BIRDS Project Newsletter

Issue No. 66
(28 July 2021)

Edited by:
G. Maeda
革新的宇宙利用実証ラボラトリー
*Laboratory of **Le**an **S**atellite **E**nterprises and **In**-Orbit **E**xperiments (**La SEINE**)*
Kyushu Institute of Technology (Kyutech)
Kitakyushu, Japan

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

世界 No.1
小型・超小型衛星の数
（大学・学術機関）
Smallsats by the Numbers 2018
- BRYCE Space and Technology -

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

Space Engineering International Course

La SEINE

SEIC

Table of Sections

From Ghana   **The Guest Box**

Roughly taken in January of 2020

The First Africa Constellation Satellite Network (AFCONSAT) is established as a platform to train and develop human capital as a resource for the continent to pursue space based missions to enhance development. The **All Nations University – Space Systems Technology Laboratory (ANU-SSTL),** Koforidua, Ghana, which is anchoring the AFCONSAT project, developed and launched Ghana's first satellite called GhanaSat-1 into space on June 3rd 2017 which carried an earth observation mission.

   -- Gladys Yaa Saah Oppong (ANU-SSTL Administrator)
12 July 2021

The Olympic games have started in Tokyo

TOKYO 2020 …1!

Opening ceremony of 23 July 2021 (in Tokyo)

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. Space Missions Design Training in Cameroon

About Me

in Asongfac Lily Rospeen

Hi 👋🖥️, I am Lily Asongfac a B.Eng Electrical and Electronic engineering graduate from the University of Buea Cameroon. I am a space enthusiast!!!

I am presently a Space Hero Insider and also leading regional partnerships in Africa, at Space Hero. During my internship at Nanosatellite Missions Design, I got the opportunity to familiarize myself with space missions design concepts and analysis, while working on some projects. I am a member of the Space Generation Advisory Council (SGAC) in Cameroon where I assist with space outreach events and trainings. I am also an Open Cosmos Academy Ambassador.

During the ActInSpace 2020 Hackathon, organized by the French space agency, I led a team that won the second prize at the national level with the Aerospace Baby project which is meant to educate children aged 4-18 years old, on basic space science and technology through hands-on interactions with electronics, basic rocket science projects, captivating comic books and video games.

I intend to become a Space Systems Engineer and want to use every knowledge gained, to push the space sector in Africa forward through my contributions.

2ND SPACE GENERATION WORKSHOP IN CAMEROON

From the 1st to the 5th of June 2021, the Space Generation Advisory Council (SGAC) in Cameroon, organized a space missions design training in partnership with Open Cosmos. This event was put together by the Amazing NPoCs, Charles-Aime and Yves Emmanuel.
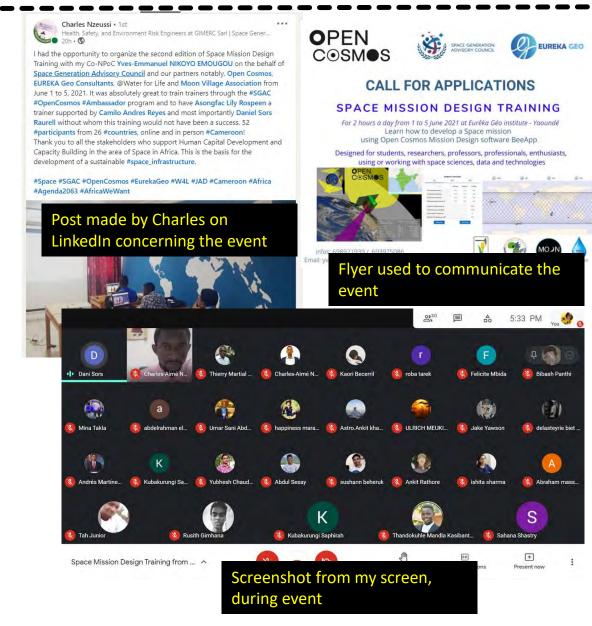
This was the 2nd space generation workshop in Cameroon, organized by SGAC and open cosmos.

The first one happened in February 2020, in Yaounde Cameroon.
This second event was the first hybrid event, with participants onsite and online.

There were so many participants from other countries joining.
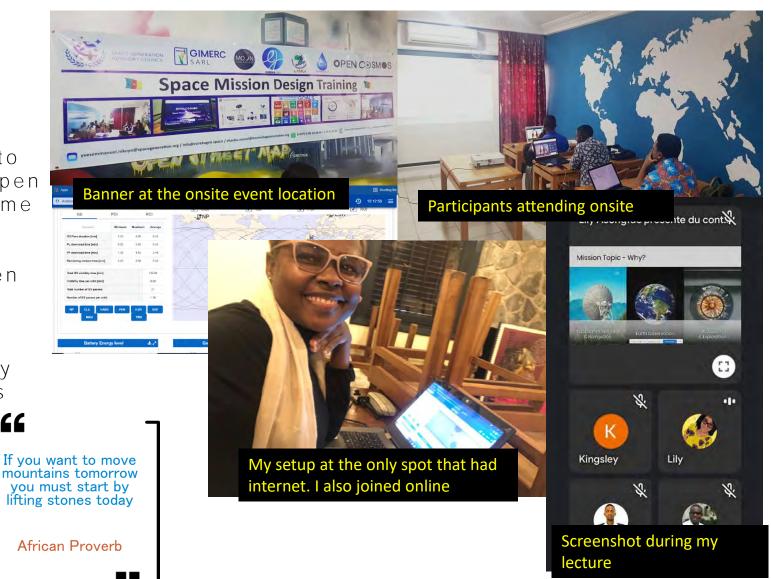
I was the main trainer at this workshop

Post made by Charles on LinkedIn concerning the event

Flyer used to communicate the event

Screenshot from my screen, during event

BEHIND THE SCENES

Few weeks to the event, I had to apply to become an academy ambassador with Open Cosmos, took a few courses to prepare me for the interview, after which I officially became an Ambassador, allowing me to carryout the training in the name of Open Cosmos.

It was an exciting opportunity for me to learn and giveback to the community. My basic prior knowledge of space missions design was handy to facilitate my preparation in a very short time.

Banner at the onsite event location

Participants attending onsite

My setup at the only spot that had internet. I also joined online

Screenshot during my lecture

" If you want to move mountains tomorrow you must start by lifting stones today

African Proverb "
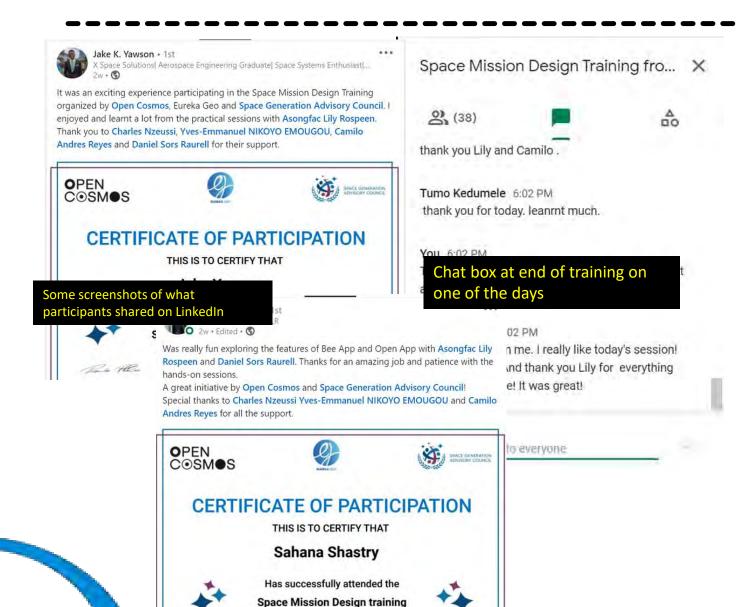
BIG PICTURE

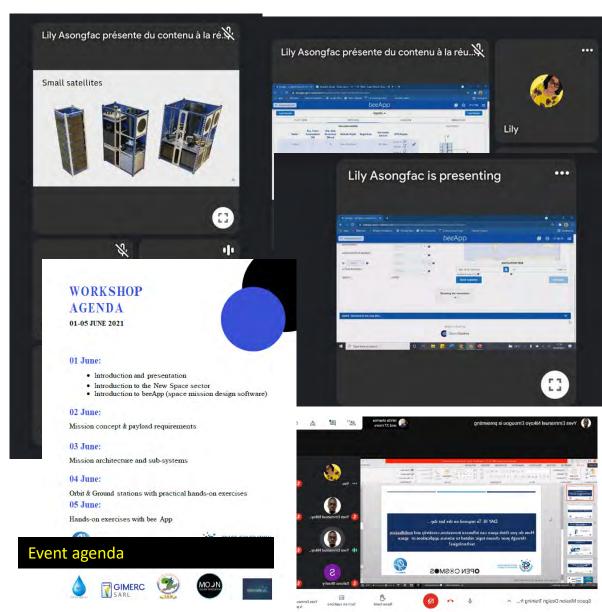The first day was meant for introductions and presentations, where we got to know the participants and where they were joining from, gave them a rundown of the entire program, Keynote presentations about SGAC, Open Cosmos, the New Space sector, the tool used; BeeApp

The following days were the actual training days. The workshop was a combination of lectures and interactive hands-on sessions.
For about 30 minutes on each day, extracurricular activities were conducted such as cultural exhibition of Cameroon(food, music, history, football), debates on interesting topics around space in Africa and networking among participants.

The entire event was moderated and organized by Charles-Aime and Yves Emmanuel, The SGAC NPoCs

Event agenda

Some screenshots of what participants shared on LinkedIn

Chat box at end of training on one of the days

REMARKS

Aside from internet issues on the last day of the training, every other things was a success and participants left learning a few things, not just on how and why space missions are designed, but also about the Cameroon and the state of the space sector in Africa.

E-Certificates were issued to participants and they were so glad to share it on social media with their feedback on how the training went for them.

END OF THIS REPORT FROM CAMEROON

02. The next president of the *British Interplanetary Society* (BIS)

Kyutech congratulates Prof. Welch on securing this prestigious position.

He delivered *SEIC Guest Lecture* on 3 June 2021.

The British Interplanetary Society (BIS) has elected Professor Christopher Welch as its new President, following a majority win in a ballot of BIS Council Members.

Christopher Welch is Professor of Space Engineering, Head of the Space Payloads Laboratory and Director of the MSc in Space Studies at the International Space University (ISU) in Strasbourg, France. He has a BSc in Physics, an MSc in space physics and a PhD in spacecraft engineering. For the BIS, Chris is currently a member of the BIS Education and Outreach, Fellowships and Awards, and Constitutional Review committees and a member of the Journal of the British Interplanetary (JBIS) Advisory Board.

Professor Welch is also a member of the International Academy of Astronautics and a former Vice-President of the International Astronautical Federation and is currently on the board of the World Space Week Association, is Deputy Chair of the Advisory Council of the Initiative for Interstellar Studies and a member of the Advisory Board of the Moon Village Association and the Editorial Board of the ROOM space journal.

Professor Welch joined the BIS in 1979 and was elected a Fellow in 1984. From today will be known as President-Elect until August, whereby the existing president, Gerry Webb, will officially handover duties and his title.

Professor Welch said "I am thrilled to be heading up the world-renowned BIS as its new president and am very excited for what the future has in store for UK's space industry and the global space endeavour. I believe that connecting with and empowering students and young professionals is vital in order for the Society to grow and develop. Additionally, we must continue our work towards achieving a significantly higher profile with the general public, bringing more attention to space exploration, advancements in technology, and working effectively with other space-related organisations and groups."

Source: https://www.bis-space.com/bis-announces-new-president-elect/

Self-Introduction

1 Profile

Name: Ratatamanun Subsinchai (Kan)
Nationality: Thai
Date of Birth: 10 December 1996
Graduated: **King Mongkut's University of Technology North Bangkok**
Major: Aerospace Engineering

2 Contract

Email: ratatamanun.kan@gmail.com
Facebook: Ratatamanun Subsinchai

3 Skill

Program: Arduino
            SOLIDWORKS
            MATLAB

Language: Thai
            English
            Basic Japanese

Hobbies

Exercise

Travel

Play various sports

Playing Music

Iconic Landmarks of Thailand

1 Grand Palace, Bangkok

Also known as the Temple of the Emerald Buddha. This are major tourist destinations in the Thai capital. Few people visit Bangkok without visiting the famous landmarks.

2 Bridge Over the River Kwai, Kanchanaburi

A symbol of the damage suffered by Thailand during wartime, the black metal Bridge Over the River Kwai is also known as the Death Railway

3 Ko Ta Pu, Phang Nga

Located in the sublime and scenic Phang Nga Bay, the spire-like karst rises up from shimmering waters with other greenery-clad limestone rocks in the background.

Competition Metrology:
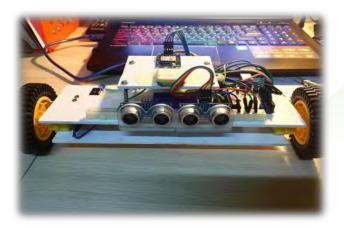2nd runner up prize in Thailand

Design and Development the Rover

Joined KNACKSAT Team

Background

1 U – CubeSat satellite
Developed by KMUTNB and funded by NBTC.

Designed and built
Designed and built 100% in Thailand by Thai researchers.

The first satellite in Thailand
the first entirely Thai-built satellite.

Launched
Launched into orbit in December 2018 by SpaceX.

KNACKSAT
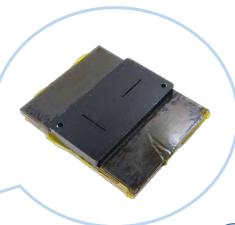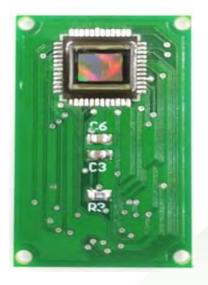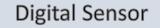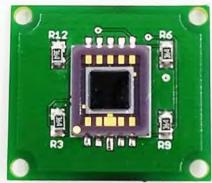(KMUTNB Academic Challenge of Knowledge SATellite)

Research Background

Design and Development Sun Sensor for Nano-satellite

Digital Sensor

Analog Sensor

A sun sensor is in the part of attitude control in the satellite that use for measure the incidence angle of sun rays with respect to a reference surface.

END OF SELF-INTRO BY KAN

Self-introducation starts on the next page.

SELF INTRODUCTION BY PEMA ZANGMO

Royal University of Bhutan

College of Science and Technology

Name: Pema Zangmo

Date of Birth: 14th November, 1996

Education: Bachelor's degree in Electronics and Communication Engineering from the College of Science and Technology (CST), Royal University of Bhutan.

Experiences: Technical Consultant at South Asia Satellite Ground Station (Jan 2019-Aug 2019); Assistant Lecturer in the College of Science and Technology (Sep 2019-till date)

I feel extremely happy and fortunate to have received the opportunity to pursue Post-graduate Studies on Nano-satellite Technologies (PNST) and explore space technologies at the Kyushu Institute of Technology. I am enrolled as a graduate student under the Electrical and Space Systems Engineering. Kyutech Offers an excellent research laboratories and I am excited to learn and get hands on experiences.

The research carried out during my graduate course will serve a larger purpose than just upgrading my education with a Master's degree certificate. The experiences and knowledge imbibed through this course would be used diligently and actively in introducing a space related course/programs in my college back home. Therefore, with such assured responsibility on me, taking up this course seriously and passionately would be my utmost privilege.

