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

Members of BIRDS -1, -2, -3, and -4, on 29 Nov 2018 in front of the lab building

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

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

ISSN 2433-8818

BIRDS Project Newsletter

Issue No. 36
(21 January 2019)

Edited by:
G. Maeda
Laboratory of Spacecraft Environment Interaction Engineering (LaSEINE),
Kyushu Institute of Technology (Kyutech)
Kitakyushu, Japan

Space Engineering International Course

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

Table of Sections

Continued on the next page

From Turkey **The Guest Box**

(Image Source: www.hatayzafer.com.tr)

Mustafa Kemal Atatürk (19 May 1881 – 10 November 1938) was a Turkish field marshal, revolutionary statesman, author, and founder of the Republic of Turkey, serving as its first president. He is the most respected man in Turkey, as he took the lead in Turkish people towards the Republic of Turkey within the Ottoman Empire which was about to fall apart after WWI. "He divided the Allies, defeated the last Sultan, and secured the territory of the Turkish national state, becoming the first president of the new republic in 1923 until his death in 1938, fast creating his own legend." as Andrew Mango states in his book https://www.amazon.com/Ataturk-Biography-Founder-Modern-Turkey/dp/158567334X

Yiğit Çay, PhD Student, BIRDS-4 Member

Table of Sections

九工大の正門 – the original main gates of Kyutech (still in use)

Kyutech is located on the great island of Kyushu, in the south west part of Japan. There is much to see in Kyushu – in this issue of the newsletter please examine **Section 14.** It explains why you should make a thorough tour of this island.

01. Dr Werner Balogh arrives at Kyutech to teach a course on space law and policy for engineers

The opening lecture of Monday, 17 Dec. 2018, 16:20 – 19:30, Tobata Campus of Kyutech

Special 2018 4th quarter SEIC 2-credit course:

The International Dimension of Space Activities: Space Law and Policy for Engineers

Taught by:

- Dr. Werner Balogh, WMO of the United Nations
- Dr. Yuri Takaya, 高屋 友里 先生

SEIC students come from all parts of the world

先端機能システム工学総合科目III
（2単位）a 2-credit course

The International Dimension of Space Activities: Space Law and Policy for Engineers

1 担当教員名・単位数
Werner Balogh, Yuri Takaya・2単位

2 目的 Purpose
Space activities enable us to explore the universe and help us solving many of the global issues and challenges facing our planet and society by providing important services as well as data and information for policy- and decision making in support of sustainable development. There are no borders in outer space and therefore, by their nature, space activities have a fundamentally international dimension. According to international space law, outer space is not subject to appropriation by any country or person and must be governed in a responsible manner by all humankind to ensure the long-term sustainability of outer space activities. Consequently, several international organizations are concerned with the governance of outer space. Space activities are also an important policy tool for international cooperation and for power projection. With the increasing number of countries conducting space-related activities, there is also a growing interest in the development and implementation of national space law and policy.

The course provides a systematic introduction to the international dimension of space activities, a topic usually not covered in great detail in space system engineering courses. Course participants will gain a comprehensive understanding of the latest developments in national and international space law and policy and learn about international space cooperation and space governance. Special focus will be given to space law and policy issues that are of particular relevance to small satellite developers.

Course participants will also learn about the available information resources, tools and vocabulary to become active, responsible and well-informed participants in space-related discussions in their own countries. Group exercises will provide guidance for the formulation of national space law and policy. Overall, the course shall improve participants' skills to interact with law-, policy- and decision makers and to promote international space cooperation.

This text continued on the next page.

3 授業計画 Teaching agenda

The following topics will be covered in this course:

- Introduction to space law and policy
- History of space activities
- Importance of space activities
- International organizations and outer space activities
- Essentials of international space law – the space treaties
- National space law and policy
- Legal aspects of small satellite missions
- Long-term sustainability of outer space activities
- International space cooperation
- Space in support of sustainable development and global development agendas
- Special topic: legal aspects of the exploitation of space resources by private entities
- Special topic: legal issues of space debris management and large satellite constellations
- The future of space governance
- International space careers

4 評価方法 Evaluation of the student

Reading assignments, group exercises, discussions during the course, short written exam.

5 履修上の注意事項 Prerequisites

This course will be taught in English language. A basic understanding of space science, technology and its applications will be helpful for following the course. There are no other prerequisites.

6　授業外学習(予習・復習)の指示 Delivery of material

The course will use the Moodle e-learning platform. Presentations and reading material for each lecture will be made available online.

7 教科書・参考書 References

International Space Law: United Nations Instruments, ST/SPACE/61/Rev.2, http://www.unoosa.org/oosa/oosadoc/data/documents/2017/stspace/stspace61rev.2_0.html

Welcome Dinner for Dr Werner (16 Dec. 2018)

http://www.irishpub-booties.net/irish/

Irish Pub “Booties”, Kokura

Dr Werner is introduced to Ms. Makino at the Grad School Office (17 Dec.)

Welcome Back Lunch of Monday, 17 December 2018

Menu:

- Beef curry rice by G.Maeda
- Roast chicken by 白川さん

Back in 2017 . . .

The first lecture of this course back on 12 January 2017 – taught by Dr. W. Balogh.

Back in 2017 . . .

A group photo before going to lunch

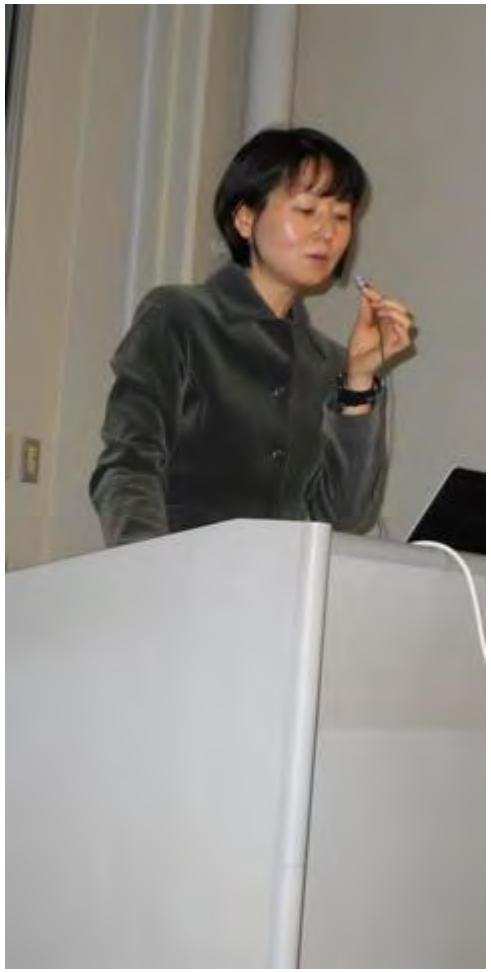
Farewell Lunch for Dr Balogh on 28th March 2017

Student cafeteria of Kyutech, Tobata Campus

Returning to 2018 . . .

Guest lecturers who arrived in Dec. of 2018

G.Maeda, Dr Yuri Takaya, Dr Tsolmon, Dr Balogh



Students of SEIC

Dr Takaya delivered this lecture (“Space Debris and Space Law”) on 21 December 2018 as a special topic inside of Dr Balogh’s course.

Above: the title of talk by Dr Y. Takaya before SEIC students on 7 Jan. 2019

Comment by a former student

Subject: Space Law Course;
Date: Sun, 6 Jan 2019 09:50:40 +0100

Dear Maeda Sensei,
Glad to know that Dr. Werner is doing the space policy and law class again.
It is very important class for Kyutech trained Engineers, the class helped me a lot.

Best regards, Tejumola Taiwo, Ph.D

Many thanks to Dr Balogh and Dr Takaya for teaching this course at Kyutech.

Students of SEIC

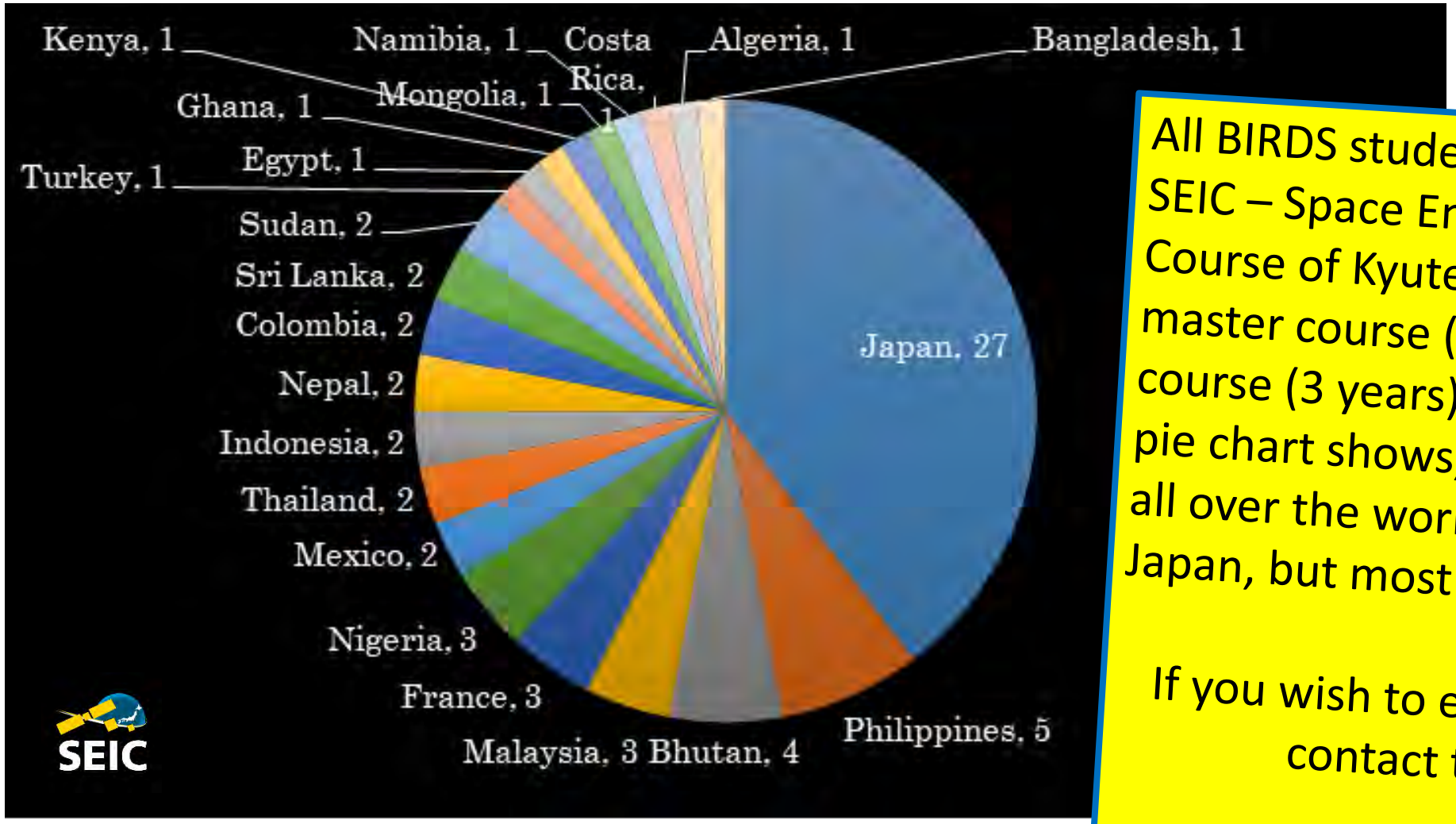
10 January 2019 on the Tobata Campus of Kyutech

This group photo of course participants was taken after the final lecture was given [but before the Final Exam of 11 Jan.]

The 90-min. final exam of 11 Jan. 2019; conducted on Moodle platform.

02. Kyutech SEIC: where the students come from

Space Engineering International Course

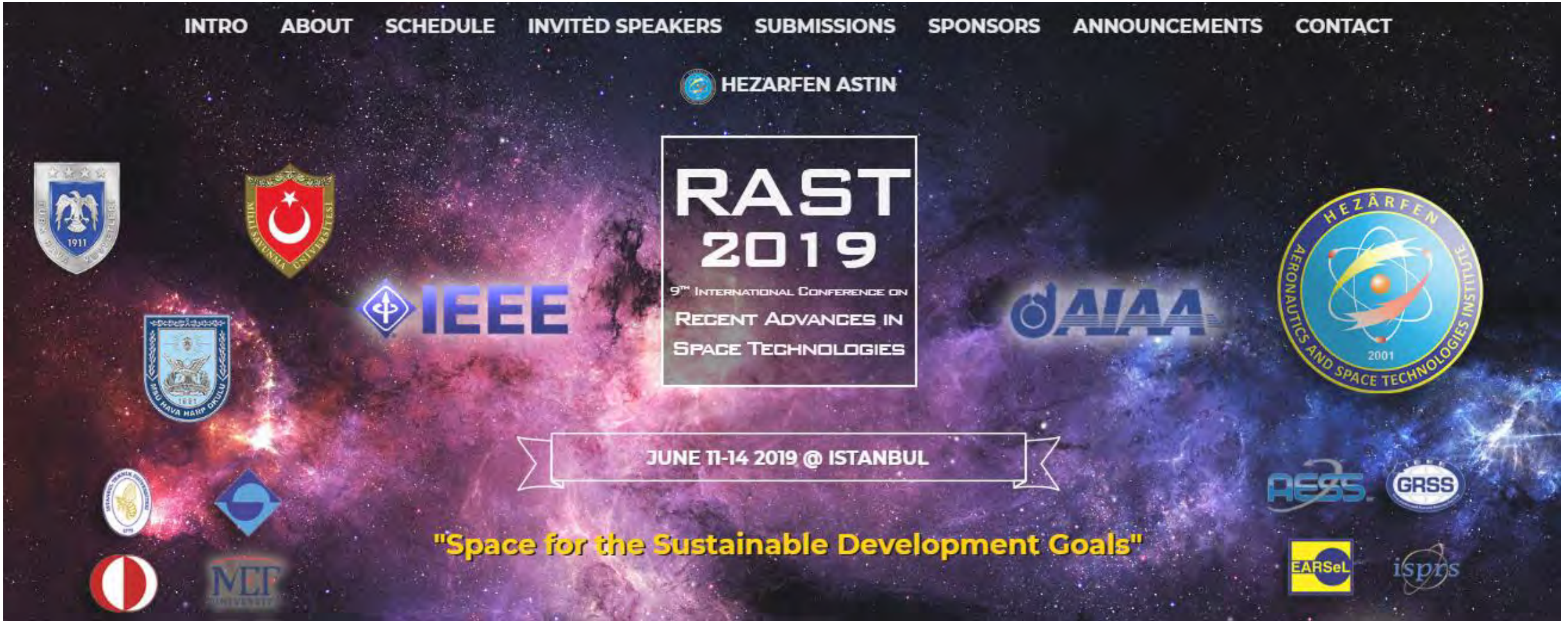


All BIRDS students are enrolled in SEIC – Space Engineering Int'l Course of Kyutech – as either master course (2 years) or Phd course (3 years) students. As this pie chart shows, they come from all over the world. Some are from Japan, but most are from overseas.

If you wish to enter SEIC, please contact the editor.

Total : 68 students, as of Fall of 2018

03. Call for papers: RAST 2019 in Turkey



Important Dates:

- Special session proposals 04 February 2019
- Submission of full papers 18 March 2019
- Notification of acceptance 22 April 2019
- Submission of camera-ready full papers 27 May 2019

http://www.rast.org.tr/

04. End-of-2018 message received from DOST of the Philippines

20 December 2018

Dear Prof. Maeda,

It brings me great pleasure to be afforded the opportunity this holiday season to greet people who have been instrumental to our success. I know that the year 2018 is fruitful because we each did our part to enhance science and technology in the Philippines and improve the opportunities available for Filipino scientists.

I am very pleased to present to you the 2018 Annual Report of the Science for Change (S4C) Program:

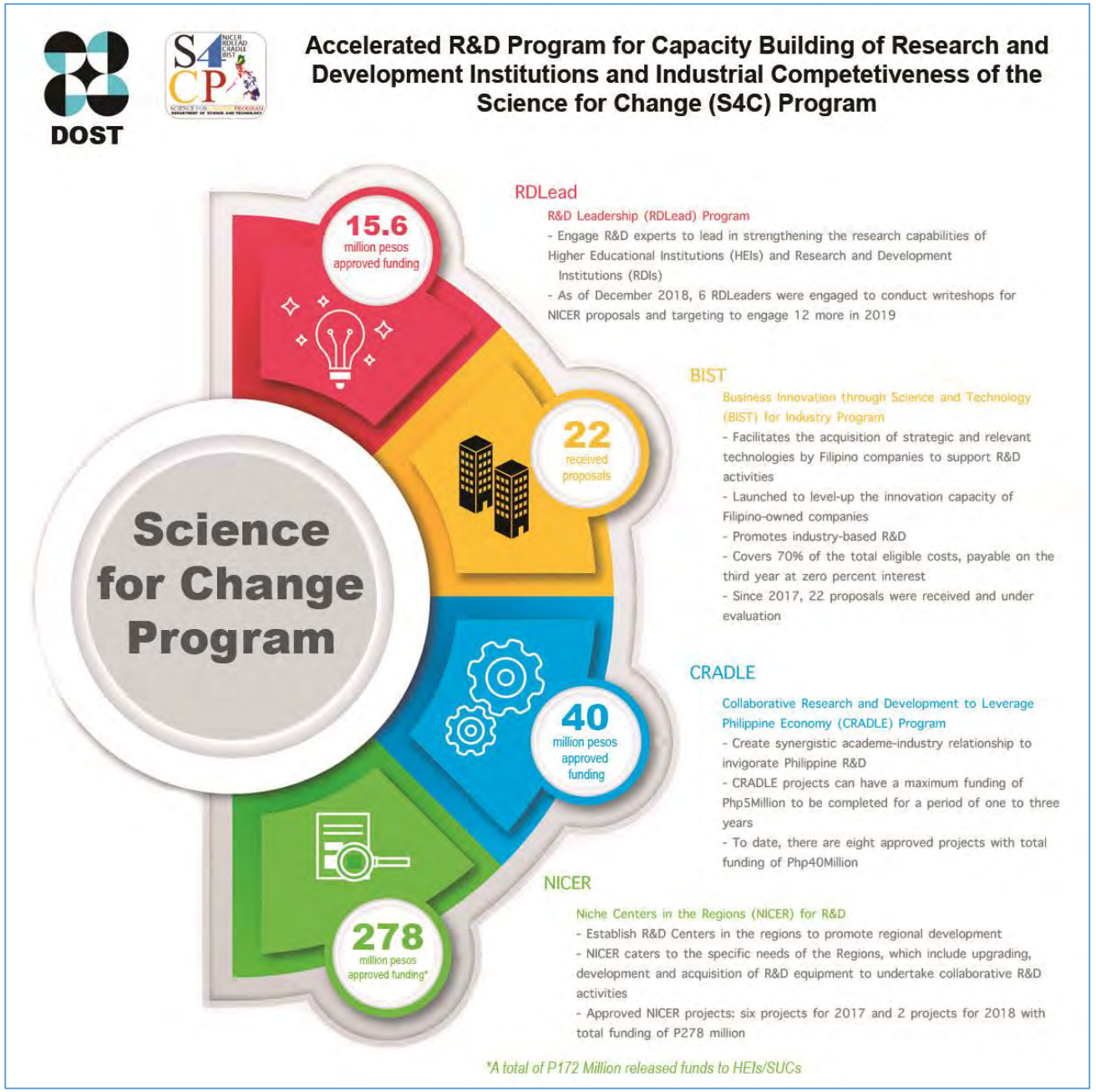
[image: at the right]

I truly hope that with these accomplishments, you will be inspired to continue to partner with DOST and work to bring science to the people in 2019 and in the years to come!

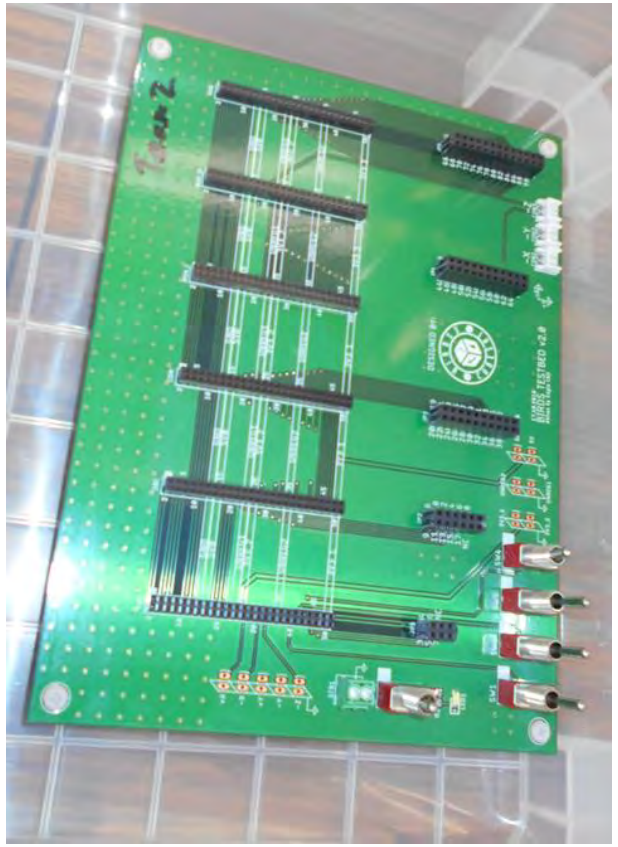
Sincerely yours,

ROWENA CRISTINA L. GUEVARA
Undersecretary for Research and Development
Department of Science and Technology

Editor's note: DOST is a major funder of BIRDS activities in the Philippines.



