BIRDS-5 FM Power Budget Calculation

- High Sampling Data from BIRDS-5 FM satellite: Nominal power consumption = 650mW.
- Hence total energy consumption = 700 mW x 1.5 h (Orbital period) = 1050 mWh.
- Which is similar to EM estimate.



1U Power Generation Prediction



*MATLAB simulation test To Determine Generated Power per orbit

BIRDS-5 :1U Power Generation

Parameters	Abbreviations/Units	Values
Solar cell efficiency	(cEff)	0.293
Solar constant	(sPower,[w/m2])	1366.1
Number of solar cell on each side	(nMX, nPY, nMY, nPZ, nMZ)	2
Area per one solar panel of satellite	(cArea,[m2])	0.003018
CubeSat Power Generation	[mW]	1436
Energy available per one orbit	[mWh]	2217
Power loss in blocking diode	[mWh]	600 (P from datasheet x Time)
Efficiency of Electronics devices{dc/dc}	[η1]	0.8 (2217-600)x.8
Total energy available per orbit	[mWh]	1293.6

- Hence Satellite Energy Generation of ≈ 1300 mWh is greater than Nominal Energy consumption of 1050 mWh.
- The satellite can charge its batteries while no missions are running.

END

Satellite Fit Check

By : Takashi Oshiro

2022/2

CubeSat Dimensional Requirement

In the JAXA's Payload Accommodation handbook, each CubeSat size is defined as shown below. The dimensional margin is very severe. Since satellite structures are normally assembled by human, satellite dimensions are depends on who assembles or how assemble. If the satellite cannot meet the dimensional requirement, JAXA will not accept your satellite.

2.1.2. Dimensional Requirements

(1) The types of satellites that can be accommodated in the J-SSOD are listed in Table 2.1.2-1, and the dimensional requirements are shown in Figure 2.1.2-1.

(2) A 1U to 6U type satellite shall be 100+/-0.1 mm wide in X and Y per Figure 2.1.2-1.

(3) A 1U type satellite shall be 113.5+/-0.1 mm tall in Z per Figure 2.1.2-1.

(4) A 1.5U type satellite shall be 170.2+/-0.1 mm tall in Z per Figure 2.1.2-1.

(5) A 2U type satellite shall be 227.0+/-0.1 mm tall in Z per Figure 2.1.2-1.

(6) A 3U type satellite shall be 340.5+/-0.3 mm tall in Z per Figure 2.1.2-1.

(7) A 4U type satellite shall be 454.0+/-0.1 mm tall in Z per Figure 2.1.2-1.

(8) A 5U type satellite shall be 567.5+/-0.1 mm tall in Z per Figure 2.1.2-1.

(9) A 6U type satellite shall be 681.0+/-0.1 mm tall in Z per Figure 2.1.2-1.

(10) A W6U type satellite shall be 100+/-0.1 mm long (X direction), 226.3+/-0.1 mm wide (Y direction), and 340.5+/-0.3 mm or 366.0 mm+/-0.3 mm tall (Z direction) per Figure 2.1.2-1.

Satellite assembly

Assembly procedure shall be used for final satellite assembly. In the document, how to assemble and which parts shall be used are described with figures. In charge person shall fill in his signature by each step. In final assembly, secondary adhesive for fasteners will be used. It means that it is very difficult to disassemble once you finish assembly. So each step must be done with extreme caution.