Know BHUTAN in a glimpse

Takin – National Animal

Blue poppy – National Flower

Ludlow's Bhutan swallowtail- National Butterfly

Archery – National Sports

"Gho" for Men & "Kira" for Women – National Dress

Raven - National Bird

"HAPPINESS is a place" and Bhutan is that place; peaceful and enriched with Gross National Happiness (GNH)

Bhutanese Food

Bhutanese are known for their love for chillies

Chillies + Cheese → Ema-datshi

Ema-datshi

Hoentey

Kewa-Datshi

Shamu-Datshi

Puta

Iconic places of BHUTAN

Buddha Statue

Punakha Dzong

Memorial Chorten

Taktshang Monastery

Chorten Kora

Takila Guru Statue

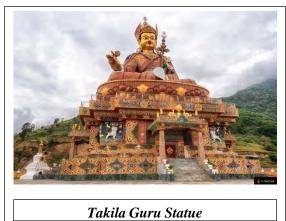## MY HOBBIES

I enjoy doing following:

- Events Coordination
- Literature Writing
- Learning new skills
- Dancing
- Modelling
- Hiking/Trekking

Learning VSAT Antenna installation

Trekking

Modelling

Hiking

Dancing

MY UNDERGRADUATE PROJECTS

- I was the project leader for my undergraduate projects. The Project that we successfully accomplished is titled as "Smart Electronic Chilli Dryer" using the Arduino module as a controlling system of the dryer.
- The project was presented in the departmental meet and secured first top marks from the class of 28 students.
- This Project of ours bagged 1st runner up award in the Third Student Research Meet (SRM-2018) organized by the College of Science and Technology.

Smart Electronic Chilli Dryer
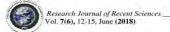

Arduino Control System

- A mini-project was carried out as a part of the undergraduate course. It is titled as "Standby Automatic LED Light on Power Failure."
- The project was presented at the 7th International Science Congress and got the paper published.
- See the gist of my paper here
  And the link is also shared below

http://www.isca.in/rjrs/archive/v7/i6/3.ISCA-RJRS-2018-041.pdf

Standby automatic LED light on power failure

Maita Raj Ghalley*, Pema Singye, Pema Zangmo, Kezang Choden and Rinzin Dorji
Department of Electronics and Communication Engineering, College of Science and Technology, Rinchending, Phuntsholing, Bhutan
maitaraj.cst@gmail.com

Abstract

Light has become the essential part of people. Works can be seldom done in absence of light. The aim of this paper is to design a Standby automatic LED light. It switches on automatically on power shutdown. This device has high luminous value, extensive valuable life and small size. Besides, they consume less power and need no manual intervention. The rechargeable battery is used to power up the LED. The battery charges when the power exists. LDR is used to sense day and night. It helps the LED glow only during night when the power supply fails. The suggested method is not complex and inexpensive. Its core feature is the ease of implementation and reliability. The designed circuit of the Standby automatic LED light is verified and fabricated. The output obtained is satisfactory.

Keywords: Light emitting diode, light dependent resistor and relay circuit, single pole double throw (SPDT).

Introduction

Standby automatic led light can be deployed to light houses and workplaces during the power shutdown. If power fails during the day the effects are not nearly as bad as at night, because without light, you can't do the smallest of works. Without light, our effectiveness is limited to daylight hours only, and in this competitive world we can't afford to lose time just because of darkness.

The standby automatic LED light illuminates when the power is shut down. This is made possible by deploying a battery which

All of them has a switch and require manual operation. The paper focuses on designing a smart device which can sense the existence of main power supply along with daylight to activate the standby LED light. The risk of hitting yourself in the dark is avoided since the light switches on/off automatically.

Circuit design: A single phase, 230 V, 50 Hz AC supply is given to the circuit in the Figure-2. It is converted to 12 V AC using TRAN-2P2S step-down Transformer[5]. Then a bridge circuit is deployed for converting 12 V AC to 12 V DC[4]. This 12 V DC supply is fed to the relay circuit. Relay and transistor BC557 work as a Switch[5]. There are mainly three terminals i.e.
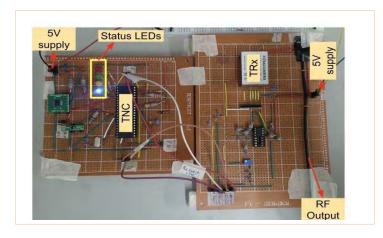
MY CURRENT WORK

- Participating in the Joint Satellite Development Project between India and Bhutan. We are a team of four engineers developing an APRS-Digipeater as the secondary payload. The APRS-Digipeater is an amateur (ham) radio payload which has the capability to receive text messages from an amateur radio user and broadcast it to the other users.

Bhutan Team with Minister of Brazil at Shriharikota, India during PSLV Launch

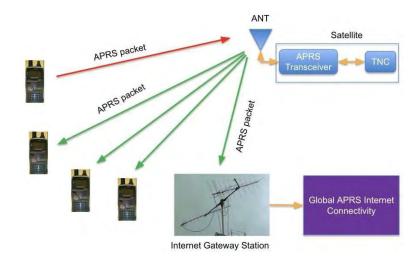*Breadboard model (BBM) of the secondary payload*

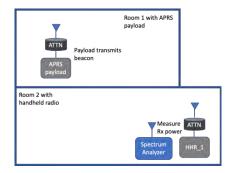*Illustration of APRS-Digipeater concept of operation*

MY CURRENT WORK

Verifying and soldering the payload circuitry (BBM Model)
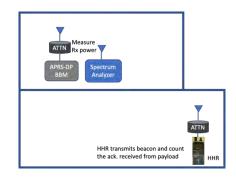

Testing the Power Circuit of the payload on breadboard

Testing the functionality test of the payload

Sensitivity test set up for the payload

Sensitivity test set up for the HHR

End of Pema's Self Intro

The 2021 Amateur Radio License (FCC) Examination Trip

Kyutech Students and Staff

June 5th, 2021, Ōita, JAPAN

Report written by Bram

(B. H. B. Pangestu, PNST student from Indonesia)

10 July 2021

Amateur Radio License (at Glance)

- **Amateur Radio**: Amateur radio, also known as ham radio, is the use of radio frequency spectrum for purposes of **non-commercial exchange of messages**, wireless experimentation, self-training, private recreation, radiosport, contesting, and emergency communication. The term "*amateur*" is used to specify "*a duly authorised person interested in radioelectric practice with a purely personal aim and without pecuniary interest*". It is officially represented and coordinated by the International Amateur Radio Union (IARU).

- In the United States, Amateur Radio is regulated by the **Federal Communications Commission** (FCC). Although it is from the US, there is **no citizenship requirement** to hold an FCC amateur license. There are 3 class of FCC amateur license: *Technician, General, and Amateur Extra*.

- **Amateur Satellite Operation** – defined as, *a radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service*. In order to operate a satellite within amateur frequency, it is mandatory for the operator to hold an amateur radio license (in general, min. of General class are required).

The Conveyance (Sonic Train – JR Kyushu)

The 883 series (metallic blue)

- Our departure (Kokura to Ōita) train.

- Photos

It is 127 km one-way trip for around 80 minutes.

Credit: Wikipedia

The 885 series (white)

- Our return (Ōita to Kokura) train.

- Photos

Credit: Wikipedia

The Examination

- *Test situation:*
  - Time: 14:00 JST - Finish
  - Place: J:COM Horuto Hall, Ōita City
  - Organiser: W5YI-VEC (NH7IG, KK6WW, K7IPR)

- ***Kyutech's Squad*** – Ariel (Paraguay), Bramandika (Indonesia), Esteban (Paraguay), Fahd (Morocco), Fatima (El Salvador), Sackdavong (Laos), Victor H. (Brazil)

Test Debrief

- The outcome from **Kyutech's squad**: 1 person eligible for Amateur Extra class, 4 person eligible for General class, and 2 person eligible for Technician class.

- As of today (July 2021), the callsign has been assigned (posted on FCC websites) for the Kyutech's squad.

BIRDS Project Newsletter – No. 66

Exploring Ōita

- **Food – 鳥天**
- **Landmark – 別府タワーと大分駅**
- **Tourism spot – 地獄のぐり**

Explore Ōita (Food – 鳥天 "Toriten")

- An emblematic local cuisine of Ōita Prefecture.

- It is a Japanese tempura-style fried chicken), which originated in a restaurant in Ōita City in 1962.

- The meat is cut into small pieces, dipped in soy sauce, sake and garlic powder, rolled in tempura powder and deep fried. Toriten is commonly served with fresh greens and eaten hot immediately after frying.

- *IT IS DIFFERENT FROM KARA-AGE!*

Explore Ōita (Landmark – 別府タワー)

- It was opened in 1957 to help boost the tourism as the Beppu Tourism Exhibition.
- The tipping point is measured at 100-metre-tall with an observation deck at a height of 55 metres.
- It was designed by Tachu "Dr. Tower" Naito of Waseda University.
- Today, the tower is primarily used as TV transmission tower and becomes one of tourist attraction in Beppu.

Explore Ōita (Landmark – 大分駅)

- It was opened since November 1, 1911.
- It serves three lines: the Nippo, Kyudai and Hohi lines.
- Limited Express Train:
  - Sonic (Hakata - Ōita)
  - Nichirin (Hakata - Miyazaki)
  - Yufuin-no-mori, Yufu (Hakata - Beppu)
  - Trans-Kyushu Limited Express (Beppu - Hitoyoshi)

Explore Ōita (地獄のぐり – Hell's tour)

- More than a thousand years past, the Jigoku 地獄 ("Hells") region of Kannawa and Kamegawa is described as home to fuming gas expulsions, bubbling mud, and steaming hot water in the ***Bungo Topography***.

- It was a place that people feared to approach and was said to have been an accrused land. (That's why it came to be known as a place of hells).

- Some (4 of 7) of it are Japan National Sites of Scenic Beauty.

#1 Hell's tour

- This place is called Oniishibozu-Jigoku 鬼石坊主地獄 ("Oniishi shaven head hell") after the name of the area, Oniishi, and because the large and small bubbles of hot gray mud that boil up here look like the shaven heads of monks.

#2 Hell's tour

- Gazing out upon the mystically cool cobalt-blue of this pond stirs images of crystal-clear sea, but in the fact the water temperature here is a scolding 98°C.

- This feature was created 1,200 years ago after the volcanic explosion of Mt. Tsurumi.

- 海地獄 – Umi-Jigoku

NATIONAL SITE OF SCENIC BEAUTY

#3 Hell's tour

- The origins of かまど地獄 – Kamado-Jigoku's name stem from ancient times with the custom of using the fumes of this spring to cook offerings of rice to the guardian god at the Kamado Hachimangu Shrine Festival.

- High-temperature water and blisteringly hot gas are expelled here. The spa temperature is 98°C.

#4 Hell's tour

- 鬼山地獄 – Oniyama-Jigoku, named after the Oniyama district in which it is found, is also known by the familiar moniker Wani-Jigoku ("crocodile-hell").

- The crocodiles were first bred here in 1923 using the hot spring's warmth, and today the bask kept here is roughly 100-strong.

- The spa temperature is 98℃ (ideal conditions for breeding crocodiles).

#5 Hell's tour

- The Shiraike-Jigoku –白池地獄 ("white pond hell") is so called because the colorless water that spouts from the ground naturally turns a bluish white due to the temperature and presurre drop when it joins the pond waters. It is a sodium chloride hot spring containing boric acid.

- A variety of large-sized tropical fish are kept on the spring grounds, warmed by its waters.

- The spa temperature is 95°C.

NATIONAL SITE OF SCENIC BEAUTY

#6 Hell's tour

NATIONAL SITE OF SCENIC BEAUTY

- The clay is steaming hot to the point that the steam is red. Japan's oldest natural Jigoku is noted in **Bungo Tophography** as "Akayusen".

- The Chinoike Ointment, effective for skin diseases, is made from the red clay produced here.

- The spa temperature is 78°C.

- 血の池地獄 – Chinoike-Jigoku.

#7 Hell's tour

- 龍巻地獄 – Tatsumaki-Jigoku, a geyser, has been designated as a natural monument by Beppu City. Geysers are a type of hot spring that spouts out boiling water and steam at intervals.

- The geyser here is particularly remarkable among the world's geysers for its short intervals between spouts (30 – 40 minutes) for a 6 – 10 minutes duration.

END OF THE TRIP REPORT TO OITA

UPDATES FROM THE PHILIPPINES

Philippine Space Agency

STAMIN4SPACE
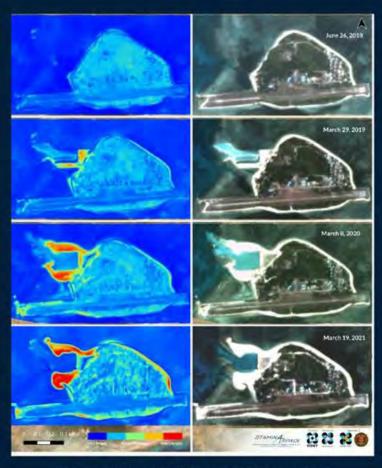
Space Technology and Applications Mastery, Innovation and Advancement (STAMINA4Space) Program

Funded by: Monitored by: Implemented by:

DOST   **DOST-PCIEERD**   **DOST-ASTI**

June 16 - July 15, 2021

High-resolution satellite images of Pag-asa Island highlighting the yearly changes associated with island developments (e.g. port construction and airstrip repair), visible from space from 2019 to 2021.

Image source: Planet
Image processing: STAMINA4Space

The added value of satellite information is demonstrated in its ability to capture images of the same location regularly. With satellite imagery, never-before-seen images from this perspective show the extent of changes in built-up features. At a finer resolution of 3m, these images allow for easier identification of the island's distinct features as seen in the image on the left.

Reclaimed areas have expanded in the past years as the island gets modified to accommodate the increasing presence of human activities. In particular, we are able to see the progression of port construction and airstrip repair.

Read the full article here:
https://philsa.gov.ph/news/the-diverse-marine-ecosystem-of-the-wps-observations-from-space

The diverse marine ecosystem of the WPS: Observations from space

2021 OUTSTANDING YOUNG SCIENTISTS

Dr. Gay Jane P. Perez (UP Diliman)
Dr. Jomar F. Rabajante (UP Los Baños)
Dr. Arnold R. Salvacion (UP Los Baños)
Dr. Pierangeli G. Vital (UP Diliman)

Photo courtesy of UP Office of the Vice President for Academic Affairs

Congratulations, Dr. Gay Jane Perez!

Congratulations, Dr. Gay Jane Perez and the other 2021 Outstanding Young Scientist Awardees!

Dr. Perez is the Project Leader of our Advanced Satellite Development and Know-How Transfer for the Philippines (ASP) Project and is the Deputy Director-General of the Philippine Space Agency.

PREPARED BY:

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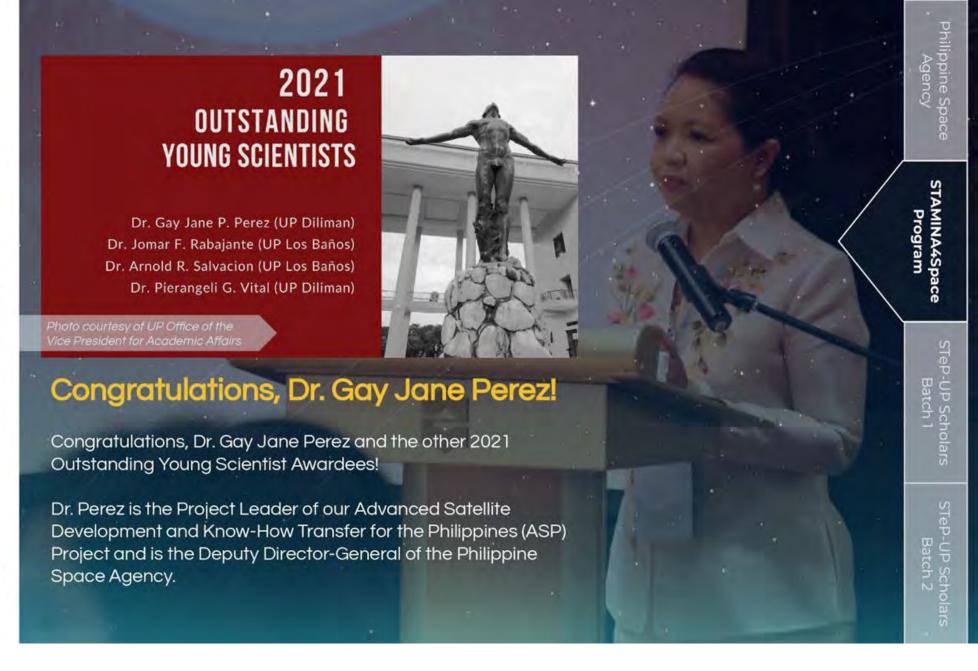
Nicole V. Ignacio
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STAMINA4Space
Contributing Writer and
Overall Editor

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

Philippine Space Agency

STAMINA4Space Program

STeP-UP Scholars Batch 1

STeP-UP Scholars Batch 2

Multispectral Unit for Land Assessment (MULA)

MULA satellite will carry a TrueColor camera capable of capturing 5m resolution images with a wide swath width of 120km. It will have 9 spectral bands that can be used for different environmental applications such as disaster management, land use and land cover change mapping, crop monitoring, and forestry management. It will also be equipped with an Automatic Identification System (AIS) and Automatic Dependent Surveillance-Broadcast (ADS-B), which can be utilized for ship and aircraft detection and tracking. It is targeted for launch by 2023.