05. Mission board contest of PBL – winner will fly aboard BIRDS-4



This emulates the BIRDS-4 backplane. Each PBL team has received one. Each team will use its emulator to test its mission board.

Three teams of PBL Class of Fall 2018 are in competition

This year at SEIC we are trying something new. Instead of the PBL class entering MIC (Mission Idea Contest), it will compete to fly aboard BIRDS-4 satellites (a constellation of three 1U Cubesats). The PBL class (instructor is G. Maeda) for Fall of 2018 has 12 students. They have formed three teams. Each team is tasked with coming up with a mission idea, and then implementing it in hardware and software. It must be built on a PCB within a specified budget. The results of the three teams will be evaluated by Kyutech staff. One will be a winner. The winner will make three boards to fly on BIRDS-4 spacecraft.

SEIC

Space Engineering International Course

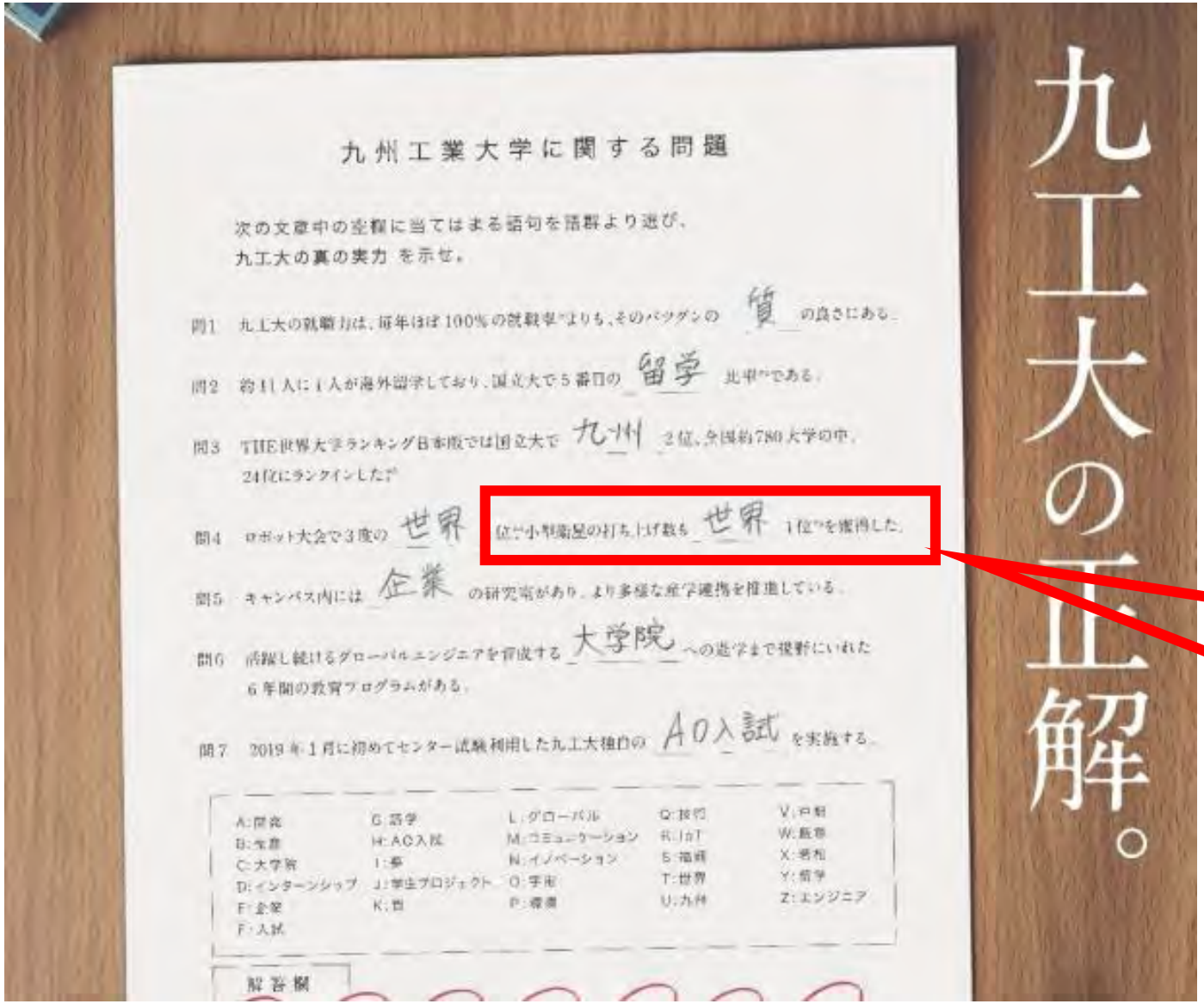
On 19 Dec. 2018, Dr Kim (in yellow jacket) of LaSEINE showed the PBL students their work area. They need to time share the space.

06. Kyutech as No. 1 in the world: Top academic operator of small satellites

This grand news was originally presented on **Page 51 of Issue No. 35 [last month] of the BIRDS Project Newsletter.** The news is that Bryce Space and Technology has declared that Kyutech has launched more small satellites than any other university in the world.

This is a screen shot of Kyutech's main website on 20 Dec. 2018.

Kyutech nano satellites flying in space – the clustered ones are BIRDS



This full-page ad by Kyutech appeared in newspapers all though out Japan on 5 Jan. 2019 to encourage students to enter Kyutech for college.

Mentioned here is the No. 1 ranking of Kyutech in terms of small sat launches among academic operators

SEE THE BRYCE REPORT

BRYCE SPACE & TECH: See page 17 of 22:
https://brycetech.com/downloads/Bryce_Smallsats_2018.pdf

Go here to see the entire Kyutech newspaper ad
http://www.kyutech.ac.jp/information/seikai.html

07. IAF Abstract Mentor Programme

AMP

IAF Abstract Mentor Programme - Deadline: 19 February 2019

The International Astronautical Federation has implemented an Abstract Mentor Programme (AMP): an extra support for authors with limited or no experience of submitting an abstract for the International Astronautical Congress.

The goal of the mentor programme is to help authors present their material clearly and concisely, before their abstracts are submitted for the formal abstract review process.

The deadline to submit your draft abstract for the AMP is 19 February 2019, 23:59 CET.

More information can be found at http://www.iafastro.org/activities/iaf-abstract-mentor-programme/
Questions should be addressed to amp@iafastro.org

08. New Year Greetings from Nepal

24 Dec. 2018; Dear All,

Greetings from Nepal Academy of Science and Technology (NAST).

We would like to wish you all a Merry Christmas and Prosperous New Year 2019.

Warm wishes from
Ms. Neesha Rana
Chief
Planning and Evaluation Division
++++++++++++++++++++++++++++++++++++
Nepal Academy of Science and Technology (NAST)
Khumaltar, Lalitpur, Nepal
GPO Box 3323, Kathmandu, Nepal

Editor's note: Nepal is a member of BIRDS-3

OLAYINKA'S WORLD

COLUMN NO 6

OLAYINKA FAGBEMIRO
NATIONAL SPACE RESEARCH & DEVELOPMENT AGENCY(NASRDA), ABUJA. NIGERIA
PRINCIPAL SCIENTIFIC OFFICER, HEAD, SPACE EDUCATION UNIT

Year 2018 in Retrospect . . .

The year 2018 started out on a very high note for the Space Industry in Nigeria. There were a lot of activities all through the year. From school Space Education outreaches to major Astronomy events such as the Lunar Eclipse, Mars Rising, International Observe the Moon Night among others.

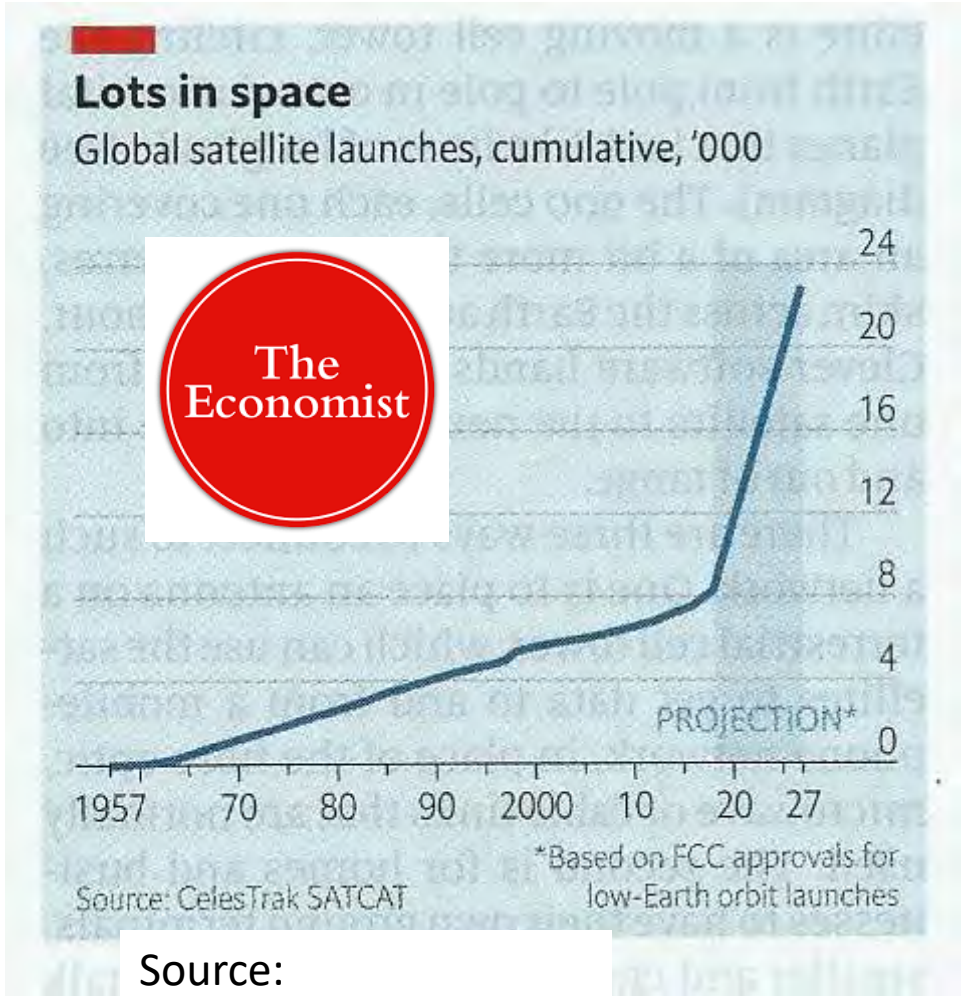
Another major feat for the National Space Research and Development Agency (NASRDA) is the visit of the Canadian Governor General, former Astronaut Julie Payette on the 29th October, 2018. Her Excellency, Julie Payette CC CMM COM CQ CD (born October 20, 1963) is the current Governor General of Canada, the 29th since Canadian Confederation. Before assuming office, she was a businesswoman, former member of the Canadian Astronaut Corps, and engineer. From 1992 to 2013, Ms. Payette worked as an astronaut and flew two missions in space. She also served many years as CAPCOM (Capsule Communicator) at NASA's Mission Control Centre in Houston, Texas, and was Chief Astronaut for the Canadian Space Agency.

The National Space Research and Development Agency (NASRDA) got the approval for the start of the Institute for Space Science and Technology which would commence academic activities in January, 2019 with the pioneer set of students.

The Astronomers Without Borders (AWB) Nigeria also had her end of the year get together hosted by the Patron of the organization in Nigeria.

Continued on the next page

10. Global satellite launches: the past and the future



Source: https://celestrak.com/

← This graph is from Page 22 of *The Economist* (8th Dec 2018).

Up til 2019 is recorded history; source is Celes Trak.

Beyond 2019 is a projection; it is based on FCC approvals for LEO launches. *As you can see, 2019 is a pivotal year for the space industry.*

11. Season's Greetings from the JAXA Office in Bangkok

Bangkok from space – photo from Wikipedia

The overseas offices of JAXA:
http://global.jaxa.jp/about/centers/resident/index.html

12. Season's Greetings from AEP

AEP is the national space agency of Paraguay. AEP is the Paraguayan member of the BIRDS-4 Project.

This message came from Colonel Vielman, who heads the AEP.

13. Evolution of Committee on the Peaceful Uses of Outer Space (COPUOS)

UNITED NATIONS
Office for Outer Space Affairs

About Us | Our Work | Benefits of Space | Information for... | Events | Space Object Register | Docu

Our Work > Secretariat of COPUOS > Member States and Observer Organizations > Membership Evolution

Committee on the Peaceful Uses of Outer Space: Membership Evolution

Year	No. of Committee Members	General Assembly Resolution/Decision	Members
1958	18	GA resolution 1348 (XIII)	**Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia (*now Czech Republic and Slovakia*), France, India, Iran, Italy, Japan, Mexico, Poland, Sweden, the Union of Soviet Socialist Republics (*now Russian Federation*), the United Arab Republic (*now Egypt*), the United Kingdom of Great Britain and Northern Ireland & the United States of America**
1959	24	GA resolution 1472	**Albania**, Argentina, Australia, **Austria**, Belgium, Brazil, **Bulgaria**, Canada, Czechoslovakia

http://www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html

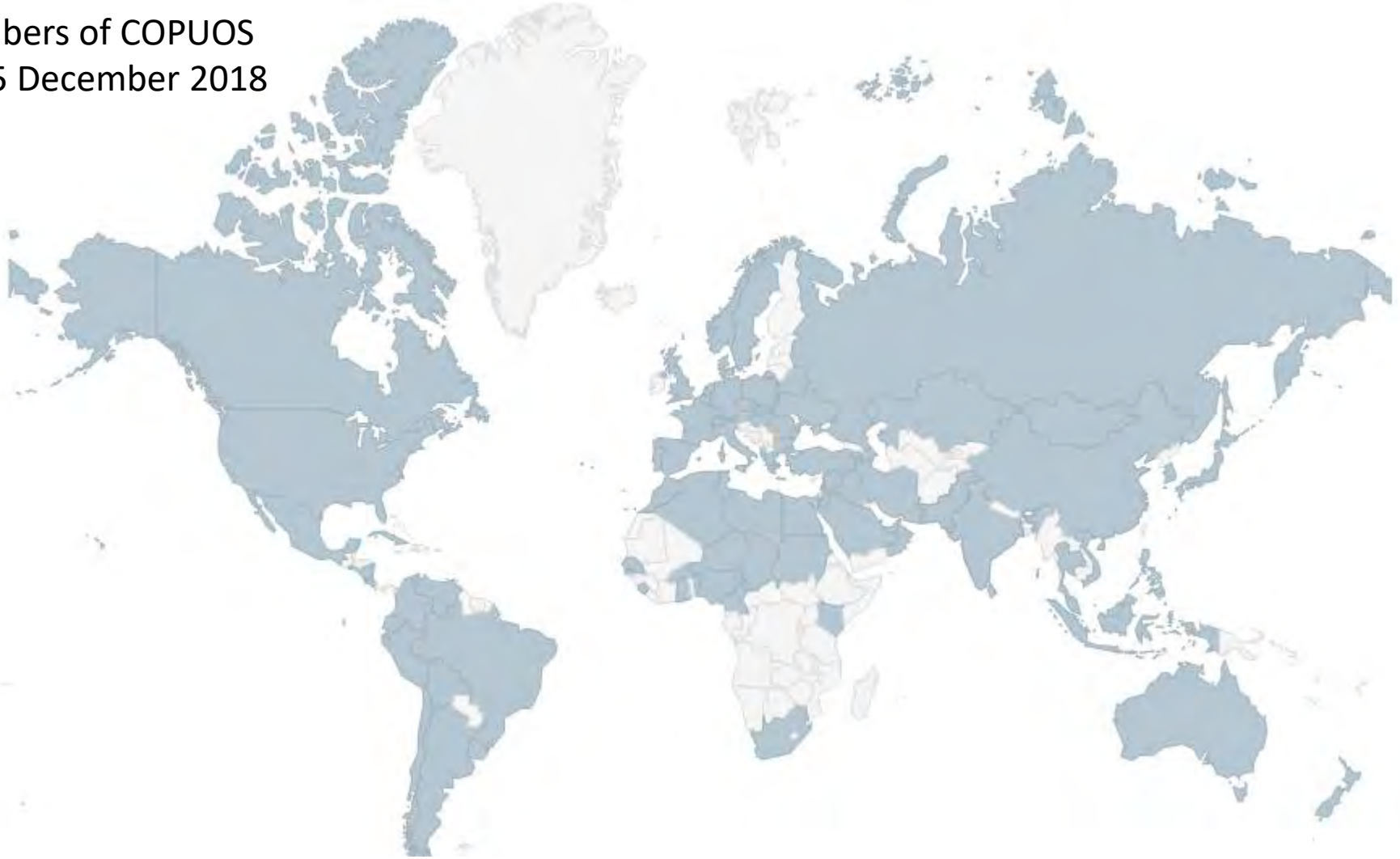
This is an interesting web page. It shows the evolution of COPUOS since 1959, when it was formed by 24 nations of the UN.

Today, COPUOS has grown to 87 members [see the next page].

Is your country a member?

COPUOS in session

Members of COPUOS
on 25 December 2018



COPUOS meets in
Vienna, Austria

http://www.unoosa.org/oosa/en/members/index.html

14. An introduction to the beauty of Kyushu Island – why it is worth touring

A Photo Essay: Kyushu, Heaven on Earth

Amazing Kyushu

九州

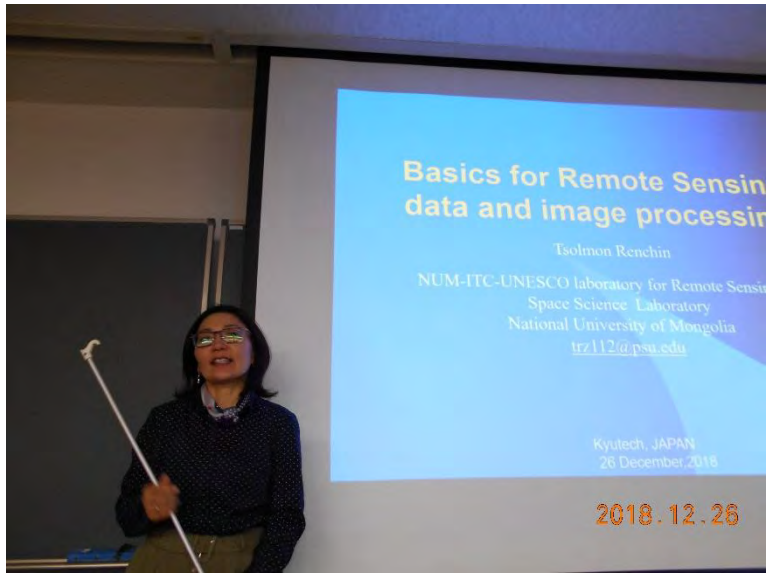
SEIC

by G. Maeda for Kyutech SEIC students, 18 December 2018

Kyushu is a most under-rated region of Japan. So I made this 29-page pdf to introduce our students to its marvels.

https://birds3.birds-project.com/wp-content/uploads/2018/12/Kyushu_for_SEIC.pdf

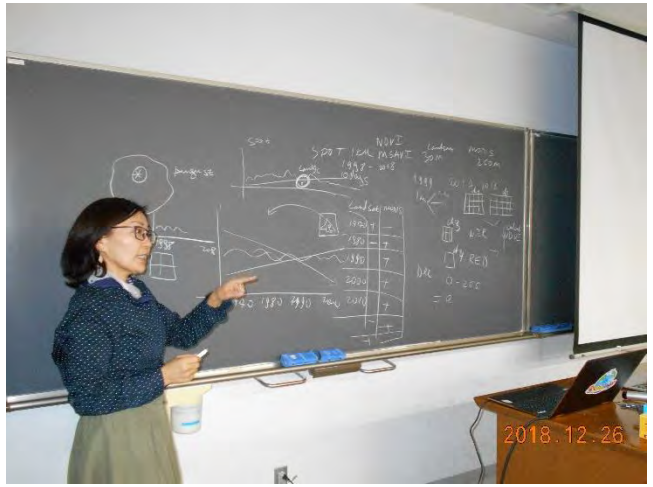
15. Prof. Tsolmon (National Univ. of Mongolia) gave lecture on remote sensing



Prof. Tsolmon (PI of Mongolia BIRDS-1) delivered two 90-min. lectures, and received a lot of questions.

26 Dec. 2018

for the students of SEIC



National University Of Mongolia

Motto	*Эрдмийн хэт цахиваас, хөгжлийн гал бадармой* *The flame of progress flourishes from the forge of education*
Type	public university
Established	1942
President	Ya. Tömörbaatar[1]
Academic staff	797 [2] (part-time 290, other 723)
Undergraduates	15,889[2]
Postgraduates	2,961[2]
Doctoral students	791[2]
Other students	406 international students, 18 language preparatory students [2]
Location	Ulaanbaatar, Mongolia 47.9231°N 106.9213°E

FROM:
https://en.wikipedia.org/wiki/National_University_of_Mongolia

16. Second African Space Generation Workshop, 2018 . . . . . photos from Taiwo

Dr Danielle Wood and Dr Tejumola Taiwo

Event web site:
https://spacegeneration.org/event/af-sgw-2018

17. Reminder about the 70th International Astronautical Congress 2019, IAC in the USA

http://www.iafastro.org/wp-content/uploads/2018/11/IAC2019_Abstract_Submission_FAQ.pdf

http://www.iafastro.org/events/iac/iac-2019/

18. JAXA video on recent CubeSat deployments from the ISS

JAXA has placed on to YouTube a video about recent CubeSat deployments: Irazu, 1KUNZ-PF, BIRDS-2, etc.