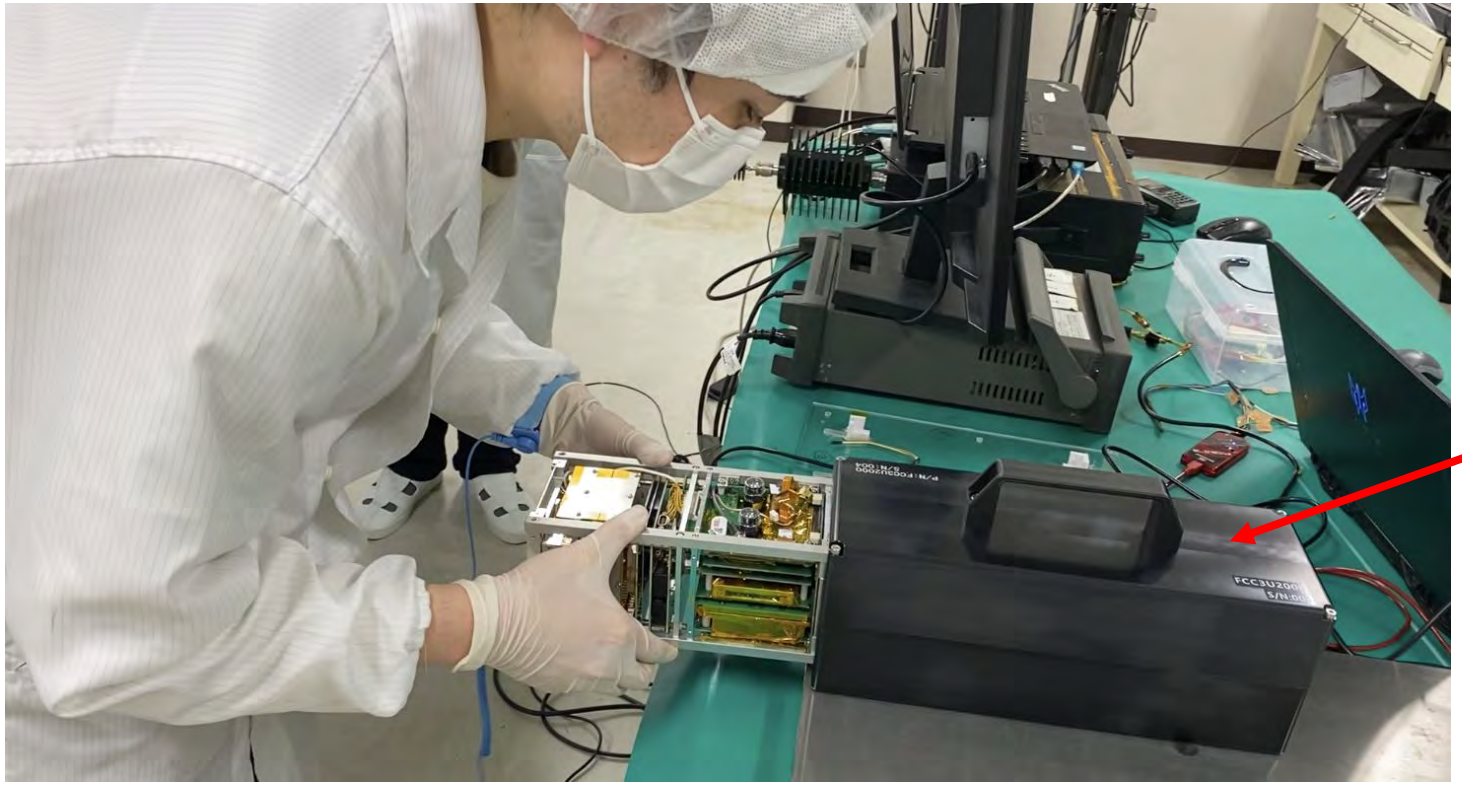
In our procedure, we check the satellite dimension twice with a fit-check case given by JAXA.

Adhesive for fasteners

https://www.loctite-consumer.jp/ja/products/anearobic/anearobic13.html

Satellite Fit-check

Before doing fit-check, we measure satellite dimension by using vernier caliper to check if the satellite is ready to do fit-check. Satellite insertion shall be smooth. Any break on the fit-check case is not allowed. Need to be very careful.