Read more:
https://stamina4space.upd.edu.ph/__/next-generation-of__/
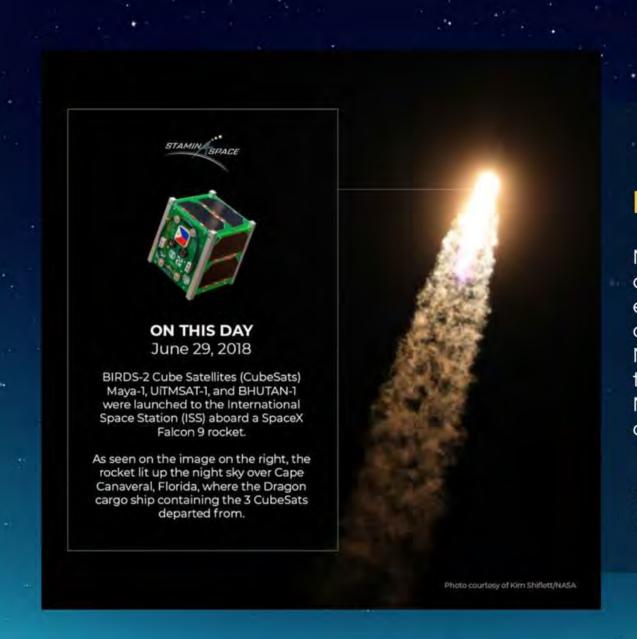
Philippine Space Agency

STAMINA4Space Program

STeP-UP Scholars Batch 1

STeP-UP Scholars Batch 2

ON THIS DAY
June 29, 2018

BIRDS-2 Cube Satellites (CubeSats) Maya-1, UiTMSAT-1, and BHUTAN-1 were launched to the International Space Station (ISS) aboard a SpaceX Falcon 9 rocket.

As seen on the image on the right, the rocket lit up the night sky over Cape Canaveral, Florida, where the Dragon cargo ship containing the 3 CubeSats departed from.

Photo courtesy of Kim Shiflett/NASA

Maya-1 3rd Launch Anniversary

Maya-1 is the Philippines' first CubeSat designed and built for technology demonstration and as an educational platform for CubeSat development in a university setting. It was decommissioned on November 23, 2020, but its legacy will live on through its successors Maya-2 (in orbit since March 2021) and Maya-3, -4, -5, and -6 (in development).

See Maya-1's journey:
https://stamina4space.upd.edu.ph/maya-1/

Maya-3 and Maya-4 CW Beacon Types

Similar to a heartbeat, Maya-3 and Maya-4's CW beacon signals operators that the CubeSats are alive and well in space. As part of a fail-safe plan, telemetry is categorized into three types. After a significant interval of not acquiring uplink, the CubeSats will automatically activate select mission payloads, and the CW beacon can be used to collect valuable mission and satellite operation data.

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STeP-UP PROJECT

Philippine Space Agency

STAMINA4Space Program

STeP-UP Scholars Batch 1

STeP-UP Scholars Batch 2

Maya-3 and Maya-4 Telemetry Format

Format	Satellite Callsign	-	Satellite Name	-	Type ID*	Telemetry Data									
						B0	B1	B2	B3	B4	B5	B6	B7	B8	B9
Example	DX3MYA	-	MAYA3	-	A	C4	7A	3B	82	7A	AB	71	ED	1C	12

* CW Beacon Type Identifier:
A – Type 1   D – Type 2   E – Type 3

Telemetry is encoded in Morse code and each beacon type contains 10 bytes of data. The beacon type 1 data include critical satellite information such as battery voltage and current, system temperature, and operation indicators. Type 2 data also indicate battery voltage and current, as well as coarse rotation and magnetic field measurements. Type 3 data provide solar cell and GPS information.

To know more about Maya-3 and Maya-4, check out their info page here:
https://stamina4space.upd.edu.ph/upcoming-satellites/maya-3and4/ .

![STeP-UP PROJECT]

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INITIAL INTEGRATION TESTS

Activation and deactivation functionality tests were performed by the On Board Computer (OBC) on the CAM, APRSDP, SFWARD, and COM payloads. The APRS payload beacons every 90 seconds after activation. The SFWARD payload receives the APRS packet from a handheld radio and stores the data on its flash memory. CAM, on the other hand, takes an image upon receiving the command from OBC.

ANTENNA DEPLOYMENT FUNCTIONALITY TEST

Test Setup

Ambient Temp (°C)	Supply Voltage (V)	Coil ΔV (V)	Current (A)	Melting Time (s)	Ave Melting Time (s)
28.05	4.2	1.275	2.015	8.82	8.30
27.9		1.259	2.022	9.05	
28		1.305	2.090	7.76	
28.1		1.291	2.068	8.07	
26.8		1.296	2.076	8.32	
26.8		1.274	2.040	8.65	
27.2		1.269	2.035	7.42	
26.95	3.8	1.172	1.893	10.76	11.27
26.5		1.181	1.891	10.27	
26.6		1.131	1.811	12.18	
26.4		1.141	1.827	12.32	
26.7		1.181	1.893	10.84	

Table 1. Measurements from initial Antenna Deployment functionality test

The setup depicted in the figures above shows how the functionality of the system level antenna deployment is tested. The release of the antenna strips from the stow configuration is defined as a successful deployment, with measurements tabulated in Table 1. Melting temperatures are not recorded since thermal scanner cannot adjust onto the target material reliably in the given time. Thermal scanner is only used for the ambient temperature. Strings are collected after the test, showing its consistency in the cut. However, further functionality tests (preferably in assembly level) are to be performed to determine the success rate or reliability of the system as antenna strips affecting the holding string route is still to be tuned, OBC will trigger the heating, and the system is powered by the CubeSat power supply.

Strings Collected After Tests
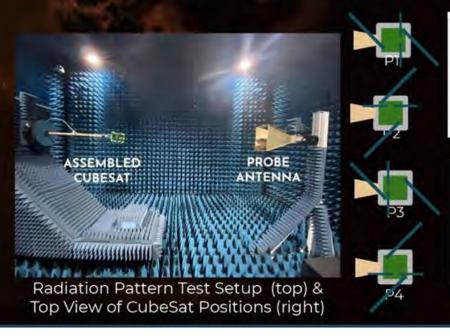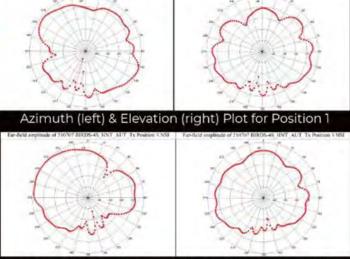
HENTENNA MEASUREMENTS
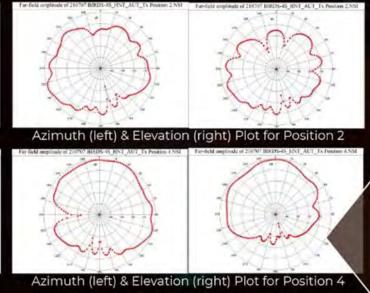
Tuning and radiation pattern measurement for the Hentenna mission was performed. An initial S11 level of -13dB on the tuning frequency was achieved, and the radiation pattern plots for each position are seen on the figures below.

Tuning and S11 Measurement Setup and Results

Radiation Pattern Test Setup (top) & Top View of CubeSat Positions (right)

Azimuth (left) & Elevation (right) Plot for Position 1

Azimuth (left) & Elevation (right) Plot for Position 2

Azimuth (left) & Elevation (right) Plot for Position 3

Azimuth (left) & Elevation (right) Plot for Position 4

PRELIMINARY DESIGN REVIEW

On July 8, the second batch of STeP-UP scholars had their Preliminary Design Review (PDR) where experts in the field of nanosatellite engineering reviewed their progress and provided valuable advice regarding the development of Maya-5 and Maya-6.

PRELIMINARY DESIGN REVIEW

Attendees of the event include PhilSA Director General Joel Joseph Marciano Jr.; PhilSA Deputy Director General and ASP Project Leader Dr. Gay Perez; STAMINA4Space Program members; members of the BIRDS-4 team and BIRDS-2S team; distinguished instructors and professors from UP EEEI and UP DMMME; representatives from DOST-SEI, DOST-ASTI, DOST-PCIEERD, and UNISEC Philippines; and officers from the Armed Forces of the Philippines - Headquarters and the Philippine Air Force.

END

07. Kyutech and the first satellite of Mauritius

23 JUNE 2021
[Successful Deployment of MIR-SAT1](#)
The MIR-SAT1 was successfully deployed into Space from the ISS via the KIBO Module on the 22 June 2021 at 14:55 (MUT). The first signals from the satellite were well-received in Australia and USA after the satellite had deployed its antennae and solar panels on orbit. As it passed for the first time over Mauritius …

https://spacemauritius.com/#news

Kyutech extends **congratulations** to Mauritius for successfully putting into LEO its first satellite. *It is a job well done!*

To assist with data acquisition for the first few weeks, two SEIC students (Ariel and Esteban, both from Paraguay) have tracked this new satellite.

On the following pages, you can find their report on their experiences with data acquisition. Also, G. Maeda writes about his visit to Mauritius in 2019.

A new learning experience, tracking the MIR-SAT1

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS SATELLITE PROJECT

Article by:

Ariel MANABE

Esteban FRETES

As mentioned in the past edition, Esteban and I just initiated to learn about how to perform satellite operations with our senpais (先輩) from Birds 4 team. Step by step we started to operate by ourselves, with some difficulties when we do it alone though but, it is part of the process.

Timingly, the past June 22 of the current year, at 19:55 (JST) a new satellite was deployed from the International Space Station by JAXA via the KIBO arm. The nanosatellite of 1U is named MIR-SAT1 (48868U – TLE SET). Good opportunity to learn more about tracking.

One of the stations in Kyutech ground station

A new learning experience, tracking the MIR-SAT1

https://spacemauritius.com/about/#Satellite

1U

MIR-SAT1 Dimensions

30cm - Deployed
10cm
10cm
10cm
100cm – Antenna Deployed

Article by:

Ariel MANABE

Esteban FRETES
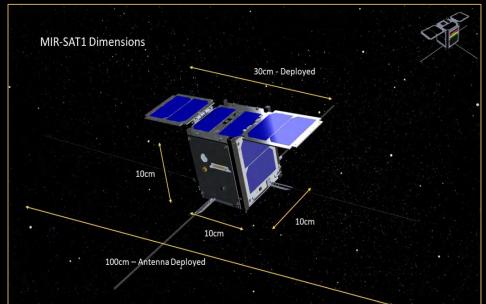
The MIR-SAT1 is the first nanosatellite from the Republic of Mauritius, an island nation of 2040 km2 located in the Indian ocean, about 2000 km from the southeast coast of Africa.

To learn more from this beautiful country, look at here: **Mauritius - Wikipedia**

Triolet
Port Louis
Centre de Flacq
Bambous
Plaines Wilhems District
Flacq
AFRICA
Petite Rivière Noire Peak 828 m (2717 ft)
Grand Port
Indian Ocean
Black River
Savanne
Mahébourg
Souillac
bing.com/maps
© 2021 TomTom

A new learning experience, tracking the MIR-SAT1

Source: The First Mauritian Satellite (spacemauritius.com)
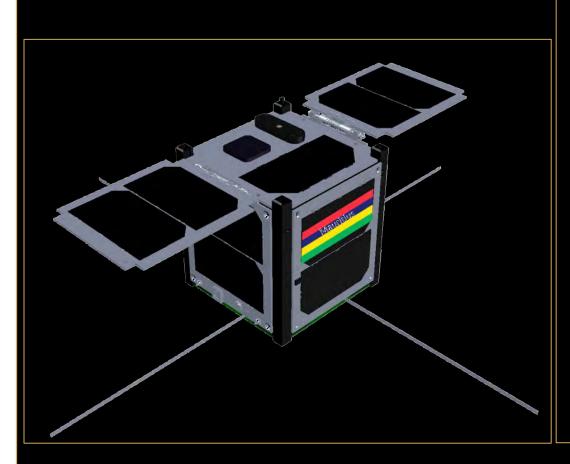
The principal mission of the Project behind the satellite, is the technology and knowledge transfer, which is obtained doing all the phases of satellite development

As objetives, the cubesat have:

1) Verify the performance of the onboards subsystems

2) Collect images of the Country (Republic of Mauritius)

3) Experimental communications with other regional islands

Article by:

Ariel MANABE

Esteban FRETES

A new learning experience, tracking the MIR-SAT1

Introduced a little the MIR-SAT1, is time to talk briefly about what we did. Our objective was to tracking the satellite and provide the team developers with the telemetry data or beacon received from the MIR-SAT1.

After deployment, there is a silence time of at least 30 min, where you do know nothing about how things are going. For this reason, the first beacon is crucial…is a way to know if you get off on the right foot

Deployment of the MIR-SAT1 from the ISS
Success! Congrats to the team!!
https://spacemauritius.com/news/successful-deployment-of-mir-sat1/

Article by:

Ariel MANABE

Esteban FRETES

A new learning experience, tracking the MIR-SAT1
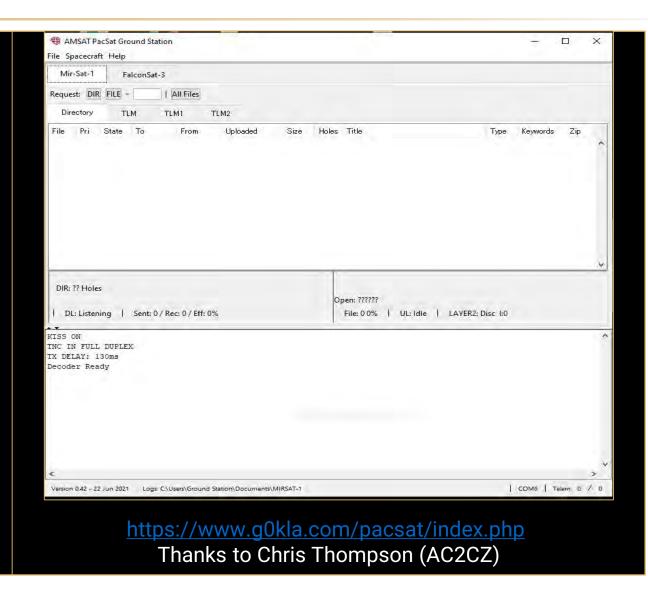
The process to track the MIR-SAT1 began by downloading one of the ground station software that supports the project; AMSAT Pacsat Ground Station Software. You can find more on

https://spacemauritius.com/radio-amateur/
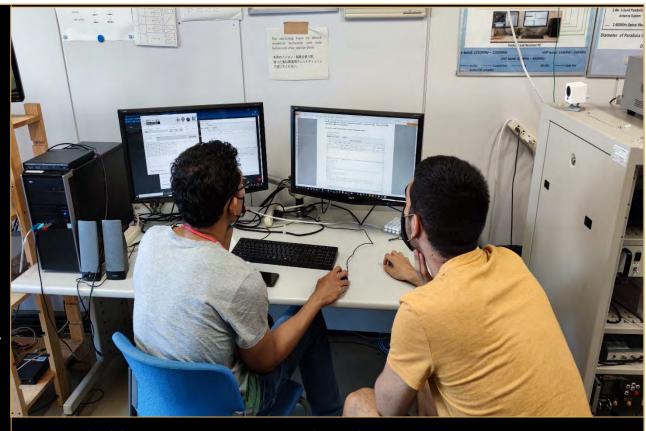
First, we downloaded into our notebooks to familiarize with the software and learn from the operation manual. It was a good experience to be able to use a different software than the one we used for BIRDS-4, since we could observe different characteristics of it and learn from them.

https://www.g0kla.com/pacsat/index.php
Thanks to Chris Thompson (AC2CZ)

Article by:

Ariel MANABE

Esteban FRETES

A new learning experience, tracking the MIR-SAT1

Then we downloaded the software into the KYUTECH ground station PC to connect to the hardware there. Thanks to this, we were also able to learn how to configure the baud rate for communication with MIRSAT 1, since it uses a different baud rate than BIRDS 4. With the help of Pooja-san (BIRDS-3) and IZ-san (BIRDS-4), we could configure all the parameters necessary for MIRSAT-1 tracking.