JAXA video (under 6 minutes)
https://www.youtube.com/watch?v=0nCtkqLAyIE
[日本語]

19. The second ground station workshop of Kyutech; and update on the BIRDS ground station network

See the full report of the first ground station workshop

22 January – 01 February, 2018

See pages 44-63 of **BIRDS Project Newsletter No. 25.**
http://birds1.birds-project.com/newsletter.html

The second workshop occurs on these dates:

23 – 28 January 2019

And it is sponsored by the following:

JSPS 独立行政法人 日本学術振興会
Japan Society for the Promotion of Science

Kyutech
Kyushu Institute of Technology

La SEINE
Laboratory of Spacecraft Environment INteraction Engineering

Cont'd on the next page

Expected outcomes of the second ground station workshop

Primary expectations

1. Train participants on general aspects of ground station operation
2. Preparation for ground station network operation of BIRDS-3 satellites
3. Draft of standardized store-and-forward (S&F) mission data format

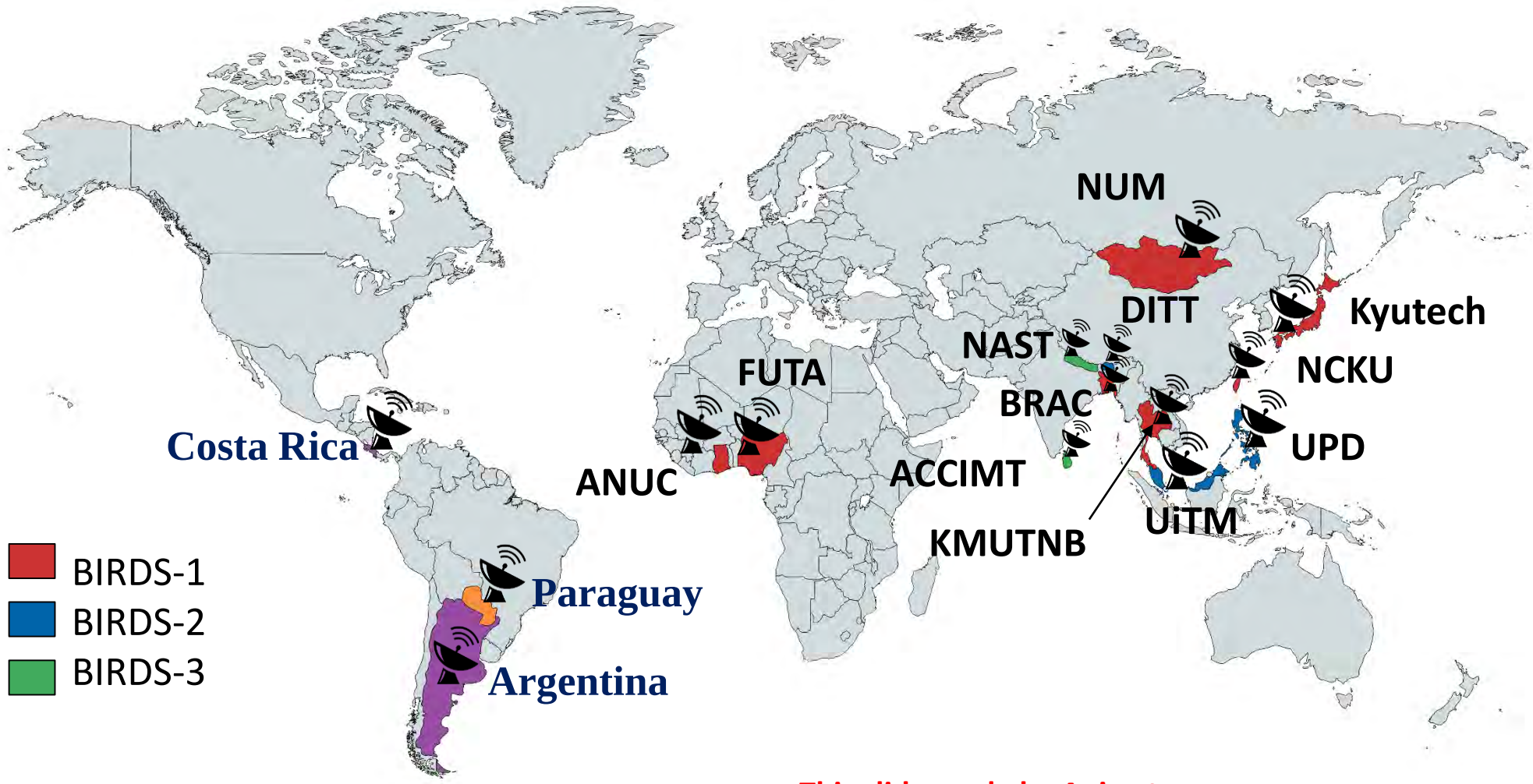
Secondary expectations

- Documentation for constellation operation in BIRDS GS network
- Discussion of lessons learned from previous ground station operations and improvements (which should be reflected in a GS operation manual)

Update on the BIRDS ground station network

The slides of the following pages are from Apiwat [BIRDS-1, Thailand]

BIRDS Ground Station Network Members



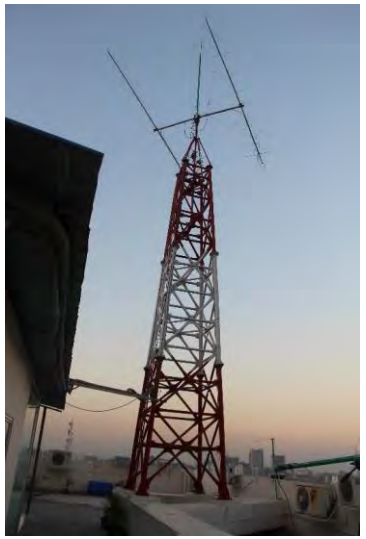
https://mapchart.net

This slide made by Apiwat

Some BIRDS Ground Station Network Members

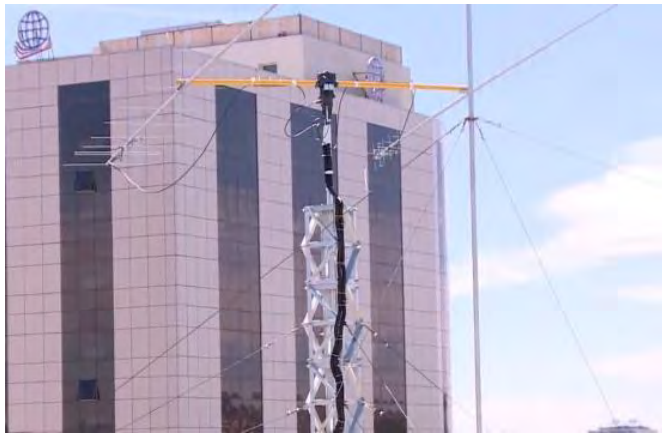
Japan

Ghana



Bangladesh

This slide made by Apiwat



Mongolia

Thailand

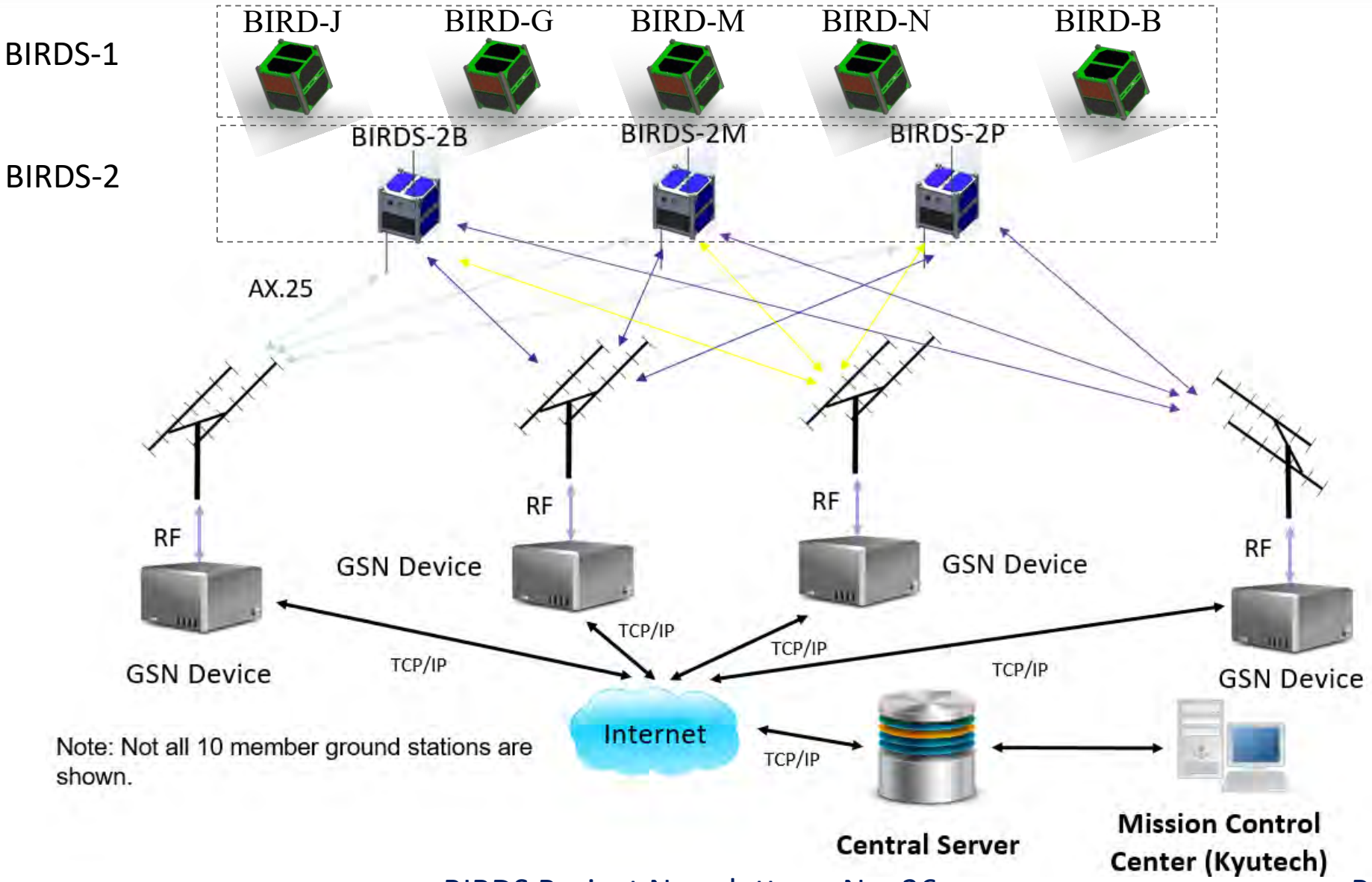
Malaysia

Philippines

Bhutan

System Architecture and Configuration

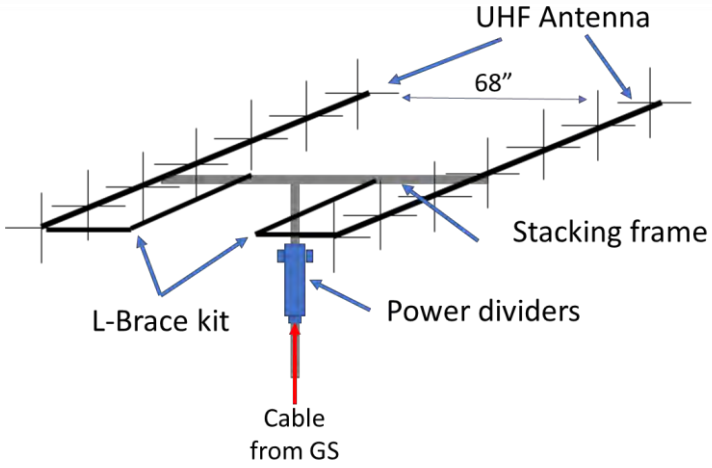
This slide made by Apiwat



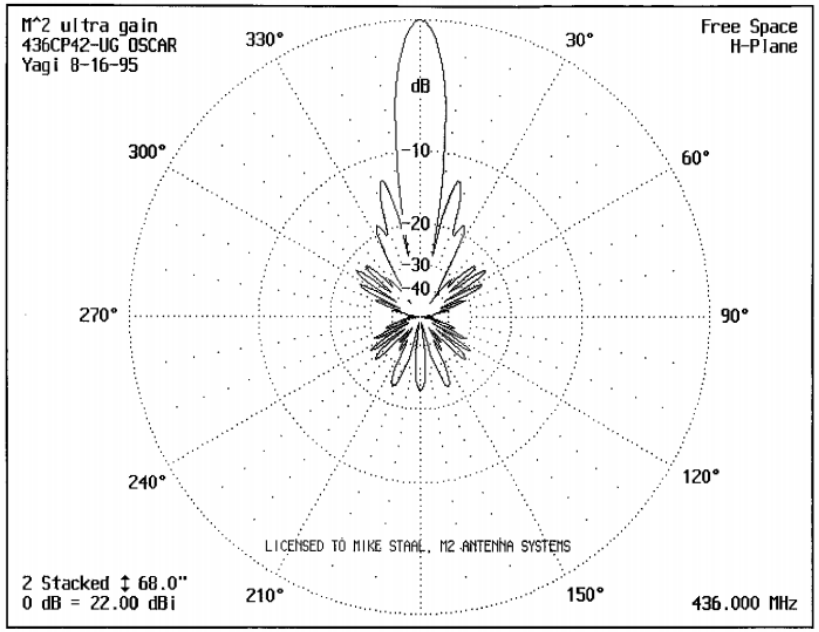
Improvement of BIRDS GS

This slide made by Apiwat

- Antenna upgrade
  - 2 array of UHF cross Yagi
  - Increase gain from 18 → 22 dBi
- Rotator upgrade
  - Improve pointing accuracy from 10 → 1 deg
  - Soft start/stop function → smooth tracking
- Will install in Jan 2019



Antenna rotator



Antenna pattern

APRS New Configuration Test Report

Test Date: 24th December, 2018
BIRDS-2 Project
by Yeshey [Bhutan] and BIRDS-2 Team on 10 January 2019

Objective

The objectives of this test were to:

- Measure the performance of the new configuration for APRS mission operation
- Compare with the old configuration
- Determine if it is advisable to implement the new configuration in BIRDS 2 ground station operation for APRS mission

Old Configuration

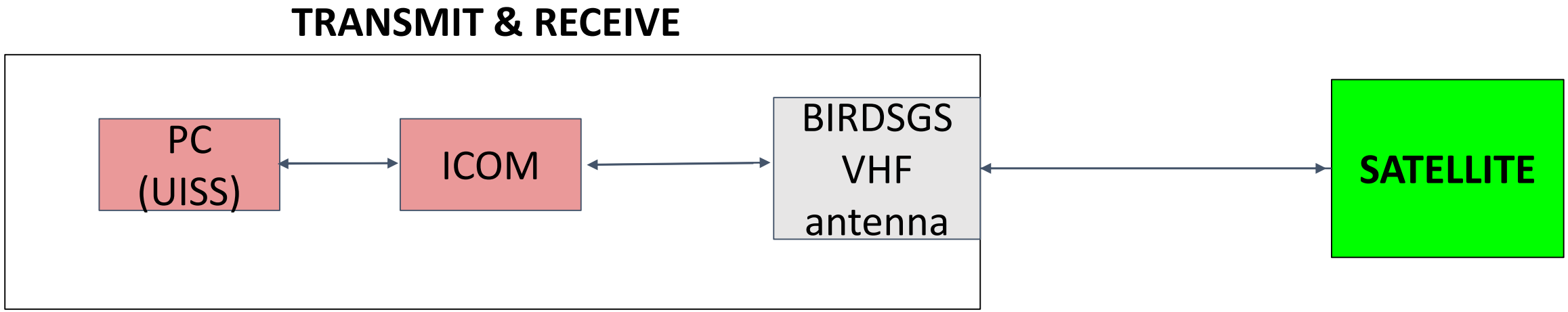


Figure 1: APRS mission old configuration

New Configuration

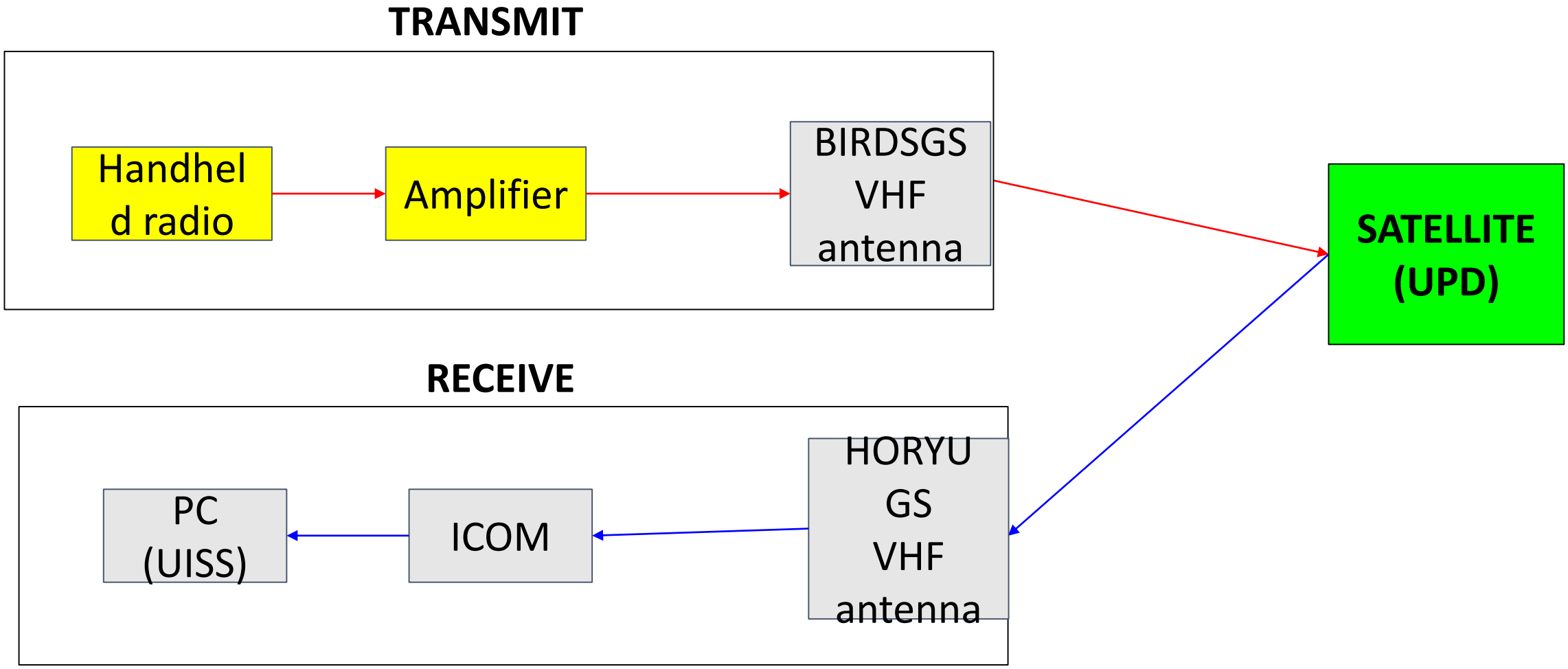


Figure 2: APRS mission new configuration

Procedure

- Test articles were setup as shown in the figures above (both old and new configuration)
- UPD satellite was placed at SEIKYO 2nd floor
- The power received at the satellite end was measured using spectrum analyser
- APRS DP functionality was tested for varying transmit powers (use attenuator to change the transmit power)

Test setup showing satellite (left) at Seikyo 2nd floor and at Kyutech Ground Station (above) on top of LaSEINE's building

Conclusion

- The new configuration showed better power received at the satellite end
- The team decided to use the new configuration for future satellite operations from Kyutech

21. Kyutech President mentions BIRDS-2 in annual new year message

From page 2 of「明専会報 Kyutech Journal」, Issue 898, Jan-Feb 2019. This journal is published for the benefit of Kyutech alumni.

This message by the president is continued on the next page.

新年おめでとうございます。

本学は今年２０１９年に創立110年を迎えます。これも明専会および会員の皆様方の永きにわたる本学の教育研究活動への格別のご理解並びに多大なるご支援の賜物と心より御礼申し上げます。

著しい技術革新とその社会への浸透が、大きな社会変革の原動力となりつつあります。特に、計算機の処理能力の飛躍的な向上とそれを背景にしたＡＩおよびビッグデータ活用は、産業分野のみならず我々の社会生活においても大きな変革をもたらしています。社会は、多様な価値を包含しており、それらは時間とともに変化しています。このような状況において、九州工業大学は、未来を見据えて、大学の社会的価値を高め、新たな価値を創造するために「未来を思考する『モノづくり』と『ひとづくり』」を行って参ります。

学生諸君は、昨年も学生プロジェクトに積極的に応募し、平成30年度は20件が採択になりました。その中でも『Hibikino-Musashi@home』はカナダで開催された「RoboCup 2018」において２連覇、10月に開催されたＷＲＳでも優勝し、世界大会において３連続で優勝するなど大きな成果を残しています。

教育の国際化についても継続して推進しています。平成29年度には600名を超える学生諸君が海外での学習を経験し、平成30年度も引き続き多くの学生が企業インターンシップを含め海外で貴重な経験をしています。平成28年のデータが公開され、学生の海外派遣率は国立大学で５番目に

Website of Meisenkai in English:
http://www.kyutech.ac.jp/english/campuslife/alumni-association.html

高いことが分かりました。宇宙工学国際コースのフィリピン、マレーシア、ブータン、日本の学生が開発した3機の超小型人工衛星が昨年8月に宇宙空間に放出されました。ブータンにおいては、初の衛星開発であり、まさに国を挙げて喜んでいただきました。

さらに、昨年度、本学の学生を海外の機関の教員と共同で指導する国際協働研究指導支援制度を新たに設け、平成29年は7件、平成30年は11件を採択しました。

研究分野においては、引き続き、大学組織レベルで国際共同研究プロジェクトを支援しており、台湾科技大およびマレーシアプトラ大学との共同研究もますます活性化しており、今年度も8件の連携を実現しています。継続的で豊かな大学間連携が築かれることを期待しています。

昨年度スタートした企業の研究者が学内に常駐し研究活動を推進する共同研究講座も平成30年度に新たに6件を設置、現在8件の共同研究講座が稼働しています。キャンパスがさらに多様化し、新たな相互作用が生じることを期待しています。

BIRDS-2 nations are mentioned here.