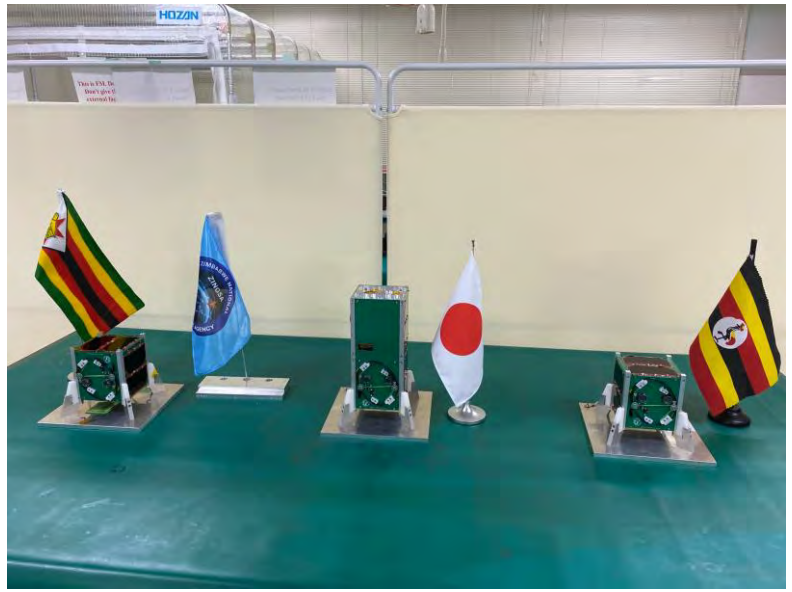


Other Structural Requirements

After final vibration test, some other dimensional measurements are required, and they are to be reported in Interface verification record document which is one of the JAXA safety review phase 3 document. Some values can be verified by referring to other documents such as mechanical drawings.

Example

- Rails Width
- Rails Surface Roughness
- Rails Edged Roundness
- Perpendicularity
- Parallelism
- Rails Edges Flatness
- Envelope



BIRDS-5 FM satellites

END

PINO test

By : Kohei Kamitani
2022/02/19

PINO Power Line

The BIRDS-5 Japanese satellite, *Taka*, is equipped with a mission instrument developed by JAXA called PINO.

Fig.1 Taka

Fig.2 RAB board

PINO and the satellite bus system exchange power, commands, and other information via an access board called RAB.

However, the last time we tested the integration of the satellite and PINO, the test was not successful due to a voltage drop in the switch circuit on the power line of RAB.

Cause of voltage drop

The N-MOSFET used in the power line had a large on-resistance, causing the voltage to drop.

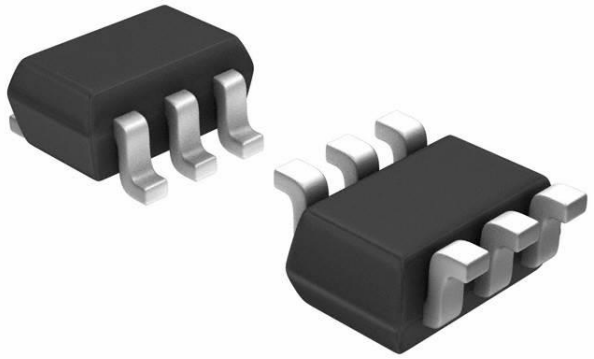


Fig.3 N-MOSFET(350 mΩ)

Therefore, I changed the N-MOSFET with large ON-resistance in the RAB to an N-MOSFET with small ON-resistance.

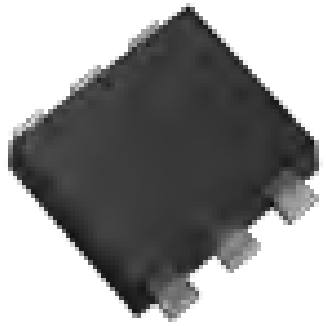


Fig.4 New N-MOSFET(15.5 ~ 23.8mΩ)

I also installed N-MOSFETs in parallel to reduce the resistance by a factor of two.

PINO Test

After the design of the RAB board was changed and the new RAB was completed, the integration test with PINO was conducted.

As a result of the test, we were able to successfully operate PINO without experiencing a large voltage drop during the test.

We also tested the PINO and OBC communication lines in addition to the power lines. No problems arose and therefore the tests were successful.