Iz-san (left) helping Esteban-san (right) with the Ground Station setup BIRDS-4 operation was right after the pass of the MIR-SAT1. So we had to be fast in our procedure

Article by:

Ariel MANABE

Esteban FRETES

A new learning experience, tracking the MIR-SAT1
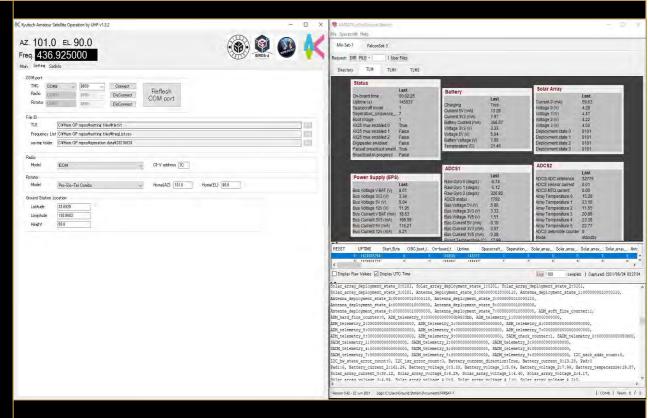
In addition to using the AMSAT Pacsat Ground Station Software, we also used the KYUTECH software ground station, with which the operating frequency and antenna rotation were controlled. We managed to combine both softwares to track a satellite! With this, it can be concluded that although both tools were made by different people and institutions, we can combine the knowledge and work together.

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS
SATELLITE PROJECT

Article by:

Ariel MANABE

Esteban FRETES

On the left, BIRDS-4 ground station software, used for the antena Rotator and the radio control. On the right, the AMSAT software, used for decoding MIR-SAT1 telemmetry

A new learning experience, tracking the MIR-SAT1
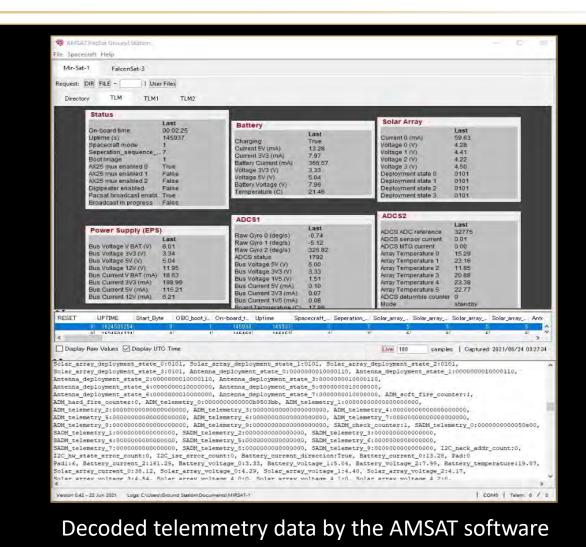
Our first attempt was successful! We thrilled when heard on the radio the changing sound of the white noise and the AMSAT Pacsat Ground Station started to decoded the data. The time of the MIRSAT pass was sometimes very similar to that of BIRDS 4, so we had to change the settings as soon as possible before starting the operation of BIRDS-4. This was also a good challenge!

Decoded telemmetry data by the AMSAT software

BIRDS-4
JOINT GLOBAL MULTI-NATION BIRDS
SATELLITE PROJECT

Article by:

Ariel MANABE

Esteban FRETES

A new learning experience, tracking the MIR-SAT1
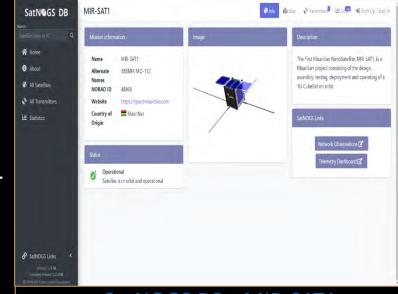
Happily, we sent the data to the team. But here we did a little mistake. We sent the team the images you already have seen.

Wouldn't it have been better to send the received frame? – Of course, it would have been better! But, we didn't realize at that moment. Now, thanks to Mr. Jean Marc Momple (part of the MIR-SAT1 team) we know that is posible to send the data trough the software. Also, it is recommended to read well the manual (and understand what are you reading) 🤦

After the first pass we tried few more times, most of them without succesfull. Only one with an elevation of >60 degrees. But still without able to send the data 🤦

At the moment, the passes of MIR-SAT1 and BIRDS-4 are overlapped, so more experiments are not posible. We won't stop until seeing our data in SATGNOS. *Until next time!*

SatNOGS DB - MIR-SAT1

You can see here all the necessary Information related to many satellites (that work with Radio Amateur band) and the observations made by enthusiast people

Article by:

Ariel MANABE

Esteban FRETES

The background of Kyutech and Mauritius

Dr N Gopaul
Officer in Charge
Mauritius Research Council

In June of 2019, G. Maeda visited MRC to see if there was any interest in joining BIRDS-5. This effort failed, but we still hope to receive students from them in the future. Goodwill has been established.

2019.06.21

Prof. George Maeda
Assistant Professor
Kyushu Institute of Technology

Dr M Atchia
Chairman
Mauritius Research Council

Dr V Bissonauth
Research Coordinator
Mauritius Research Council

Introductory words by Dr Atchia, chairman of MRC

Introductory words by Dr Vickram, in charge of the space unit

Morning of 21 June 2019

Above: GM takes questions

Left: Video recorded for live broadcast via FaceBook.

Right:
GM chats with Dr Vickram.

My talk was broadcast live on MRC's *FaceBook* channel

Mauritius Research Council - MRC
@MauritiusResearchCouncil

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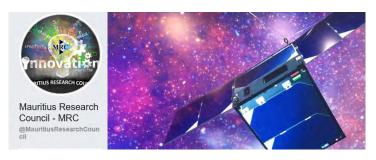
Mauritius Research Council - MRC was live — at Mauritius Research Council - MRC.
6 hrs · Ebène, Mauritius · 🌐

Seminar: New Space v/s Old Space by Prof. Georges Maeda, Associate Professor - Kyushu Institute of Technology. #MRC #seminar #MIRSAT1, #SpaceMauritius, #spacetechnology, #satellite

Mauritius Research Council - MRC
@MauritiusResearchCouncil

This is Mauritius' first satellite – it won a free launch from JAXA under KiboCube.

Tea break at MRC

21 June 2021

Flag of Mauritius

Dr Atchia, chairman of MRC

ENGINEERING TEAM

2019.06.21

After lunch, Dr Vickram, Faraaz, Ziyaad, and I visited this university – the biggest one in Mauritius.

Main website: http://www.uom.ac.mu/

https://www.google.co.jp/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&ved=2ahUKEwi2zNOi3_riAhVSzBoKHbeuAQoQjRx6BAgBEAU&url=https%3A%2F%2Fbusiness.mega.mu%2F2016%2F03%2F24%2Flecturers-travaillant-pour-dautres-institutions-la-direction-de-luom-assouplit-les-reglements%2F&psig=AOvVaw2u7pwp2x8nN3LYQoQxiZSs&ust=1561212275526592

Test facilities of CeNT of Kyutech

Dr Beeharry (Physics Dept.) →
wanted me to show pics of CeNT

I made the full sales pitch for BIRDS-5 to members of Physics and Engineering Department – they were interested.

END OF REPORT ABOUT MAURITIUS

08. Applications are open for the 7ᵗʰ round of UN/JAXA KiboCUBE competition

EMAIL FROM UNOOSA:

Subject: [UNOOSA]: UN/IAF Workshop
+ KiboCUBE open for applications
From: UNOOSA Access to Space
<unoosa-access-to-space*un.org>
Date: 2021/07/16

Dear colleagues, In this update...

Applications are open for the "**UN/IAF Workshop**",
Dubai, United Arab Emirates, 22-24 October 2021, in
conjunction with the *72nd International Astronautical
Congress*

Registration Deadline: 31 August 2021
More information: https://www.unoosa.org/oosa/en/ourwork/psa/schedule/2021/2021-iaf.html

... email continued on the next page ...

***** Applications Open for 7th Round of KiboCUBE *****

Deadline: 31 December 2021
More information:
https://www.unoosa.org/oosa/en/ourwork/access2space4all/KiboCUBE/KiboCUBERounds.html

KiboCUBE
A few weeks ago, we witnessed the 1st satellite of Mauritius MIR-SAT 1 https://spacemauritius.com/ , developed by the Mauritius Research and Innovation Council
http://www.mric.mu/English/Pages/default.aspx
successfully be deployed...   (if you missed out, check out the YouTube streaming https://www.youtube.com/watch?v=XqXMy3NDZn0)

The United Nations Office for Outer Space Affairs
<https://www.unoosa.org/oosa/index.html>
and our partner Japan Aerospace Exploration Agency (JAXA)
<https://global.jaxa.jp/>
are pleased to announce that we have opened applications for the 7th round of KiboCUBE
https://www.unoosa.org/oosa/en/ourwork/psa/hsti/kibocube.html
today --- the programme that grants a 1U CubeSat deployment opportunity from the ISS "Kibo".

=========>   Applications are accepted until 31 December 2021.

For more details on how to apply for this round, please check the KiboCUBE rounds webpage
https://www.unoosa.org/oosa/en/ourwork/access2space4all/KiboCUBE/KiboCUBERounds.html

When applying, please make sure to carefully read all 4 documents under "7th Round Documents" and also refer to the KiboCUBE Academy webinar series for more information on how to develop, operate and utilize a CubeSat.

KiboCUBE Academy webinar series and other webinar materials can be found on the main KiboCUBE website
< https://www.unoosa.org/oosa/en/ourwork/psa/hsti/kibocube.html >.

Note that a webinar will be organized to provide more information about this opportunity.

Best regards,
 The Access to Space for All team
 (UNOOSA Access to Space unoosa-access-to-space@un.org<mailto:unoosa-access-to-space@un.org>)
 Space Applications Section, Vienna, Austria
 United Nations Office for Outer Space Affairs (UNOOSA)
 www.unoosa.org <http://www.unoosa.org/>

How the Game of Go Inspired the QR Code

Developed by automotive manufacturer Denso in 1994, the code is used for scanning boarding passes and contactless credit card payments

BY JOANNA GOODRICH

"The most important feature of a QR code is that it can be read five times faster than a typical bar code."

← **June 2021 issue of *The IEEE Spectrum***

Space Studies Possibilities at Kyutech-Japan

Escuela de Ciencia y Tecnología ECYT_UNSAM

Kyutech — Kyushu Institute of Technology

Introduction to "Space Engineering International Course (SEIC)" Master's and Ph.D Programs
Prof. George Maeda, Assistant Professor
Kyushu Institute of Technology (KYUTECH)
*English Presentation

CubeSats Development at KYUTECH:
"Design, Construction, Assembly, and Operation"
Ph.D. Rodrigo Cordova, Postdoctoral Researcher at
Laboratory of Lean Satellite Enterprises and
In-Orbit Experiments (LaSEINE)
Kyushu Institute of Technology (KYUTECH)
*Spanish Presentation

Date: Thursday June 24th
Time: 09:00 (Argentine time)
ZOOM ID: 896 0974 5597
Passcode: 611210

Moderator:
Dr. Livio Gratton
(UNSAM)

Kyutech thanks Dr. Livio Gratton (UNSAM) for organizing this webinar event.

There were participants from all over Argentina.

On the 9th October 2012 Uganda celebrated fifty years of independence. At Lambeth Palace Library we hold the records of Bishop Leslie Brown (1912-1999), MS 3779-3827, who was Bishop of Uganda (1953-1960) and Archbishop of Uganda, Rwanda and Burundi (1961-1965). His documents cover the lead up to and the eventual independence of Uganda.

← This image of the *Ugandan Independence Ceremony* comes from his 1953-1964 photograph album, MS 3826, item 3. The British Crown was represented by HRH Prince Edward Duke of Kent and his wife Katharine, Duchess of Kent (pictured left of centre). The image also features Milton Obote, Prime Minister of Uganda and leader of the Ugandan People's Congress (UPC). Celebrations were also held in the UK and one item in the Brown papers is a programme from Wesminster Abbey's service for Uganda's independence, MS 3817.

https://www.lambethpalacelibrary.org/content/ugandan-independence-ceremony

The following information comes from the Office of the President (Kyutech) via Mr. Wakabayashi of the International Section:

Among the first graduates of Kyutech in 1913, Mr. Shigeki TASHIRO, who was the President and then Chairman of TOREY, is associated with Uganda. He was the official representative of the Government of Japan to attend Uganda's independence ceremony (see the previous page) in October of 1962. At that time, Mr. TASHIRO was the president of the Japan-Africa Association.

President OIE is happy to know that Kyutech and Uganda have this historic relationship.

← **Issued in 2019 by the Japan Embassy in Uganda**

田代茂樹 TASHIRO SHIGEKI

出典: フリー百科事典『ウィキペディア（Wikipedia）』

田代 茂樹（たしろ しげき、1890年(明治23年)12月5日 - 1981年(昭和56年)8月8日）は、東洋レーヨン元社長、元会長、元名誉会長、日本化学繊維協会元会長、日本腎臓財団初代会長、福岡県人会第三代会長、明治専門学校第一期生。

福岡県北九州市出身。旧制東筑中学（現在の福岡県立東筑高等学校）、明治専門学校（**現在の九州工業大学**）機械工学科を卒業後、三井物産に入社、24年間の勤続後、1936年に東洋レーヨン（現在の東レ）に取締役として就任し、社長、会長、名誉会長を歴任した。1959年（昭和34年）日本インダストリアル・エンジニアリング協会初代会長に就任。1960年に（財）東洋レーヨン科学振興会を設立した。1972年に日本経済新聞の名物コラム『私の履歴書』に東レの名誉会長として取り上げられた。

https://ja.wikipedia.org/wiki/%E7%94%B0%E4%BB%A3%E8%8C%82%E6%A8%B9

"Kitakyushu Flowers"
by
Mark Angelo Purio
16 July 2021

BIRDS-4

Kitakyushu Flowers

July 16, 2021

Photo Presentation by
Mark Angelo Purio
BIRDS-4 Member
from the Philippines

Spring has already passed here in Japan but the beauty brought by flowers never stop in summer. During the pandemic, I happen to rekindle my love for photography and notice beautiful flower sightings around Kitakyushu.

This article in somewhat a photobook of the flowers one can find in Kitakyushu between the spring and summer period.

I used Google lens to name the flowers which are not familiar to me.

Tulips bloomed inside our university (KyuTech). I love how they manage to change what is planted everytime they wither.

Black-eyed Susan

Globe Amarath

Trailing Ice Plant

Mexican Marigold

Surfinia

Rose

Iris

Lantana

Garden Cosmos

Chinese Trumpet Vine

Day-Lily

Cheeses

Hydrangea

Of course, not all flowers around Kitakyushu were covered by this photo presentation but I believe this gives an idea on how beautiful summer time would be despite of the scorching weather.