本学卒業生とのネットワークも、本学の貴重な資産と理解し、海外の研究機関および高専で勤務している卒業生との共同研究を平成28年度から支援しています。昨年度は13件、今年度には31件を採択しました。今後、更にネットワークを広げていきたいと思っています。

このような様々な活動を通じ、研究の国際化が進展し、本学の国際共著論文が占める割合および論文あたりの引用数に関して、日本全体の平均を上回りました。

また、職員が誇りをもって働ける職場づくりにも引き続き取り組んでいます。

このような国際競争力のある教育研究活動を通して、かけがえのない大学で在り続けるために、学内外での対話の機会を増やし、本学の社会的価値をさらに高めるとともに、多様な組織と豊かな価値を共有していきたいと考えております。

最後になりましたが、皆様方が、多くの良き機会に恵まれ、実り多き年となりますことを祈念いたします。今年もよろしくお願い申し上げます。

End of message

VISIT TO SPACE SYSTEM LAB, UNIVERSITI SAINS MALAYSIA (USM)

28 NOVEMBER 2018

Prepared by: Siti Amalina Enche Ab Rahim, *D. Eng*
Research Coordinator
Center for Satellite Communication
Faculty of Electrical Engineering, Universiti Teknologi MARA (UiTM)
14.January.2019

Dr. Siti Amalina Enche Ab Rahim was invited by Space System Lab, Universiti Sains Malaysia (USM) to be the panel for High Altitude Balloon (HAB) USM project during the CDR. She was also invited as a guest lecturer, where she gave a lecture on the UiTM Satellite Ground Station.

Students were presenting the technical details of their HAB project.

Lecture on UiTM Satellite Ground Station, where I also shared the success story of BIRDS-2 project.

VISIT TO KYUTECH

12-17 DECEMBER 2018

Prepared by: Siti Amalina Enche Ab Rahim, *D. Eng*
Research Coordinator
Center for Satellite Communication
Faculty of Electrical Engineering, Universiti Teknologi MARA (UiTM)
14.January.2019

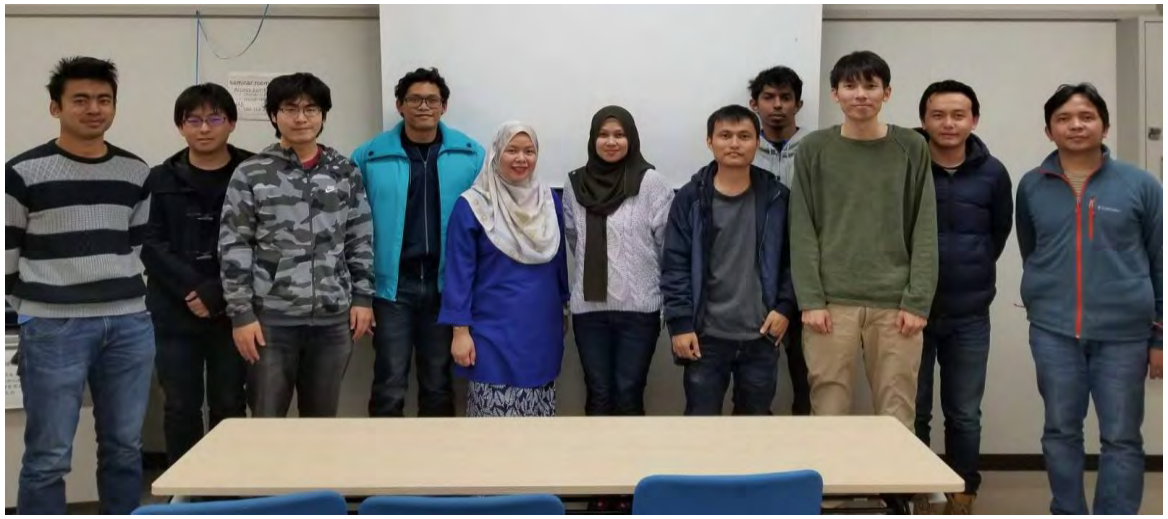
On 12 – 17 December 2018, Dr. Siti Amalina Enche Ab Rahim visited Kyushu Institute of Technology (Kyutech).

The purposes of this visit are; 1) to learn more about BIRDS project, 2) to be a guest lecturer and 3) to present her abstract at the 6th Symposium on Applied Engineering and Sciences (SAES 2018).

She also took the opportunity to meet the BIRDS-2 team members, to visit the lab facilities and to discuss on the study progress of Mrs. Syazana Basyirah Mohamad Zaki, who is a member of Malaysian team in BIRDS-2 project.

1. Guest Lecture: RF Transceiver System Design for nanosatellites

The lecture was attended by BIRDS members. The topic of the lecture is : RF Transceiver System Design for nanosatellites applications.



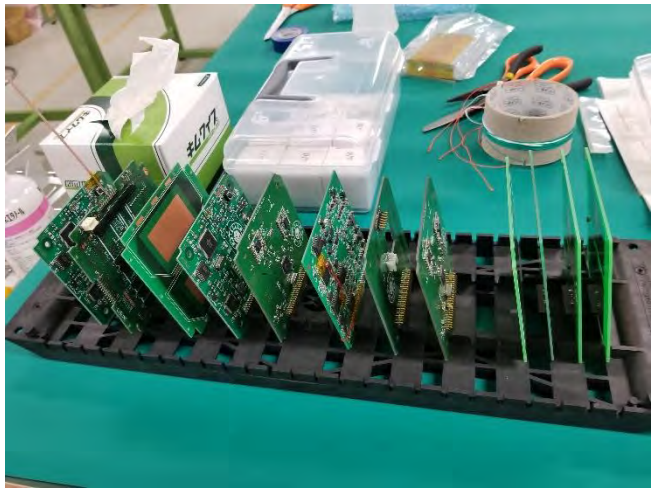
With the students. Thank you very much for your time, I enjoyed having discussion with you guys.

2. *Lab visit : LaSeine, CENT, Cleanroom*

Mrs. Syazana Basyirah brought Dr. Amalina for a lab visit. They visited the LaSeine lab where Dr. Kim explained about the equipment in the lab. Then the visit continued to CENT and the cleanroom.

With Kim sensei. Thank you for the tour.

With Syazana at CENT



With some of BIRDS-3 members. They were preparing for FM. Mina-san, gambatte kudasai.

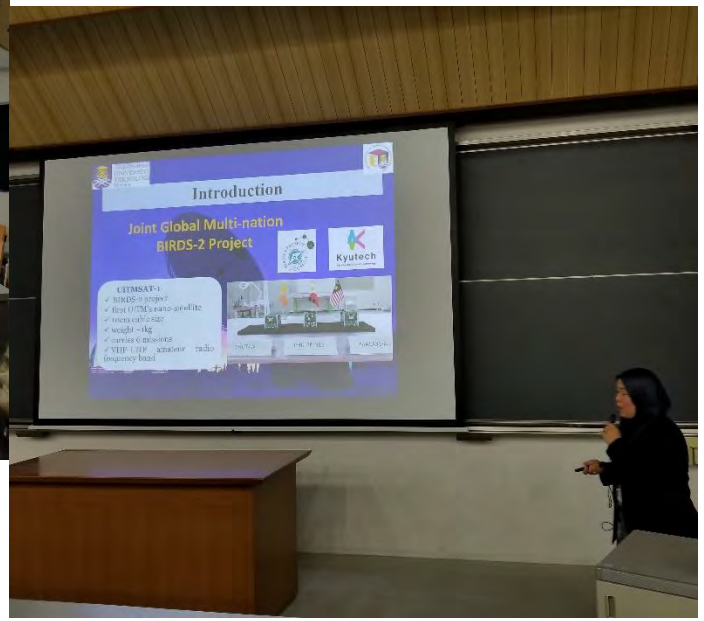
3. The 6th Symposium on Applied Engineering and Sciences (SAES 2018)

The symposium was held for two days, started with the opening ceremony. It was followed by the technical sessions. Dr. Amalina was invited to chair one of the technical sessions. She also presented her abstract on the "Preliminary Performance of UiTMSAT-1 by Observation at UiTM ground station".

SAES 2018 Opening Ceremony, attended by the President of Kyutech and Vice Chancellor of Universiti Putra Malaysia.

Chaired the technical session

Me in action!



Presenter

3. The 6th Symposium on Applied Engineering and Sciences (SAES 2018)

At the end of the symposium, there were poster presentations by students. During the closing ceremony, she grabbed the opportunity to meet the President of Kyutech and the Vice Chancellor of UPM.

Student poster presentation. There were some interesting topics that are related with my research work.

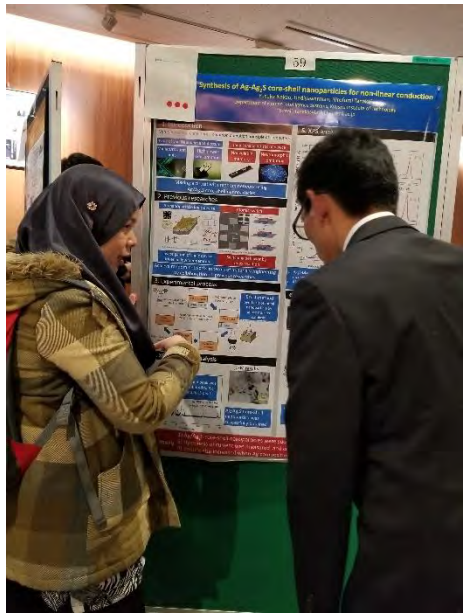


Photo session with President of Kyutech

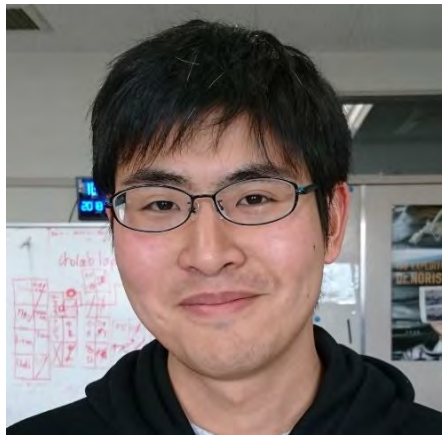
Photo session with Vice Chancellor and Deputy Vice Chancellor of Universiti Putra Malaysia

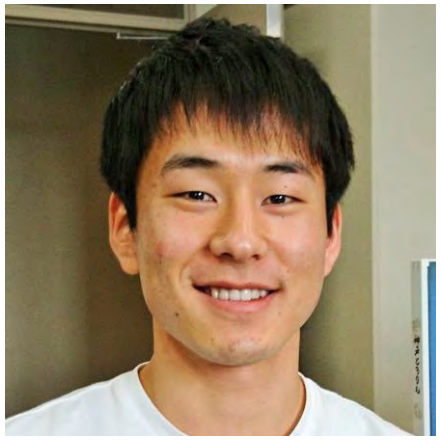
END OF REPORT FROM UiTM

Reports for the BIRDS Project Newsletter

January 15, 2019

BIRDS-4 contributions – Issue No. 36





BIRDS-4 Mission Definition Review (MDR) Presentation

Daisuke Nakayama, Yiğit Çay, Tomoaki Murase

BIRDS-4

January 5, 2019

BIRDS-4 MDR Presentation

Written By: Daisuke Nakayama

Mission Definition Review (MDR) is the review meeting for checking what are the missions of a satellite. Each mission needs to satisfy stakeholder needs and to have a research background to make sure its feasibility. MDR is the first step for realizing a satellite project. The definitions and design idea modifications are finalized during the MDR.

MDR of BIRDS 4 was held on December 28, 2018. The project has got 3 main and 4 sub missions. BIRDS 4 is planned to include 1 PBL mission. This is the first attempt at BIRDS 4 in the history of satellite development at KyuTech. The PBL mission is chosen by the competition of three teams. There were 10 mission presentations in total and the review started at 1 pm and was done until 6 pm.

Izrael started BIRDS-4 MDR meeting at 1:00 PM.

MDR presentation started with BIRDS 4's mission statements and objectives. **The overall objective** of BIRDS project is *making the first step towards creating an indigenous space program by designing, building, testing, launching and operating, the first satellites for participating nations.* **BIRDS-4 aims** *to build Paraguay's first satellite while improving the standardized bus system for future missions…*

…and give continuity to the satellite development of Japan and Philippines, and previous missions from BIRDS-1, 2 and 3. In this issue, the missions defined in MDR are presented one by one in dedicated articles. The satellite missions presented at MDR are listed as follows:

Main Missions

- Camera mission
- Store and Forward
- *APRS-Digipeater*

Sub Missions

- Total Ionizing Dose Measurement
- Hentenna
- Perovskite Solar Cell
- Active Attitude stabilization and Control

Mission competition of PBL teams

- Organic Polymer Solar Cell
- Solid State Battery
- On-board image classification

BIRDS-4 MDR: PBL Presentations

Written By: Yiğit Çay

Project Based Learning, known as PBL, is a compulsory course for the students of KyuTech. In this course, students are involved in a space project where they can actively work and develop their own project ideas.

For the 3rd and 4th quarter of educational terms, LaSEINE decided to provide the chance to PBL students to participate in a competition to design a mission board of BIRDS-4. Conditions of the mission board and the capabilities of BIRDS-4 satellites are explained to the students in detail, at the beginning of the course led by Assist. Prof. Dr. George Maeda. 12 students were divided into 3 groups and they presented their ideas after BIRDS-4's MDR presentation had finished.

Team 1 students are presenting their mission ideas with the title of "Demonstration and Characterization of Organic Polymer Solar Cell in Space".

The first team presented their idea of utilizing an onboard experiment to characterize organic polymer solar cells exposed to the space environment. As the team members pointed out, the demonstration of these cells is the hot topic at the moment considering the publication of Cardinaletti et al., 2018 in which the results of the stratospheric mission, OSCAR are presented.

Although their short lifespan, the organic solar cells are promising in terms of being lightweight and easy to manufacture with their low cost. Team 1 proposed to monitor the space environment effects by recording the changes in output parameters of organic cells attached to the satellite body.

Team 2 students are presenting their mission ideas with the title of "Study of The New Energy Storage Solid State Battery Performance for Space Application on Cube Satellites".

BIRDS-4 MDR: PBL Presentations

Written By: Yiğit Çay

The second team introduced the solid-state batteries and proposed the demonstration in space environment using BIRDS-4 satellites. Currently, Li-ion rechargeable batteries are the technology of choice for the majority of aerospace applications. Due to the rising demand for a small-sized, lightweight, safer and high-capacity of energy storage (battery) that can support space missions compared with the current energy storage, solid state batteries has risen to become a candidate for the next generation batteries. The team thinks it is required to collect performance evaluation data in order to make this technology useful for future spacecraft usage. Proposal includes the demonstration of the battery as well as the data comparison with the onboard batteries.

The third team proposed to add the capability of image classification and indexing to the onboard camera. In order to stay in the limits of CubeSat standards, the team thinking of optimizing the data to be downlinked.

The team pointed out the image classification has never implemented in BIRDS projects. With this system, the command to the satellite is given to take a photo in a regular frequency, a couple of minutes, then the classification is going to be performed using the DSP algorithm. They defined the categories of classifications and described the algorithmic logic of each of them. For the identification of color and shape features respectively color histogram and mathematical morphology are planned to be utilized.

Proposed ideas are considered as candidates for BIRDS-4 project and found promising although the teams have received questions and suggestions by the participating students and staff, just as the BIRDS-4 team during their MDR presentations. The competition is going to be finalized before March and the team members of the winning team are going to have a chance to become team members of BIRDS-4.

Team 3 students are presenting their mission ideas with the title of "Onboard Image Classification".

BIRDS-4 Post-MDR Party

Written By: Tomoaki Murase

For the afterwards of BIRDS-4's MDR presentation, Mark and I organized a party with a theme of BIRDS-3 send-off and end of BIRDS-4 MDR presentation. Students from PBL competition groups were also invited.

We ordered 14 pizzas with different flavors. Pizzas were made with American, Italian, and Japanese styles. Pizza prepared with only cheese and vegetable were served as the halal food. Although the number of pizzas was too many for the all participants, they almost managed to finish everything because they were tired and hungry after a long day. We also provided some liquors, so everybody was smiling during the event.

Digging in to pizzas!!!!

Feeling so happy

Everyone was smiling during the event.

BIRDS-4 … party continued

Written By: Tomoaki Murase

Group photo taken during the party. BIRDS-3, BIRDS-4 and PBL team members were altogether.

BIRDS-4 members gave lucky charms (お守り [Omamori] in Japanese) to BIRDS-3 members – see the next page. Lucky charms are Japanese amulets commonly sold at Shinto shrines and Buddhist temples, dedicated to a particular Shinto god as well as Buddhist figures, and are said to provide various forms of luck or protection. We thought lucky charms would be a nice, ceremonial gift to be given according to the responsibilities in the team. For example, the project manager of BIRDS-4 presented a lucky charm to BIRDS-3's project manager and each subsystem's responsible member did the same. They seemed pretty happy to receive these gifts. After completing this little ceremony to strengthen our bonds between two teams, we took some group pictures.

We would like to present our ceremonial photos from the event starting from

Project Management – from Izrael to Abhas

BIRDS-4 … party continued

Envelopes are explained on the previous page

Written By: Tomoaki Murase

EPS – from Hari to Pooja

Ground Station – from Nakayama to Kishimoto

ADCS – from Hisatsugu to Dulani

COM – from Marloun to Tharindu

OBC – from Adolfo to Kakimoto

Structure – from Yigit to Sasaki

Outdoor Communication Test of BIRDS-2 APRS-DP/S&F Payload

Marloun P. Sejera

January 9, 2019

Outdoor Communication Test

Written By: Marloun P. Sejera

To better understand the series of activities to be conducted in the development of BIRDS-4 satellites, members began to consult with senior BIRDS members. The seniors have shared their best practices in working with subsystems and mission payload, as well as issues they encountered and how they were able to resolve them. They even invited BIRDS-4 members to join them on experiment and test activities.

I joined Adrian of BIRDS-2 in the outdoor communication test of APRS-DP/S&F payload. The test was conducted on Sunday morning of December 2, 2018 at an open ground of KyuTech Tobata Campus. This test would provide engineering insights on how to improve the payload for BIRDS-4. The test setup consisted of two communicating sides: Ground Sensor Terminal (GST) side and satellite side with the said payload.

At the GST side, a handheld radio (HHR) was used as radio transmitter. To supplement the signal attenuation due to physical distance between two sides, attenuators were connected to the output of HHR before the signal emission using a dipole antenna. A laptop (GST PC) was used to generate packets to be sent. It also counted the number of acknowledgment packets received from the payload. This would quantify the downlink success rate.

Setup at the ground sensor terminal side

Setup at the satellite side

At the satellite side, the payload would receive packets from GST side and send an acknowledgement packet for any successful reception. A laptop (SAT PC) connected to the payload by serial interface monitored the number of successfully received packets to quantify the uplink success rate. Also, a spectrum analyzer was used to measure the received signal strength.

BIRDS 4 Camera Mission

Mark Angelo C. Purio

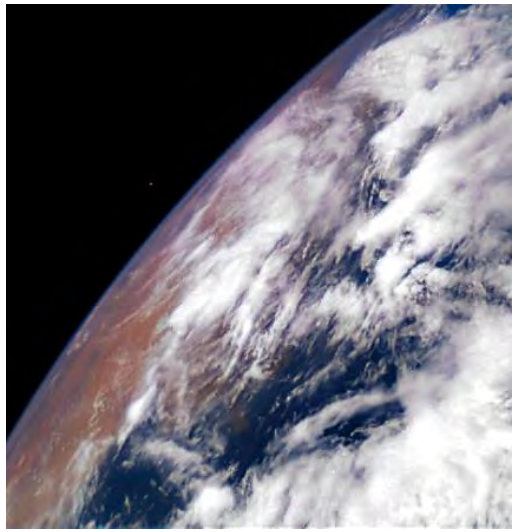
January 11, 2018

BIRDS 4 Camera Mission

Written By: Mark Angelo C. Purio

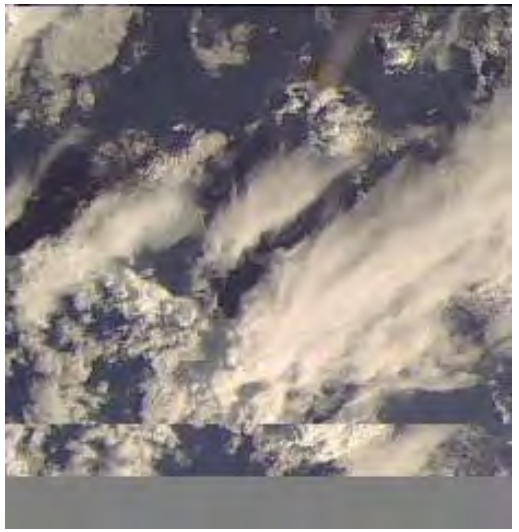
A photo taken by a satellite and received in a ground station is one tangible proof of its functionality. While satellite imagery pose great importance in several different applications, a camera payload despite of CubeSat's size limitations should still provide data that can later on be processed and used.