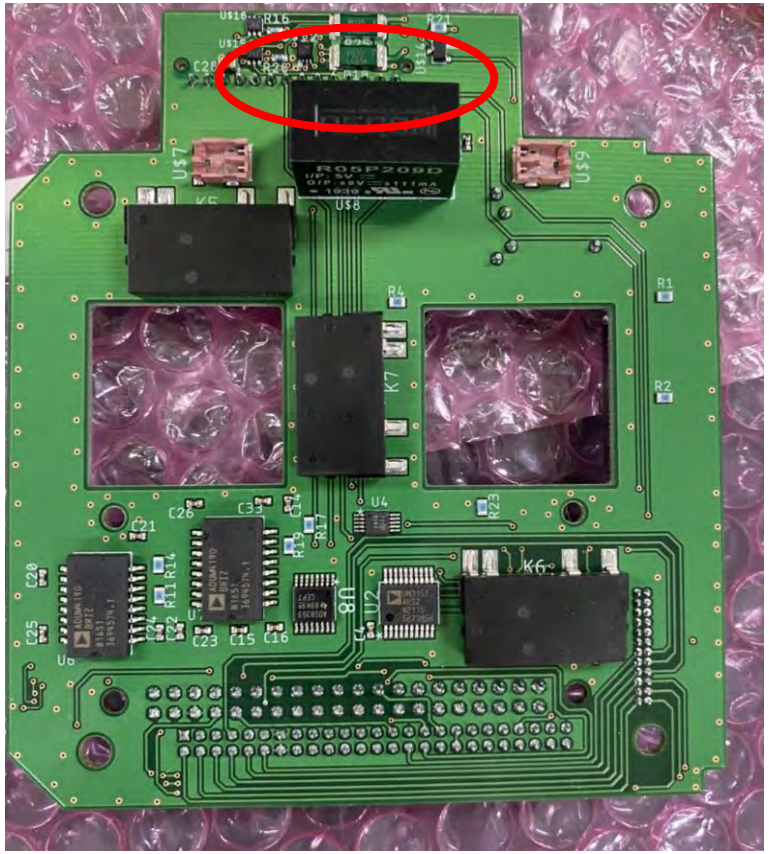
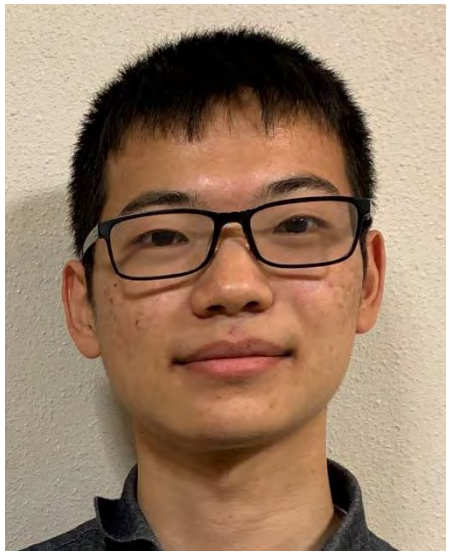


Fig.4 New RAB Board
(The position of the circle is the switch circuit for the PINO power line.)

END

International Workshop on Lean Satellite



By: Yukihisa Otani

21 February 2022

What is the lean satellite?

- A “lean satellite” is a satellite that utilizes non-traditional, risk-taking development and management approaches with the aim to provide value of some kind to the customer at low-cost and without taking much time to realize the satellite mission. (lean sat homepage : https://lean-sat.org/about.html)

IWLS history

2011 : First International Workshop on Standardizing of Nanosatellite Technologies

2012 : Second International Workshop on Lean Satellite Standardization

2013 : International Workshop on Small-Scale Satellite Testing Standardization

2017 : International Workshop on Lean Satellite Standardization - 2017

2018 : International Workshop on Lean Satellite – 2018

2019 : International Workshop on Lean Satellite – 2019

2020 : International Workshop on Lean Satellite – 2020 (Virtual)

2021 : International Workshop on Lean Satellite – 2021 (Virtual)

IWLS is held every year in recent years.