If you happen to visit Kitakyushu or Japan in general, please spare some time to marvel in the beauty of the flowers around it. Aside from being a beautiful sight, they are also Instagram-worthy.

All photos were personally taken by me this season while wandering around Kitakyushu area.

Bonus: Sakura Flowers taken at the start of spring

END

13. If you wish, you can easily view the ISS with your own unassisted eyes

Use this NASA website to find out when you can view the ISS from your backyard at home.

The ISS is easily seen with the naked human eye.

Enter your city or town here

Spot The Station will give you a list of upcoming space station sighting opportunities for your location.

Several times a week, Mission Control at NASA's Johnson Space Center in Houston, TX, determines sighting opportunities for over 6,700 locations worldwide. If your specific city or town isn't listed, pick one that is fairly close to you. The space station is visible for a long distance around each of the listed locations.

Use this website: https://spotthestation.nasa.gov/sightings/index.cfm
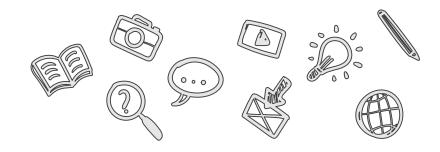
BPN
Español
- No. 5 -

Fatima Duran

El Salvador

Estudiante SEIC/PNST

En la columna No. 4, te compartí un algunos detalles sobre el programa Post-graduate Study on Nano-satellite Technologies (PNST), del cual formo parte desde octubre de 2020. En esta ocasión, te compartiré un poco sobre la Agencia de Cooperación Internacional del Japón (JICA), la cual puede apoyar económicamente a estudiantes y profesionales de países designados para continuar sus estudios en Japón. Sin embargo, JICA no tiene programas de becas abiertos al público. Por lo tanto, te recomiendo visitar las oficinas de JICA o la embajada de Japón en tu país para obtener más información.

AGENCIA DE COOPERACIÓN INTERNACIONAL DEL JAPÓN (JICA)

La Agencia de Cooperación Internacional del Japón (JICA), se dedica a promover el desarrollo de sus actividades con una orientación hacia el trabajo de campo, enfocándose en áreas como la seguridad humana y adoptando un abordaje de mayor eficacia, eficiencia y celeridad.

Para más información sobre JICA…

https://www.jica.go.jp/english/countries/index.html

JICA, lleva a cabo una diversidad de programas los cuales tienen como fin abordar las necesidades específicas de cada país. En especial, estos programas se enfocan en organizaciones encargadas de la creación de políticas, suministros de servicios, instituciones académicas y de investigación. De acuerdo a JICA-El Salvador, JICA ofrece tres diferentes tipos de cursos o programas a nivel regional, grupal o de país. Por ello, te recomiendo consultar los programas que JICA ofrece específicamente en tu país.

Curso Regional

Curso Grupal

Curso de Tercer País

Enfocado a una determinada región geográfica, tienen como fin la ejecución de proyectos de cooperación técnica.

Ofrecido para diferentes países, a través del intercambio entre becarios. Estos cursos son solicitados por los gobiernos receptores.

Ofrecidos por países de la región y enfocado en problemáticas comunes.

Para más información sobre becas otorgadas por el gobierno de Japón, …

https://www.studyinjapan.go.jp/en/planning/about-scholarship/
https://www.studyinjapan.go.jp/en/_mt/2021/04/Scholarship%20for%20international%20students%20EN.pdf
https://www.jasso.go.jp/en/study_j/scholarships/index.html

UiTMSAT COLUMN

Column No. 19

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

UiTM Sentiasa Di Hatiku
"UiTM Always in My Heart"
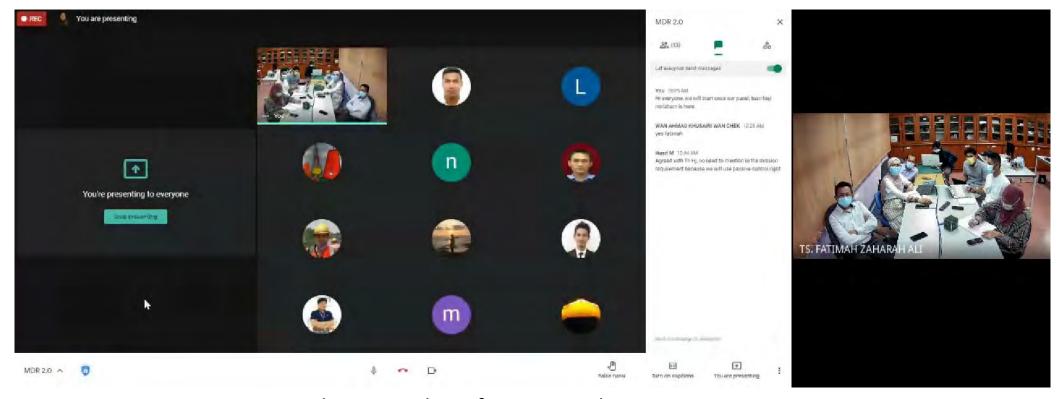
ASEANSAT PROJECT: THE MDR 2.0 & THE IMPETUS TO SDR

On 27th May 2021, the team from ASEANSAT project had conducted another session of Mission Design Review that was called as MDR 2.0 in presenting the reviewed project mission based on the advices and guidance from panels of first MDR. The lead panel, Mr Norhizam Hamzah, the Managing Director of Mercu Tekun Sdn. Bhd., was the panel of the MDR 2.0. ASEANSAT team had also invited Dr Abhas Maskey, a founder of Space Foundation Nepal, which was also the Project Manager of BIRDS-3, as a panel of MDR 2.0.

Figure 1: Some of MDR2.0 attendees at UiTM.

Figures 2: The screenshot of ongoing online MDR2.0 presentation.

MDR 2.0 was conducted through hybrid where some of the teammates of ASEANSAT project including the Principal Investigator, Dr Mohamad Huzaimy Jusoh and the panel, Mr Norhizam Hamzah, were stationed together at Laboratory of Space Waether and Satellite System, Universiti Teknologi MARA, Selangor Malaysia. The other teammates of ASEANSAT project, Malaysian Space Agency (MYSA) participants and Dr Abhas had virtually joined the presentation through online platform. The MDR 2.0 presentation was carried on through Google Meet application.

The second MDR (MDR 2.0) was meant to present the whole project's objectives and functions (overall missions) and the proposed operations in implementing the two (2) missions that will be carried out by the 1U CubeSat. The missions mentioned are:

i. Camera mission for Earth observation
ii. Store-and-forward mission for Ground Sensor Terminal (GST) data transmission.

Figures 3: The general concept of operation of ASEANSAT satellite that was presented during the MDR 2.0. Dr Abhas was giving advices on this.

The project manager of ASEANSAT, Fatimah Zaharah was in-charged in presenting the MDR 2.0. The panels, Mr Norhizam and Dr Abhas gave inputs and feedbacks as well as some advices in reviewing the proposed satellite operation and development.

In conjunction with that, the subsystem design review (SDR) had been proposed. This was to ensure the bus systems of the satellite could support the presented satellite's operation. The SDR is to ensure the overall system of the satellite can be successfully operated by the subsystems and the mission can successfully be executed as presented in MDR 2.0.

The SDR was held in stages as follows:

i. SDR on Communication (including antenna) Subsystem and Electrical Power Subsystem (EPS) – was held on 17th June 2021

ii. SDR on Attitude Determination Control Subsystem (ADCS) and On-Board Computer (OBC) – was held on 1st July 2021

iii. SDR on structure – was held on 16th July 2021.

The SDR was held in stages to ensure the person-in-charge (PIC) of the subsystem has enough time to prepare the presentation according to the needs of achieving the missions' execution.

From the SDR, we would see the clearer picture on how to design the satellite based on the requirements stated in MDR. The successful of SDR would lead to the next stage of satellite development and it will be presented during the Preliminary Design Review (PDR) presentation.

Figures 4: The SDR presentation through online platform.

End of Malaysia's Column

The following sections are the BIRDS-5 articles for July 2021

(compiled by Timothy of Zimbabwe)
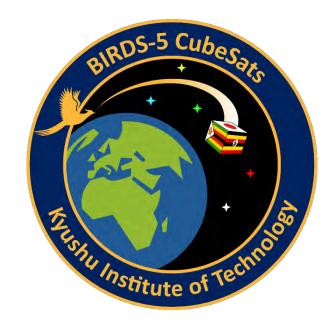
BIRDS 5 Team Jacket Photoshoot
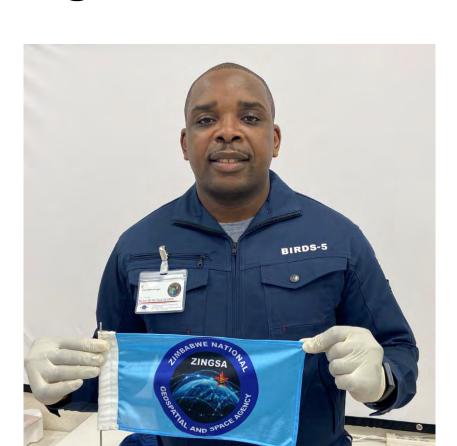
By : Timothy Kudzanayi Kuhamba

(Zimbabwe)

Date: 21 July 2021

Design of the Jacket

BIRDS-5 Project Manager, Victor

Back of the Jacket

BIRDS-5 Team

BIRDS-5 Team members from Uganda, Japan, Morocco, Trinidad-Tobago, and Zimbabwe

BIRDS-5 Team

Japan Team Members

Shoma   Fahd   Otani   Oshiro   Kamitani   Keenan

Uganda Team Members

Edgar
Bonny
Derrick

Zimbabwe Team Members

Timothy   Ramson   Victor

BIRDS-5 African Connection

Focusing the lenses for BIRDS-5

by
OMARA
Bonny
(Uganda)

July 22, 2021
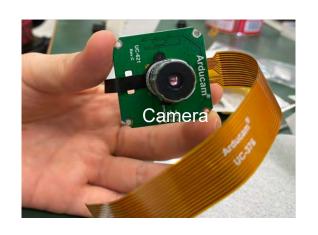
Focusing the lenses for BIRDS-5

- BIRDS-5 is implementing multispectral camera to facilitate analysis of water quality, soil fertility, land use and cover

Objective

- to set focus for our Cameras as we prepare to conclude Engineering model phase for our satellites

- The team assembled the cameras in BIRD5 laboratory and moved to the staircases of library which has a very clear view of Sarakura Mountain with towers

Team work: Filter assembly

Inserting filters before fitting lens holder

Assembling of Cameras

Victor from Zimbabwe is applying torque.

Staircase of library of Kyutech

Mount Sarakura

Sarakura Mountain is about 6.4km as the crow flies from Kyutech.

Targeted towers

Very hot day, the team had to use Umbrellas.

There are to two methods to perform focus:
1. Using a collimator lens or,
2. By focusing a distant object of about 2km and beyond.

BIRDS-5 team chose **option two** because our lens has a very small focal length which makes it harder to get a collimator that suits this test.

Adjusting lens

1st Camera with 790nm

2nd Camera with 550nm
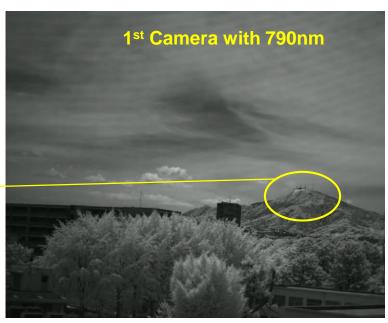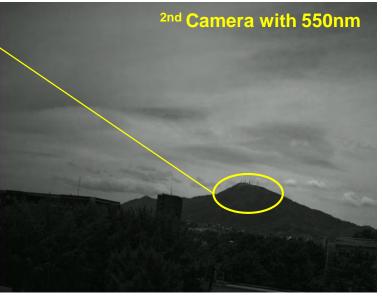
With the camera connected to a display and set to preview mode, we were able to set our lens at its center of focus before applying Araldite.

A closer view of our target after setting focus!

End of this section
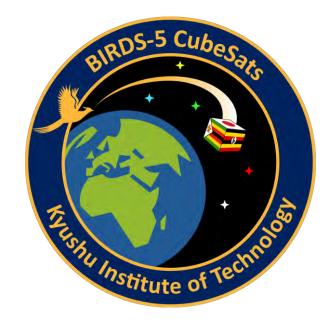
DLP Testing at ISAS

By : Kohei Kamitani
2021/ 7 /22

DLP Testing at ISAS

DLP circuit Experiment was carried out using the facilities of the *Institute of Space and Astronautical Science* (ISAS) in Kanagawa, Japan.

Location of ISAS

The actual M V rocket at the ISAS site

ISAS has a large chamber that can simulate ionospheric conditions, thus the DLP experiments were conducted there.

DLP Testing at ISAS

After that, the results of the plasma measurement with variable voltage applied by the source meter were compared with the results of the measurement with variable voltage applied by the circuit for DLP.

Experimental setup (top view of the chamber)
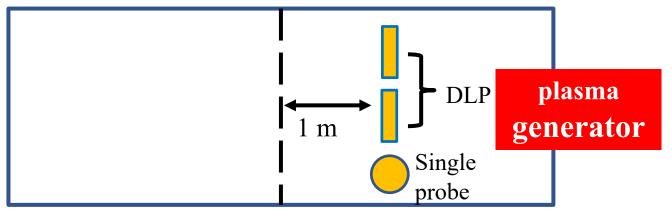
FIRST: In the experiment, a circular copper plate was used as a probe for DLP. This probe was placed in the chamber.

Then the respective variable voltages created by the source meter and the circuit for DLP were applied to the probes.

Source Meter
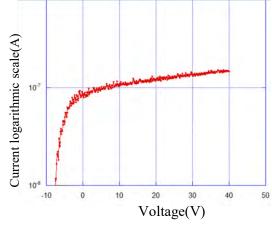
DLP circuit
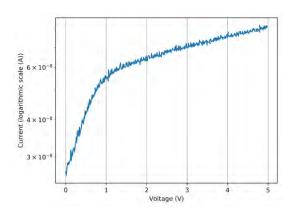
Measurement results

As a result of the measurement, there was no significant difference between the result of measuring plasma with the source meter and the result of measuring plasma with the circuit for DLP using Raspberry Pi.

It was observed that the circuit for DLP could sufficiently measure the plasma.

Test results with SourceMeter

Test results with DLP circuit

Comparison of test results

	1		2		3		4		5	
	Electron density(m⁻³)	electron temperature(ev)	Electron density(m⁻³)	electron temperature(ev)	Electron density(m⁻³)	electron temperature(ev)	Electron density(m⁻³)	electron temperature(ev)	Electron density(m⁻³)	electron temperature(ev)
DLP(Source meter)	1.33×10^{11}	0.0469	7.45×10^{11}	0.12	9.68×10^{11}	0.0524	4.58×10^{11}	0.377	4.77×10^{11}	0.245
DLP(Raspberry Pi)	1.78×10^{11}	0.19	9.18×10^{10}	0.88	1.17×10^{11}	0.46	9.47×10^{10}	0.72	1.32×10^{11}	0.31

Using GitHub Desktop in BIRDS-5

By: Keenan Chatar

(Trinidad-Tobago)

22/07/2021

What is GitHub?