In the context of putting camera payload in the BIRDS 4 CubeSat, its importance lies on the fact that photographs taken for participating countries (Japan, Paraguay and Philippines) are part of the stakeholders' requirement. In this regard, this mission shall require the satellite to capture images of the member countries and be able to transmit it for further processing.



The first picture taken by the amateur radio CubeSat ESTCube-1 [image ref]

Masat-1 first photographs taken during flight [image ref]



Picture taken by Fox-1D AO-92 on January 13, 2018 [image ref]

The photos shown are some examples of the first photographs recently taken by various CubeSats currently orbiting Earth. Amazing as it is, camera missions still face challenges in implementation and integration in the whole CubeSat system.

Aside from being a mere part which takes photos for the satellite, image data taken by this payload will allow documentation of CubeSats' actual release from ISS and a tool to check the attitude of the satellites.

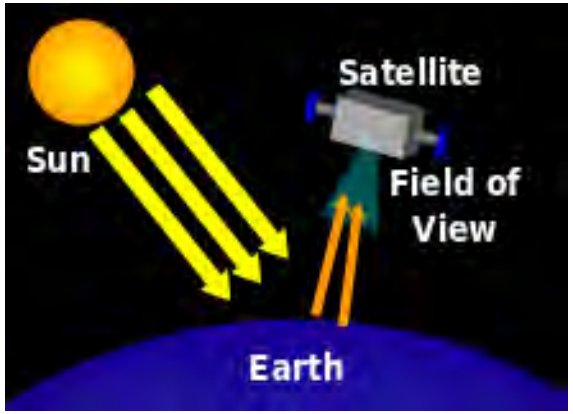
BIRDS 4 Camera Mission

Written By: Mark Angelo C. Purio

Aside from what was previously stated, the camera mission has the following educational merits for its stakeholders:

- Offers a great deal of importance in terms of media information, dissemination of information, and educational encouragement.
- Raise technological and scientific interest not only for the member countries but also for the global community.
- Provides tangible representation that the satellite functions accordingly, therefore raising awareness about satellite technology.

With the aforementioned merits, it is important that the camera mission be designed in such a way that its modes of implementation, hardware considerations and software execution are integrated properly and working effectively.



Simple illustration on how the camera captures photo of the Earth. Source: https://en.wikipedia.org/wiki/Nadir

To address the requirement of the stakeholders, the camera mission will be composed of a camera module (CMOS IC & Optical Lens), a memory and a microprocessor. Moreover, the following modes are considered: Normal, Continuous, Target and Timed.

How taking pictures from space works?

As it is expected that the satellite will be approx. 400 km, and given that it orbits around Earth, taking photos form space will be a lot trickier than merely taking it on ground.

Since it is expected that the camera mission shall take photos of the participating countries, the mission needs the exact location of the country and be taken by the camera as the satellite points to Earth. In order to increase the field of view of the camera, therefore covering larger areas, special lens will also be used. Moreover, a microprocessor will be used to execute taking photos in either single shot or burst and implementing different algorithms. The captured photos are them saved to the memory and be sent to the ground when communication is available between the satellite and ground station.

As BIRDS-4 Satellite project progresses, more information about the camera mission will be disclosed.

BIRDS-4 S&F-WARD Mission

Adolfo Jara, Izrael Zenar Bautista

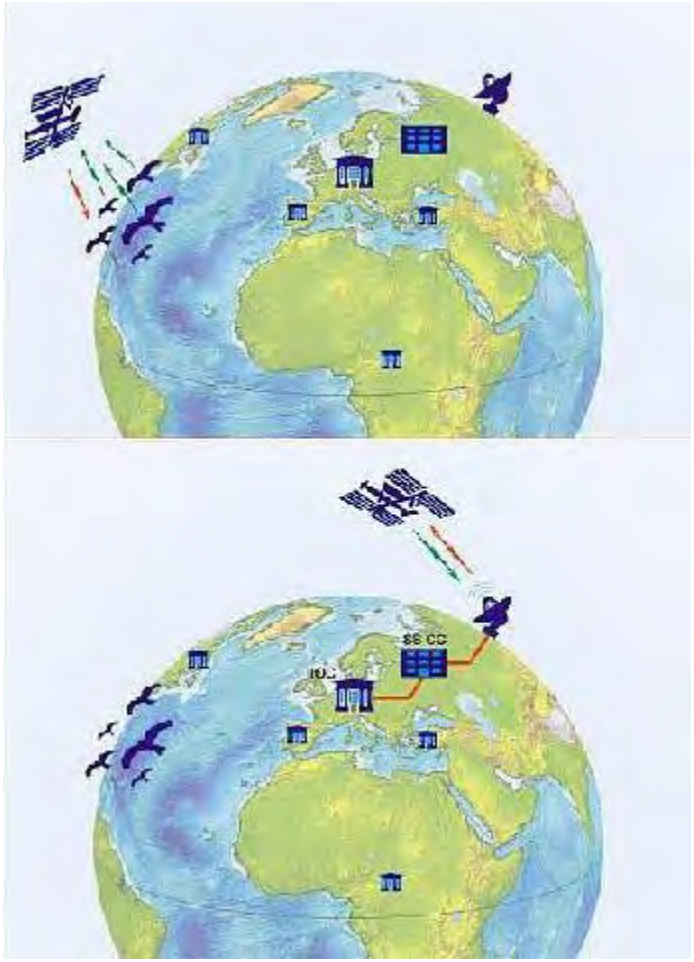
BIRDS-4

January 7, 2019

Store-and-forward (S&F) Satellites

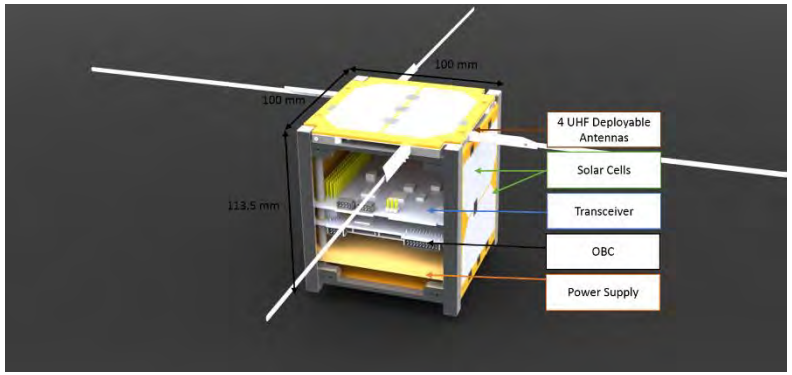
Written By: Adolfo Jara

Store-and-forward is a technique used in telecommunication systems. It depends on the idea of an intermediate station that receives data from the transmitting station and transmits to the station that needs to be reached by the first station. The station verifies the integrity of the data before forwarding. Store-and-forward satellites inherit this technique by using a satellite as an intermediate station. Especially for the LEO satellites having high speeds that result in fast reaches to the target station's area, a COTS (Commercial off-the-shelf) communication port may be added for a cheaper communication solution compared to what is needed on the ground.



https://directory.eoportal.org

Store-and-forward satellites are usually used to collect data from remote areas. Portable data collecting and transmitting devices not requiring long maintenance services are put these regions. Satellite crossing above these areas collect the data onboard it received from the remote area sensors' transmitters and when the downlink communication link is established with the ground station, the onboard data are forwarded.



Yiğit ÇAY, Isai Fajardo TAPIA, Jesus GONZALEZ-LLORENTE, Juan J. ROJAS, Marcos HERNANDEZ HERRERA, Nicolas JOURDAINE. "Jaguar Monitoring Store-and-Forward Satellite: JaguarSAT"

S&F of Weather And Re-infestation Data (WARD)

Written By: Adolfo Jara & Izrael Zenar Bautista

In the Philippines:

Department of Science and Technology-Advanced Science and Technology Institute (DOST-ASTI) has scattered weather data sensors in Philippines, currently, more than 1800 sensors are installed using the advanced remote data-acquisition unit (arQ) which can simultaneously measure wind speed and direction; air temperature; air humidity; air pressure, among others. The data from the sensors are transmitted using SMS.

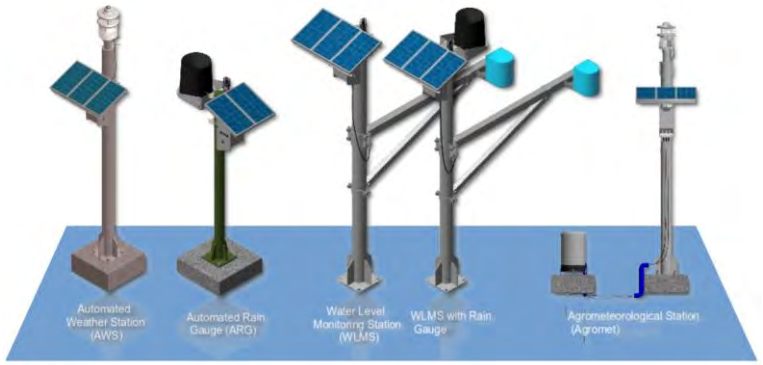


Image taken from: [1] Combinido,J.S., "Quality control on observations from the ASTI-developed weather stations", Asia Pacific Advanced Network 44, 2017

In Paraguay:

The Paraguayan Chaco records the highest historical levels of infection with vinchuca and presents in the country the highest endemic for Chagas Disease. The National Chagas Disease Control Program works actively to eliminate T. infestans from houses and their surroundings through chemical controls with insecticides. To detect re-infestation, a wireless network of sensors that detect the presence of the insect is currently used, this detection information is transmitted to the research centers through SMS, which means that its use is limited to areas with cellular coverage.

Image source

The danger to lives caused by Chagas disease in Paraguay and Weather calamities in the Philippines presents the need for scientists to forecast these events using the data of remote sensors located in far areas not reached by terrestrial networks, but we hope can be sent through BIRDS-4 satellites.

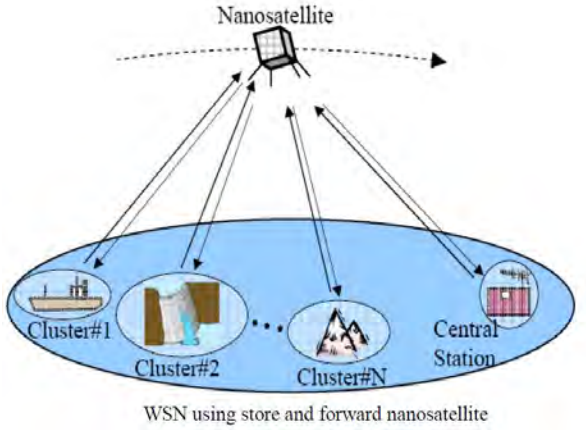


Image taken from: A. Addaim, A. Kherras and Z. Gennoun., "Design of WSN with Relay Nodes Connected Directly with a LEO Nanosatellite", Int. J. of Computer and Communications Engineering, Vol. 3, No. 5, September 2014.

BIRDS-4 APRS-Digipeater Mission

Izrael Zenar Bautista

BIRDS-4

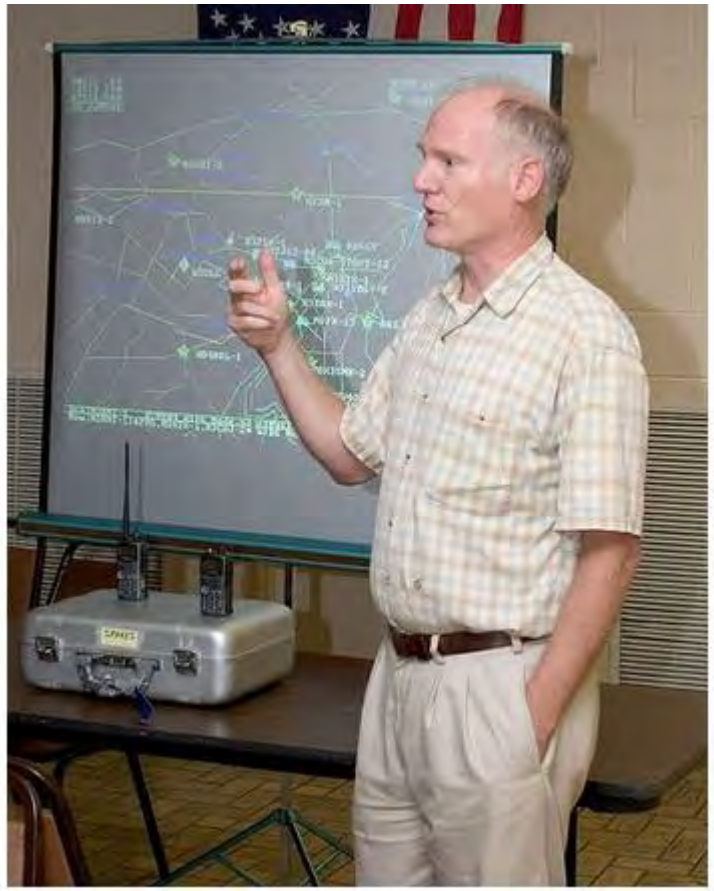
January 5, 2019

What is APRS and Digipeater?

Written By: Izrael Zenar Bautista

The Automatic Position Reporting System or APRS, created by Bob Bruninga, is a digital radio communication system for the real-time exchange of information among members of a "net" or group of amateur radio users. This information includes position, messages (SMS or E-mail), weather information and other telemetry data to all members of the network. The information can be displayed using a computer and mapping software and can be used in a number of ways.

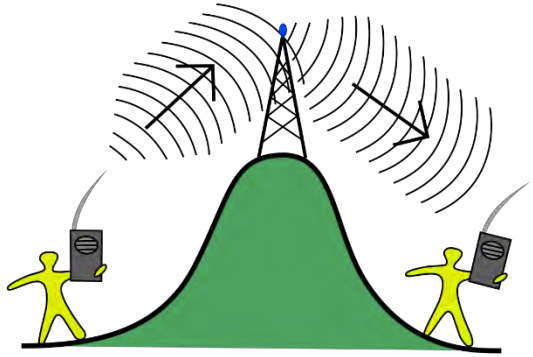
APRS can be used for disaster management, search and rescue, public service events, logistics management and utilization of telemetry data transmitted, such as weather information.



Mr. Bob Bruninga, creator of APRS
Image from: https://qrznow.com/us-naval-academy-cubesat-launch-to-include-next-aprs-satellite/

A digipeater by definition is a station performing the digital repeating. It means that it receives and transmits a digital signal at the same frequency, unlike voice repeaters which usually operate in the full-duplex mode where the receive and transmit frequencies are different.

This allows information from one user to travel greater distance not reached by the radio's capability due to power and location constraints.



Simple diagram of a digital repeater or digipeater
Image from: http://w4wvl.weebly.com/repeater.html

Why put an APRS-Digipeater in BIRDS-4?

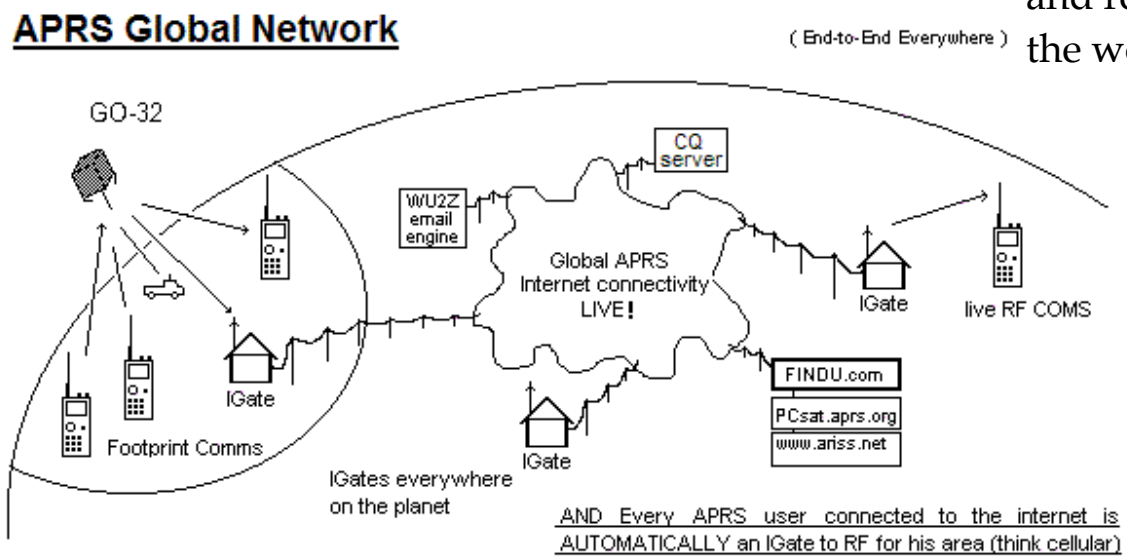
Written By: Izrael Zenar Bautista

By putting an APRS-Digipeater in a satellite, the effective area is further increased. This means more users get updated by the packet sent by the source versus terrestrial digipeating. In addition to this, the satellite can, therefore, be used for self-improvement and learning by the amateur radio community, achieving one of its goal of outreach and service to the masses.

This mission will also demonstrate the functionality of low-cost commercial-off-the-shelf (COTS) components in actual space environment. This will give heritage to these components for future satellite projects that have similar goals to this mission.

How it works?

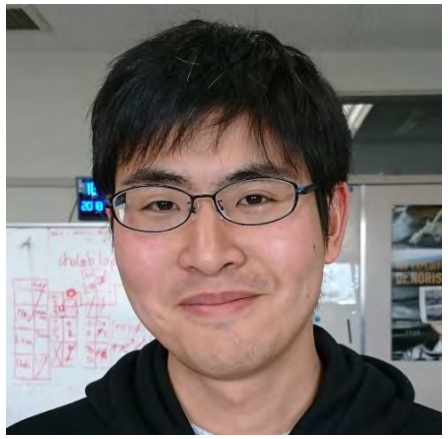
An APRS user or station broadcasts packets of information. This is received by local and decoded by nearby users/stations while a digipeater like the BIRDS-4, receives the packet and upon learning it is a packet to be digipeated, it is rebroadcasted based on the routing path the user instructed. Using internet gateway stations or IGates, the on-air APRS network is connected to the internet to the APRS Internet System (APRS-IS) which further extends the reach of the APRS network making it possible to send and receive information from anywhere in the world every time the satellite passes.



The APRS network
Image taken from: Bruninga, B., 2014, APRS Frostfest 2015

Although APRS has worldwide connectivity, it is primarily designed to be optimal for short-distance real-time crisis operations.

The BIRDS-4 project hopes to provide this useful capability that is useful especially during disasters and relief operations.



BIRDS 4
Hentenna Mission

Mark Angelo Cabrera Purio, Daisuke Nakayama

January 15, 2019

BIRDS 4 Hentenna (HNT) Mission

Written By: Mark Angelo Cabrera Purio & Daisuke Nakayama

An antenna is a metallic structure that captures and/or transmits the electromagnetic waves. Antennas come in all shapes and sizes from the little ones that can be found on your roof to watch TV to the really big ones that capture signals from satellites millions of kilometers away. Having said that antennas come in different shapes and sizes, one may encounter a different kind of antenna, which is called "Hentenna".

Described first in the 1970s by Japanese amateur radio community, a Hentenna is a special kind of a single loop which literally translates as strange ("Hen" in Japanese) antenna. The benefits of this type of antenna are good performance in terms of gain, low angle radiation, and total performance; easy to program, and easy to build up.

Actual Hentenna Prototype

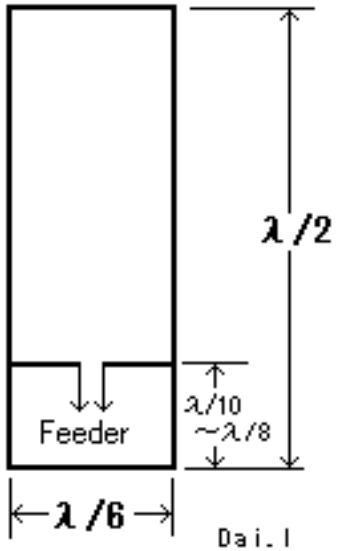
Actual Loop Hentenna Prototype

Why use a Hentenna in space?

With the good points stated, the implementation of the Hentenna in a CubeSat and being able to use it in space may be a viable option in order for the CubeSat to communicate to ground stations.

Using a 1U aluminum frame as a loop antenna placed around the CubeSat structure, the goal of the mission is to demonstrate a new antenna configuration that can be used in space.

Currently, the team is working with its feasibility to check whether it can be integrated with the CubeSat structure, taking into consideration its performance and how it will affect the other parts of the satellite.