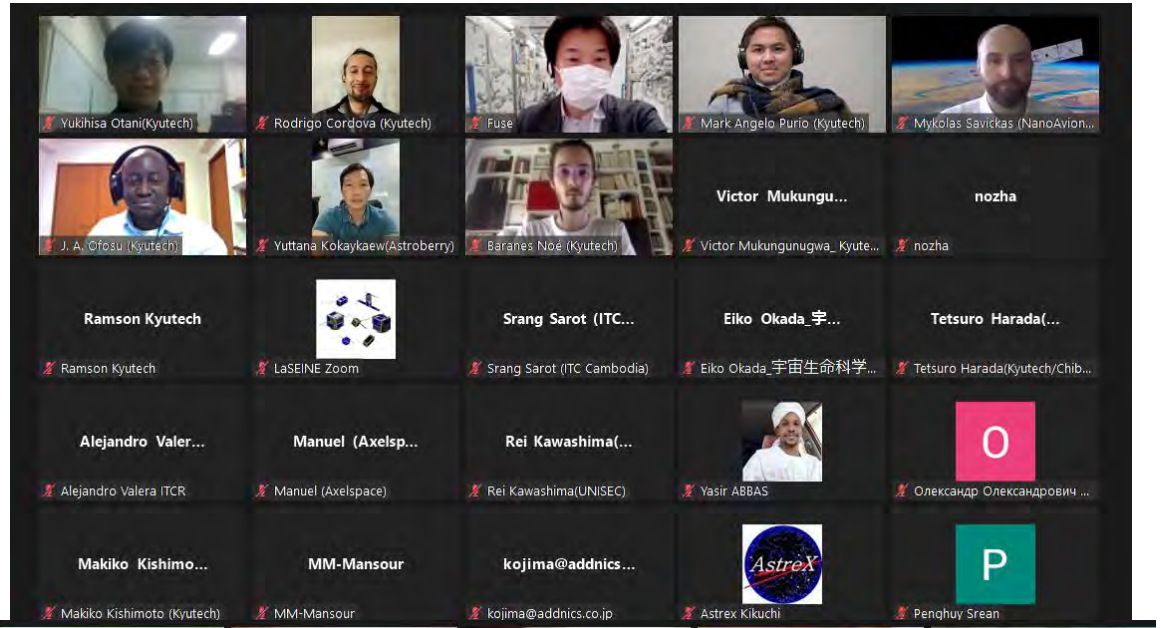
Lean Satellite Webinar Series 2021

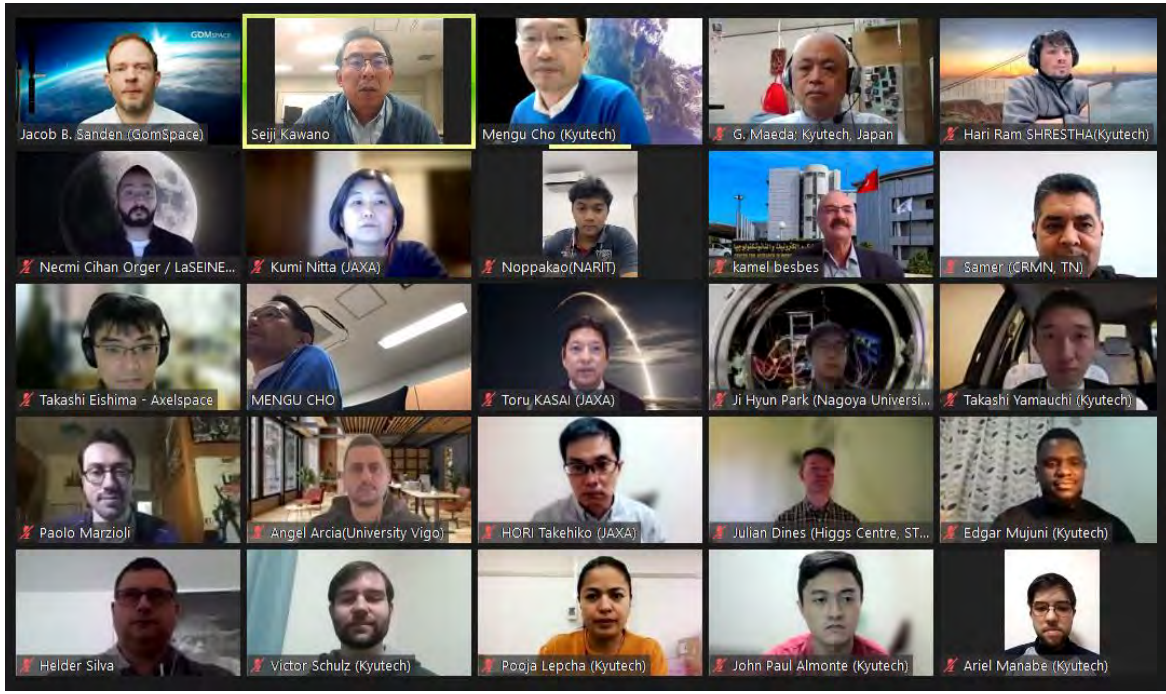
- Professors, researchers, and engineers who relate to the satellite development presented about lean satellite (https://lean-sat.org/proceedings_2021.html.)