- It is a Code-hosting platform designed for sharing code:
  - Free to use
  - Excellent version tracking capabilities
  - Proper documentation and organization
  - Cloud repository which is accessible from anywhere
  - Supports easy integration of coding with multiple team members
  - Private repositories for secure code storage

Getting Started

1. Create a new GitHub account using your student email

1. Download GitHub Desktop

1. Configure settings and Sign in with your newly created GitHub account
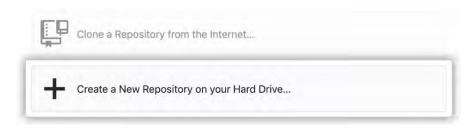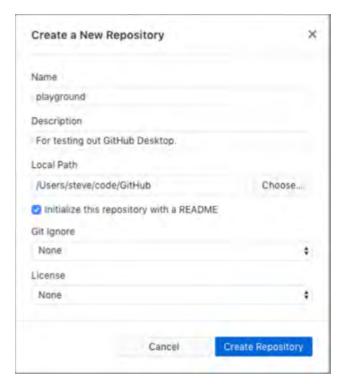
Create your first repository

- A repository is the database in which you will store all your code

1. Go the GitHub home screen and select Create a New Repository on your Hard Drive.

1. Fill in the fields depending on the code you would like to store. A "ReadMe" describes what the repository contains. A Git Ignore tells GitHub which files to ignore when saving data to the cloud

Exploring GitHub Desktop – Main Screen
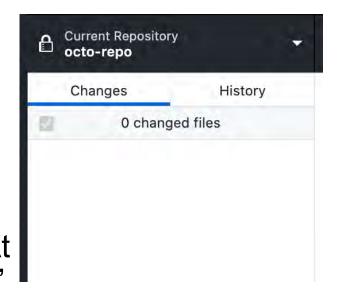
- The desktop app allows you to view the current state of your repository

- Current repo shows the name of the repository you are on. Current branch shows that you are on the main (master) branch for your repo. Publish Repository appears because you have not pushed your repository into the cloud. We will go over how to do this soon
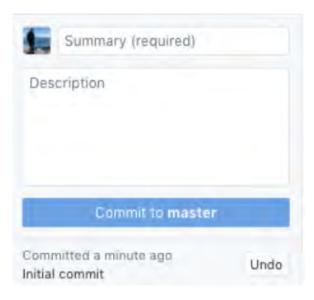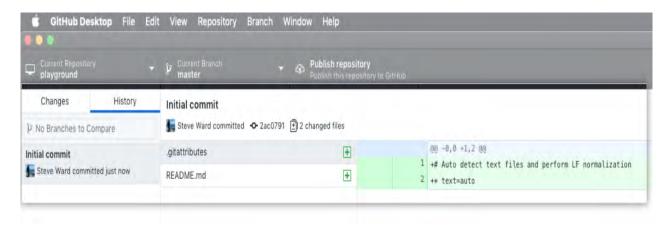
Changes and History

- On the left you will see the Changes and History Pane

- The Changes pane shows you changes you've made to files. At the bottom there is a "summary" field that you must fill in before you commit any changes to your master branch

- The History Pane shows all the changes made to files such as additions or removal of code.
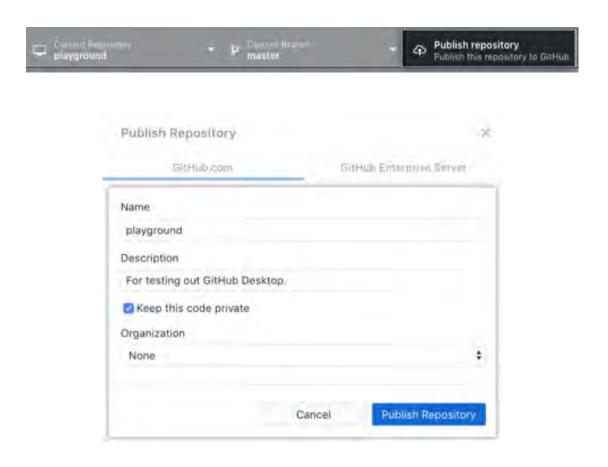
Publishing
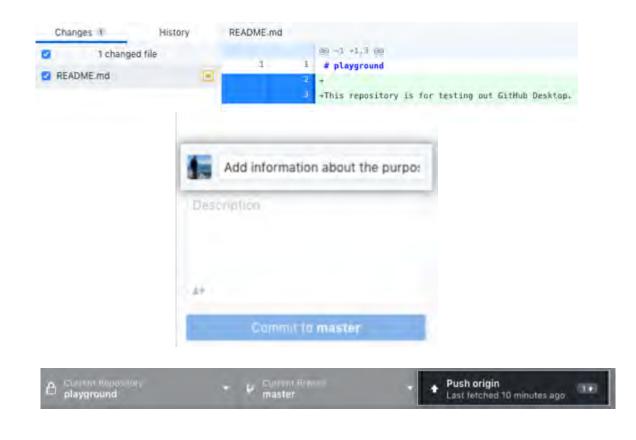
- When you create a new repository, it only exists on your computer. Publishing to GitHub cloud allows others to access your repository. Select **Publish Repository**

- GitHub Desktop automatically fills the "Name" and "Description" fields with the information you entered when you created the repository.

- Keep this code private lets you control who can view your project. If you leave this option unselected, other users on GitHub will be able to view your code. If you select this option, your code will not be publicly available.

- The Organization drop-down menu, if present, lets you publish your repository to a specific organization that you belong to on GitHub.

Making and Committing Changes
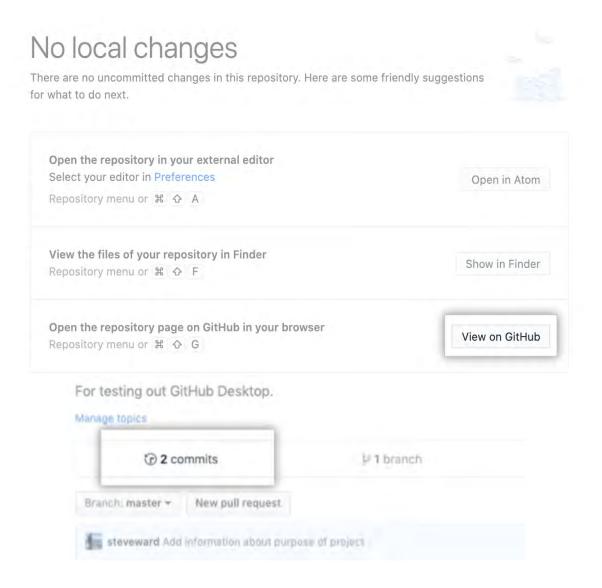
- Now that you've created and published your repository, you're ready to make changes to your project and start crafting your first commit to your repository.

- Find the README.md file in your GitHub repository and add some information to it. Once you've saved the file. Check the GitHub Desktop Changes Pane and you should see the new additions you made to your file.

- At the bottom, add a summary and commit your changes to your master branch. Note, this will commit the changes to your LOCAL repository on your machine, not the one in the cloud.

- Once you've committed to your local repo, we want to push these changes to the REMOTE repository in the cloud. Select "Push Origin" to publish the changes we've just made to the README.md file.

Remote Repository

- Now that you've saved your local repository, and pushed all changes to your remote repository, you can view the changes in your remote by selecting "View on GitHub"

- In your browser, you would be led to the GitHub website where your repository is hosted. Here you will see "2 commits" The first commit was when you created the repository. The second commit was when you added changes to the README.md file.

- In conclusion, you've now created a repository, published the repository to GitHub, made a commit, and pushed your changes to GitHub. You can follow this same workflow when contributing to other projects that you create or collaborate on.

Conclusion

- In conclusion, you've now created a repository, published the repository to GitHub, made a commit, and pushed your changes to GitHub. You can follow this same workflow when contributing to other projects that you create or collaborate on.

- Learning to use GitHub is a bit difficult but very rewarding when working with large teams on large codebases.

- GitHub is used in many companies and work-places, you will likely find yourself using it at some point in life.

- Visit the GitHub Desktop Documentation for more tutorials on how to understand and use GitHub Desktop

https://dev.to/g_abud/advanced-git-reference-1o9j

End of this section about GitHub
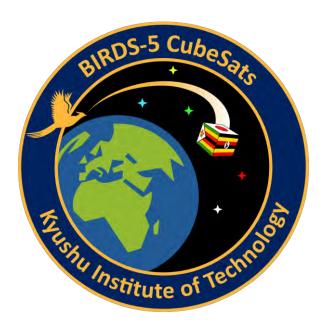
Tips to Research Paper Writing

By : Ramson M Nyamukondiwa

Date: 21/07/2021

Research Papers Overview

- A research paper is an essay in which you explain what you have learned after exploring your topic in depth.

- In a research paper, you include information from sources such as books, articles, interviews, and Internet sites.

- You also use your own ideas, knowledge, and opinions.

- Most of your paper (as a rule of thumb, at least 80%) must be in your own words.

- Example of some of my Research Papers

EXIT Chart Generation for LDPC Codes

Ramson Munyaradzi Nyamukondiwa, Meixiang Zhang, and Sooyoung Kim

Division of Electronics Engineering
Chonbuk national University
Jeonju, Korea
ramynyamukondiwa@gmail.com,mei1986xiang@live.cn,sookim@jbnu.ac.kr

IEICE TRANS. FUNDAMENTALS, VOL.E94–A, NO.1 JANUARY 2011

1

PAPER   Special Issue on Satellite Communication Technologies in Conjunction with Main Topics of JC-SAT2015

Efficient utilization of rateless LDPC codes for satellite broadcasting services*

Meixiang ZHANG[†], Ramson MUNYARADZI NYAMUKONDIWA[††], *Nonmembers,*
and Sooyoung KIM[††], *Member*

Typical Sections of a Research Paper

Types of Research Papers

For various types of Research papers they are composed of the following sections

- Title
- Abstract
- Introduction
- Materials and Methods
- Results
- Discussion
- Conclusion
- References
- Appendices

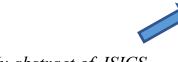https://www.allassignmenthelp.com/blog/types-of-research-papersl

Title

- Many read title but few read whole paper
- Describe the contents of the paper with the fewest possible words
- Accurate, Unambiguous, specific and correct
- Insert as many key words as possible (facilitates indexing/cataloguing/computer-based search)
- Rarely use abbreviations should not be in title
- Shorter the better (e.g.) <15 words
- If the title is long, provide a main title followed by a substitute e.g.

- **Software Defined Wide Area Networks (SD-WANS): A Solution for Modern Enterprise Network Challenges**

Discussing with the supervisor is helpful

Abstract

- Why you did the study (Introduction)
- How you did the study (Materials and methods)
- Your main results (Results)
- Major conclusions from results (Discussion)
- In the past tense; single space. One page (50 to 350 words); no table, diagrams, graphs or references
- Abstract is usually the last component to write and refine in the paper e.g

My abstract of ISICS conference paper in Tianjin China 2015

Abstract— In this paper, we present a method to produce the extrinsic information transfer (EXIT) chart for low density parity check (LDPC) codes. The EXIT chart is used to trace the transfer of mutual information during the iterative decoding. This allows to visualise the decoding performance behaviour of many iterative detection and decoding schemes with soft information. In this paper, we utilise a simulation method to generate EXIT chart which was originally proposed for turbo codes. The generated EXIT charts for LDPC codes show that the presented method appropriately demonstrates the performance behaviours of iterative decoding for LDPC codes.[1]

Keywords— EXIT chart, mutual information, LDPC codes, iterative process, forward error correction coding.

The introduction [Why you started the work]

- Basis and background

- Literature leading to logical development of hypothesis

- Previous studies in relation to hypothesis

- Gap in literature

- Scope of the study

- Objectives /activities proposed for investigating hypothesis

- Review of literature –included in the introduction or given as a separate section

- Introduction answers a series of questions
  - What is the problem
  - Are there any existing solutions
  - Which one is the best
  - What is the main limitation
  - What do you hope to achieve

Materials and Methods [What you did]
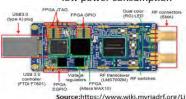
- Give complete details- Materials, instruments and Methods

- Give standard methods of statistical/chemical analysis (but not in detail)

- Give enough details so that other scientist can repeat the work

- Write in past tense

E.g. Some of the materials l use for my current research

Hardware Component

- **Software Defined Radio**
- **Lime SDR-Mini:** an open-source, and a low-cost platform
- **SDR requirement:**
  - small board size (69 mm x 31.4 mm, 20 grams)
  - low power consumption

Source:https://www.wiki.myriadrf.org/LimeSDR-Mini
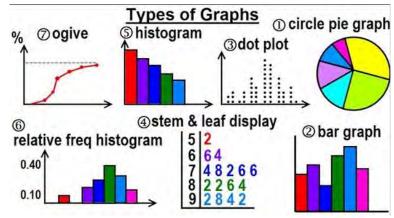
Courtesy to Professor K.M Liyanage, University of Peradeniya

Results

- The core of the paper (very important)
- Often include tables figures or both
- Should summaries findings rather than providing data in detail
- Be simple and clear
- Only give the data which is relevant to the paper
- Refer to every table or figure in the text
- Should present true unmodified results

My past research results

Graphical Presentation
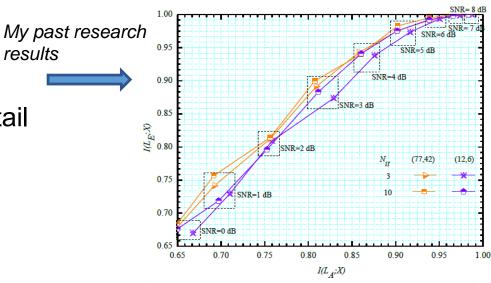
Fig. 4 EXIT chart performance comparison of the (77,35) and (12,6) codes when N_{it} is fixed.

Other ways for data/ results presentation

https://www.youtube.com/watch?v=JVaKq-oJnFs

Tabular Statistical Presentation

Table 5: Group 5: e-SCM in different task areas

	S	C	M	L	W	Mean
Effective intranet for internal communication	7	21	7	0	1	3.92
e-SCM monitors Inventory system & purchasing situation	7	17	8	3	1	3.72
Effective e-SCM for product distribution	9	18	7	2	0	3.94
Effective e-SCM for procurement	4	19	11	1	1	3.67
Automated Transmitting and Processing of Data	5	14	16	0	1	3.61
Internet Enabled System for Sharing	7	19	9	0	1	3.86
e-SCM system Fully Integrated with existing systems	4	19	12	1	0	3.72
E-SCM beneficial to EMS industry	14	19	3	0	0	4.30
Adequate Training for Users	3	21	12	0	0	3.75
Extranet Exists for Communication to External Parties	2	24	10	0	0	3.80
Group Mean						3.80
Group Study Deviation						0.10

https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-18762015000100007&lng=en&nrm=iso&tlng=en

Discussion section

- It is about what the results mean and what are the implications of the finding

- State the major findings of the study

- Explain the meaning of the findings and why the findings are important

- Relate the findings to those f similar studies

- State the relevance of the findings

- Acknowledge the study limitations

- Make suggestions for further research

Conclusion

- Give the *take home message* in the form of a conclusion

- Avoid the temptation to allow your biased to enter in to the conclusion and discussions. Be supported by facts.

Appendices [For supplementary data and information]

- Appendices includes

- Detailed instructions for the routine procedures

- Derivation of formulae and mathematical equations

- Write-ups for computer routines

- Screening protocols for human subjects

- Number or letter the appendices sequentially, with title headings s in tables

References

A. Name and year system (Harvard system)

   i.   In-text :

- According to Gray (2018, p. 175), there is 'significant…

   ii.   Reference List entry:

- Gray, L 2018, 'Exploring how and why young people use social networking sites', *Educational Psychology in Practice*, vol. 34, no. 2, pp. 175-194.

B. Citation order system (Numeric system)

   i.   In-text

- Digital video broadcasting - 2nd generation satellite (DVBS2X) defines low density parity check (LDPC) codes as a forward error correction (FEC) coding scheme [1].

   ii.   In Reference List

- [1] DVB Document A83-2, Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications, Part II: S2-Extensions (DVBS2X) - (Optional), March 2014.