Hentenna structure.
Image Source:
https://as76.net/en/ant/hentenna.php

Reference Links:

1) http://rfanat.qrz.ru/s4/hent.html
2) http://www.hamuniverse.com/hentenna.html
3) https://www.qsl.net/dk7zb/Quadlong/Hentenna.htm
4) https://as76.net/en/ant/hentenna.php
5) https://www.nasa.gov/directorates/heo/scan/communications/outreach/funfacts/txt_antenna.html

BIRDS-4 ADCS Mission

Hiroki Hisatsugu, Yuma Nozaki

BIRDS-4

January 11, 2019

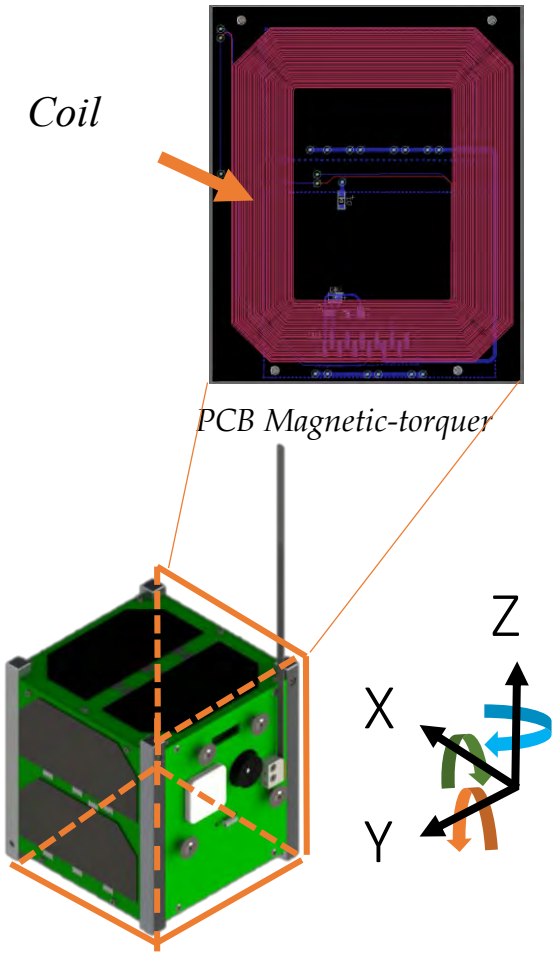
BIRDS4 ADCS Mission

Written By: Yuma Nozaki

ADCS (Attitude Determination and Control System) is an important subsystem for achieving satellite missions.

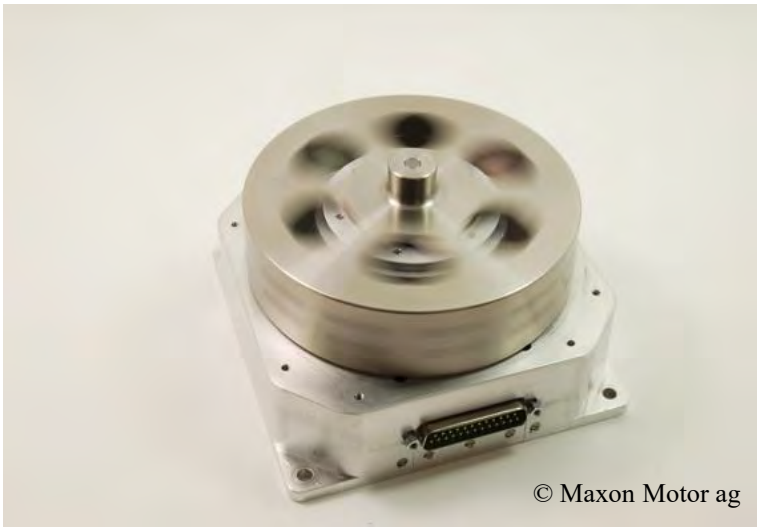
In BIRDS 4, it is closely related to the camera mission and it is the key to the success of the mission. If you do not control the attitude of the satellite, the mission will not succeed because you can not continue to point the camera in the direction of the Earth.

There are various actuators used for attitude control, magnetic-torquer and reaction wheel are introduced in this article. Magnetic-torquer is a type of electromagnet that controls the rotation of the spacecraft using the torque that is acted on by geomagnetism and magnetic moment.



Three-axis magnetic-torquer mount on structure

The reaction wheel with the flywheel attached to the end of the motor as shown in the figure controls the rotation of the spacecraft by using the reaction torque accompanying the change in the rotation speed of the motor.



Reaction wheel

BIRDS4 ADCS Mission

Written By: Hiroki Hisatsugu

In BIRDS-3 satellites, only attitude stabilization control is performed using magnetic-torquer. This has the effect of facilitating shooting of cameras and transmission and reception of radio waves by controlling the angular velocity of the satellite to be reduced by using the geomagnetic sensor and three-axis magnetic-torquer.

For BIRDS-4, one of the camera missions is to take photos of the participating countries. This requires attitude control to point the camera to the ground. Active pointing control requires a single-axis reaction wheel in addition to three-axis magnetic-torquer.

A commercial-off-the-shelf (COTS) motor shall be used a reaction wheel.

Attitude determination is needed in order for successful attitude control. To do so, sensors such as sun sensor, geomagnetic sensor, gyro sensor are used to determine the satellite's position. After calculations, actuators shall help in pointing the camera towards the ground.

Currently, BIRDS-4 are considering COTS CD drive spindle motor to be used as reaction wheel. In order to verify whether it can be used in space, durability test shall be conducted by placing the motor inside a vacuum chamber.

CD drive spindle motor to be used as a reaction wheel

Solar cells Attachment Procedure of BIRDS-3

Hari Ram SHRESTHA

BIRDS-3/4

January 12, 2019

Solar cells Attachment Procedure

Written By : Hari Ram Shrestha

On November 2018, Nepal, Sri Lanka and Japan team members finished the solar cells attachment for BIRDS-3 satellites in the clean room. Solar Cells attachment procedure is one of the important and critical activity since the solar cells are very expensive. In BIRDS-3, Pooja coordinated the solar cell attachment. All team members attached their own country's satellite. Abhas and Hari worked for Nepalese, Dulani and Tharindu for Sri Lankan and Kakimoto, Sasaki and Makiko for Japanese. Since she solar panel is fragile, this work is tough.

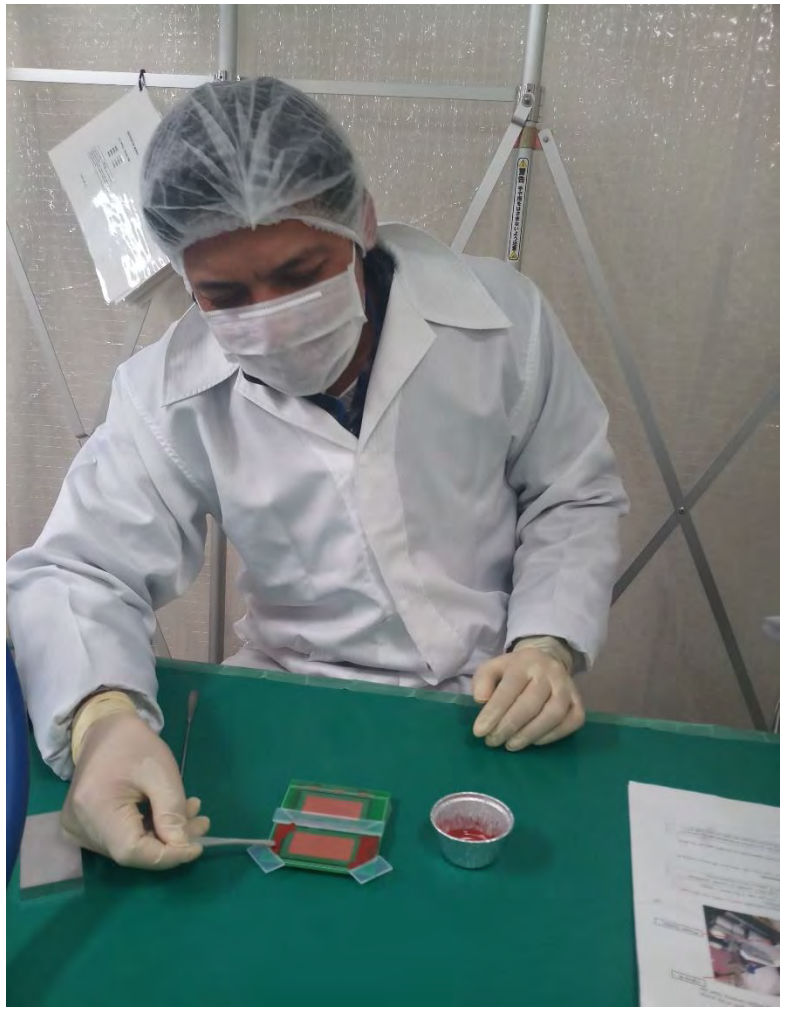
The solar cells after being attached to the PCB

In order to correctly attach a solar cells and prevent it from breaking, Pooja had prepared a new solar cell attachment procedure incorporating a Silicon jig that prevented the solar cells from sliding. The procedure was strictly followed during the attachment session.

[*RTV= Room-Temperature-Vulcanizing]

1. Preparation:
   a. Wear the clean room attire (rubber gloves, hair cap, surgical face mask, dustproof coat, slipper)
   b. Check grounding (table, personnel etc.)
   c. Check all the required tools are available and places on the working space (spatulas, polyimide tape, measuring scale, cotton swabs, cutter and /or scissors, wipes, Ethanol, PCBs, Solar cell, RTV, conductive glue, Vacuum machine, Weights, silicon jig, soldering station with paste, Trash bag)
2. Clean all the tools and PCBs with isopropyl alcohol
3. Measure the weight of the PCB before assembly.
4. PCB Preparation
   • Place the silicon jig on the outskirts of the solar cell pattern…
5.* RTV Silicone preparation (consider and assume the area, volume, thickness, density, mass)
6. RTV is composed of two different components like the RTV-S691 A and the catalyst (RTV-S691 B)
7. RTV mix the two RTV constituents until the mixture becomes homogenous
8. Vacuum Pumping
   a. Place the RTV sample inside the vacuum chamber and prepare three-minute timer
   b. Start up and shut down operations (manual has defined all the method of vacuum case)
9. Apply the conductive glue
10. Solar cell or cover glass placement with method and experiences.
11. Cover RTV may be rubber, polymer buffer on top of the solar cell
12. Clean and organize the workplace
13. Retrieve the samples after the 24 h cure
14. Secure the perpendicular corners
15. Soldering
16. Weigh the PCB and test it in the simulator

Solar cells Attachment Procedure



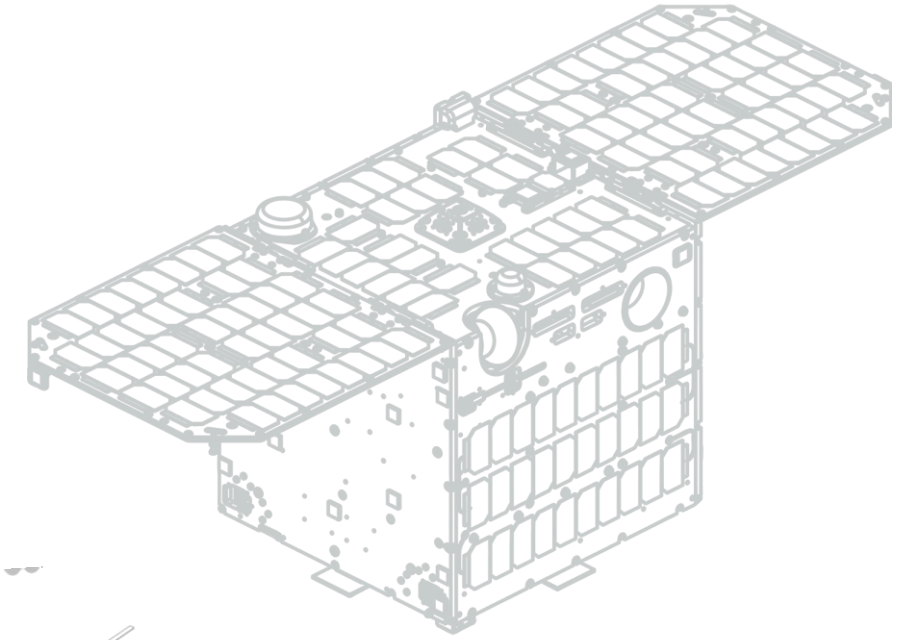
Hari applying RTV for solar cell attachment on the PCB.

Pooja coordinates for Japanese team

Dulani and Tharindu attaching the solar cells

Abhas spreading the RTV on the PCB.

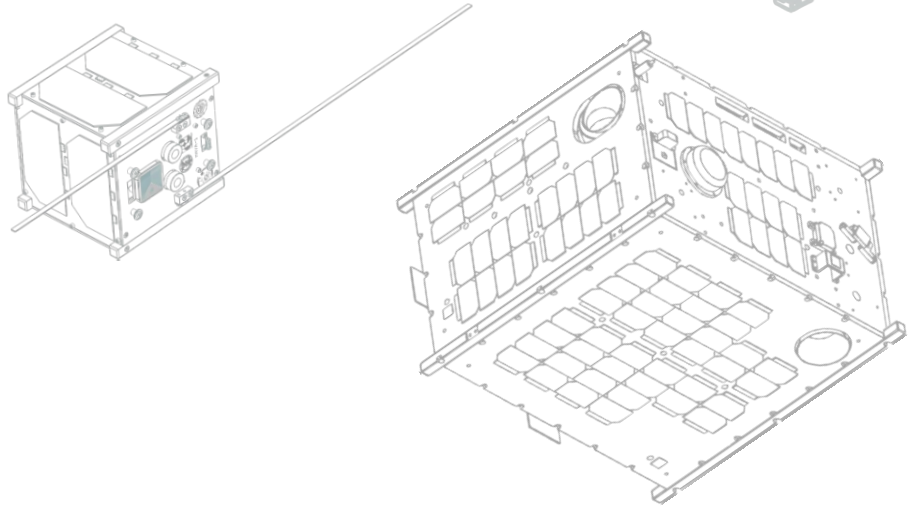
END OF ARTICLES FROM BIRDS-4 MEMBERS



UPDATES FROM THE PHILIPPINES

January 15, 2019

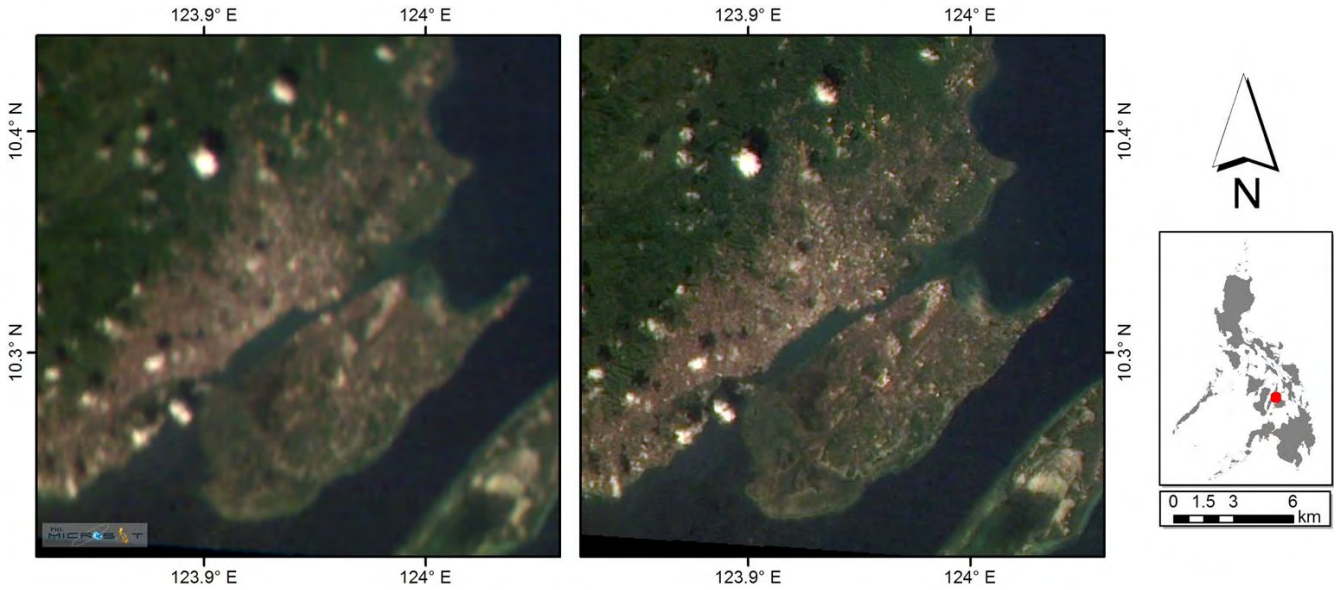
University of the Philippines-Diliman
Quezon City, Philippines



Prepared by:
Nicole V. Ignacio and Mae Ericka Jean C. Picar
(PHL-Microsat/STAMINA4Space Communications Team)

Look: Diwata-2's SMI+ERC and MFC Images

Diwata-2 sent back more images before 2018 came to a close, this time showing acquisitions made by the microsatellite's Enhanced Resolution Camera (ERC) and Middle Field Camera (MFC). The image below shows a side-by-side comparison of an SMI image, with one enhanced or pansharpened by the ERC (right), and the other with no pansharpening applied (left). Pansharpening is a technique used to enhance an image's details, which allows us to distinguish more features of the area shown.



Captured area: Cebu, Philippines

Capture date/time:
December 14, 2018, 12:53:31 PHT

Payload used:
Spaceborne Multispectral Imager (SMI) with Enhanced Resolution Camera (ERC) pansharpening on the right

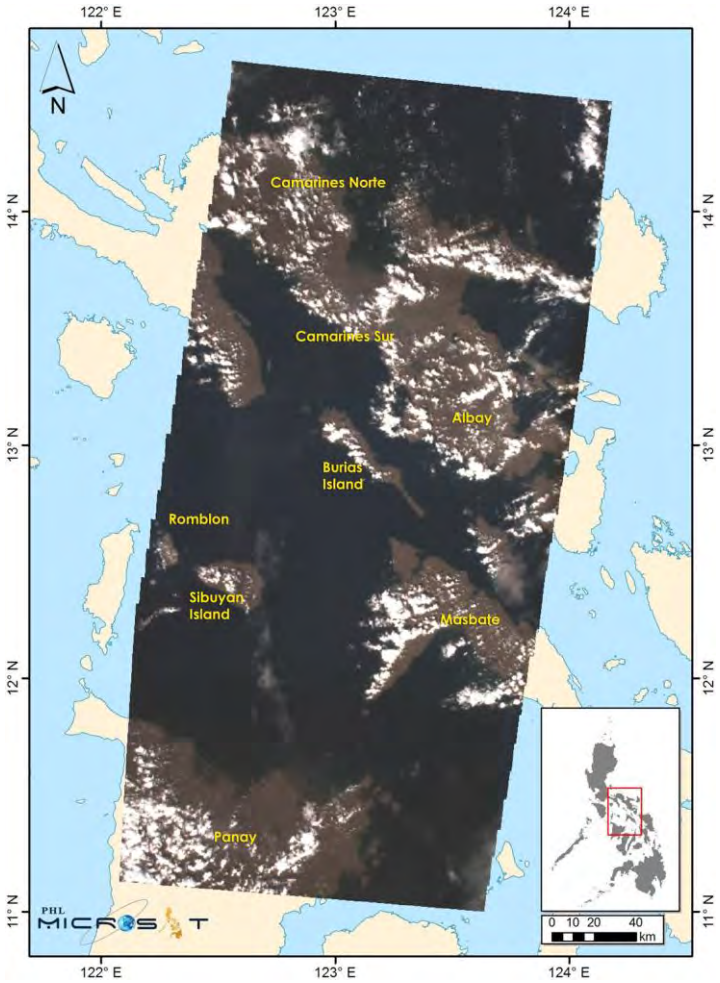
Look: Diwata-2's SMI+ERC and MFC Images

Captured areas: A portion of Luzon and Visayas

Capture date/time:
December 25, 2018, 12:47:41 PHT

Payload used:
Middle Field Camera (MFC)

This image stretches from Camarines Norte down to part of Panay on December 25, 2018. The MFC is a camera used to help locate the images captured by the High Precision Telescope (HPT) and SMI on the map. It is important in helping determine which part of the world is shown in the captured images.



Bringing the knowledge back home

Engr. John Leur Labrador was one of the DOST scholars sent to Japan to develop and assemble the Diwata-1 microsatellite. He served as a Research Associate in the PHL-Microsat Program, specifically tasked to help in the bus development of Diwata-2. He graduated with his masters in Aerospace Engineering on March 2017.

He is now back in the Philippines to share the knowledge he gained during his stay in Tohoku University, Japan. As part of his welcome, our team had a look-see on his learnings while he settles down back here.

Team Member Feature: Engr. Leur Labrador

What was the role you played during your stay in Japan?

I was in Tohoku University for 8 months, from April to December 2018. I was a Research Associate to the PHL-Microsat project, helping specifically on the development of Diwata-2.

How was your stay there as an MS scholar?

Perhaps the biggest difference was the level of understanding of the various concepts used in the development of satellite systems. As we already had previous experience in building Diwata-1, we had more confidence in coming up with ideas that could improve the second satellite.

What are your plans now that you're back in the Philippines? What are your immediate and future career goals?

I'll join a team of dedicated and talented pioneering engineers in space technology based in UP EEEI. Hopefully, we can build a thriving environment wherein we could harness the benefits of space technology to improve the lives of Filipinos.

Team Member Feature: Engr. Leur Labrador

If you were to name our next microsatellite, what would you name it and why?

I'm totally fine with Diwata. I care more about the numbering. I hope we would have a "Diwata-10" in the future, wherein each new release is a better version of the previous iteration.

How do you foresee the status of Philippine space technology in 10 years? What are your hopes for Philippine space science and research in the country?

I chose to be optimistic about it. For sure, we'll encounter setbacks along the way, but I hope that we'll keep going. With the growing interest of young engineers and scientists, along with the continued support from the government, I hope that the Philippines can become a respected country in the field of space technology in the foreseeable future.

What culture from Japan do you want to bring into your work?

I like the concept of "kaizen," the Japanese term for "improvement". It's all about continuously striving to be better at what you do. As Filipinos, I think we are very fond of making "big leaps," to the point that some of us see it as the only way towards improving. But this Japanese concept is a good reminder that it's the small things that count, which, when done consistently, will produce great results over time.