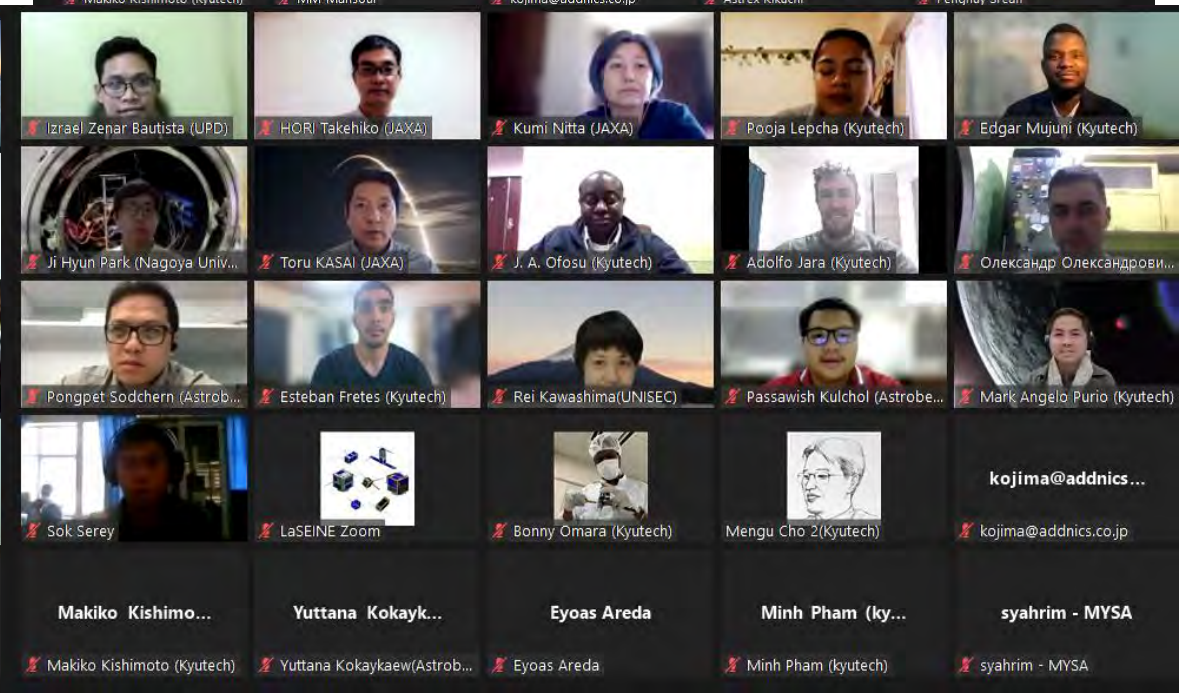
Presentation Title	Presenter
POWERFUL Connectivity Everywhere: From prototype to constellation	Mr. Daniel Rockberger
MBSE: The path to Small Satellites Modelling	Prof. Fernando Aguado
Lean satellites as a tool for solving global challenges	Mr. Tuomas Tikka
Lean Satellites at ESA	Mr. Cesar Bernal Franco
Lean concepts enabling formations of cooperating satellites	Mr. Oliver Ruf
ESA Cubesat Missions overview and the challenges of a ride to Deep Space	Mr. Franco Perez
Applying International Space Standards to CubeSat Projects	Mr. Artur Scholz
Aqiwo -- A Controlled, Educational, and Open-Source Satellite Platform to Enable Diverse Communities to Learn Space Engineering through Hands-On Activities	Ms. Pauline Faure

IWLS-2021 (Virtual)

Why don't you join us???