Some papers includes biography Section
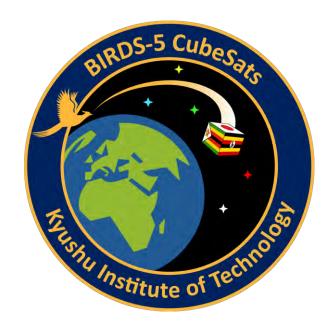
BIRDS-5 Ground Sensor Terminal
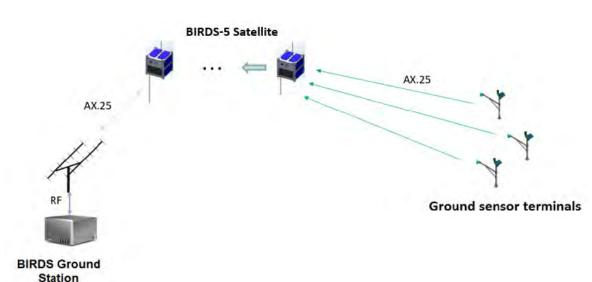
By: Edgar MUJUNI
(Uganda)

18th July 2021

GST for SF-Ward Mission

- One of the main missions of Birds5 satellites is the Store & Forward Mission ("SF-ward").
- Under this mission, satellites will receive, and store remote sensor data inform of messages from the remote regions our countries. This data will then be downloaded to the main Ground station.
- The stand-alone terminals that collect this data are what we term as Ground Sensor terminals.
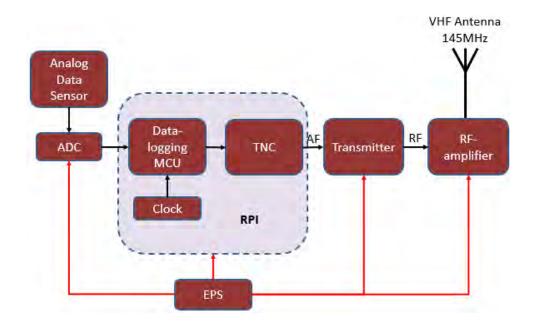
In BIRDS-5 SF-ward mission, Our Ground sensor terminals will be used to:
- Collect average solar illumination measurement from remote sensors in various regions of the country.
- collect data on the amount of rainfall, humidity and temperature levels, and soil movements that can be used to predict landslides in landslide-prone areas.
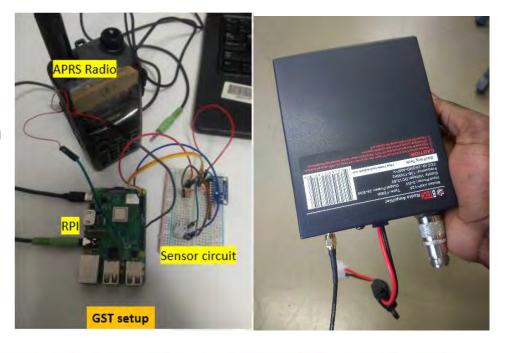
BIRDS-5 Satellite

AX.25

AX.25

RF

BIRDS Ground Station

Ground sensor terminals

Ground Sensor Terminal Configuration

- These Ground sensor terminals will employ APRS, an amateur radio-based digital system for real-time communications.

- In implementing the development of these GSTs, simplicity is key to facilitate mass development if we need (many) data from various parts/regions of our countries.

JG6YBW>APDW17::BIRDSGST1 – 240321 120907 2.17 1.14
JG6YBW>APDW17::BIRDSGST1 – 240321 120937 1.66 1.65

Initial tests on GST set-up
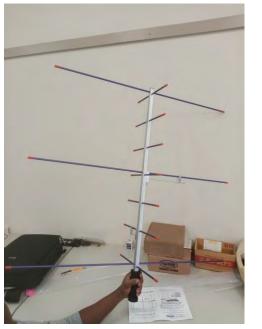
Ground Sensor Terminal Development

Two ham VHF antennas 6dBi & 9dBi, most likely to be used in our GSTs are under uplink tests with BIRDS-4 satellites.
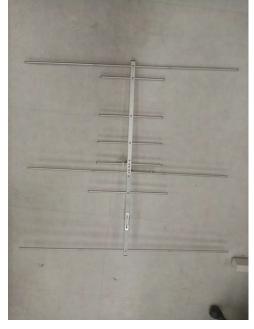
The different components that make up our GST can be compacted into an IP66 Spelsberg Junction box (250x180x90mm).

END OF THIS SECTION BY EDGAR


```
Detecting...Please wait
Connected to Server 127.0.0.1
JK1ASJ/6 Registered.
Port1 with SoundCard Ch: A;

Fm JG6YBA To APDW17 <UI pid=F0 Len=41 >[18:49:00]
:BIRDS5 GST1 - 180721 184843  0.54  0.57{
```

← GST transmission testing using UISS packet Radio Software
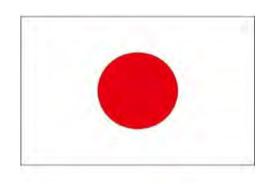
BIRDS-5 1U INTEGRATION

UGANDA   JAPAN   ZIMBABWE

By : Victor Mukungunugwa
BIRDS-5 Project Manager
23/07/2021

The designing team

Fahd Moumni:

Fahd is a Moroccan, a graduate from France. On the BIRDs 5 project he is responsible for the designing of the 1U CubeSat and space environmental testing among others. He recently joined Micro Orbiter Project were he is the project manager

Victor Mukungunugwa:

Victor is a Zimbabwean, a graduate Aerospace Engineer from Ukraine. On the BIRDs 5 project he is the project manager and is responsible for the designing of the 1U CubeSat and space environmental testing among others.

Takashi Oshiro:
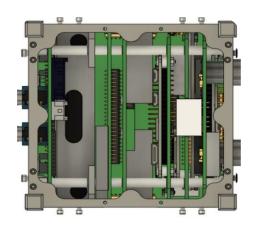
Takashi is Japanese, graduate from Kyutech. On the BIRDs 5 project he is responsible for the designing of the 2U CubeSat and space environmental testing among others.
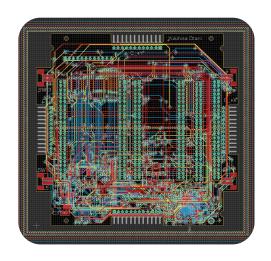
==1U-(PearAfricaSat-1, ZIMSAT-1)==

Procedure taken by BIRDS 5

Current status of BIRDS 5

Structure designers define the satellite configuration using CAD software (Fusion 360), check for interferences and export brd geometry to the EAGLE software

Subsystem members design the PCB schematics, brd and in cooperate 3D footprint for the components. A comprehensive checking is conducted to see conformity of the PCB design with structure. Final PCB designs are exported back the final design to Fusion for interference checking

The structure designers check interferences of the newly designed PCBs. If issues arise, modification is done then eventually ordering to P ban for PCB printing and populating

The structure designers check for interference on a physical satellite through an integration of the whole satellite

If one would take a close look on each stage there is checking in each stage, these inspections are vital for they minimize cost and saves time in the long run

Designing to Manufacture flow

Through out these stages communication is of paramount importance to avoid mistakes, to mechanically and electrically interface accurately

Victor conducting structural inspection to check for the satellite configuration and interference

Edgar Mujuni from Uganda doing the designing (Schematic and brd) of the Store & forward mission and multispectral mission
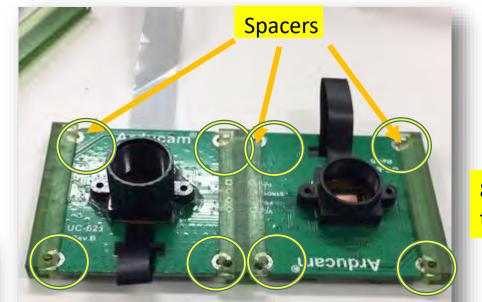
Otani checking a delivered Back Plane Board for functionality, electrical interface and programing of the CPLD and mission Boss

Camera fixing

Spacers

The holes for the cameras could not fit so the structure team designed spacers in order to fix the camera to board. This was one of the errors identified after

8 Screw mounting the two cameras
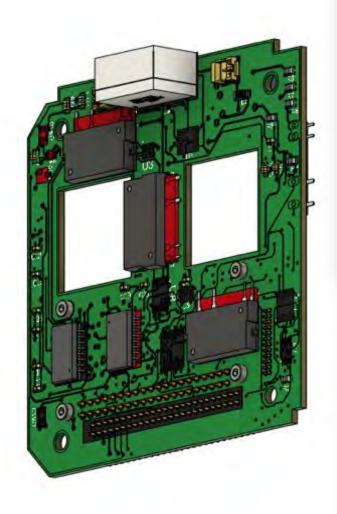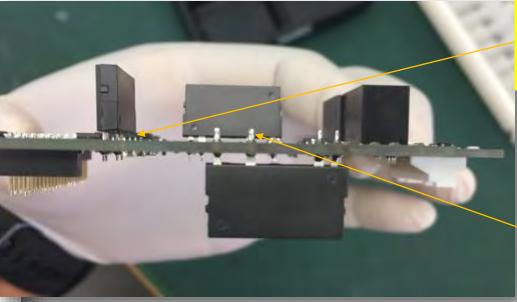
The biggest worry was that will these spacers sustain the random vibration during the space environmental testing. The structure team designed spacers made from PEEK material

Board preparation before integration

Component interference preventing the mosphets from lying horizontal as in the CAD design

To avoid short circuiting all protruding pins are cut

P Ban Board population
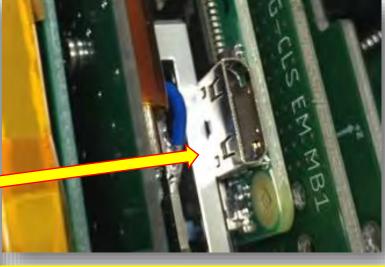
All mosphets needs to lie down and glued on the board to improve their stiffness during vibration

CAD Design
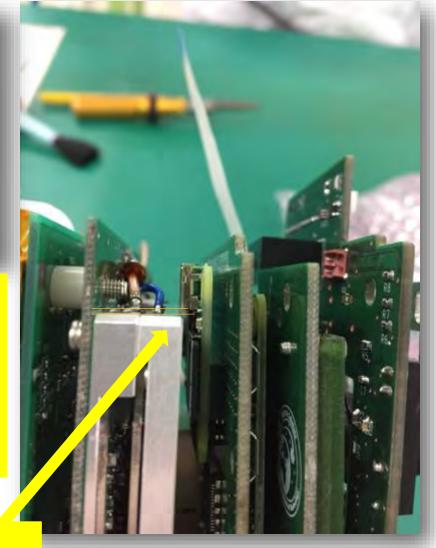
Interference Check during integration

It is important to check every corner, space and components for interference to avoid short circuiting. Any potential short circuiting will be covered by Kapton tape
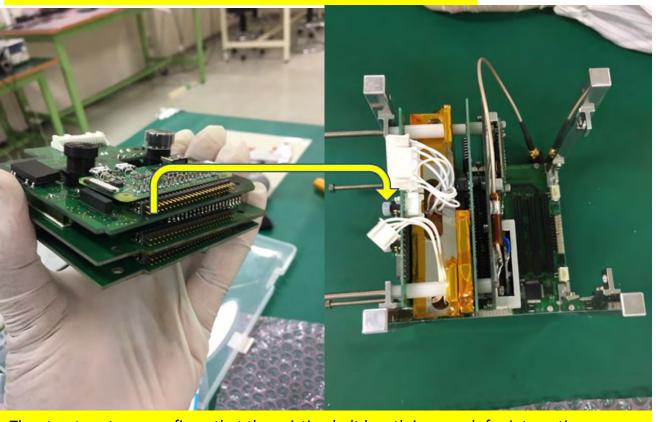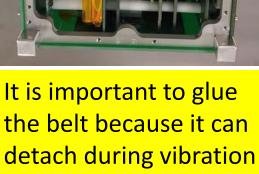
COMMS board and Raspberry Pi tight clearance
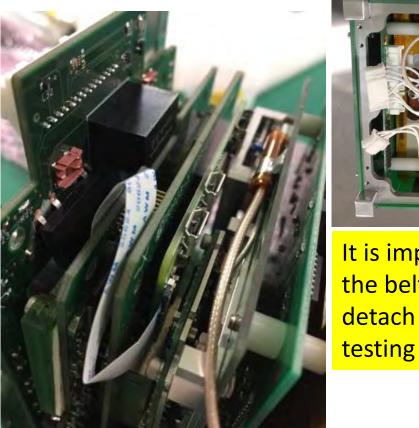
The complicated integration steps

For BIRDS 5, the Mission board 1, Mission Board 2 and rear access boards will be fixed at the same time this is a unique step in the assembly procedure
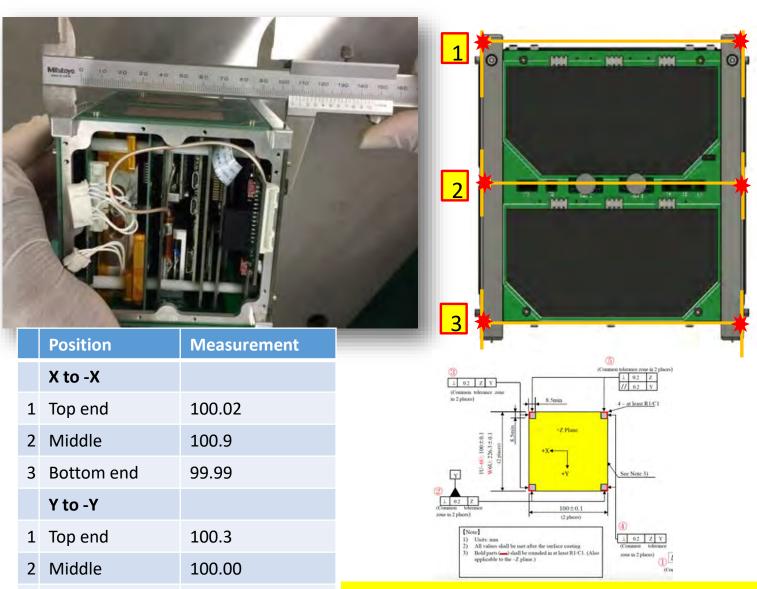
Camera Belt folding and length

It is important to glue the belt because it can detach during vibration testing

The structure team confirms that the existing belt length is enough for integration

External Dimension

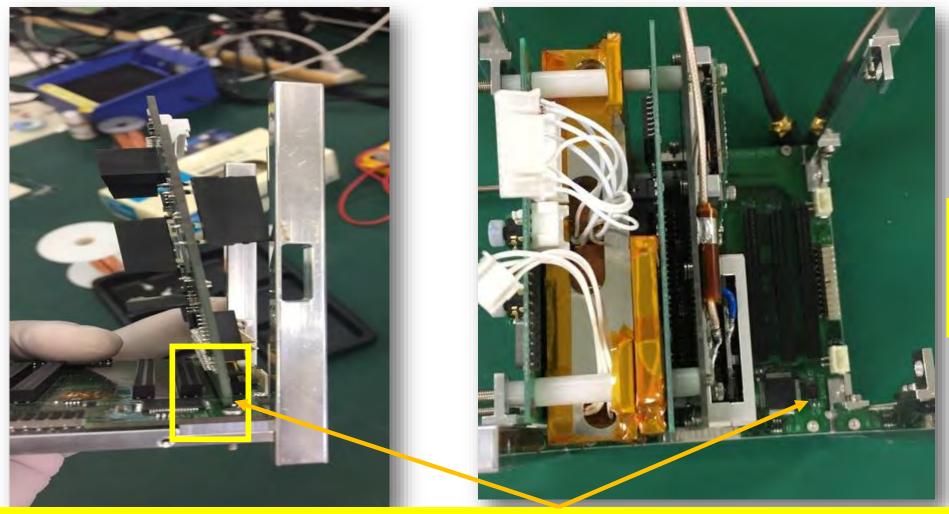| Position	Measurement
X to -X	
1 Top end	100.02
2 Middle	100.9
3 Bottom end	99.99
Y to -Y	
1 Top end	100.3
2 Middle	100.00
3 Bottom end	100.4

Skewness Check

Camera protrusion as per JAXA requirements it should not pass6.5mm from the rail end