What is the best lesson you learned from your work experience Japan that you would want to share with our Filipino youth/team?

I've always been amazed with how passionate they are with what they do. I guess we've already heard "find your passion and stick to it" countless times that it has already become cliche. But seeing it everyday, in the flesh, reminded me of how

finding something you're willing to work hard for and always doing your best at it can do wonders not only for an individual, but for the society as a whole.

- Engr. John Leur Labrador

Supporting STEM students

Senior STEM students of the Manila Science High School visited the PHL-Microsat (now STAMINA4Space) Team on December 18, 2018 to know more about space technology here in the Philippines and for fulfillment of their case study in the *Practical Research* subject. The aim is to improve their knowledge on aerospace research and development, and to know more on how they can participate in this field.

The group was welcomed by Engr. Ariston Gonzalez, who was also a Manila Science High School graduate. He guided the group through the facilities, explaining the importance and the basic operations of each.

Aris was part of the team who developed the Diwata-1 and Diwata-2 bus, and currently is a University Researcher for the PHL-50 Project under the STAMINA4Space Program. He was also featured by University of the Philippines Diliman-Media and Public Relations Office. Read more here:
https://www.up.edu.ph/index.php/building-a-soul-for-diwata/

Davao Ground Radio Station (GRS)

These are photos taken during the construction of the Davao Ground Radio Station in Davao City, Philippines.

Photo courtesy of Philippine Earth Data Resource and Observation Center (PEDRO)

Philippine Earth Data Resource and Observation (PEDRO) Center established a second Ground Receiving Station in Davao City, Philippines, in partnership with the Civil Aviation Authority of the Philippines, Department of Information Communication Technology, and Department of Science and Technology Region XI. The Davao Ground Receiving Station will have a larger moving antenna with 7.3 m diameter and will be capable of receiving higher frequency data.

END OF UPDATES FROM THE PHILIPPINES

25. Kyutech receives Dominic Lunde, exchange student from Cal Poly

Tutor Hiraka (Japan), Dominic (USA), Necmi (Turkey)

15 January 2019: Arrival at Kyutech

Dinner at Yappari Steak House of Tobata Station on 16-Jan-2019

Kyutech and Cal Poly have an active staff and student exchange program in progress. In 2017, Dr Amelia Greig taught rocket propulsion during the summer here at Kyutech; we hope to get another Cal Poly lecturer this summer. Last summer, our student Uemura san spent his summer at Cal Poly. He produced a nice 28-page photo report. It can be viewed here: https://birds3.birds-project.com/wp-content/uploads/2019/01/18_10_17_z_uemura.pdf

It is expected that two Kyutech students will go to Cal Poly this summer; it is being organized now. In addition, we are receiving Cal Poly students. Shown at the left is Dominic, who just arrived. He will be with us until 8 March. He is a master degree student in aerospace engineering – he expects to complete his degree in May 2019. He is a student of Dr Greig.

His hobbies include Frisbee-throwing and rock-climbing. We plan to teach him much about the splendor of Japan. And its food, of course. You can do sinful food adventures in Japan.

26. BIRDS-3: Monthly activities report

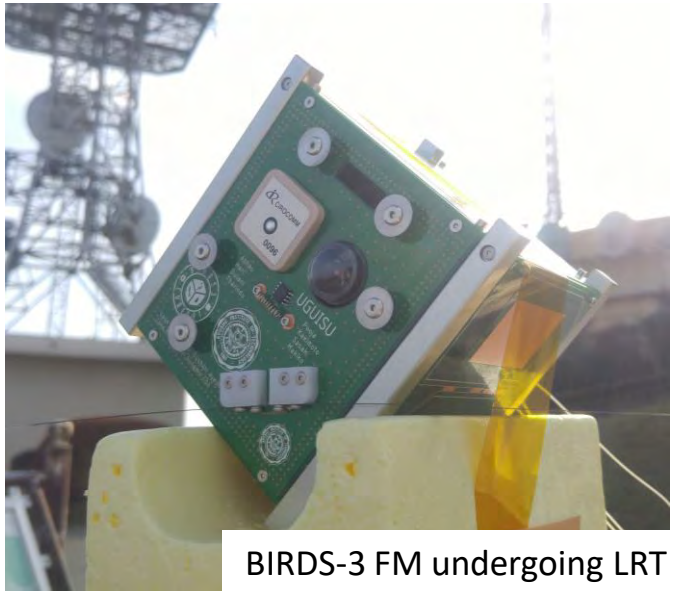
BIRDS-3
Dec ‘18- Jan ‘19
Monthly Report

by Abhas, BIRDS-3
Project Manager

BIRDS-3 Team in the clean room

BIRDS-3 Activities on Dec ’18 – Jan ‘19

BIRDS-2/3 Team during Mock LRT



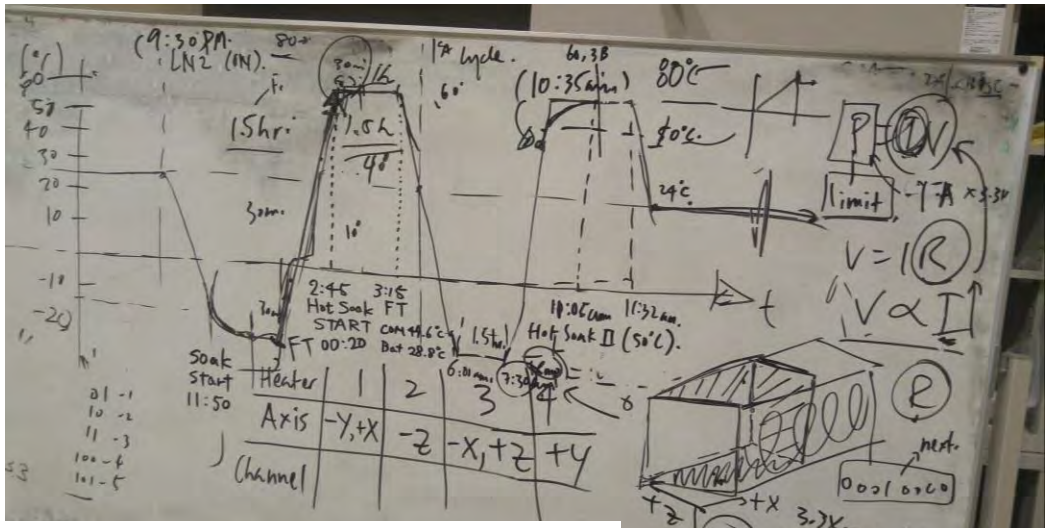
BIRDS-3 FM undergoing LRT

Kiran of BIRDS-2 testing the satellite

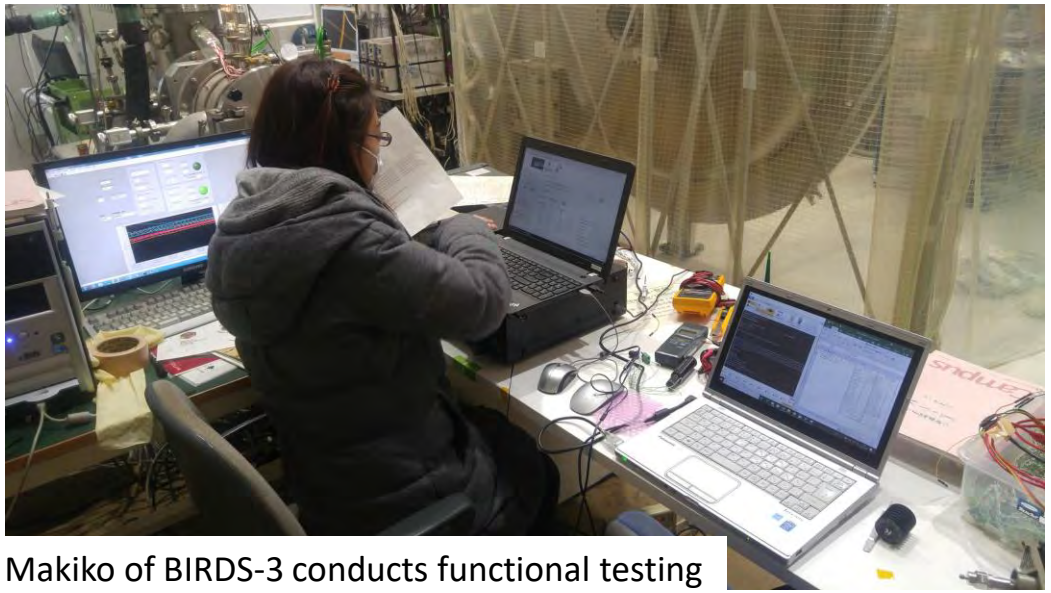
Long Range Test (LRT) at Mt. Sarakura

The satellite was attracting unsuspecting guests

BIRDS-3 Activities on Dec ’18 – Jan ‘19

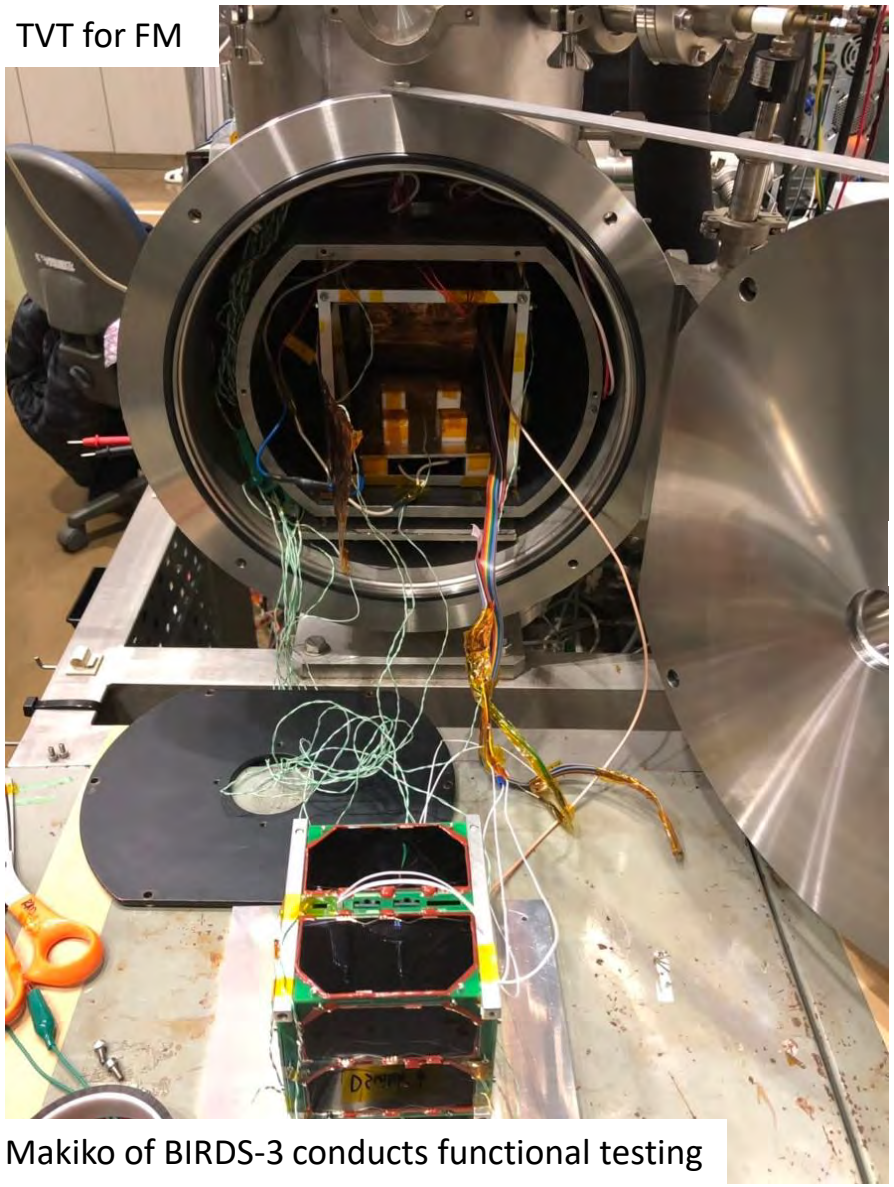


Thermal Vacuum Testing (TVT) profile

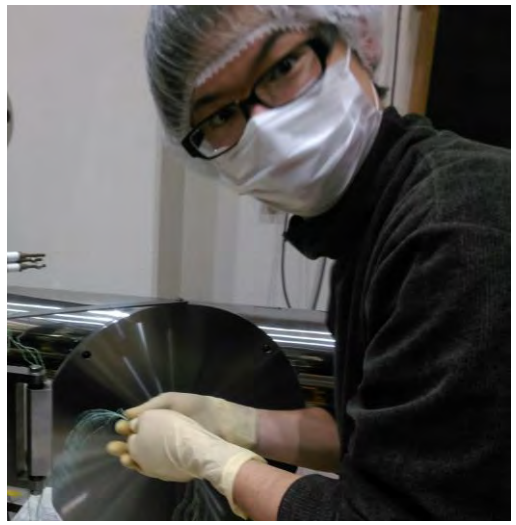


Makiko of BIRDS-3 conducts functional testing

TVT for FM

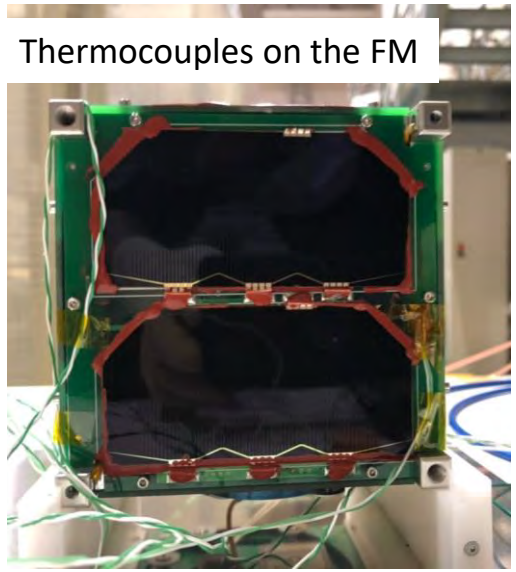


Makiko of BIRDS-3 conducts functional testing

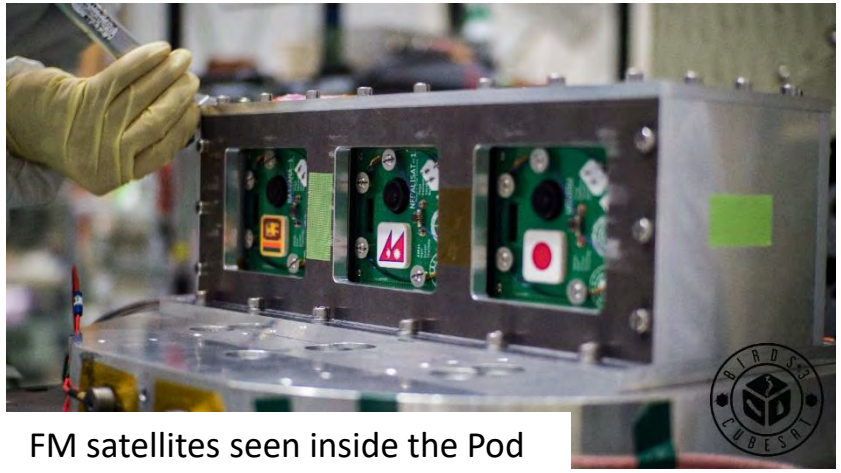


Sasaki of BIRDS-3 preps chamber

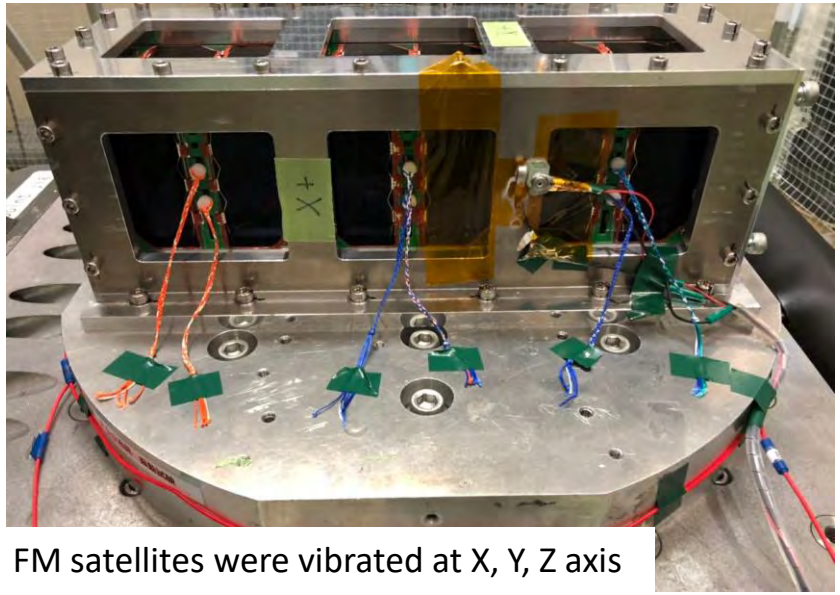
Thermocouples on the FM



BIRDS-3 Activities on Dec ’18 – Jan ‘19



FM satellites seen inside the Pod

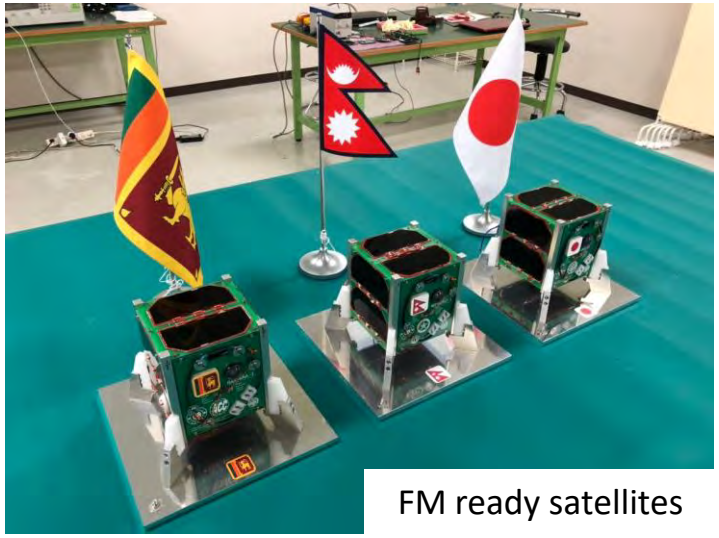


FM satellites were vibrated at X, Y, Z axis

Wider view of the satellite being placed on the shaker at CeNT

BIRDS-3 Activities on Dec ’18 – Jan ‘19

BIRDS-3 FM Final Integration



FM ready satellites

Deployment Test

BIRDS-3 FM Preparation

Team Sri Lanka

Team Nepal

Team Japan

26. BIRDS-3: Headlines of NepaliSat-1 in Nepalese Medias

By: Shrestha Hari Ram, Nepal

At the beginning of 2019, the news about Nepal's first Satellite was highlighted by the national media. The news about the launching of the first satellite was covered by the mainstream media, television, local and national newspapers as well as online portals. According to the news report, Nepal's first satellite has already reached for the environment test at KyuTech in Japan. BIRDS-3 Project has three different Nano Satellites viz. Nepalisat-1 from Nepal, Raavana-1 from Sri Lanka Uguisu from Japan.

All these three satellites have been developed by the eight members from Kyushu Institute of Technology(KyuTech) University. Among them, two students are Nepali i.e. Abash Maskey (PhD) and Hari Ram Shrestha (Masters' degree). Furthermore, the news has covered about the detail information for the date of handover of satellite from KyuTech to JAXA being on 18th Feb, 2019. Also, they added that the launch may be in the month of April from the Cygnus company of The USA. Correspondingly, Dr. Rabindra Prasad Dhakal, Chief of Faculty of Technology, from Nepal Academy of Science and Technology (NAST) has given all the detail information about the Kyushu Institute Of Technology (KyuTech) and BIRD-3 Project.

Initially, the news about the launching of Nepal's satellite went viral in social medias inside the country as well as among the Nepalese. They not only supported on this but also encouraged the team members of BIRDS-3 for this project. Additionally, while making a remark about the progress of Nepalese Government, Hon. Prime Minister of Nepal, Mr. K. P. Oli, has notified with the brief information on NepaliSat-1 project.

कान्तिपुर

समाचार

वैशाखमा नेपालले आफ्नै भू-उपग्रह प्रक्षेपण गर्ने (कार्यतालिकासहित)

पुस १७, २०७५ | गोविन्द पोखरेल

काठमाडौं – नेपालले अब आफ्नै स्याटालाइट 'भू-उपग्रह' उडाउने भएको छ । अगामी वैशाखमा नेपालले पहिले पटक आफ्नै भू-उपग्रह उडाउन लागेको हो ।

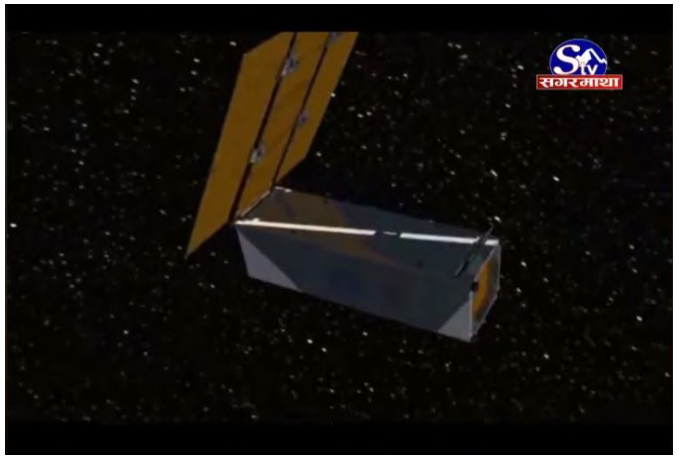
Source: KantipurDaily

Some News capture photos from Nepal

Written By: Shrestha Hari Ram

The news from the news24

News from nagariknews



Broadcasted by Sagarmatha Television

PM of NEPAL address to the NanoSatellite in Nepal Parliament.