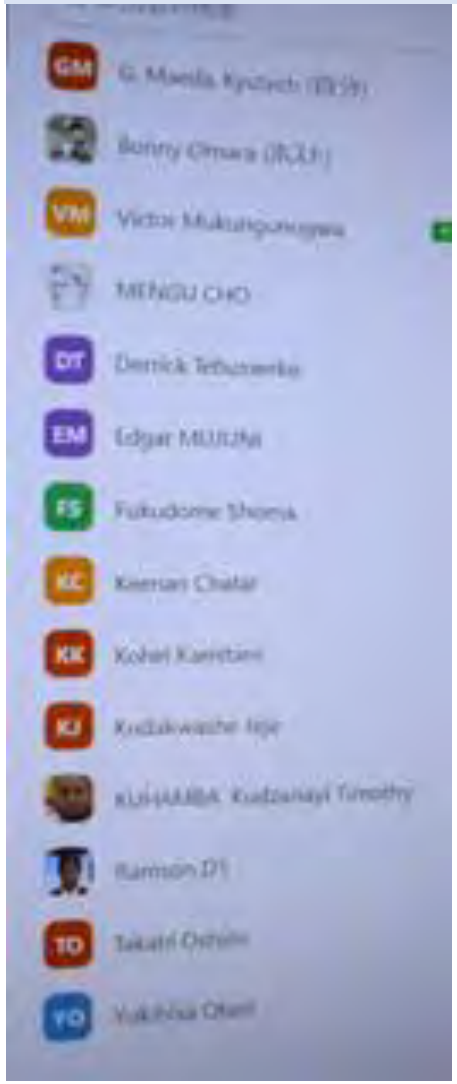


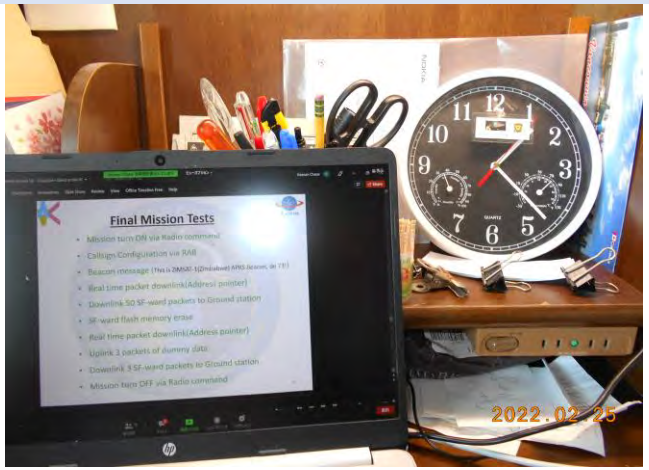


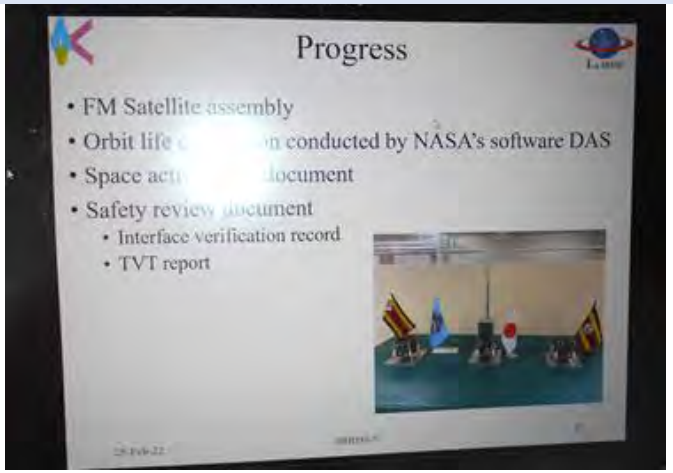


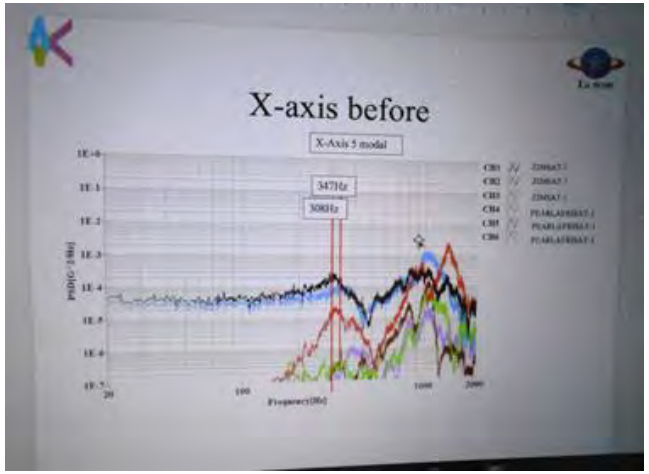
END

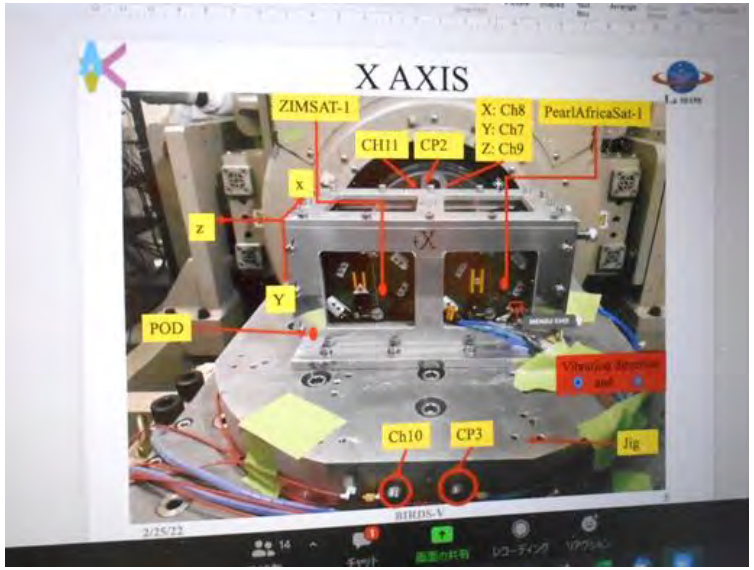
025. BIRDS-5: Weekly project meeting of 25 Feb 2022 via ZOOM











Weekly BIRDS-5 Meeting via ZOOM on 25 Feb 2022 during 13:00-14:00

Flight Readiness Review (FRR) meeting is set for 10 March 2022

End of BIRDS-5 reports for this month

026. BIRDS ground station antenna was damaged by strong winds

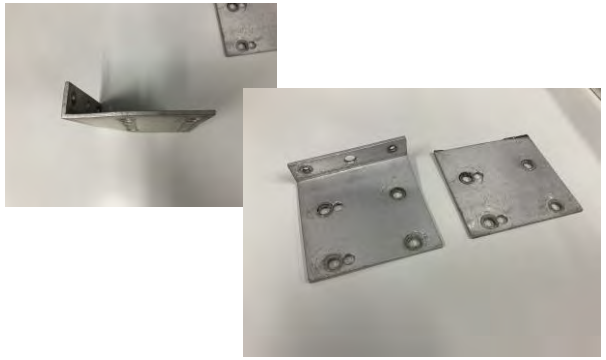
The BIRDS GS antenna at Kyutech was damaged by strong winds on February 20, 2022, so we asked the construction company (WAVE CO.,LTD.) to fix it.

They came on the 22nd and found that the joints were completely broken. They prepared and installed the new joints last March 3.

The antenna is now in working condition.

Damaged antenna

Fixed antenna



Damaged joints

New Joints

BIRDS-4

JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Daisuke Nakayama

End of this **BIRDS Project Newsletter**

(ISSN 2433-8818)

Issue Number Seventy-Three

This newsletter is archived at the BIRDS Project website:
http://birds1.birds-project.com/newsletter.html

When a new issue is entered in to the archive, an email message is sent out over a mailing list maintained by the Editor (G. Maeda, Kyutech). If you wish to be on this mailing list, or know persons who might be interested in getting notification of issue releases, please let me know.

This newsletter is issued once per month. The main purpose of it is to keep BIRDS stakeholders (the owners of the satellites) informed of project developments.