BPB Interference
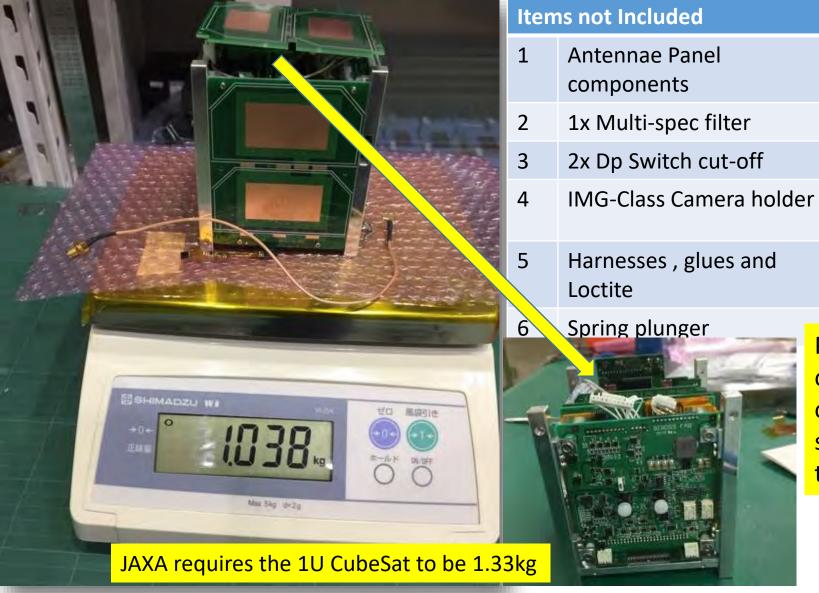
The crystal that interferes with the Back Plane Board
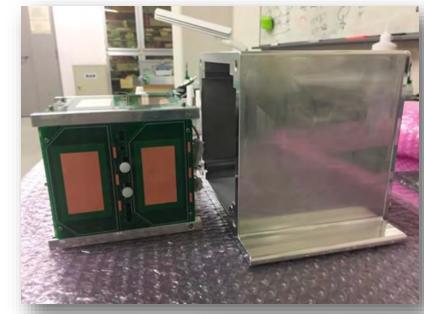
Despite the extensive checking, the Rear Access Board could not be fully integrated because of interference with the BPB crystal. For this reason BIRDS 5 had to reorder the Back Plane Board. It is the Project Manager's view that the Back Plane Board and the Rear access board were the most complicated boards
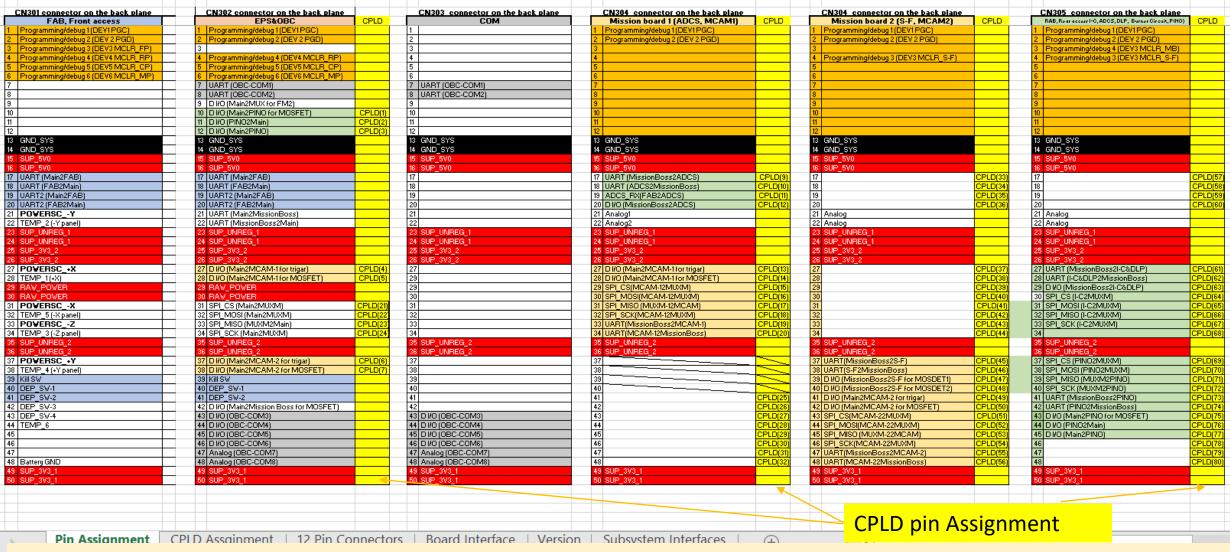
Rough Mass Measurement of 1U satellite

Items not Included	
1	Antennae Panel components
2	1x Multi-spec filter
3	2x Dp Switch cut-off
4	IMG-Class Camera holder
5	Harnesses , glues and Loctite
6	Spring plunger

JAXA requires the 1U CubeSat to be 1.33kg

POD fit check was conducted to check if the structure will fit in the POD from JAXA

CPLD pin Assignment

The BIRDS 5 configuration has a Mission Boss and CPLD that makes the integration easy in that even if there is a mistake on the pin assignment, there is no need to re-order the board. The pin assignment can be adjusted by the CPLD code.

Some lessons learnt

- Documentation of identified errors or mistake, monitoring, error rectification and review of documents is very important.

- It is important to make 3D footprints for all components on the Eagle so that when uploaded to Fusion, interferences will be identified.

- It is better to spend more time checking that to reorder boards.

- During the BBM stage, most adequate testing is necessary to avoid complications during EM stages.

- Covid 19 has had a great impact on team working together and subsystems need to complete tasks at the same time to avoid stagnation of other subsystems related.

End of BIRDS-5 reports for this month

GST Column

Nineth Issue:
Fatima's Research Seminar
by
Pooja Lepcha and Fatima Duran
22 July 2021

Fatima gave her first research seminar presentation before Cho Lab on 14th July 2021.
This article shows a few of the slides taken from her presentation that are important for *GST Builders* to understand.

LoRa Modulation

❑ **What is LoRa?**

LoRa spread spectrum is a patented modulation developed by **Semtech** based on the Chirp Spread Spectrum (CSS) modulation.

❑ **Provides…**

- Long range

- Low-power consumption

- Low data rate

- Can be easily integrated with existing networks and enables low-cost, battery-operated Internet of Things (IoT) application

- More complex and resilient to background noise
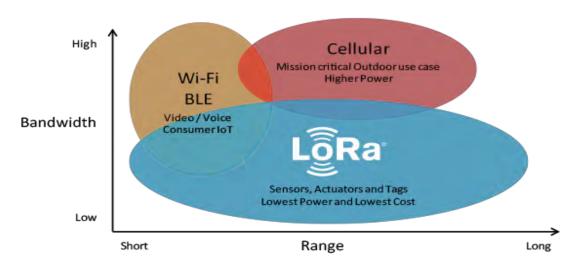
- Doppler effect resistant

Fig. 1. LoRa vs. Other Wireless Technologies. Source: Semtech

Fig. 2. Applications of LoRa. Source: Semtech

Parameters of LoRa Modulation

❑ **Forward Error Correction**

- Error correction bits added to the transmitted data.

- To restore the data when data is corrupted by interference.

Fig. 3. LoRa Gateway (left) and End-Node (right)

❑ **Coding Rate (CR)**

- Proportion of the transmitted bits that actually carries information.

- For LoRa, CR = 1,2,3, 4

Fig. 4. A byte with error correction bits (CR=1)

$$R_S = \frac{BW}{2^{SF}} \qquad (symbol/\sec)$$

❑ **Symbol Rate (Rs)**

- Effective data rate (R_B) Need to count for error correction bits.

$$R_B = SF \times \frac{BW}{2^{SF}} \times \frac{4}{(4 + CR)} \quad (bit/\sec)$$

Parameters of LoRa Modulation

❑ **Types of packets modes**

  ▪ Explicit header

  ▪ Implicit header

❑ **Elements of LoRa packets**

  ▪ Preamble

  ▪ Header (Optional)

  ▪ Data (Payload)
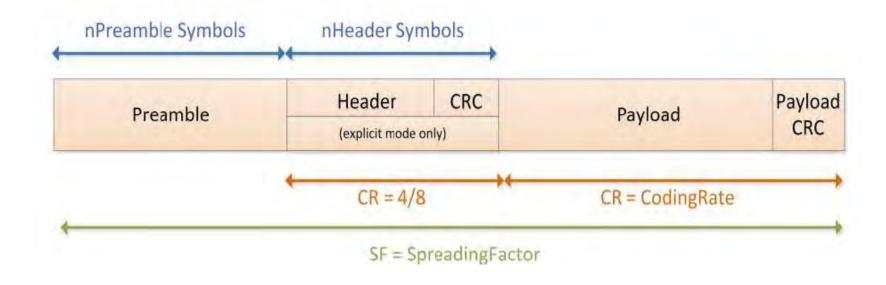

Fig. 5. LoRa packet format

Doppler Effect

❑ **Definition**

▪ Discovered by Cristian Doppler (1803-1853).

▪ The observed frequency of any source (sound, radio, light, etc.) to differ from the radiated frequency of the source if there is motion that is increasing or decreasing the distance between the source and the observer.

❑ **Considerations**

• **1. Distance between the source and receiver remains constant.**

▪ The frequency of the source and received wave forms is the same.

• **2. Distance between the source and receiver increase.**

▪ Frequency of the received wave appears lower than the source wave form.

• **3. Distance between the source and receiver decreases.**

▪ Frequency of the received wave form will be higher.

His biography by Wikipedia:
https://en.wikipedia.org/wiki/Christian_Doppler

Research Objectives

❑ **Primary Objective**

- Demonstrate the adaptability of LoRa modulation in space environment.

❑ **Secondary Objectives**

- Evaluate the Doppler Effect in LoRa modulation for satellite communication.

- Develop a testing method to evaluate the resistance of LoRa modulation to Doppler Effect in orbit.

- Check the compatibility of using commercial ground terminals with LoRa receiver board.

LoRa receiver Design

❑ **Objective**

  ▪ Provide BIRDS-countries a LoRa receiver following the design of the LoRa board of KITSUNE.

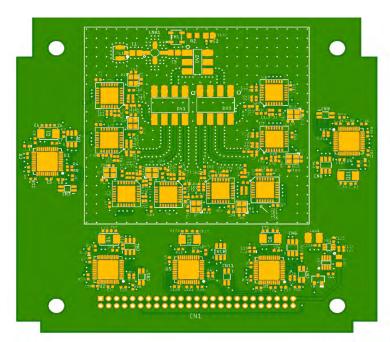❑ **Requirements**

  ▪ Similar design to LoRa board of KITSUNE.
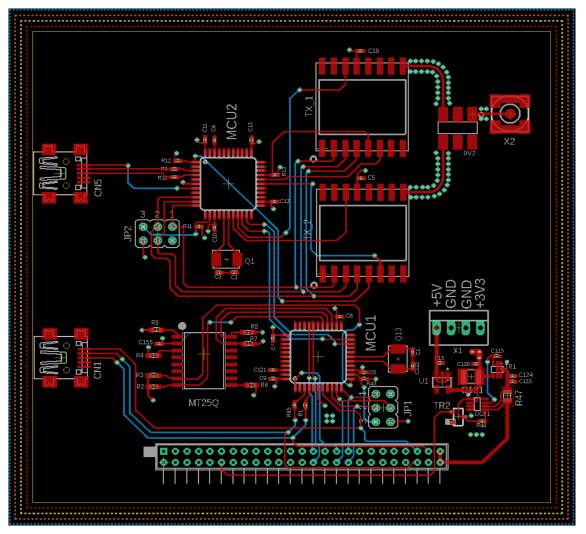

Fig. 6. Mounting Board, LoRa Board, KITSUNE

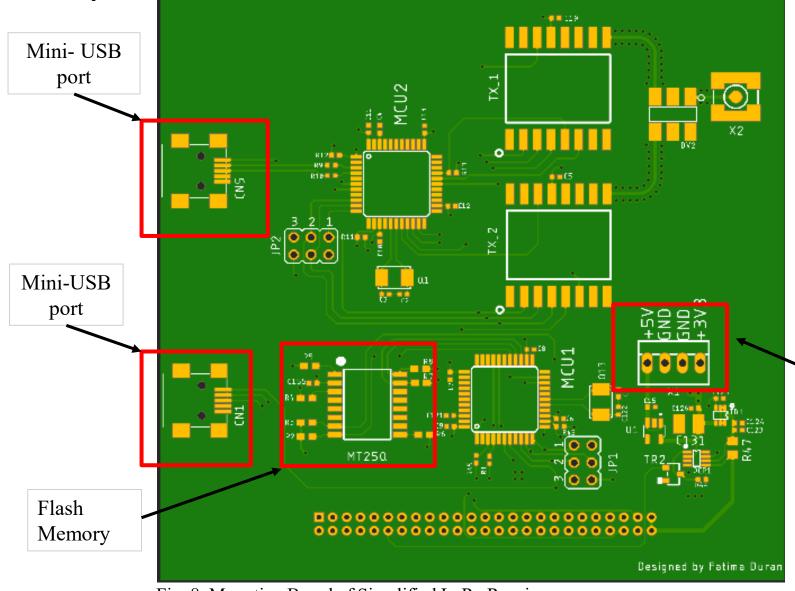Fig. 7. PCB of Simplified LoRa receiver

Simplified LoRa receiver

Mini- USB port

Mini-USB port

Flash Memory

3.3V-5V Power Supply

Fig. 8. Mounting Board of Simplified LoRa Receiver

❑ **New design**

- Reduced number of receivers (2)
  - RFM98
- 1 Flash Memory
- 2 USB ports
- 3.3-5 V Power Supply

Functionality test setup and results

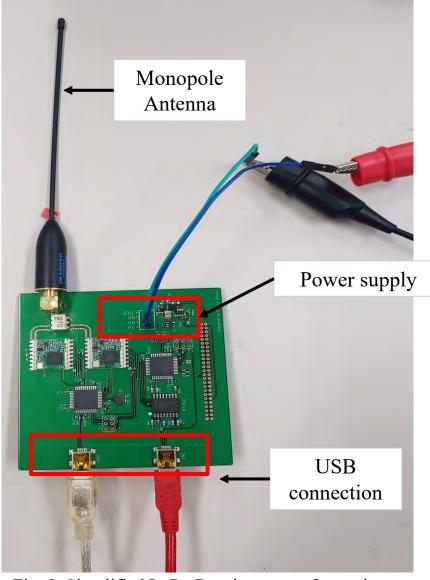Fig. 9. Simplified LoRa Receiver setup for testing

Monopole Antenna
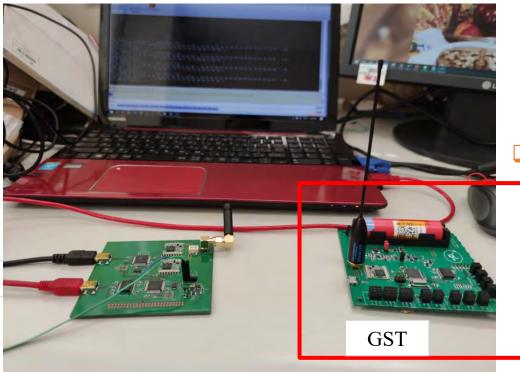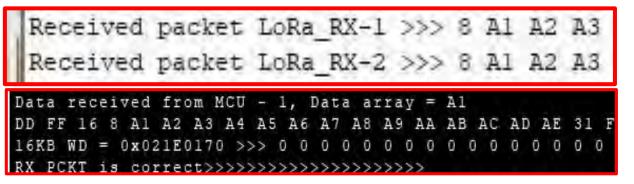
Power supply

USB connection

Fig. 10. GST and LoRa board functionality test setup

GST

❑ **Functionality Test Results**

- Both receivers can operate and receive data normally.


```
Received packet LoRa_RX-1 >>> 8 A1 A2 A3
Received packet LoRa_RX-2 >>> 8 A1 A2 A3
Data received from MCU - 1, Data array = A1
DD FF 16 8 A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE 31 F
16KB WD = 0x021E0170 >>> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX PCKT is correct>>>>>>>>>>>>>>>>>>>>>>>>>>
```

THE END

End of this **BIRDS Project Newsletter**

(ISSN 2433-8818)

Issue Number Sixty-Six

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.