News fromonlinekhabar.com

Posted by the NASA exploring the universe Facebook page

BIRDS-3 FM Satellite Communication Test (All Satellite Together)

2019-01-15

By: Tharindu

BIRDS-3 FM Satellite Communication Test (All Satellite Together)

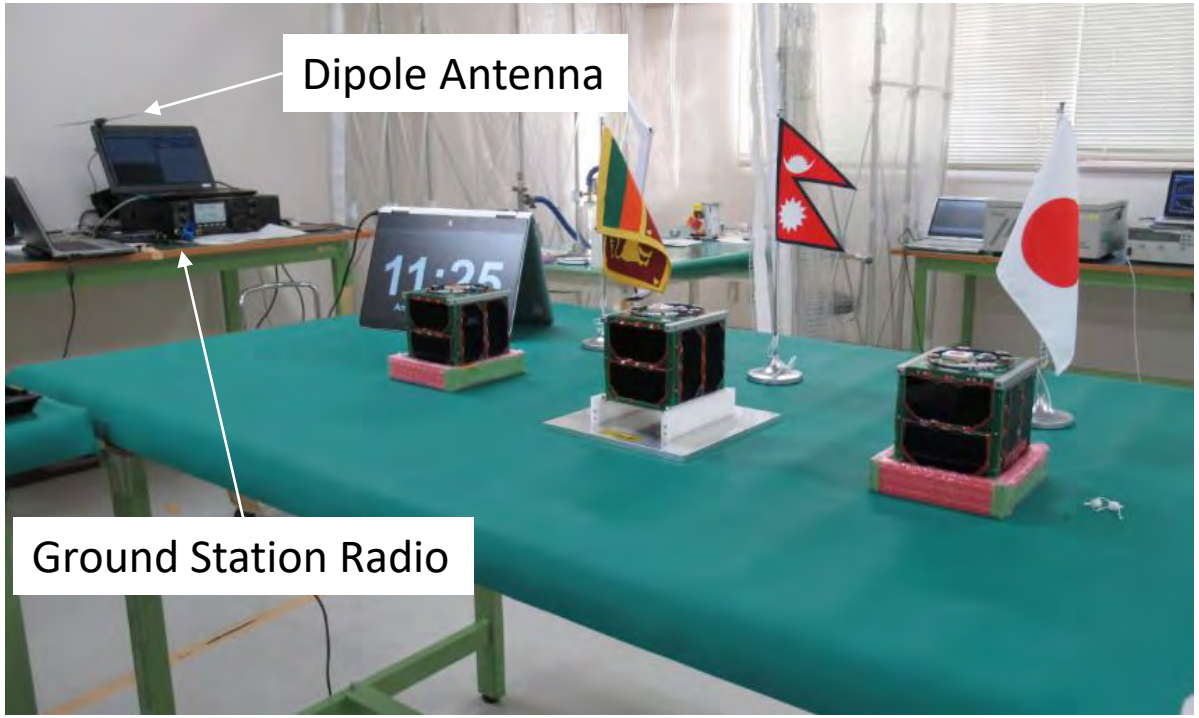
Why is this test needed?

There are two main reasons

1. Checking whether satellites are working correctly after final assembly.

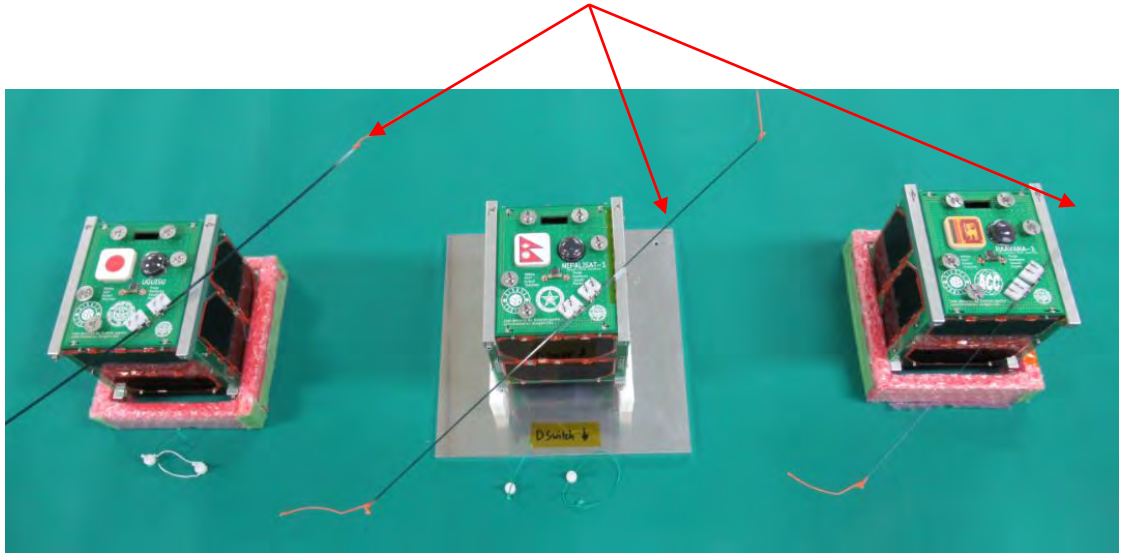
2. On orbit all satellites are closer. When one satellite is transmitting beacon other two satellites are in receiving mode. Because of beacon of one of satellite other two satellites' receiving mode might be interrupted. Second reason is to see when all satellites are turned on, satellites can be operated or not and getting an idea about how to operate.

While Test was being done



Before the antenna deployment

All antennas are in deployed state



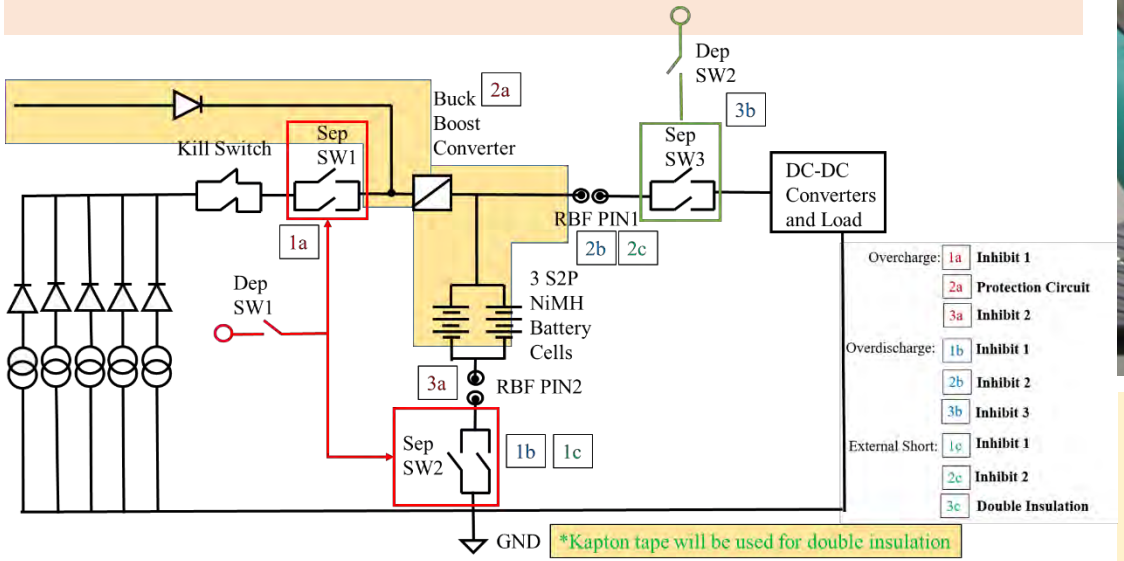
After the antenna deployment

From the ground station different commands were sent to selected satellite and checked the response and its functionality.

29. BIRDS-3: FM Inhibit Check

- By Pooja Lepcha, Bhutan, 15-Jan-2019

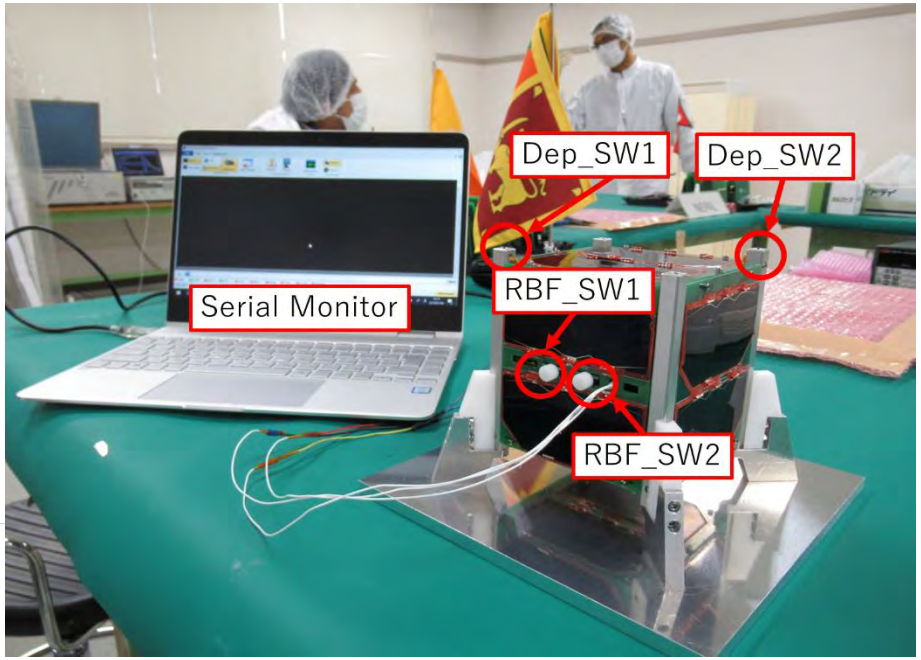
It comes as a requirement from JAXA for any satellites to have a protection circuit with 3 inhibits. BIRDS-3 satellites have been designed to incorporate 3 inhibit system with the use of Remove Before Flight (RBF) pins and Deployment Switches.



EPS block diagram with inhibits

Pattern	1	2	3	4	5
RBF-1	O	×	×	×	×
RBF-2	×	O	×	×	×
Dep-SW1	×	×	O	×	×
Dep-SW2	×	×	×	O	×

O : inserted, pushed X : removed , released



The way inhibits works is, when it is removed or released, the circuit completes, so the satellite turns on. The procedure for performing this test is by following the patterns as shown in the table on the left. The satellite shouldn't turn on in any of the patterns except pattern 5 where no inhibit is functioning. The satellite operation is checked via serial monitor

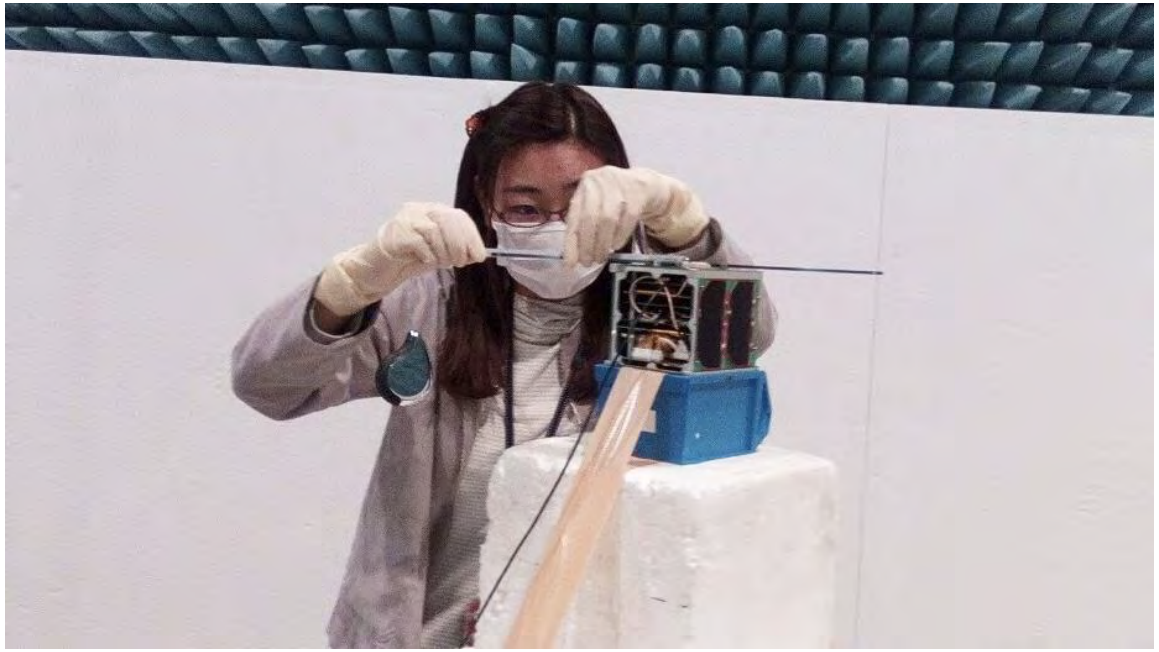
This inhibit test report has to be submitted to JAXA as a safety review document. It has to be made absolutely sure that these inhibit systems are working properly because the satellites needs to be OFF state from delivery, to launch until deployment. All the BIRDS-3 FM satellites passed this test.

30. BIRDS-3: FM (flight model) antenna tuning

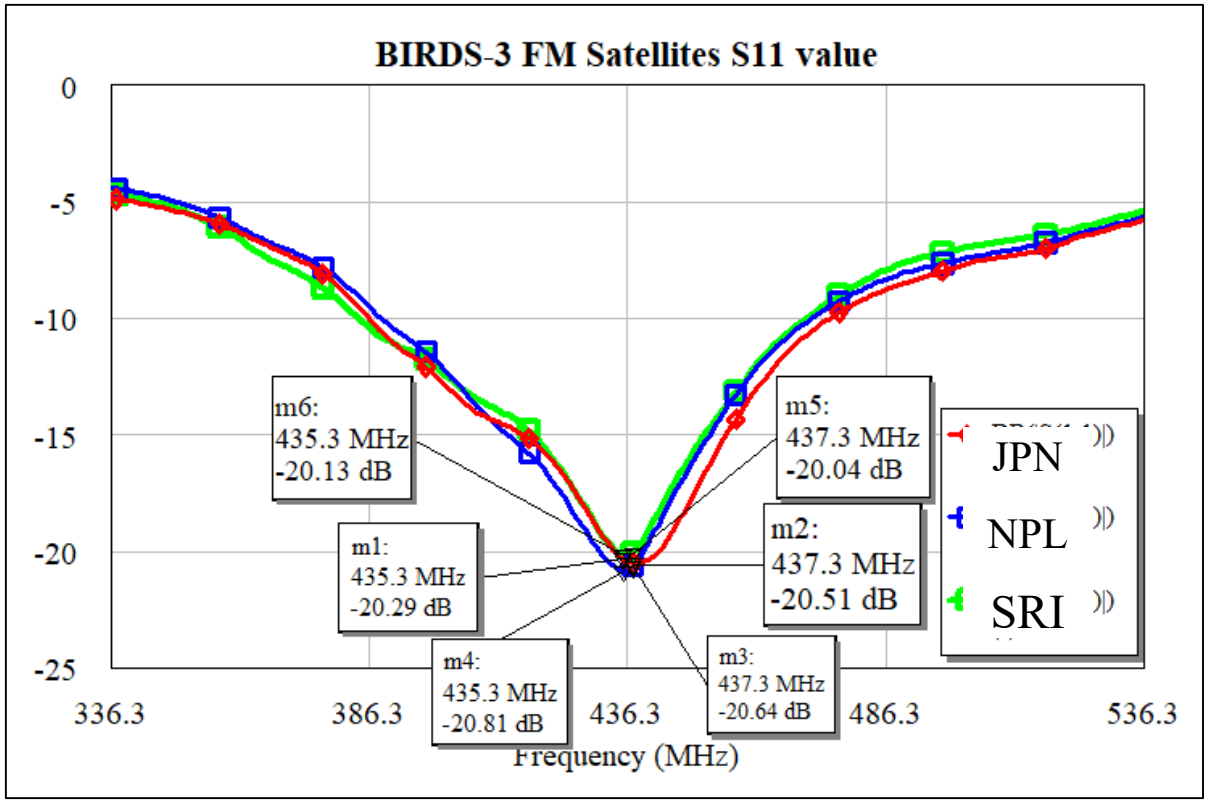
-- by Makiko Kishimoto (Japan, BIRDS-3), 16-Jan-2019

BIRDS-3 FM antennas were tuned on 5 January, 2019. It is very important to tune antennas to get communication success. Because if it is not correct length, the frequency which can receive from ground station also change.

When tuning antennas, use vector network analyzer (VNA). To tune best condition, repeat cut the antenna, measure the length of antenna, and also check the S11 value of VNA; it should be less than -10dB for good antenna.



Measuring antenna length



After finishing measurement, plotted the graph with S11 value. The result is the right side graph. Red line is Japan, blue line is Nepal, and green line is Sri Lanka, then approximate shapes of the graph were almost the same for all three satellites.

31. Aoba VELOX-IV launched successfully by JAXA

Launch Success,
The Innovative Satellite Technology Demonstoration-1 aboard Epsilon-4
January 18, 2019 (JST)

Aoba VELOX-IV is a collaborative project between Kyutech and NTU of Singapore. It is the 4th of a series. The goal of the series is lunar science missions.

https://www.youtube.com/watch?v=WeJGPmB-3LM

National Research and Development Agency Japan Aerospace Exploration Agency (JAXA) launched the Innovative Satellite Technology Demonstration-1* aboard the fourth Epsilon Launch Vehicle (Epsilon-4) from the JAXA Uchinoura Space Center. The launch proceeded on time at 9:50:20 a.m., (Japan Standard Time, JST) January 18, 2019.
The launch and flight of Epsilon-4 occurred nominally. All seven satellites separated from the launch vehicle successfully; the Rapid Innovative Payload Demonstration Satellite 1 (RAPIS-1) was jettisoned from the launch vehicle approximately 51 minutes 55 seconds into launch. Thereafter, other onboard satellites - MicroDragon, RISESAT, ALE-1, OrigamiSat-1, Aoba VELOX-IV and NEXUS - were respectively separated from Epsilon-4.

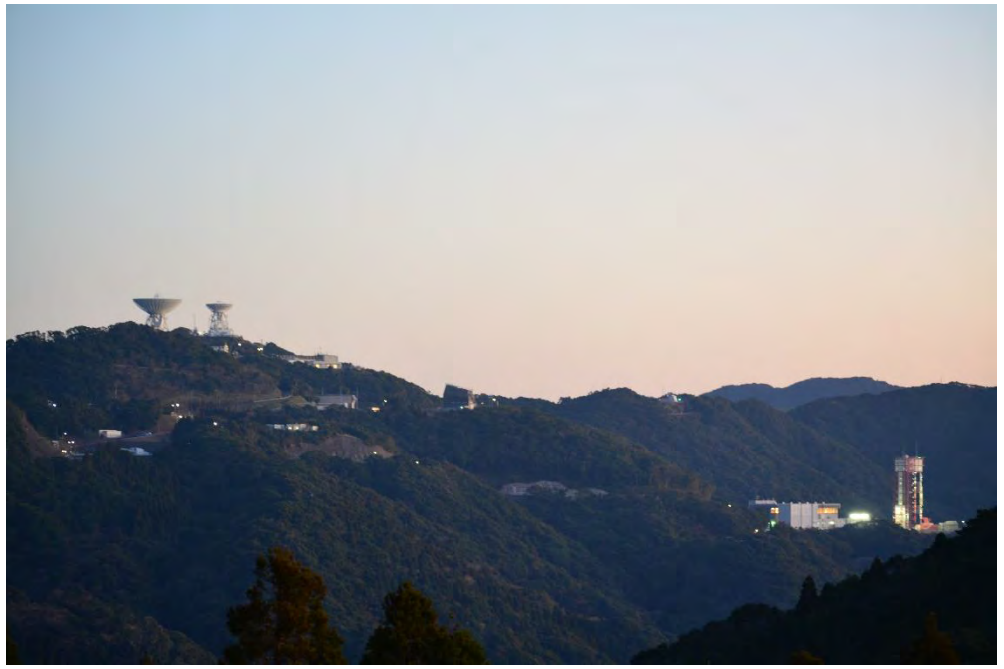
JAXA appreciates all for the support shown in behalf of the Epsilon-4 launch.

*Innovative Satellite Technology Demonstoration-1 is a suit of seven small satellite missions to demonstrate innovative new technological approaches;
- Rapid Innovative payload demonstration Satellite 1 (RAPIS-1), which JAXA developed with the assistance of startups
- Small satellites: MicroDragon, RISESAT and ALE-1
- CubeSats: OrigamiSat-1, **Aoba VELOX-IV**, NEXUS

See the original JAXA press release:
http://global.jaxa.jp/press/2019/01/20190118_epsilon4.html

Continued next page

All photos on this page were taken by Dr. Rodrigo Cordova [LaSEINE post-doc, Mexico] on 18 January 2019



JAXA's Uchi No Ura Space Center

This is an outstanding CG (computer graphics) simulation, by JAXA, of the deployment of the onboard satellites
https://www.youtube.com/watch?v=wZm50MfdCLc

The launch pad after launch

End of this **BIRDS Project Newsletter**

(ISSN 2433-8818)

Issue Number Thirty-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.